**Dr.M.G.R.**
**Educational and Research Institute**
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University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095

**COMPUTER SCIENCE AND ENGINEERING**
**(ARTIFICIAL INTELLIGENCE)**

# CURRICULUM & SYLLABUS

## BACHELOR OF TECHNOLOGY

## COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE)

## (ACADEMIC YEAR - 2020 -2021)

## DEPARTMENT

## OF

## COMPUTER SCIENCE AND ENGINEERING

**Dr.M.G.R.**
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**COMPUTER SCIENCE AND ENGINEERING**
**(ARTIFICIAL INTELLIGENCE)**

# DECLARATION

I, **Dr. S. GEETHA**, Head of Computer Science and Engineering Department, hereby declare that this copy of the syllabus (B.Tech –Computer Science and Engineering – Artificial IntelligenceFull Time) is the final version which is being taught in the class and uploaded in our University website. I assure that the Syllabi available in our University website is verified and found correct. The Curriculum and Syllabi have been ratified by our Academic Council / Vice Chancellor.

**Date:**                                             **Signature**

Dr.M.G.R.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | | **I SEMESTER** | | | | | |
| 1 | BEN18001/ BEN20001 | Technical English –I | Ty | 1 | 0/0 | 2/0 | 2 |
| 2 | BMA18001/ BMA20001 | Mathematics – I | Ty | 3 | 1/0 | 0/0 | 4 |
| 3 | BPH18001/ BPH20001 | Engineering Physics –I | Ty | 2 | 0/1 | 0/0 | 3 |
| 4 | BCH18001/ BCH20001 | Engineering Chemistry –I | Ty | 2 | 0/1 | 0/0 | 3 |
| 5 | BES18001/ BES20001 | Basic Electrical &Electronics Engineering | Ty | 2 | 0/1 | 0/0 | 3 |
| 6 | BES18002 / BES20002 | Basic Mechanical &Civil Engineering | Ty | 2 | 0/1 | 0/0 | 3 |
| | | **PRACTICALS*** | | | | | |
| 1 | BES18L01/ BES20L01 | Basic Engineering Workshop | Lb | 0 | 0/0 | 2/0 | 1 |
| 2 | BES18ET1/BES20ET1 | Orientation to Entrepreneurship &Project Lab | ETL | 0 | 0/0 | 2/0 | 1 |

**Credits Sub Total: 20**

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | | **II SEMESTER** | | | | | |
| 1 | BMA18003/BMA20003 | Mathematics – II | Ty | 3 | 1/0 | 0/0 | 4 |
| 2 | BPH18002/ BPH20002 | Engineering Physics –II | Ty | 2 | 0/1 | 0/0 | 3 |
| 3 | BCH18002/ BCH20002 | Engineering Chemistry –II | Ty | 2 | 0/1 | 0/0 | 3 |
| 4 | BES18003/ BES20003 | Environmental Science* | Ty | Non credit course | | | |
| | | **PRACTICALS*** | | | | | |
| 1 | BEN18ET1/BEN20ET1 | Communication Lab | ETL | 1 | 0/0 | 2/0 | 1 |
| 2 | BES18ET2/BES20ET2 | Basic Engineering Graphics | ETL | 1 | 0/0 | 2/0 | 2 |
| 3 | BES18L02/BES20L02 | Integrated Physical Science Lab | Lb | 0 | 0/0 | 2/0 | 1 |
| 4 | BES18ET3/BES20ET3 | C Programming and Lab | ETL | 1 | 0/0 | 2/0 | 2 |

**Credits Sub Total: 16**
**TOTAL CREDITS: 36**

**C: Credits L: Lecture T: Tutorial S.Lr:  Supervised Learning P: Problem / Practical R: Research**
**Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab     * Internal Evaluation**

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# COMPUTER SCIENCE AND ENGINEERING
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|---|---|---|---|---|---|---|---|
| | | **III SEMESTER** | | | | | |
| 1 | BMA18008/BMA20008 | Discrete Mathematics | Ty | 3 | 1/0 | 0/0 | 4 |
| 2 | BCS18001/BCS20001 | Data Structures | Ty | 3 | 1/0 | 0/0 | 4 |
| 3 | BCS18003/BCS20003 | Computer Organization and Architecture | Ty | 3 | 1/0 | 0/0 | 4 |
| 4 | BEC18I01/BEC20I01 | Digital Systems | Ty | 3 | 0/0 | 0/0 | 3 |
| | | **PRACTICALS*** | | | | | |
| 1 | BCS18L01/BCS20L01 | Data Structures Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BCS18L02/BCS20L02 | Object Oriented Programming With C++ Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BEC18IL1/BEC20IL1 | Digital Systems Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BCS20AET1 | Artificial Intelligence: Principles and Techniques | ETL | 1 | 0/1 | 3/0 | 3 |

**Credits Sub Total: 21**

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | | **IV SEMESTER** | | | | | |
| 1 | BMA18016/BMA20016 | Statistics for Computer Engineers | Ty | 3 | 1/0 | 0/0 | 4 |
| 2 | BCS18004/BCS20004 | Database Management Systems | Ty | 3 | 0/1 | 0/0 | 4 |
| 3 | BCS18005/BCS20005 | Design and Analysis of Algorithms | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BEC18I02/BEC20I02 | Microprocessors and Microcontrollers | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BHS18NC1/BHS20NC1 BHS18NC2/BHS20NC2 | The Indian Constitution*/The Indian Traditional Knowledge* | Ty | 2 | 0/0 | 0/0 | NC |
| | | **PRACTICALS*** | | | | | |
| 1 | BCS20AET2 | Deep Learning and its Applications | ETL | 1 | 0/1 | 3/0 | 3 |
| 2 | BCS18L03/BCS20L03 | Database Management Systems  Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BCS18L04/BCS20L04 | Design and Analysis of Algorithms  Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BEC18IL2/BES20IL2 | Microprocessors and Microcontrollers Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 5 | BCS18TS1/BCS20TS1 | Technical Skill I (Evaluation) | Lb | 0 | 0/0 | 3/0 | 1 |
| 6 | BEN18SK1/ BEN20SK1 | Soft Skill I | ETL | 0 | 0/0 | 3/0 | 1 |

**Credits Sub Total: 22**

**C: Credits L: Lecture T: Tutorial S.Lr:  Supervised Learning P: Problem / Practical R: Research Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab     * Internal Evaluation**

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| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | V SEMESTER | | | | | | |
| 1 | BCS18006/BCS20006 | Operating Systems | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BCS18007/BCS20007 | Computer Networks | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BXX18OEX/BXX20OEX | Open Elective | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCS18008/BCS20008 | System Software and Principles of Compiler  Design | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BCS20A03 | Big Data Analytics | Ty | 3 | 0/0 | 0/0 | 3 |
| | | PRACTICALS* | | | | | |
| 1 | BCS18ET2/BCS20ET2 | Computer Graphics | ETL | 1 | 0/1 | 3/0 | 3 |
| 2 | BCS18L05/BCS20L05 | Network Programming Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BCS18L06/BCS20L06 | Operating Systems Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BCS20AL1 | Big Data Analytics Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 5 | BCS18TS2/BCS20TS2 | Technical Skill II | Lb | 0 | 0/0 | 3/0 | 1 |

**Credits Sub Total: 22**

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| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| VI SEMESTER | | | | | | |
| 1 | BCS18009/BCS20009 | Object Oriented Software Engineering | Ty | 3 | 1/0 | 0/0 | 4 |
| 2 | BIT18003/BIT20003 | Web Technology and Web Services | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BXX18OEX/BXX20OEX | Open Elective | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCS20A04 | Natural Language Processing | Ty | 3 | 0/0 | 0/0 | 3 |
| | PRACTICALS* | | | | | | |
| 1 | BCS18ET3/BCS20ET3 | PHP/MySQL | ETL | 1 | 0/1 | 3/0 | 3 |
| 2 | BCS18L08/BCS20L08 | Object Oriented Software Engineering Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BCS20AL2 | Natural Language Processing Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BEN18SK2/ BEN20SK2 | Soft Skill II | ETL | 0 | 0/0 | 3/0 | 1 |
| 5 | BCS18L09/BCS20L09 | Inplant Training / Internship /  Mini Project | Lb | 0 | 0/0 | 3/0 | 1 |
| 6 | BCS18TS3/BCS20TS3 | Technical Skill III (Evaluation) | Lb | 0 | 0/0 | 3/0 | 1 |

**Credits Sub Total: 21**

**C: Credits L: Lecture T: Tutorial S. Lr : Supervised Learning P : Problem / Practical**

**R : ResearchTy/Lb/ETL: Theory/Lab/Embedded Theory and Lab*Internal evaluation**

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| VII SEMESTER | | | | | | |
| 1 | BCS18010/BCS20010 | Data Warehousing and Data Mining | Ty | 3 | 0/0 | 0/3 | 4 |
| 2 | BCS18011/BCS20011 | Dot Net Framework | Ty | 3 | 1/0 | 0/0 | 4 |
| 3 | BMG18002/BMG20002 | Management  Concepts and Organizational  Behavior | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCS20A05 | **Data Visualization Techniques** | Ty | 3 | 0/0 | 0/3 | 4 |
| | PRACTICALS* | | | | | | |
| 1 | BXX18OLX/BXX20OLX | Open Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BCS18L11/BCS20L11 | Data Mining Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BCS18L12/BCS20L12 | Dot Net Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BCS18L13/BCS20L13 | Project Phase – I | Lb | 0 | 0/0 | 3/3 | 2 |
| 5 | BHS18FLX/BHS20FLX | Foreign Language | Lb | 0 | 0/0 | 3/0 | 1 |

**Credits Sub Total: 21**

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| | | VIII SEMESTER | | | | | |
|---|---|---|---|---|---|---|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
| 1 | BCS18EXX/BCS20EXX | Elective I | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BCS20A06 | Machine Learning | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BCS18EXX/BCS20EXX | Elective II | Ty | 3 | 0/0 | 0/0 | 3 |
| | | PRACTICALS* | | | | | |
| 1 | BCS18L14/BCS20L14 | Project (Phase – II) | Lb | 0 | 0/0 | 12/12 | 8 |

**Credits Sub Total: 17**

**C: Credits L: Lecture T: Tutorial S.Lr:  Supervised Learning P: Problem / Practical R: Research
Ty/Lb/ETL: Theory /Lab/Embedded Theory and Lab     * Internal Evaluation**

| | | ELECTIVE –I & II(CSE) | | | | | |
|---|---|---|---|---|---|---|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
| 1 | BCS18E24/ BCS20E24 | Information Storage  Management | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BCS18E25/ BCS20E25 | Network  Infrastructure Management | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BCS18E26/BCS20E26 | Foundations of Parallel Programming | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCS18E27/ BCS20E27 | Virtualization | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BCS18E28/ BCS20E28 | Hadoop Distributed File System | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BCS18E29/ BCS20E29 | Mobile Databases | Ty | 3 | 0/0 | 0/0 | 3 |
| 7 | BCS18E30/ BCS20E30 | Web Engineering | Ty | 3 | 0/0 | 0/0 | 3 |
| 8 | BCS18E31/ BCS20E31 | 4G Networks | Ty | 3 | 0/0 | 0/0 | 3 |
| 9 | BCS18E16/ BCS20E16 | Database Security | Ty | 3 | 0/0 | 0/0 | 3 |
| 10 | BCS18E01/ BCS20E01 | Video Analytics | Ty | 3 | 0/0 | 0/0 | 3 |
| 11 | BCS18E34/ BCS20E34 | Mainframe Computing | Ty | 3 | 0/0 | 0/0 | 3 |
| 12 | BCS18E35/ BCS20E35 | Neuro Fuzzy Computing | Ty | 3 | 0/0 | 0/0 | 3 |
| 13 | BCS18E02/ BCS20E02 | AI and Cyber Security | Ty | 3 | 0/0 | 0/0 | 3 |
| 14 | BCS18E03/ BCS20E03 | Business Intelligence | Ty | 3 | 0/0 | 0/0 | 3 |
| 15 | BCS18E39/ BCS20E39 | Real Time Systems | Ty | 3 | 0/0 | 0/0 | 3 |
| 16 | BCS18E40/ BCS20E40 | Distributed Computing | Ty | 3 | 0/0 | 0/0 | 3 |

**Credit Summary**
**Semester : 1    : 20**
**Semester : 2    : 16**
**Semester : 3    : 21**
**Semester : 4    : 22**
**Semester : 5    : 22**
**Semester : 6    : 21**
**Semester : 7    : 21**
**Semester : 8    : 17**

**Total Credits   : 160**

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| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| Open Electives -CIVIL |||||||||
| 1 | BCE18OE1/BCE20OE1 | Water Pollution And Its Management | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BCE18OE2/BCE20OE2 | Environment,HealthAndSafety InIndustries | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BCE18OE3/BCE20OE3 | Green Building And Vastu Concepts | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCE18OE4/BCE20OE4 | Climate Change And Sustainable Development | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BCE18OE5/BCE20OE5 | Intelligent Transportation Systems | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BCE18OE6/BCE20OE6 | Geographical Information System And Mapping | Ty | 3 | 0/0 | 0/0 | 3 |
| 7 | BCE18OE7/BCE20OE7 | Industrial Pollution Prevention And Cleaner Production | Ty | 3 | 0/0 | 0/0 | 3 |
| 8 | BCE18OE8/BCE20OE8 | Air Pollution And Control | Ty | 3 | 0/0 | 0/0 | 3 |
| Open Electives Lab ||||||||
| 1 | BCE18OL1/BCE20OL1 | Building Drawing Practice Using Autocadd | LB | 0 | 0/0 | 3/0 | 1 |
| 2 | BCE18OL2/BCE20OL2 | GeographicalInformationSystemAnd MappingLab | LB | 0 | 0/0 | 3/0 | 1 |
| 3 | BCE18OL3/BCE20OL3 | Environmental Engineering Laboratory | LB | 0 | 0/0 | 3/0 | 1 |

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVES- CHEMICAL ENGINEERING ||||||||
| 1 | BCT18OE1/BCT20OE1 | Fundamentals Of Nanoscience | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BCT18OE2/BCT20OE2 | Electrochemical Engineering | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BCT18OE3/BCT20OE3 | Alternative Fuels And Energy System | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BCT18OE4/BCT20OE4 | Petrochemical Unit Processes | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BCT18OE5/BCT20OE5 | Principles Of Desalination Technologies | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BCT18OE6/BCT20OE6 | Piping Design Engineering | Ty | 3 | 0/0 | 0/0 | 3 |
| 7 | BCT18OE7/BCT20OE7 | E-Waste Management | Ty | 3 | 0/0 | 0/0 | 3 |

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| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVE- Electrical and Electronics Engineering | | | | | | | |
| 1 | BEE18OE1/BEE20OE1 | Electrical Safety for Engineers | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BEE18OE2/BEE20OE2 | Energy Conservation Techniques | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BEE18OE3/BEE20OE3 | Electric Vehicle Technology | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BEE18OE4/BEE20OE4 | Biomedical Instrumentation | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BEE18OE5/BEE20OE5 | Introduction to Power Electronics | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BEE18OE6/BEE20OE6 | Industrial Instrumentation | Ty | 3 | 0/0 | 0/0 | 3 |
| 7 | BEE18OE7/BEE20OE7 | Solar Energy Conversion System | Ty | 3 | 0/0 | 0/0 | 3 |
| 8 | BEE18OE8/BEE20OE8 | Wind Energy Conversion System | Ty | 3 | 0/0 | 0/0 | 3 |
| 9 | BEE18OE9/BEE20OE9 | Energy Storage Technology | Ty | 3 | 0/0 | 0/0 | 3 |
| OPEN LAB | | | | | | | |
| 1 | BEE18OL1/BEE20OL1 | Transducer Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BEE18OL2/BEE20OL2 | PLC and SCADA Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BEE18OL3/BEE20OL3 | Electrical Maintenance Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BEE18OL4/BEE20OL4 | Power Electronics Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 5 | BEE18OL5/BEE20OL5 | Bio Medical Instrumentation Lab | Lb | 0 | 0/0 | 3/0 | 1 |

| S.No | Course Code | Course Title | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVES-Biotechnology | | | | | | | |
| 1. | BBT18OE1/BBT20OE1 | Food and Nutrition | Ty | 3 | 0/0 | 2/0 | 3 |
| 2. | BBT18OE2/BBT20OE2 | Human Physiology | Ty | 3 | 0/0 | 0/0 | 3 |
| 3. | BBT18OE3/BBT20OE3 | Clinical Biochemistry | Ty | 3 | 0/0 | 0/0 | 3 |
| 4. | BBT18OE4/BBT20OE4 | Bioprocess Principles | Ty | 3 | 0/0 | 0/0 | 3 |
| 5. | BBT18OE5/BBT20OE5 | Biosensors and biomedical Devices in Diagnostics | Ty | 3 | 0/0 | 0/0 | 3 |
| 6. | BBT18OE6/BBT20OE6 | Basic Bioinformatics | Ty | 3 | 0/0 | 0/0 | 3 |
| Open Labs | | | | | | | |
| 1. | BBT18OL1/BBT20OL1 | Basic Biochemistry Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2. | BBT18OL2/BBT20OL2 | Basic Bioprocess Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3. | BBT18OL3/BBT20OL3 | Basic Microbiology Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4. | BBT18OL4/BBT20OL4 | Basic Bioinformatics Lab | Lb | 0 | 0/0 | 3/0 | 1 |

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# COMPUTER SCIENCE AND ENGINEERING
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| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVES- MECHANICAL ENGINEERING | | | | | | | |
| 1 | BME18OE1/BME20OE1 | Industrial Engineering | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BME18OE2/BME20OE2 | Finite Element Method | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BME18OE3/BME20OE3 | AutomobileEngineering | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BME18OE4/BME20OE4 | Industrial Robotics | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BME18OE5/BME20OE5 | Renewable Sources Of Energy | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BME18OE6/BME20OE6 | Refrigeration And Air Conditioning | Ty | 3 | 0/0 | 0/0 | 3 |
| 7 | BME18OE7/BME20OE6 | Composite Materials | Ty | 3 | 0/0 | 0/0 | 3 |
| Open Labs | | | | | | | |
| 1 | BME18OL1/BME20OL1 | Internalcombustion Engines & steamlab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BME18OL2/BME20OL2 | Computer aided design And analysis lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BME18OL3/BME20OL3 | Mechanical measurements & metallurgy lab | Lb | 0 | 0/0 | 3/0 | 1 |

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVES- Dr APJ Abdul Kalam Center for Research | | | | | | | |
| 1 | BMG18OE1/BMG20OE1/ BMG13E12/BMG20E12 | Technical Entrepreneurship | ETL | 2 | 0/1 | 2/0 | 3 |
| 2 | BMG18OE2/BMG20OE2 | Advanced Program in Entrepreneurship | ETL | 2 | 0/1 | 2/0 | 3 |

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| OPEN ELECTIVES - ELECTRONICS AND COMMUNICATION ENGINEERING | | | | | | | |
| 1 | BEC18OE1/BEC20OE1 | Internet of Things and its Applications | Ty | 3 | 0/0 | 0/0 | 3 |
| 2 | BEC18OE2/BEC20OE2 | Cellular Mobile Communication | Ty | 3 | 0/0 | 0/0 | 3 |
| 3 | BEC18OE3/BEC20OE3 | Satellite and its Applications | Ty | 3 | 0/0 | 0/0 | 3 |
| 4 | BEC18OE4/BEC20OE4 | Fundamentals of Sensors | Ty | 3 | 0/0 | 0/0 | 3 |
| 5 | BEC18OE5/BEC20OE5 | Basics of Microprocessors and Microcontrollers | Ty | 3 | 0/0 | 0/0 | 3 |
| 6 | BEC18OE6/BEC20OE6 | Industry 4.0 Concepts | Ty | 3 | 0/0 | 0/0 | 3 |

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| OPEN LABS | | | | | | | |
|---|---|---|---|---|---|---|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.L r | P/R | C |
| 1 | BEC18OL1/BEC20OL1 | Sensors and IoT Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BEC18OL2/BEC20OL2 | Robotics Control Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BEC18OL3/BEC20OL3 | Basics of MATLAB | Lb | 0 | 0/0 | 3/0 | 1 |

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

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# COMPUTER SCIENCE AND ENGINEERING
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**SEMESTER – I**
**DEPARTMENT OF ENGLISH**

| Subject Code | Subject Name :  TECHNICAL ENGLISH - I | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18001/ BEN20001 | Prerequisite : None | Ty | 1 | 0/0 | 2/0 | 2 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Strengthen their vocabulary in both technical and business situations
- Get practice in functional grammar
- Learn the effective way of corresponding with officials
- Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages.
- Strain learners in organized academic and professional writing in LSRW skills

**COURSE OUTCOMES (Cos)**
Students completing this course were able to

| CO1 | Strengthen their active and technical vocabulary |
|---|---|
| CO2 | Understand functional grammar and gain proficiency in technical writing |
| CO3 | Learn the appropriate technique of writing formal and business letters and  prepare oneself to read the advertisement and prepare the resume relevantly |
| CO4 | Learn to give instructions, suggestions, recommendations and comprehend and infer the information from the given passages |
| CO5 | Focus on academic and technical writing |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | 3 | - | - | - | - | 3 | - | 3 |
| CO2 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 1 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 2 | 2 |  | 2 | 3 |  | 3 |
| CO4 | 3 | 3 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 3 | 1 | 3 |
| CO5 | 1 | 2 | 2 | 3 | 3 | 2 | 2 |  | 3 | 3 | 2 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 |  | 1 |  |  |
| CO2 | 1 | 2 | 1 | 2 |
| CO3 | 1 | 2 | 1 | 2 |
| CO4 | 1 | 2 | 2 | 2 |
| CO5 | 1 | 2 | 2 | 1 |

3/2/1 Indicates Strength of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18001/ BEN20001 | **TECHNICAL ENGLISH - I** | Ty | 1 | 0/0 | 2/0 | 2 |

**UNIT I          VOCABULARY BUILDING                                                    6 Hrs**

The concept of Word Formation-Root words and affixes from foreign languages and their use in English to form derivatives.-Homophones- Words often confused-Verbal analogy

**UNIT II          BASIC WRITING SKILLS                                                    6 Hrs**

Using Idioms and phrases in sentences-Sentence structures: statements, interrogative and imperative-Use of Conditional/if' clauses in sentences-Importance of proper punctuation-Creating coherence with sentence markers- Organizing coherent paragraphs in essays

**UNIT III          IDENTIFYING COMMON ERRORS IN WRITING                        6 Hrs**

Subject-verb agreement-Noun-pronoun agreement- Misplaced modifiers-Articles-Prepositions- Redundancies and Clichés

**UNIT IV          WRITING PRACTICE- NATURE AND STYLE OF TECHNICAL WRITING**

**6 Hrs**

Describing Gadgets- Defining Concepts-Classifying data-Comprehension-Essay Writing-Informal and Formal  Letter Writing:

**UNIT V          ORAL COMMUNICATION AND INTERACTIVE LEARNING          6 Hrs**

(This unit involves interactive practice sessions in Language Lab)

Activities to develop knowledge in Word formation, Vocabulary and analytical thinking-Instructions and – Recommendations-Formal and Informal Registers in Speech-Listening and taking notes

**Total Hours :  30**

**TEXT BOOK :**

1. Quest : A Textbook of Communication Skills, Vijay Nicole, 2017.
2. Pushkala, R, Padmasani Kannan S, Anuradha  V, Chandrasena M Rajeswaran

**REFERENCE BOOKS:**

(i) Practical English Usage. Michael Swan. OUP. 1995.

(ii) Remedial English Grammar. F.T. Wood. Macmillan.2007

(iii)On Writing Well.William Zinsser.Harper Resource Book. 2001

(iv) Study Writing. Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.

(v) Communication Skills. Sanjay Kumar and Pushp Lata.Oxford University Press. 2011.

(vi) Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press

(vi) Pronunciation in Use ,Mark Hancock. Cambridge University Press. 2012

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ACCREDITED WITH GRADE

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**DEPARTMENT OF MATHEMATICS**

| Subject Code | Subject Name : **MATHEMATICS-I** | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18001/ BMA20001 | Prerequisite : None | Ty | 3 | 1/0 | 2/0 | 4 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Apply the Basic concepts in Algebra
- Use the Basic concepts in Matrices
- Identify and solve problems in Trigonometry
- Understand the Basic concepts in Differentiation
- Apply the Basic concepts in Functions of Several variables

**COURSE OUTCOMES (Cos)**

Students completing this course were able to

| | |
|---|---|
| CO1 | Find the summation of the given series of binomial, exponential & logarithmic |
| CO2 | Transform a non – diagonal matrix into an equivalent diagonal matrix using orthogonal transformation. |
| CO3 | Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts. |
| CO4 | Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function. |
| CO5 | Evaluate the partial / total differentiation and maxima / minima of a function of several variables. |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 2 | 1 | - | 3 | 3 | - | 3 |
| CO2 | 3 | 3 | 1 | 2 | 3 | 1 | 1 | - | | 1 | - | 3 |
| CO3 | 3 | 3 | 2 | 2 | 3 | 2 | 1 | | 2 | 3 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 2 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 2 | 3 | 1 | 1 |
| CO4 | 2 | 3 | 1 | 1 |
| CO5 | 2 | 3 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 –High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18001/ BMA20001 | **MATHEMATICS – I** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I         ALGEBRA                                                                                    12Hrs**

Binomial, Exponential, Logarithmic Series (without proof of theorems) – Problems on Summation, Approximation and Coefficients.

**UNIT I I        MATRICES                                                                               12Hrs**

Characteristic equation – Eigen values and Eigen vectors of a real matrix – Properties of Eigen values – Cayley - Hamilton theorem(without proof) – Orthogonal reduction of a symmetric matrix to Diagonal form.

**UNIT I II       TRIGONOMETRY                                                                      12Hrs**

Expansions of Sin $n\theta$, Cos $n\theta$ in powers of $\operatorname{Sin}\theta$ and $\operatorname{Cos}\theta$ – Expansion of Tan $n\theta$ – Expansions of $\operatorname{Sin}^n\theta$ and $\operatorname{Cos}^n\theta$ in terms of Sines and Cosines of multiples of $\theta$ – Hyperbolic functions –  Separation into real and imaginary parts.

**UNIT I V       DIFFERENTIATION                                                                   12Hrs**

Basic concepts of Differentiation – Elementary differentiation methods – Parametric functions – Implicit function – Leibnitz theorem(without proof) – Maxima and Minima – Points of inflection.

**UNIT V         FUNCTIONS OF SEVERAL VARIABLES                             12Hrs**

Partial derivatives – Total differential – Differentiation of implicit functions – Taylor's expansion – Maxima and Minima by Lagrange's Method of undetermined multipliers – Jacobians.

**Total Hours :  60**

**TEXT BOOKS:**
1. Kreyszig E., Advanced Engineering Mathematics (10 th ed.), John Wiley & Sons, (2011).
2. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).

**REFERENCE BOOKS:**
1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).
**2.** John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, Engineering   Mathematics Vol. I (4th Revised ed.), S.Chand& Co., Publishers, New Delhi (2000).
4. John Bird, Higher Engineering Mathematics (5th ed.), Elsevier Ltd, (2006).

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# COMPUTER SCIENCE AND ENGINEERING
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| Subject Code | Subject Name : **ENGINEERING PHYSICS - I** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BPH18001/ BPH20001 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Outline the relation between Science, Engineering & Technology.
- Demonstrate competency in understanding basic concepts.
- Apply fundamental laws of Physics in Engineering & Technology.
- To identify & solve problems using physics concepts.
- Produce and present activities associated with the course through effective technical communication

**COURSE OUTCOMES (Cos)**
Students completing this course were able to

| | |
|---|---|
| CO1 | Demonstrate competency in understanding basic concepts. |
| CO2 | Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge. |
| CO3 | Identify and provide solutions for engineering problems. |
| CO4 | Relate the technical concepts to day to day life and to practical situations. |
| CO5 | Think analytically to interpret concepts. |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 2 | 2 | 1 | | 1 | 2 | | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | | 2 | 2 | 1 | 1 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 1 | 2 |
| CO5 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 1 | 1 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 2 | 3 | 1 | 1 |
| CO4 | 2 | 3 | 1 | 1 |
| CO5 | 1 | 3 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BPH18001/ BPH20001 | **ENGINEERING  PHYSICS – I** | Ty | 2 | 0/1 | 0/0 | 3 |

## UNIT I    MECHANICS & PROPERTIES OF MATTER                                        9Hrs
**Mechanics** : Introduction- scalar and vector quantities - rigid body - moment of inertia - forces in nature -  Newton's laws of motion - derivation of Newton's second law of motion - motion of rocket – dynamical concepts - kinematics - conservation of energy and momentum - conservative and non-conservative forces - mechanics of continuous media - friction and its applications.
**Properties of Matter:** Elasticity - stress, strain and Hook's law - Poisson's ratio - three moduli of elasticity - twisting couple on a wire - viscosity - flow of liquid through a narrow tube: Poiseuille's law - Ostwald`s viscometer - flow of blood in human body.

## UNIT II   SHM AND ACOUSTICS                                                                         9Hrs
**SHM**:  Simple harmonic motion - differential equation of SHM - graphical representation of SHM - average kinetic energy of vibration - total energy of vibration - free and forced vibrations - damped and undamped vibrations - resonance - transverse wave on a string - law of transverse vibration of string - verification of the laws of transverse vibration of string - standing waves.
**Acoustics :** Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics Ultrasonics - Production of ultrasonic waves - detection of ultrasonic waves - acoustic grating -    application of ultrasonic waves.

## UNIT III WAVE OPTICS                                                                                         9Hrs
Huygen`s principle - interference of light - wavefront splitting and amplitude - airwedge - Newton`s   rings - Michelson interferometer and its applications - Fraunhofer diffraction from a single slit - Rayleigh criterion for  limit of resolution - diffraction grating and resolving power of a telescope.

## UNIT IV  ELECTROMAGNETIC THEORY                                                          9Hrs
Electric field - coulomb`s law - alternating emf - rms and average value  of an alternating current & voltage - resistors, capacitors and inductor - energy stored in a capacitor - LCR circuit & resonance – magnetism- definition - types - Biot Savart law - energy stored in a magnetic field - Domain theory - electromagnetic induction - self and mutual inductance - Faraday`s law of electromagnetic induction -Lenz law.

## UNIT V   LASER                                                                                                      9Hrs
Laser principle and characteristics - amplification of light by population inversion -  properties of laser beams: mono-chromaticity, coherence, directionality and brightness -  different types of lasers - Ruby laser-Nd-YAG laser-He-Ne laser-$CO_2$ laser -  semiconductor laser - applications of lasers in science, engineering and medicine.

**Total Hours : 45**

### TEXT BOOKS :
1.  Brijlal, M. N. Avadhanulu & N. Subrahmanyam, Text Book of Optics, S. Chand Publications, 25th edition, 2012
2.  R. Murugeshan, Electricity and Magnetism, S.Chand Publications, 10th edition, 2017
3.  R. Murugeshan & Kiruthiga Sivaprasath, Modern Physics, S.Chand Publications, 2016

### REFERENCE BOOKS:
1.  Dr. Senthil Kumar  Engineering Physics I  VRB Publishers, 2016
2.  N Subrahmanyam & Brijlal, Waves and Oscillations, Vikas Publications, New Delhi,1988
3.  N Subrahmanyam & Brijlal, Properties of Matter, S. Chand Co., New Delhi, 1982
4.  N Subrahmanyam & Brijlal, Text book of Optics, S. Chand Co., New Delhi, 1989
5.  R. Murugeshan, Electricity and Magnetism, S. Chand & Co., New Delhi, 1995
6.  Thygarajan K & Ajay Ghatak, Laser Theory and Applications, Macmillan, New Delhi, 1981

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARTMENT OF CHEMISTRY

| Subject Code | Subject Name : **ENGINEERING CHEMISTRY - I** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCH18001/ BCH20001 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

## OBJECTIVES

- Providing an insight into basic concepts of chemical thermodynamics.
- To create awareness about the water quality parameters, water analysis and softening of water from industrial perspective.
- Imparting fundamentals of emf, storage and fuel cells.
- Creating awareness about corrosion and its control methods.
- Introducing modern materials such as composites along with basic concepts of polymer chemistry and plastics.

## COURSE OUTCOMES (Cos)

Students completing this course were able to

| CO1 | Gain a clear understanding of the basics of chemical thermodynamics which include concepts such as Enthalpy, Entropy and Free energy. |
|---|---|
| CO2 | Obtain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening and Domestic Water treatment. |
| CO3 | Improving the basic knowledge in electrical conductance and emf and also understand the chemical principles of storage devices. |
| CO4 | Observe the information about corrosion and understand the mechanisms of corrosion and the methods of corrosion control. |
| CO5 | Articulate the science of polymers and composites. |

## Mapping of Course Outcome with Program Outcome (POs)

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | - | - | - | - | - | - | - | 3 |
| CO2 | 3 | 3 | 2 | 3 | - | - | - | - | - | 3 | - | 2 |
| CO3 | 3 | 2 | 2 | - | 2 | 3 | - | 3 | - | - | - | 3 |
| CO4 | 3 | - | - | 3 | 3 | 3 | 3 | - | - | - | - | 3 |
| CO5 | 3 | - | - | 3 | 3 | - | - | - | - | - | - | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | - | 3 | - | - |
| CO2 | - | 3 | - | - |
| CO3 | - | 3 | - | - |
| CO4 | - | 3 | - | - |
| CO5 | - | 3 | - | - |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCH18001/ BCH20001 | **ENGINEERING CHEMISTRY – I** | Ty | 2 | 0/1 | 0/0 | 3 |

**UNIT I           CHEMICAL THERMODYNAMICS                                        8Hrs**
Introduction, Terminology in thermodynamics –System, Surrounding, State and Path functions, Extensive and intensive properties.Laws of thermodynamics – I and II laws-Need for the II law.Enthalpy, Entropy, Gibbs free energy, Helmholtz free energy - Spontaneity and its criteria.Maxwell relations, Gibbs -Helmholtz equation (relating E & A) and (relating H & G), Van't Hoff equations.

**UNIT II        TECHNOLOGY OF WATER                                            9Hrs**
Water quality parameters – Definition and expression.Analysis of water – alkalinity, hardness and its determination (EDTA method only).Boiler feed water and Boiler troubles-Scales and sludges, Caustic embrittlement, Priming and Foaming and Boiler corrosion. Water softening processes – Internal and external conditioning – Lime soda, Zeolite, Demineralisation methods.Desalination processes-RO and Electrodialysis .Domestic water treatment.

**UNIT III        ELECTROCHEMISTRY AND ENERGY STORAGE DEVICES                10Hrs**
Conductance – Types of conductance and its Measurement. Electrochemical cells – Electrodes and electrode potential, Nernst equation – EMF measurement and its applications. Types of electrodes- Reference electrodes-Standard hydrogen electrode- Saturated calomel electrode-Quinhydrone electrode –Determination of $P^H$ using these electrodes.Reversible and irreversible cells– Fuel cells- $H_2$–$O_2$ fuel cell, Batteries-Lead storage battery,Nickel– Cadmium and Lithium-Battery.

**UNIT IV        CORROSION AND PROTECTIVE COATING                            9Hrs**
Introduction–Causes of Corrosion–Consequences- Factors affecting corrosion. Theories of corrosion-Chemical corrosion and Electrochemical corrosion. Methods ofcorrosion control – corrosion inhibitors, Sacrificial anode and Impressed current cathodic protection.Protective coatings- Metallic coatings- Chemical conversion coatings-paints-Constituents and functions.

**UNIT V        POLYMERS AND COMPOSITES                                        9Hrs**
Monomers – Functionality – Degree of polymerization-Tacticity.Polymers – Classification, Conducting Polymers,Biodegradable polymers- Properties and applications.Plastics – Thermoplastics and thermosetting plastics,Compounding of plastics – Compression moulding, injection moulding and extrusion processes.Polymer composites- introduction- Types of composites- particle reinforced- fiber reinforced- structural composites- examples. Matrix materials, reinforcement materials- Kevlar, Polyamides, fibers, glass, carbon fibers, ceramics and metals .

**Total Hours : 45**

**TEXTBOOKS:**
1. S.Nanjundan & C.SreekuttanUnnithan, "Applied Chemistry", Sreelakshmi Publications, (2007)
2. Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

**REFERENCE BOOKS:**
1. P.C. Jain & Monika Jain, "Engineering Chemistry", Dhanpat Rai publishing Co., (Ltd.) (2013).
2. J. C. Kuriacose & J. Rajaram, "Chemistry in Engineering & Technology", Tata Mc Graw Hill (1996).
3. B.R.Puri, L.R.Sharma & M.S.Pathania, "Principles of Physical Chemistry", Vishal publishing co., (2013).

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

### DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

| Subject Code | Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18001/ BES20001 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Understand the concepts of circuit elements, circuit laws and coupled circuits.
- Acquire knowledge on conventional &non conventional energy production.
- Gain information on measurement of electrical parameters.
- Identify basic theoretical principles behind the working of modern electronic gadgets.
- Demonstrate digital electronic circuits and assemble simple devices.

**COURSE OUTCOMES (Cos):(3-5)**
Students completing this course were able to

| CO1 | Students understand Fundamental laws and theorems and their practical applications |
|---|---|
| CO2 | Predict the behavior of different electric and magnetic Circuits. |
| CO3 | Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution. |
| CO4 | Identify & Apply schematic symbols and understand the working principles of electronic devices |
| CO5 | Analyze basics of digital electronics and solving problems  and design combinational circuits |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 1 | 1 | 1 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 1 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 3 | 1 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 1 |
| CO2 | 2 | 3 | 2 | 1 |
| CO3 | 1 | 2 | 1 | 1 |
| CO4 | 2 | 3 | 2 | 1 |
| CO5 | 3 | 3 | 3 | 2 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium,1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18001/ BES20001 | BASIC ELECTRICAL & ELECTRONICS ENGINEERING | Ty | 2 | 0/1 | 0/0 | 3 |

**UNIT I          ELECTRIC CIRCUITS                                                     9Hrs**
Electrical Quantities – Ohms Law – Kirchhoff's Law – Series and Parallel Connections – Current Division and Voltage Division Rule -  Source Transformation – Wye (Y) – Delta (Δ) , Delta  (Δ) – Wye (Y) Transformation – Rectangular to Polar and Polar to Rectangular.

**UNIT II          MACHINES & MEASURING INSTRUMENTS                        9Hrs**
Construction & Principle of Operation of DC motor & DC Generator – EMF equation of Generator – Torque Equation of Motor – Construction & Principle of operation of a Transformer – PMMC – Moving Iron types of meter – Single Phase Induction Type Energy Meter.

**UNIT III          BASICS OF POWER SYSTEM                                            9Hrs**
Generation of Electric Power (Thermal, Hydro, Wind and Solar) – Transmission & Distribution of Electric Power – Types of Transmission & Distribution Schemes – Representation of Substation.

**UNIT IV          ELECTRON DEVICES                                                       9Hrs**
Passive Circuit Components-Classification of Semiconductor-PN Junction Diode-Zener diode- Construction and Working Principle –Applications--BJT-Types of configuration-JFET.

**UNIT V          DIGITAL SYSTEM                                                             9Hrs**
Number System – Binary, Decimal, Octal, Hexadecimal – Binary Addition Subtraction, Multiplication & Division– Boolean Algebra – Reduction of Boolean Expressions – Logic Gates - De-Morgan's Theorem , Adder – Subractor.

**Total Hours : 45**

**TEXT BOOKS:**
1. D P Kothari, I J Nagrath, Basic Electrical Engineering, Second Edition, , Tata McGraw-Hill Publisher
2. A Course In Electrical And Electronic Measurements And Instrumentation,A.K. Sawhney, publisher DHANPAT RAI&CO
3. Text Book of Electrical Technology: Volume 3: Transmission, Distribution and Utilization,B.L.Theraja, A.K.Theraja, publisher S.CHAND
4. Morris Mano, M. (2002) Digital Logic and Computer Design. Prentice Hall of India
5. Millman and Halkias1991, Electronic Devices and Circuits , Tata McGraw Hill,

**REFERENCE BOOK:**
1. R.Muthusubramanian, S.Salivahanan, K A Muraleedharan, Basic Electrical, Electronics And Computer Engineering, Second Edition, ,Tata McGraw-Hill publisher.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARMENT OF MECHANICAL ENGINEERING

| Subject Code | Subject Name : **BASIC MECHANICAL & CIVIL ENGINEERING** | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18002 / BES20002 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Learn  Basics of  Internal Combustion  Engines, power plants and boilers
- Demonstrate How metals are formed, joined, using machining operations Lathe, Milling and Drilling machines
- To identify & solve problems in Engineering Mechanics
- Learn basics of Building materials and construction
- Know the basic process of concrete, types  of  masonry Construction of Roads , Railways, Bridges and Dams.

**COURSE OUTCOMES (Cos)**
Students completing this course were able to

| CO1 | Demonstrate the working principles of power plants, IC Engines and boilers.. |
|---|---|
| CO2 | Utilize the concept of metals forming, joining process and apply in suitable machining process |
| CO3 | Identify and provide solutions for problems in engineering mechanics |
| CO4 | Utilize the  concept of  Building materials and construction able to perform  concrete mix and masonry types |
| CO5 | Demonstrate how Roads, Railways,  dams, Bridges have been constructed |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 3 | 3 | - | 3 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | - | 2 |
| CO3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 2 | - | 2 |
| CO4 | 3 | 2 | 2 | 1 | 1 | 1 | 3 | 1 | 2 | 2 | - | 2 |
| CO5 | 3 | 2 | 2 | 1 | 1 | 1 | 3 | 2 | 2 | 2 | - | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | - | 1 | 1 | - |
| CO2 | - | 1 | 1 | 1 |
| CO3 | - | 1 | 1 | - |
| CO4 | - | 1 | 1 | 1 |
| CO5 | - | 1 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ ETL | L | T/ SL r | P/R | C |
|---|---|---|---|---|---|---|
| BES18002 / BES20002 | **BASIC MECHANICAL & CIVIL ENGINEERING** | Ty | 2 | 0/1 | 0/0 | 3 |

**UNIT I     THERMAL ENGINEERING**                                            **9 Hrs**
Classification of internal combustion engine – two stroke, four stroke petrol and diesel engines.Classification of Boilers – Cochran boiler – Locomotive boilers – Power plant classification – Working of Thermal and Nuclear power plant.

**UNIT II     MANUFACTURING PROCESS**                                        **13 Hrs**
Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing. Casting process – Patterns -Moulding tools - Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.
Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature.

**UNIT III     MECHANICS**                                                    **9 Hrs**
Stresses and Strains – Definition – Relationship – Elastic modulus – Centre of gravity – Moment of Inertia – Problems. (Simple Problems Only).

**UNIT IV     BUILDING MATERIALS AND CONSTRUCTION**                          **7 Hrs**
**Materials**: Brick - Types of Bricks - Test on bricks - Cement – Types, Properties and uses of cement – Steel - Properties and its uses – Ply wood and Plastics.
**Construction**:Mortar – Ingredients – Uses – Plastering - Types of mortar - Preparation – Uses – Concrete – Types – Grades – Uses – Curing – Introduction to Building Components (foundation to roof) – Masonry – Types of masonry (Bricks & Stones)

**UNIT V     ROADS, RAILWAYS, BRIDGES & DAMS**                               **7 Hrs**
Roads – Classification of roads – Components in roads – Railways -Components of permanent way and their function – Bridges – Components of bridges – Dams – Purpose of dams – Types of dams.
**Total  Hours : 45**

**TEXT BOOKS:**
1.  S. Bhaskar, S. Sellappan, H.N.Sreekanth,, (2002), "Basic Engineering" –Hi-Tech Publications
2.  K. Venugopal, V. Prabhu Raja, (2013-14), "Basic Mechanical Engineering", Anuradha Publications.
3.  K.V. Natarajan (2000), Basic Civil Engineering,Dhanalakshmi Publishers
4.  S.C. Sharma(2002),Basic Civil Engineering,Dhanpat Raj Publications

**REFERENCE BOOKS:**
1.  PR.SL. Somasundaram, (2002), "Basic Mechanical Engineering" –, Vikas Publications.
2.  S.C. Rangawala(2002), Building Material and Construction, S. Chand Publisher

**DEPARTMENT OF ENGINEERING SCIENCES**

| Subject Code | Subject Name : **BASIC ENGINEERING WORKSHOP** | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18L01/ BES20L01 | Prerequisite : None | **Lb** | **0** | **0/0** | **2/0** | **1** |

L : Lecture  T : Tutorial  SLr : Supervised Learning  P: Project  R : Research  C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Familiarize the plumbing tools, fittings, carpentry tools, etc.
- Identify basic electrical wiring and measurement of electrical quantities.
- Identify Electronic components, logic gates and soldering process
- Display simple fabrication techniques
- Execute a project independently and make a working model

**COURSE OUTCOMES (Cos)**

Students completing this course were able to

| CO1 | Demonstrate fitting tools and carpentry tools, & Perform the process of Filing, Chipping, Cutting. |
|---|---|
| CO2 | Perform the process of fabrication of tray, cones and funnels, Tee Halving Cross, Lap Joint Martise & Joints |
| CO3 | Demonstrate various types of wirings and other equipments. |
| CO4 | Measure fundamental parameters using the electronic instruments |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | - | - | - | - | 2 | - | 3 | 3 | 3 | - | 3 |
| **CO2** | 3 | 2 | - | - | 1 | 2 | - | 2 | 2 | 2 | - | 2 |
| **CO3** | 3 | 3 | - | - | 1 | 1 | - | 3 | 2 | 2 | - | 2 |
| **CO4** | 3 | 2 | - | - | 1 | 1 | - | - | 2 | 2 | - | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| **CO1** | - | 1 | - | - |
| **CO2** | - | 1 | - | - |
| **CO3** | - | 1 | - | - |
| **CO4** | - | 1 | - | - |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18L01/ BES20L01 | **BASIC ENGINEERING WORKSHOP** | Lb | 0 | 0/0 | 2/0 | 1 |

## MEP  PRACTICE

1. **FITTING :**
   Study of fitting tools and Equipments – Practicing, filing, chipping and cutting – making V-joints, half round joint, square cutting and dovetail joints.

2. **CARPENTRY:**
   Introduction – Types of wood – Tools – Carpentry processes – Joints – Planning practice – Tee Halving Joint – Cross Lap Joint – Maritse and Tenon Joint – Dovetail Joint

3. **SHEET METAL:**
   Study of tools and equipments – Fabrication of tray, cones and funnels.

## CIVIL ENGINEERING PRACTICE

1. Study of Surveying and its equipments
2. Preparation of plumbing line sketches for water supply and sewage lines
3. Basic pipe connection using valves, laps, couplings, unions, reduces and elbows in house hold fittings

## ELECTRICAL ENGINEERING PRACTICE

1. Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
2. Measurement of energy using single phase energy meter.
3. Measurement of resistance to earth of an electrical equipment.
4. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
5. Fluorescent lamp wiring.
6. Stair case wiring

## ELECTRONIC ENGINEERING PRACTICE

1. Study of Electronic components and equipments – Resistor, colour coding measurement of AC signal parameter (peak- peak, rms period, frequency) using CRO
2. Soldering practice – Components Devices and Circuits – Using general purpose PCB

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**Abdul Kalam CoE for Innovation & Entrepreneurship**

| Subject Code | Subject Name : **ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET1/BES20ET1 | Prerequisite : None | **ETL** | **0** | **0/0** | **2/0** | **1** |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

## OBJECTIVES

- Understand how entrepreneurship Education transforms individuals into successful leaders.
- Identify individual potential &S have career dreams
- Understand difference between ideas & opportunities
- Identify components & create action plan.
- Use brainstorming in a group to generate ideas.

## COURSE OUTCOMES (Cos) : (3 – 5)
Students completing this course were able to

| CO1 | Develop a Business plan & improve ability to recognize business opportunity |
|---|---|
| CO2 | Do a self-analysis to build an entrepreneurial career. |
| CO3 | Articulate an effective elevator pitch. |
| CO4 | Analyze the local market environment & demonstrate the ability to find an attractive market |
| CO5 | Identify the required skills for entrepreneurship & develop |

## Mapping of Course Outcome with Program Outcome (POs)

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 2 | 2 | 3 | 2 | 2 | 2 | - | 2 | 2 | 2 | 1 |
| CO2 | 3 | 2 | - | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 |
| CO3 | - | 2 | 2 | 2 | - | 3 | - | 3 | 3 | 3 | - | - |
| CO4 | - | 3 | 2 | 2 | 2 | 2 | - | 3 | 2 | 2 | 3 | - |
| CO5 | - | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 1 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 1 |
| CO2 | 1 | 1 | - | - |
| CO3 | 1 | 1 | - | - |
| CO4 | 1 | 1 | 1 | 1 |
| CO5 | 1 | 1 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET1/BES20ET1 | **ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB** | ETL | 0 | 0/0 | 2/0 | 1 |

**UNIT I        CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR                3 Hrs**
Introduction to entrepreneurship education – Myths about entrepreneurship – How has entrepreneurship changed the country – Dream it. Do it - Idea planes - Some success stories – Global Legends – Identify your own heroes

**UNIT I I        ENTREPRENEURIAL STYLE        3 Hrs**
Entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

**UNIT III        DESIGN THINKING                                        3 Hrs**
Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer – Personal selling – concept & process – show & tell concept – Introduction to the concept of Elevator Pitch

**UNIT IV        RISK MANAGEMENT        3 Hrs**
Introduction to risk taking & Resilience – Managing risks (Learning from failures, Myth Buster) – Understanding risks through risk takers – Why do I do? – what do I do ?

**UNIT V        PROJECT  3 Hrs**
How to choose a topic – basic skill sets necessary to take up a project – creating a prototype – Pitch your project – Project presentation.

**Total Hours :15**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**SEMESTER – II**
**DEPARTMENT OF MATHEMATICS**

| Subject Code | Subject Name : **MATHEMATICS-II** | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18003/ BMA20003 | Prerequisite : None | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Understand the Basic concepts in Integration
- Identify the Basic concepts in Multiple integrals
- Use the Basic concepts in Ordinary Differential equations
- Apply the Basic concepts of Analytical Geometry
- Analyze the Basic concepts of Vector Calculus

**COURSE OUTCOMES (Cos):(3-5)**

Students completing this course were able to

| | |
|---|---|
| CO1 | Integrate given function by using methods of integration and to find the area under curve and the volume of a solid by revaluation. |
| CO2 | Evaluate the multiple integrals / area /volume and to change the order of integration. |
| CO3 | Solve the ordinary differential equation and to solve Eulers differential equation. |
| CO4 | Find the equation of planes, lines and sphere and to find the shortest distance between to skew lines. |
| CO5 | Find the gradient, maximum directional derivative and work done by a force and to verify Green/ Stokes/ Gauss divergence theorem |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 2 | 2 | - | - | 2 | 2 | - | 3 |
| CO2 | 3 | 3 | 2 | 1 | 2 | 3 | - | - | 3 | 3 | - | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | - | 3 | 3 | - | 2 |
| CO4 | 3 | 3 | 2 | 1 | 1 | 2 | - | 1 | 2 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 3 | 1 | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 1 | 1 |
| CO2 | 2 | 3 | 1 | - |
| CO3 | 2 | 3 | 1 | 1 |
| CO4 | 2 | 3 | 1 | 1 |
| CO5 | 2 | 3 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18003/ BMA20003 | **MATHEMATICS – II** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I        INTEGRATION**                                                                                    **12 Hrs**

Basic concepts of Integration – Methods of Integration– Integration by substitution –  Integration by parts – Definite integrals– Properties of definite integrals – Problems on finding Area and Volume using single integrals (simple problems).

 **UNIT II        MULTIPLE INTEGRALS**                                                            **12Hrs**
Double integral in Cartesian and Polar Co-ordinates – Change of order of integration – Triple integral in Cartesian Co-ordinates – Spherical Polar Co-ordinates – Change of variables (simple problems).

**3UNIT III        ORDINARY DIFFERENTIAL EQUATIONS**                          **12 Hrs**
First order differential equations – Second and higher order linear differential equations with constant coefficients and with RHS of the form: $e^{ax}$, $x^n$, Sin ax, Cos ax, $e^{ax}f(x)$, x f(x) where f(x) is Sin bx or Cos bx – Differential equations with variable coefficients (Euler's form) (simple problems).

**UNIT IV        THREE DIMENSIONAL ANALYTICAL GEOMETRY**              **12Hrs**
Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

**UNIT V        VECTOR CALCULUS**                                                                   **12 Hrs**
Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green's, Stoke's and Gauss divergence theorems (statement only) – Verification.
**Total Hours :  60**

**TEXTBOOKS:**
1. Kreyszig E., Advanced Engineering Mathematics (10th ed.), John Wiley & Sons, (2011).
2. Veerarajan T., Engineering Mathematics (for first year), Tata McGraw Hill Publishing Co., (2008).

**REFERENCE BOOKS:**
1. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).
2. John Bird, Basic Engineering Mathematics (5th ed.), Elsevier Ltd, (2010).
3. P.Kandasamy, K.Thilagavathy and K. Gunavathy, Engineering  Mathematics Vol. I (4th Revised ed.), S.Chand& Co.,Publishers,New Delhi (2000).
4. John Bird, Higher Engineering Mathematics (5th ed.), Elsevier Ltd, (2006).

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARTMENT OF PHYSICS

| Subject Code | Subject Name : **ENGINEERING PHYSICS - II** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BPH18002/ BPH20002 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Design, conduct experiment and analyze data.
- Develop a Scientific attitude at micro and nano scale of materials
- Understand the concepts of Modern Physics
- Apply the science of materials to Engineering & Technology

**COURSE OUTCOMES (Cos) : (3 – 5)**
Students completing this course were able to

| | |
|---|---|
| **CO1** | Demonstrate skills necessary for conducting research related to content knowledge and laboratory skills. |
| **CO2** | Apply knowledge and concepts in advanced materials and devices. |
| **CO3** | Acquired Analytical, Mathematical skills for solving engineering problems. |
| **CO4** | Ability to design and conduct experiments as well as function in a multi disciplinary teams. |
| **CO5** | Generate analytical thought to interpret results & place them within a broader context |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 2 | 2 | 1 | 1 | - | - | 2 | - | 1 |
| **CO2** | 3 | 3 | 1 | 2 | 2 | 1 | 1 | - | 1 | 2 | - | 1 |
| **CO3** | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | | 2 | 1 | 1 |
| **CO4** | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 3 | 2 | 1 | 1 |
| **CO5** | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| **CO1** | 1 | 3 | 1 | 1 |
| **CO2** | 1 | 3 | 1 | 1 |
| **CO3** | 1 | 3 | 2 | 1 |
| **CO4** | 1 | 1 | 2 | 2 |
| **CO5** | 1 | 2 | 2 | 2 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BPH18002/ BPH20002 | **ENGINEERING PHYSICS - II** | Ty | 2 | 0/1 | 0/0 | 3 |

**UNIT I          QUANTUM   PHYSICS**                                                                 **9 Hrs**
Quantum free electron theory - deBroglie waves - derivation of deBroglie waves - Davisson and Germer experiment - uncertainty principle - electron microscope -  scanning electron microscope - physical significance of wave function - Schrodinger wave equation and its applications - Fermi energy- effective mass - phonons - Fermi function-density of states - origin of bandgap in solids - 1D scattering of electrons in periodic potential.

**UNIT II         SEMICONDUCTORS**                                                                       **9 Hrs**
Introduction - properties of semiconductors - classification of semiconductor - effect of temperature in semiconductor - hole current - carrier concentration in intrinsic semiconductor (electron and hole density) - variation of Fermi energy level and carrier concentration with temperature in an intrinsic semiconductor - carrier transport - diffusion - drift - mobility - Hall effect - determination of Hall coefficient and its applications - diodes.

**UNIT III         LIGHT SEMICONDUCTOR INTERACTION**                                     **9 Hrs**
Types of electronic materials: metals, semiconductors and insulators - qualitative analysis of extrinsic semiconductor & its applications - optical transition in bulk semiconductors: absorption, spontaneous and stimulated emission - exciton and its types -  traps and its types -  colour centers and its types and importance - luminescence - classifications of luminescence based on excitation -  optical loss and gain - Photovoltaic effect -  Photovoltaic potential - spectral response - solar energy converters -  solar cells.

**UNIT IV         OPTO ELECTRONIC DEVICES**                                                     **9 Hrs**
Photodetectors - photoconductors - photodiodes principle, construction, working and characteristics     - Phototransistors - Laser diodes - LED theory, construction and working - seven segment display, advantages of LED - LCD theory, construction and working.

**UNIT V   ENGINEERED MATERIALS**                                                                **9 Hrs**
Classification of engineered materials - nano phase materials - its synthesis and properties - shape memory alloys and its applications - biomaterials - non linear materials - metallic glasses - metamaterials - homo and hetero junction semiconductors - semiconducting materials for optoelectronic devices - quantum wells, wires and dots.

**Total Hours :  45 Hrs**

**TEXT BOOKS:**
1.  P.K. Palanisamy, Semiconductor Physics and Optoelectronics, Scitech Publications, 2010
2.  Jyoti Prasad Bandyopadhyay, Semicoductor Devices, S. Chand  Publications, 2014
3.  Charles Kittal, Introduction to Solid State Physics, Wiley Publications, 2012

**REFERENCE BOOKS:**
1.  S. Shubhashree, S. Bharathi Devi & S. Chellammal Madhusudanan, Engineering Physics, Sree Lakshmi Publications, 2004
2.  G. Senthil Kumar, N. Iyandurai, & G. Vijayakumar,  Material Science, VRB Publishers, 2017
3.  R.Murugeshan &  Kiruthigasivaprakash, Modern Physics, 14th edition, S. Chand & Co,   2008
4.  Pallab Bhattacharya, Semiconductor optoelectronic devices, second edition, Pearson     Education, 2003
5.  V Rajendran & A. Marikani, Materials Science, Tata McGraw- Hill, New Delhi, 2004

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARTMENT OF CHEMISTRY

| Subject Code | Subject Name :<br>**ENGINEERING<br>CHEMISTRY - II** | Ty/<br>Lb/<br>ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCH18002/<br>BCH20002 | Prerequisite : None | Ty | 2 | 0/1 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Imparting the basic concepts of phase rule and apply the same to one and two component systems.
- Introducing the chemistry of engineering materials such as cement, lubricants, abrasives, refractories, alloys and nano materials.
- To impart a sound knowledge on the principles of chemistry involving different application-oriented topics
- Introducing salient features of fuels and combustion.
- To give an overview on modern analytical techniques

**COURSE OUTCOMES (Cos): (3 – 5)**
Students completing this course were able to

| | |
|---|---|
| CO1 | Understand the science of phase equilibria and apply the phase rule to different systems. |
| CO2 | Gain an overview of Engineering Materials such as Lime, Cement, Lubricants, Abrasives, Refractories, Alloys and Nanomaterials. |
| CO3 | Recognize the essential information about consumer products such as Soaps and Detergents, also gaining the basic knowledge about Explosives and Propellants. |
| CO4 | Discover the fuel Chemistry and Combustion process. |
| CO5 | Inferring few important Analytical Techniques and their applications. |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | 3 | 3 | - | - | - | - | - | - | - | 3 |
| CO2 | 3 | 3 | - | 3 | 3 | - | 3 | - | - | 3 | - | 3 |
| CO3 | 3 | 3 | 3 | - | - | 3 | - | 3 | - | - | - | 3 |
| CO4 | 3 | - | - | - | - | - | 3 | - | - | 3 | - | 3 |
| CO5 | 3 | - | 3 | - | 3 | - | - | - | | | - | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | - | 3 | - | - |
| CO2 | - | 3 | - | - |
| CO3 | - | 3 | - | - |
| CO4 | - | 3 | - | - |
| CO5 | - | 3 | - | - |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCH18002/ BCH20002 | **ENGINEERING CHEMISTRY – II** | Ty | 2 | 0/1 | 0/0 | 3 |

**UNIT I       PHASE EQUILIBRIA                                                                           8 Hrs**
Introduction – Definition of terms involved in phase rule. Derivation of Gibbs phase rule –  Applications to one component system – water system. Binary system – Eutectic system – Pb – Ag system, Bi – Cd system .Thermal analysis – Cooling curves.

**UNIT II       MATERIAL CHEMISTRY                                                                    10 Hrs**
Cement – Manufacture, Chemistry of setting and hardening .Lubricants – Requirements of good lubricants, Mechanism, Properties of lubricants, Classification – Examples. Abrasives–Classification –Moh's scale-Hard and soft abrasives, Preparation of artificial abrasives (silicon carbide, boron carbide), Applications of abrasives. Refractories – Classification, Properties-Refractoriness, RUL, Porosity, Thermal spalling Alloys  Classification of alloys – Purpose of making alloys - Ferrous  and non-Ferrous alloys - Heat treatment Nano materials – properties, carbon nano tubes – properties, fabrication – carbon arc method, laser vapourization method.

**UNIT III       APPLIED CHEMISTRY                                                                     9 Hrs**
Soaps and detergents : Soaps – Saponification of oils and fats,  manufacture of soaps,  classification of soap – soft soap, medicated soap, herbal soap, shaving soap and creams.
Detergents – Anionic detergents – manufacture and applications, Comparison of soaps and detergents.
Rocket propellants and explosives: Rocket propellants – characteristics, solid and liquid propellants – examples. Explosives-Introduction, characteristics, classification, Oxygen balance , preparation, properties and uses of detonators, low explosives and high explosives, Dynamites, Gun cotton, Cordite.
Food adulterants- Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages, Contamination with toxic chemicals – pesticides and insecticides.

**UNIT IV       FUELS & COMBUSTION                                                                   9 Hrs**
Introduction to Fuels – classification – Calorific value – GCV, LCV.Solid Fuels–Coal-Proximate Analysis, Metallurgical Coke–Manufacture of Metallurgical Coke – Liquid Fuel–Refining of Petrol, Synthetic Petrol–Manufacturing Process– Hydrogenation of Coal, Polymerization, Cracking–Knocking–Octane Number–Leaded Petrol (or) Anti–knocking – Cetane Number–Ignition Lag–Gaseous fuels–CNG–LPG–Water Gas,  Producer gas–Biogas- Combustion– Flue Gas analysis– Orsat's method.

**UNIT V       ANALYTICAL AND CHARACTERIZATION TECHNIQUES                     9 Hrs**
Electron microscopes: Scanning electron microscope & Transmission electron microscope, instrumentation and applications Absorption and Emission Spectrum - Beer - Lambert's law. Visible and UV Spectroscopy – instrumentation – Block diagram - working. IR Spectroscopy – instrumentation - Block diagram  – molecular vibrations – stretching and bending – $H_2O$, $CO_2$. –Characterization of some important organic  functional groups. Chromatographic techniques – column, thin layer and paper.
        **Total Hours  : 45**

**TEXTBOOKS :**
1.  C. S.Unnithan, T. Jayachandran& P. Udhayakala,  "Industrial Chemistry",  Sreelakshmi Publications (2009).
2.  Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.

**REFERENCE BOOKS:**
1.  P.C. Jain & Monika Jain, "Engineering Chemistry", DhanpatRai publishing Co., (Ltd.)  (2013).
2.  B. R. Puri ,L.R. Sharma &M.S.Pathania, "Principles of Physical Chemistry", Vishal publishing co., (2013).

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARTMENT OF ENGINEERING SCIENCES

| Subject Code :<br>BES18003/<br>BES20003 | Subject Name :<br>**ENVIRONMENTAL SCIENCE**<br>**(Non- Credit Course)** | Ty/<br>Lb/<br>ETL | L | T/<br>SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite : None | Ty | - | - | - | - |

L : Lecture T : Tutorial  SLr : Supervised Learning P : Project  R : Research  C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES :**
- To acquire knowledge of the Environment and Ecosystem & Biodiversity
- To acquire knowledge of the different types of Environmental pollution
- To know more about Natural Resources
- To gain understanding of social issues and the Environment
- To attain familiarity of human population and Environment

**COURSE OUTCOMES (Cos) : (3 – 5)**
Students completing the course were able to

| CO1 | To known about Environment and Ecosystem & Biodiversity |
|---|---|
| CO2 | To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and  identify the importance of natural resources like forest, water, and food resources |
| CO3 | To discover  water conservation and watershed management |
| CO4 | To identify its problems and concerns  climate change, global warming, acid rain, ozone layer depletion etc., |
| CO5 | To explain family welfare programmes and  role of information technology in human health and environment |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | 2 | 3 | 2 | - | - | - | 2 |
| CO2 | - | - | - | - | - | 2 | 3 | - | - | 2 | - | 2 |
| CO3 | - | - | - | - | - | 2 | 3 | 2 | - | - | - | 2 |
| CO4 | - | - | - | - | - | 2 | 3 | 2 | - | 2 | - | 2 |
| CO5 | - | - | - | - | - | 2 | 3 | 2 | - | 2 | - | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | - | 3 | - | - |
| CO2 | - | 3 | - | - |
| CO3 | - | 3 | - | - |
| CO4 | - | 3 | - | - |
| CO5 | - | 3 | - | - |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18003/ BES20003 | **ENVIRONMENTAL SCIENCE** | Ty | - | - | - | - |

**UNIT I        ENVIRONMENT AND ECOSYSTEM**
Definition, Scope and Importance of environment – need for public awareness – concept, structure and function of an ecosystem - producers, consumers and decomposers – energy flow in the ecosystem. Biodiversity at national and local levels – India

**UNIT II        ENVIRONMENT POLLUTION**
Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution    (f) Nuclear hazards (g) E-Wastes and causes, effects and control measures

**UNIT III        NATURAL RESOURCES**
Forest resources: Use and over-exploitation, deforestation. Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems. Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems.

**UNIT IV        SOCIAL ISSUES AND THE ENVIRONMENT**
From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns  climate change, global warming, acid rain, ozone layer depletion, nuclear accidents ,central and state pollution control boards- Public awareness.

**UNIT V        HUMAN POPULATION AND THE ENVIRONMENT**
Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

**TEXT BOOKS:**
1. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGrawHill,NewDelhi, (2006).

**REFERENCE BOOKS:**
1. Vairamani, S. and Dr. K. Sankaran. **Elements of Environmental and Health Science.**Karaikudi: KPSV Publications, 5th Edition, July, 2013.
2. Ifthikarudeen, Etal, **Environmental Studies**, Sooraj Publications,2005.
3. R.Murugesan, **Environmental Studies,** Millennium Publishers and Distributors, 2nd Edition, July, 2009.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## DEPARTMENT OF ENGLISH

| Subject Code | Subject Name : **COMMUNICATION LAB** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18ET1/BEN20ET1 | Prerequisite : None | ETL | 1 | 0/0 | 2/0 | 1 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

The Student should be able to
- Use appropriate vocabulary and structure for effective interpersonal and academic communication
- Interpret charts, diagrams, advertisements, etc.,
- Participate in group discussions and present project effectively
- Present project and ideas effectively
- Attend interviews

**COURSE OUTCOMES (Cos) : (3 – 5)**
Students completing this course were able to

| | |
|---|---|
| **CO1** | Use appropriate vocabulary and structure for effective interpersonal and academic communication |
| **CO2** | Interpret charts, diagrams, advertisements, etc., |
| **CO3** | Participate in group discussions and present project effectively |
| **CO4** | Present project and ideas effectively |
| **CO5** | Attend interviews |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | - | - | - | - | 3 | - | - | - | - | 3 | 3 | 3 |
| **CO2** | 3 | 2 | - | 3 | 3 | - | 3 | - | - | 3 | 2 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | - | 3 | 3 | - | 3 | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 3 | 3 | - | - | - | 3 | 3 | 3 | - | 3 |
| **CO5** | - | - | - | - | - | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| **CO1** | 1 | 3 | 1 | 1 |
| **CO2** | 1 | 3 | 1 | 1 |
| **CO3** | 1 | 3 | 1 | 1 |
| **CO4** | 1 | 3 | 1 | 1 |
| **CO5** | 1 | 3 | - | - |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | √ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18ET1/ BEN20ET1 | **COMMUNICATION LAB** | ETL | 1 | 0/0 | 2/0 | 1 |

**UNIT I**                                                                                          **6HRS**

    Listening and Speaking- Informal and Formal Contexts\

**UNIT II**                                                                                         **6HRS**

    Interpretation of charts/ Diagrams – Group Discussion

**UNIT III**                                                                                        **6HRS**

    Compeering –Anchoring – Welcome Speech – Vote of Thanks

**UNIT IV**                                                                                        **8HRS**

    Formal Presentation -Power point presentation – Poster Presentation

**UNIT V**                                                                                          **4HRS**
    Interview

                                                                        **Total Hours : 30**

**SUGGESTED READINGS:**

    (i) Practical English Usage. Michael Swan. OUP. 1995.
    (ii) Remedial English Grammar. F.T. Wood. Macmillan.2007
    (iii)On Writing Well.William Zinsser.Harper Resource Book. 2001
    (iv) Study Writing. Liz Hamp-Lyons and Ben Heasly.Cambridge University Press. 2006.
    (v) Communication Skills. Sanjay Kumar and Pushp Lata.Oxford University Press. 2011.
    (vi) Exercises in Spoken English. Parts.I-III. CIEFL, Hyderabad. Oxford University Press
    (vi) Pronunciation in Use ,Mark Hancock. Cambridge University Press. 2012

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**DEPARTMENT OF MECHANICAL ENGINEERING**

| Subject Code | Subject Name : **BASIC ENGINEERING GRAPHICS** | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET2/BES20ET2 | Prerequisite : None | ETL | 1 | 0/0 | 2/0 | 2 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits     T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Learn to know what kind of pencils to be used to sketch lines, numbers, Letters and Dimensioning in drawing sheet.
- Draw Projection of points, line, planes and solids using Drafters
- To identify the angle of projection and development of surfaces, isometric projection and Orthographic projection
- Know the basics of elevation and plan of building.
- Learn the basics of Drafting using AutoCAD Software

**COURSE OUTCOMES (Cos)**

Students completing this course were able to

| CO1 | Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards |
|---|---|
| CO2 | Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications. |
| CO3 | Identify basic sketching techniques of engineering equipments |
| CO4 | Demonstrate the projections of Points, Lines, Planes and Solids. |
| CO5 | Draw the sectional view of simple buildings and utilize Auto CAD Software. |
| CO6 | Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | - | - | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 2 | 2 | - | - | 2 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 2 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 1 | 3 |
| CO6 | 3 | 3 | 3 | 1 | 3 | | 2 | 1 | 2 | 2 | 1 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 2 | 1 | 1 |
| CO2 | 1 | 2 | 1 | 1 |
| CO3 | 1 | 2 | 1 | 1 |
| CO4 | 1 | 3 | 1 | 1 |
| CO5 | 1 | 3 | 1 | 1 |
| CO6 | 1 | 3 | 1 | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET2/BES20ET2 | **BASIC ENGINEERING GRAPHICS** | ETL | 1 | 0/0 | 2/0 | 2 |

**UNIT I CONCEPTS AND CONVENTIONS (Not for examination)**                                **3Hrs**
Introduction to drawing, importance and areas of applications – BIS standards – IS: 10711 – 2001 : Technical products Documentation – Size and layout of drawing sheets – IS 9606 – 2001: Technical products Documentation – Lettering – IS 10714 & SP 46 – 2003: Dimensioning of Technical Drawings – IS : 15021 – 2001 : Technical drawings – Projections Methods – drawing Instruments, Lettering Practice – Line types and dimensioning – Border lines, lines title blocks Construction of polygons – conic sections – Ellipse, Parabola, Hyperbola and cyloids.

**UNIT II        PROJECTION OF POINTS, LINES AND PLANE SURFACES                6 Hrs**
Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations – projection of polygonal surface and circular lamina in simple position only.

**UNIT III        PROJECTION OF SOLIDS                                6 Hrs**
Projection of simple solids like prism, pyramid, cylinder and cone in simple position Sectioning of above solids in simple vertical position by cutting plane inclined to one reference plane and perpendicular to the other.

**UNIT IV        DEVELOPMMENT OF SURFACES AND ISOMETRIC PROJECTION        6 Hrs**
Development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders, and cones. Principles of isometric projection – isometric scale – isometric projections of simple solids, like prisms pyramids, cylinders and cones.

**UNIT V        ORTHOGRAPHICS PROJECTIONS                        6 Hrs**
Orthographic projection of simple machine parts – missing views
**BUILDING DRAWING**
Building components – front, Top and sectional view of a security shed.

**UNIT VI        COMPUTER AIDED DRAFTING                        3 Hrs**
Introduction to CAD – Advantages of CAD – Practice of basic commands – Creation of simple components drawing using CAD software.

                                                        **Total  Hours:30**

**Note:First angle projection to be followed.**

**TEXT BOOKS:**
1. Bhatt, N.D. and Panchal, V.M. (2014) Engineering Drawing Charotar Publishing House
2. Gopalakrishnan, K.R. (2014) Engineering Drawing (Vol.I& II Combined) Subhas Stores, Bangalore.

**REFERENCE BOOKS:**
1. Natarajan, K.V (2014) A Text Book of Engineering Graphics, DhanalakshmiPublisheres, Chennai
2. Venugopal, K and Prabhu Raja, V. (2010) Engineering Graphics, New Age International (P) Limited

**Special Points applicable to University examinations on Engineering Graphics**
1. There will be five questions, each of either or type  covering all UNIT-s of the syllabus
2. All questions will carry equal marks of 20 each making a total of 100
3. The answer paper shall consists of drawing sheets of A2 size only. The students will be permitted to use appropriate scale to fit solution within A2 size.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code | Subject Name : **INTEGRATED PHYSICAL SCIENCE LAB** | Ty/ Lb/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18L02/BES20L02 | Prerequisite : None | **Lb** | **0** | **0/0** | **2/0** | **1** |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits       T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Demonstrate the ability to make physical measurements & understand the limits of precision in measurements.
- Display the ability to measure properties of variety of mechanical, optical, electrical and electronic systems.
- To help learners measure conductivity and EMF using electrical equipment.
- To understand the analytical skills through chromatography & viscometry
- To familiarize the concepts of chem informatics

**COURSE OUTCOMES (Cos) : (3 – 5)**
Students completing this course were able to

| CO1 | Recognize the correctness and precision in the results of measurements. |
|---|---|
| CO2 | Construct and compare the properties of variety of mechanical, optical, electrical and electronic systems. |
| CO3 | Familiarizing the titration methods using conductometry & potentiometry |
| CO4 | Developing the Research spirit through the knowledge of Chem informatics & Analytical skills. |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 3 | 3 | 1 | 1 | - | 1 | 2 | - | 1 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | - | 1 | 2 | 1 | 1 |
| CO3 | 3 | 3 | 2 | 3 | 3 | - | - | - | 3 | - | - | - |
| CO4 | 3 | 3 | 3 | 3 | 3 | - | 2 | 2 | 3 | - | 3 | 2 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | - | - | - | - |
| CO4 | - | 3 | - | 1 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, L- Low

| Category | Basic Sciences | Engg.Science | Humanities & social Science | Program Core | Program Elective | Open Elective | Practical/Project | Internships/Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | √ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18L02/BES20 L02 | **INTEGRATED  PHYSICAL SCIENCE LAB** | Lb | 0 | 0/0 | 2/0 | 1 |

## LIST OF EXPERIMENTS

1. Determination  of Coefficient of Viscosity of a given liquid by  Poiseuille`s method.

2.  Particle Size  determination using Laser Source.

3. Determination of Numerical Aperture of an Optical Fiber.

4. Spectrometer- Refractive Index/Dispersive power/i-d curve.

5. Potentiometer - Resistance of a wire.

6. Transistor Characteristics - Input Resistance, Output Resistance and Gain .

7. Studies on acid-base conductometric titration.

8. Determination of redox potentials using potentiometry.

9. Determination of $R_f$ values of various components using thin layer chromatography.

10. Viscosity studies using Digital capillary viscometer.

11. Compute the structures of the given polymers, drugs, biomolecules usingChem Draw.

12. Studies on potential energy surface of the given molecules.

13. Estimate NMR spectra from a Chem Draw structure.

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### DEPARTMENT OF COMPUTER SCIENCE

| Subject Code | Subject Name :<br>**C PROGRAMMING & LAB** | Ty/<br>Lb/<br>ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET3/BES20ET3 | Prerequisite : None | ETL | 1 | 0/0 | 2/0 | 2 |

L : Lecture T : Tutorial SLr : Supervised Learning P: Project R : Research C : Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES**

- Outline the basics of C Language.
- Apply fundamentals in C programming.
- Produce and present activities associated with the course**.**

**COURSE OUTCOMES (Cos) : (3 – 5)**
Students completing this course were able to

| CO1 | Acquire knowledge how to write and execute c programs |
|---|---|
| CO2 | Understand the fundamental expression and statements of C Language. |
| CO3 | Work with arrays, functions, pointers, structures, Strings and Files in C. |
| CO4 | Identify and provide solutions for engineering problems in C programming |

**Mapping of Course Outcome with Program Outcome (POs)**

| Cos/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 1 | 2 | 1 | | 2 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 3 | 1 | 2 | 3 | 3 | 1 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 2 |

3/2/1 Indicates Strength Of Correlation, 3 – High, 2- Medium, 1- Low

| Category | Basic<br>Sciences | | Engg.Science | Humanities<br>& social<br>Science | Program<br>Core | Program<br>Elective | Open<br>Elective | Practical/Project | Internships/Technical<br>Skills | Soft<br>Skills |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | √ | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BES18ET3/BES 20ET3 | **C  PROGRAMMING AND LAB** | ETL | 1 | 0/0 | 2/0 | 2 |

**UNIT I          INTRODUCTION                                                                                          6Hrs**
Fundamentals, C Character set, Identifiers and Keywords, Data Types, Variables and Constants, Structure of a C Program, Executing a C Program.

**UNIT II         EXPRESSION AND STATEMENT                                                          6 Hrs**
Operators, Types-Complex and Imaginary, Looping Statement-For, While, Do, Break, continue, Decision Statement-If, If else, Nested if, Switching Statement, Conditional Operator.

**UNIT III        ARRAYS AND FUNCTIONS                                                                  6 Hrs**
Defining an Array, Using Array elements as counters, Generate Fibonacci number, Generate Prime Numbers, Initializing Arrays, Multidimensional Arrays, Defining a Function, Function call -types of Function calls -Function pass by value -Function pass by reference, Write a Program in Recursive Function.

**UNIT IV        STRUCTURES AND POINTERS                                                             6Hrs**
Working with Structures -Introduction -Syntax of structures -Declaration and initialization -Declaration of structure variable -Accessing structure variables, Understanding Pointers -Introduction -Syntax of Pointer.

**UNIT V         STRINGS AND FILE HANDLING                                                          6 Hrs**
Strings -Syntax for declaring a string -Syntax for initializing a string -To read a string from keyboard, Files in C -File handling functions -Opening a File closing a file --example: fopen, fclose -Reading data from a File- Problem solving in C
**Total Hours: 30**

1. www.spoken-tutorials.org
2. http://www.learn-c.org/

**REFERENCE BOOKS :**
1. Stephen G. Kochen" Programming in C- A complete introduction to the C Programming Language. Third Edition, Sams Publishing -2004
2. Ajay Mital, " Programming in C: A Practical Approach", Pearson Publication-2010

**LIST OF PROGRAMS**
1. Write a program to check 'a' is greater than 'b' or less than 'b' Hint: use if statement.
2. Write another program to check which value is greater 'a', 'b' or 'c'. Hint: use else-if statement. (Take values of a, b, c as user inputs)
3. Write a Program to find the sum of the series : $x + X^3/3! + X^5/5! + \ldots\ldots\ldots\ldots.. X^n/n!$
4. Write a C Program to solve a Quadratic Equation by taking input from Keyboard
5. Write a C Program to arrange 20 numbers in ascending and descending Order. Input the Numbers from Keyboard
6. Write a C Program to Multiply a 3 x 3 Matrix with input of members from Keyboard
7. Write a program that takes marks of three students as input. Compare the marks to see which student has scored the highest. Check also if two or more students have scored equal marks.
8. Write a program to display records of an employee. Like name, address, designation, salary.
9. Write a C program, declare a variable and a pointer. Store the address of the variable in the pointer. Print the value of the pointer.
10. Write a C program to concatenate String 'best' and String 'bus'. Hint: strcat(char str1, char str2);
11. Explore the other functions in string library.
12. Write a program to create a file TEST. Write your name and address in the file TEST. Then display it on the console using C program.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**SEMESTER – III**

| Subject Code : BMA18008/BMA 20008 | Subject Name : **DISCRETE MATHEMATICS** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite : None | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning P : Project  R : Research  C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES :**
- To understand the Basic concepts in Logic and Predicate calculus
- To understand the Basic concepts in Combinatorics
- To understand the Basic concepts in Group theory
- To understand the Basic concepts in Lattices
- To understand the Basic concepts in Graph theory

**COURSE OUTCOMES (COs) :**
Students completing the course were able to

| | |
|---|---|
| CO1 | Find the summation of the given series logical equations and predicate calculus. |
| CO2 | To determine the functions of permutation and combination. |
| CO3 | To understand the concept of group theory and analysis operation of set operations. |
| CO4 | Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function using lattices. |
| CO5 | Evaluate the partial / total differentiation and maxima / minima of a function of several variables. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | - | 3 |
| CO2 | 3 | 3 | - | - | 3 | 1 | - | - | - | - | - | 3 |
| CO3 | 3 | 3 | - | - | 2 | - | - | - | 2 | 3 | - | 1 |
| CO4 | 3 | 3 | - | - | 1 | - | - | - | 2 | 3 | - | 2 |
| CO5 | 3 | 3 | - | - | - | 2 | - | - | 2 | 2 | - | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 1 |
| CO2 | 2 | 1 | 3 | 1 |
| CO3 | 2 | 1 | 3 | 1 |
| CO4 | 2 | 1 | 3 | 1 |
| CO5 | 2 | 1 | 3 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18008/ BMA20008 | DISCRETE MATHEMATICS | Ty | 3 | 1/0 | 0/0 | 4 |

(Common to II yr. / III Sem. B.Tech (Full Time), I yr. / I Sem. B.Tech (Part Time) - CSE,IT)

**UNIT I        LOGIC**                                                                                                 **12 Hrs**
Statements – Truth Table – Connectives – Normal Forms – Predicate Calculus – Inference Theory.

**UNIT II        COMBINATORICS**                                                                                  **12 Hrs**
Mathematical Induction – Pigeon Hole Principle – Principle of Inclusion and Exclusion – Recurrence Relations – Generating Functions.

**UNIT III        GROUPS**                                                                                            **12 Hrs**
Basic Concepts – Groups – Subgroups – Homomorphism – Kernel – Cosets – Lagrange's theorem (simple theorems and problems).

**UNIT IV        LATTICES**                                                                                          **12 Hrs**
Partial ordering – Posets – Hasse Diagram – Lattices – Properties of lattices – Sub lattices – Special lattices – Boolean Algebra(Definition & simple problems).

**UNIT V        GRAPHS**                                                                                             **12 Hrs**
Introduction to Graphs – Terminology – Matrix representation of Graphs: Incidence matrix, Adjacency matrix – Graph Isomorphism – Connectivity – Euler and Hamiltonian Paths (simple theorems and problems).

**Total Hours: 60**

**TEXT  BOOKS:**
1. Veerarajan T., Discrete Mathematics, Tata McGraw Hill Publishing Co., (2008).
2. Tremblay J.P., Manohar R., Discrete Mathematical structures with applications to Computer science, Tata McGraw Hill Publishing Co., (2008).

**REFERENCE BOOKS:**
1. Kolman, Busby, Ross, Discrete Mathematical Structures, Pearson, (2014).
2. Kenneth Rosen, Discrete Mathematics and its applications (SIE), Tata McGraw Hill Publishing Co., (2007).

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# COMPUTER SCIENCE AND ENGINEERING
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| Subject Code: BCS18001/BCS20001 | Subject Name : **DATA STRUCTURES** | | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Master the implementation of linked data structures such as linked lists and binary trees
- with  Be familiar with advanced data structures such as AVL trees and  hash tables.
- Be familiar with several sub-quadratic sorting algorithms including quicksort, mergesort and heapsort
- Be familiar some graph algorithms such as shortest path and minimum spanning tree
- Master the standard data structure library of a major programming language(C++)

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Student will be able to choose appropriate data structure as applied to specified problem definition |
| CO2 | Student will be able to handle operations like searching, insertion, deletion, traversing mechanism on various data structures. |
| CO3 | Students will be able to apply concepts learned in various domains like DBMS, compiler construction etc. |
| CO4 | Students will be able to use linear and non-linear data structures like stacks, queues , linked list etc |
| CO5 | Student will be able to choose appropriate data structure as applied to specified problem definition |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 3 | 2 | 3 | 2 | 1 | 2 |
| CO3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 | 1 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 3 | 2 | 1 | 2 | 1 |
| | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 1 | 2 |
| CO3 | 3 | 2 | 3 | 1 |
| CO4 | 3 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 2 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18001/ BCS20001 | **DATA STRUCTURES** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I**                                                                                                    **12 Hrs**
**Data Representation**: Introduction, Linear Lists, Formula Based Representation, indirect addressing, simulating pointers, comparisons and applications. Arrays, matrices, special and sparse matrices,

**UNIT II**                                                                                                  **12 Hrs**
Stack Operations and Applications, Queue Operations and Applications, Single Linked List, Double Linked List, Circular Linked List.

**UNIT III**                                                                                                **12 Hrs**
**Trees:** Definitions and Properties, Representation of binary trees and its operations , Binary Tree Traversal, Binary Search Tree, AVL trees and its operations , 2-3 tree, 2-3-4 tree.

**UNIT IV**                                                                                                 **12 Hrs**
**Searching & Sorting:** Selection Sort, Merge Sort, Quick Sort, Heap Sort, and Radix Sort - Complexity analysis. Sequential Search, Binary Search, Hashing and its Types.

**UNIT V**                                                                                                   **12 Hrs**
**Graphs:** Definitions and Representation of Graphs, DFS, BFS, Prim's Algorithm, Kruskal's Algorithm

**Total Hours: 60**
**TEXT BOOKS:**
1. S.Sahani,"Data Structures. Algorithms and Applications in C++", Tata Mc-Graw Hill, 2005
2. Yedidyah Langsam, MosheJ Augenstein Aaron M. Tenenbaum, "Data Structures using C and C++", Prentice Hall India,1996, Second Edition.

**REFERENCE BOOKS:**
1. Seymour Lipschutz (Schaum"s Outline series). McGraw-Hill – 2005,3rd Edition
2. Sartaz Sahani McGraw – HillS.K. Srivatsava, Deepli Srivatsava. BPB Publications.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18003/BCS20003 | Subject Name : COMPUTER ORGANIZATION AND ARCHITECTURE | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BEC18I02 | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To understand the major components of a computer including CPU, memory, I/O  and  storage, understand the uses for cache memory,
- To understand a wide variety of memory technologies both internal and external,
- To understand the role of the operating system in interfacing with the computer hardware

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Students will understandhow computer hardware has evolved to meet the needs of multi-processing systems. |
| CO2 | Students will understandthe basic structure and operation of digital computer |
| CO3 | Students will understanda wide variety of memory technologies both internal and external. |
| CO4 | Students will understand the different ways of communicating with I/O devices and standard I/O interfaces |
| CO5 | Students will understandhow computer hardware has evolved to meet the needs of multi-processing systems. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO5 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 |
| CO2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 2 |
| CO4 | 2 | 2 | 3 | 2 |
| CO5 | 2 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18003/ BCS20003 | **COMPUTER ORGANIZATION AND ARCHITECTURE** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I      BASIC STRUCTURE OF COMPUTERS**                                    **12 Hrs**
Basic structure of Computer Hardware-Von-Neumann Architecture-Functional units – Bus Structures - Software performance - Memory locations and addresses - Memory operations -Instruction and instruction sequencing

**UNIT II      ARITHMETIC AND LOGIC UNIT**                                          **12 Hrs**
Fixed point arithmetic operation-addition – subtraction – multiplication - division Floating point arithmetic operation-Design of ALU

**UNIT III      PROCESSOR UNIT**                                                         **12 Hrs**
Data path implementation-Control unit-hardwired control - micro programmed control, nano programming -Concepts of pipelining - Pipeline hazards

**UNIT IV      MEMORY SYSTEM**                                                         **12 Hrs**
Memory hierarchy-Internal organization of RAM – ROM - Interleaved memory-Cache and associative memories -Virtual memory - Memory organization and cache coherence issues

**UNIT V      INPUT/OUTPUT AND PERIPHERALS**                                **12 Hrs**
Accessing I/O devices – Programmed Input/ Output -Interrupts – Direct Memory Access – IO Processor - Buses – Interface circuits – Standard I/O Interfaces (PCI, SCSI, USB) - I/O devices

**Total Hours: 60**

**TEXT BOOKS:**
1. John Hayes (2012) ,(2007)digitized Computer Architecture and Organization, Tata McGraw Hill
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky and Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw Hill, 2012.

**REFERENCE BOOKS:**
1. Morris Mano (2009) Computer System Architecture,(3rd ed.),Pearson Education
2. John L. Hennessey and David A. Patterson, "Computer Architecture – A Quantitative Approach", Morgan Kaufmann / Elsevier Publishers, Fifth Edition, 2012.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18I01/BES20I01 | Subject Name : **DIGITAL SYSTEMS** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BES18001 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Acquired knowledge about number systems and its conversions |
|---|---|
| CO2 | Acquired knowledge about boolean algebra |
| CO3 | Ability to identify, analyze & design combinational circuits |
| CO4 | Ability to identify & analyze synchronous & asynchronous circuits |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | |
|---|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 | |
| CO2 | 1 | 3 | 1 | 1 | |
| CO3 | 3 | 2 | 1 | 1 | |
| CO4 | 3 | 2 | 1 | 1 | |

3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ✓ | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEC18I01/ BEC20I01 | DIGITAL SYSTEMS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I  NUMBER SYSTEMS**                                                                                    **9 Hrs**
Review of Decimal, Binary, Octal And Hexadecimal Number Systems –Number  Conversions – Signed Magnitude form – 1's and 2's Complement    - Binary weighted codes- Binary arithmetic – codes – BCD code, Gray code, Excess-3 Code.

**UNIT II  BOOLEAN ALGEBRA**                                                                               **9 Hrs**
Binary logic Functions- Boolean laws – De Morgan's Theorems, Sum Of Products –Product Of Sums –karnaugh map- Quine McCluskey Method.

**UNIT III  COMBINATIONAL LOGIC**                                                                       **9 Hrs**
Logic gates – AND, OR, NOT, NOR, NAND and EX-OR  Gates– Half adder –Full adder- Half subtractor–Full subtractor - Multiplexer – Demultiplexer- Encoder – Decoder – Code converters - PAL- PLA.

**UNITIV  SYNCHRONOUS SEQUENTIAL LOGIC**                                                  **9 Hrs**
Latches-R-S- Flip Flop, S-R Flip Flop, D Flip Flop, JK Flip Flop, T Flip-Flop - Master slave Flip-Flop -    Counters –Up Down counters- Binary counters-Ring counter- Shift Registers.

**UNIT V  ASYNCHRONOUS SEQUENTIAL LOGIC**                                              **9 Hrs**
Asynchronous counters –Decade counters - State diagram - State Table – State Reduction – State Assignment- Excitation Table-Analysis of Asynchronous sequential circuits - Design of ASynchronous Sequential Circuits.
 **Total Hours: 45**
**TEXT BOOKS**:
1. Charles H. Roth & Larry L.Kinney, "Fundamentals of Logic Design", Cengage Learning, 7th Edition.
2. M. Morris Mano & Michael D.Ciletti (2008) Digital Design. Pearson Education
3. Thomas.L.Floyd (2013) "Digital Fundamentals", 10th Edition Pearson Education

**REFERENCE BOOKS:**
1. Ronald J. Neal S. Gregory L (2009), "Digital Systems", 10th Edition, Pearson Prentice Hall.
2.     R P Jain, (2010), "Modern Digital Electronics", 4th Edition, Tata Mcgraw Hill Ed. Pvt. Ltd.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L01/BCS20L01 | Subject Name : **DATA STRUCTURES LAB** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To strengthen their problem solving ability by applying the characteristics of an object-oriented approach.
- To introduce object oriented concepts in C++ and Java.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches |
|---|---|
| CO2 | Apply an object-oriented approach to developing applications of varying complexities |
| CO3 | Describe the basic operations on arrays, lists, stacks and queue data structures |
| CO4 | Explain what constitutes an object-oriented approach to programming and identify potential benefits of object-oriented programming over other approaches |
| CO5 | Apply an object-oriented approach to developing applications of varying complexities |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 1 | 2 | 1 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 2 | 1 | 1 | 3 | 1 | 2 | 1 | 2 | 2 |
| CO5 | 3 | 3 | 1 | 3 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 |
| CO2 | 3 | 1 | 2 | 1 |
| CO3 | 2 | 2 | 1 | 3 |
| CO4 | 3 | 2 | 1 | 3 |
| CO5 | 3 | 2 | 1 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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| Subject Code: | Subject Name : COMPUTER SCIENCE AND ENGINEERING | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L01 /BCS20L01 | DATA STRUCTURES LAB | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Operation on arrays – insertion and deletion
2. Linked lists-creation, insertion, deletion of single, double and circular lists.
3. Stack- operations using arrays and linked lists.
4. Infix to postfix conversion
5. Evaluation to postfix expression.
6. Queue- operations using arrays and linked lists.
7. Dequeue, circular-operations
8. Binary tree traversals- In order, pre order, post order using recursion
9. Binary tree traversals- In order, pre order, post order using non recursion
10. Linear and binary search
11. Sorting – Selection Sort, Quick sort, Heap Sort and Merge Sort.
12. Addition, multiplication of sparse matrices
13. Polynomial addition and multiplication
14. Depth first search of a graph
15. Breadth first search of a graph.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L02/BCS20L02 | Subject Name : **OBJECT ORIENTED PROGRAMMING WITH C++ LAB** | | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BES18ET2 | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- 1.To develop skills to design and analyze simple linear and non linear data structures
- 2.To Strengthen the ability to identify and apply the suitable data structure for the given real world problem
- 3. To Gain knowledge in practical applications of data structures

**COURSE OUTCOMES (COs) :**

| CO1 | Be able to design and analyze the time and space efficiency of the data structure |
|---|---|
| CO2 | Be capable to identity the appropriate data structure for given problem |
| CO3 | Have practical knowledge on the application of data structures |
| CO4 | Implementation real-world entities like inheritance , hiding,polymorphismetc in programming |
| CO5 | Develop application programs in C++ |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L02/ BCS20L02 | **OBJECT ORIENTED PROGRAMMING WITH C++ LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Simple C++ Programs to Implement Various Control Structures.
   - a. If statement
   - b. Switch case statement and do while loop
   - c. For loop
   - d. While loop
2. Programs to Understand Structure & Unions.
   - a. Structure
   - b. Union
3. Programs to Understand Pointer Arithmetic.
4. Functions & Recursion.
   - a. Function
   - b. Recursion
5. Inline Functions.
6. Programs to Understand Different Function Call Mechanism.
   - a. Call by reference & Call by Value
8. Programs to Understand Storage Specifiers.
8. Constructors & Destructors.
9. Use of "this" Pointer, using class
10. Programs to Implement Inheritance and Function Overriding.
   - a. Multiple inheritances –Access Specifiers
   - b. Hierarchical inheritance – Function Overriding /Virtual Function
11. Programs to Overload Unary & Binary Operators as Member Function & Non Member Function.
   - a. Unary operator as member function
   - b. Binary operator as non member function
12. Programs to Understand Friend Function & Friend Class.
   - a. Friend Function
   - b. Friend class
13. Programs on Class Template

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18IL1/BEC20IL1 | Subject Name : **DIGITAL SYSTEMS LAB** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BES18001 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To introduce number systems and codes and its conversions
- To introduce Boolean algebra and its applications in digital systems
- To introduce the design of various combinational digital circuits using logic gates
- To bring out the analysis for synchronous and asynchronous Sequential circuits

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Acquired knowledge about number systems and its conversions |
|---|---|
| CO2 | Acquired knowledge about boolean algebra |
| CO3 | Ability to identify, analyze & design combinational circuits |
| CO4 | Ability to identify & analyze synchronous & asynchronous circuits |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 3 | 2 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEC18IL1/ BEC20IL1 | **DIGITAL SYSTEMS  LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Verification of Truth tables of Logic Gates
2. Implementation of Boolean function
3. Implementation of Half and full Adders
4. Implementation of Half and full Subtractors
5. Implementation of Multiplexers
6. Implementation of Demultiplexers
7. Implementation of Encoder
8. Implementation of Decoders
9. Verification of Flip – Flops
10. Implementation of Shift Registers
11. Implementation of Counters
12. Study of A to D Converters

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20A01 | Subject Name : ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | ETL | 1 | 0/1 | 3/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**

The objective of this course is to
- Become familiar with basic principles of AI toward problem solving, inference, perception, knowledge representation, and learning.
- Elucidate the basic knowledge representation, problem solving, and learning methods of Artificial Intelligence
- Assess the applicability, strengths, and weaknesses of the basic knowledge representation, problem solving, and learning methods in solving particular engineering problems

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Demonstrate fundamental understanding of the evaluation of Artificial Intelligence (AI) and its foundations. |
|---|---|
| CO2 | Apply basic principles of AI in solutions that require problem solving, perception, knowledge representation, andlearning. |
| CO3 | Design simple software to experiment with various AI concepts and analyseresults |
| CO4 | To show the importance of artificial intelligence and planning in solving real worldproblems |
| CO5 | Demonstrate working knowledge of reasoning in the presence of incomplete and/or uncertain information also to show how the searching algorithms playing vital role in problemsolving |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 1 |
| CO4 | 3 | 2 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| CO5 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 |
| CO2 | 2 | 1 | 2 | 2 |
| CO3 | 2 | 2 | 1 | 2 |
| CO4 | 1 | 2 | 2 | 1 |
| CO5 | 2 | 2 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20AET1 | **ARTIFICIAL INTELLIGENCE: PRINCIPLES AND TECHNIQUES** | ETL | 1 | 0/1 | 3/0 | 3 |

**Unit:1 INTRODUCTION**      **9 Hrs**

Philosophy of artificial intelligence, Definitions - Evolution of AI - Applications of AI, Classification of AI- Intelligent Agents: Agents and Environment-Nature of Environment- Structure Environment

**Unit:2- SEARCHING BASED PROBLEM SOLVING**      **9 Hrs**

Problem Solving Agent - Blind Search- Performance measures - Informed Search: Introduction to Heuristics-Variants of heuristic search-uniform cost, A*,Greedy - Overview of Hill Climbing – Simulated Annealing – Genetic Algorithms – Adversarial Search – Minimax, Alpha beta pruning

**Unit:3- KNOWLEDGE REPRESENTATION ANDREASONING**      **9 Hrs**

Logical systems – Knowledge Based systems, Propositional Logic – Constraints, Predicate Logic– First Order Logic, Inference in First Order Logic, Ontological Representations and applications Knowledge representation and reasoning through logic

**Unit:4- UNCERTAINTY AND KNOWLEDGE REASONING**      **9 Hrs**

Overview – Definition of uncertainty, Utility Based System, -Bayes Rule – Inference, Belief Network, Markov decision processes, knowledge representation and reasoning through fuzzy logic and Bayesian networks

**Unit:5- VI LEARNING SYSTEMS**      **9 Hrs**

Machine learning, Forms of Learning – Types - Supervised, unsupervised, reinforcement learning, Learning Decision Trees, soft computing- Artificial Neural Network.

    **Total hours:    45 hours**

**TEXT BOOKS**

1. Stuart Russell and Peter Norvig Artificial Intelligence - A Modern Approach, Prentice Hall, 3rd edition,2011.
2. Elaine Rich, Kevin Knight and Shiv Shankar B. Nair, Artificial Intelligence, 3rd edition, Tata McGraw Hill,2009.

**REFERENCE BOOKS**

1. Wolfgang Ertel," Introduction to Artificial Intelligence", Second Edition, Springer,2017.
2. Stephen Lucci and Danny Kopec," Artificial Intelligence in the 21st Century, Second Edition, Mercury Learning and Information,2015.
3. Deepak Khemani, "A First Course in Artificial Intelligence", McGraw Hill Education, 2013.
4. Miroslav Kubat," An Introduction to Machine Learning", Springer,2016.
5. DavidL.PooleandAlanK.Mackworth,"ArtificialIntelligence:Foundationsof Computational Agents

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**SEMESTER – IV**

| Subject Code :<br>BMA18016/BMA20016 | Subject Name :<br>**STATISTICS FOR COMPUTER ENGINEERS** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite : None | | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning  P : Project  R : Research  C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

**OBJECTIVES :**
- To understand the Basic concepts in Statistics
- To understand the Basic concepts in Probability
- To understand the Basic concepts in Correlation
- To understand the Basic concepts in Probability distributions
- To understand the Basic concepts in Sampling theory

**COURSE OUTCOMES (COs) :**
Students completing the course were able to

| | |
|---|---|
| CO1 | Find the summation of the given series. |
| CO2 | To determine the functions of permutation and combination. |
| CO3 | To understand the concept of corelation operations. |
| CO4 | Apply knowledge and concepts in finding the derivative of given function and to find the maxima / minima of the given function using lattices. |
| CO5 | Evaluate the partial / total differentiation and maxima / minima of a function of several variables. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | - | - | 2 | 2 | - | - | 3 | 3 | - | 3 |
| CO2 | 3 | 3 | - | - | 3 | 1 | - | - | | - | - | 3 |
| CO3 | 3 | 3 | - | - | 2 | - | - | - | 2 | 3 | - | 1 |
| CO4 | 3 | 3 | - | - | 1 | - | - | - | 2 | 3 | - | 2 |
| CO5 | 3 | 3 | - | - | 2 | - | - | - | 2 | 2 | - | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 1 |
| CO2 | 2 | 1 | 3 | 1 |
| CO3 | 2 | 1 | 3 | 1 |
| CO4 | 2 | 1 | 3 | 1 |
| CO5 | 2 | 1 | 3 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BMA18016 /BMA20016 | **STATISTICS FOR COMPUTER ENGINEERS** | Ty | 3 | 1/0 | 0/0 | 4 |

(Common to III yr. / V Sem. B.Tech (Full Time), I yr. / II Sem. B.Tech (Part Time)  – CSE,IT)

**UNIT I  BASICS OF STATISTICS**                                                                            **12 Hrs**

Variables – Uni-variate Data – Frequency Distribution – Measures of Central Tendency – Mean –Median –Mode – Quartiles – Measures of Dispersion – The Range – Quartile Deviation –Standard Deviation – Relative Measures of Dispersion – Coefficient of Variation – Quartile Coefficient of Variation.

**UNIT II   PROBABILITY AND RANDOM VARIABLE**                                          **12 Hrs**

Axioms  of Probability – Conditional probability – Total probability – Baye's Theorem – Random variable – Probability mass function – Probability density function – Properties – Moments (Definition and simple problems).

**UNIT III    CORRELATION & REGRESSION**                                                        **12 Hrs**

Measures of Skewness & Kurtosis – Bi-variate data – Applications of Correlation: Karl Pearson's      Coefficient of Correlation – Rank Correlation: Spearman's Rank Correlation – Linear Regression.

**UNIT IV   STANDARD DISTRIBUTIONS**                                                             **12 Hrs**

Binomial – Poisson – Geometric –Uniform – Exponential –Normal distributions.

**UNIT V   TESTING OF HYPOTHESIS**                                                                 **12 Hrs**

Tests of Significance – Large Sample Tests – Mean – Proportions – Small Sample Tests – t, F, Chi-square Tests: Independence of Attributes, Goodness of Fit.

                                                                                                                     **Total Hours: 60**

**TEXT BOOKS:**

1. Veerarajan T., Probability, Statistics and, Random Processes, Tata McGraw Hill Publishing Co., (2008).
2. Gupta S.C., Kapoor V.K., Fundamentals of Mathematical Statistics, S.Chand & Co., (2007).

**REFERENCE BOOKS:**

1. Singaravelu, Probability and Random Processes, Meenakshi Agency, (2017).
2. Richard Johnson A., Miller & Freund's Probability and statistics for Engineers (9[th]ed), Prentice Hall of India, (2016).

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18004/BCS20004 | Subject Name : **DATABASE MANAGEMENT SYSTEMS** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18001 | Ty | 3 | 0/1 | 0/0 | 4 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the different issues involved in the design and implementation of a database system.
- To study the physical and logical database designs, database modeling, relational, hierarchical, and network models.
- To develop an understanding of essential DBMS concepts such as: database security, integrity, and concurrency.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | • Understand the most fundamental DBMS concepts and techniques |
|---|---|
| CO2 | • Learn techniques required for building, maintaining, and querying databases. |
| CO3 | • Design Databases for applications |
| CO4 | • Represent diverse indexing approach in different database systems |
| CO5 | • Evaluate a directory on base of adequate scheme |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 3 |
| CO5 | 2 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18004/ BCS20004 | **DATABASE MANAGEMENT SYSTEMS** | Ty | 3 | 0/1 | 0/0 | 4 |

**UNIT I     FUNDAMENTALS OF DATABASE**                                                    **12 Hrs**

Introduction - Purpose of database systems – Data Abstraction -Data models – Instances and schemas – Data Independence – DDL – DML – Database user – ER model – Entity sets- keys – ER diagram – relational model – structure – relational algebra- relational calculus- views

**UNIT II     SQL**                                                                              **12Hrs**

SQL - QBE - level – Basic Structure – various operations – relational database design – problems in the relational database design – normalization – normalization using functional – Multivalued join dependence

**UNIT III     FILE STRUCTURE, INDEXING & HASHING**                                       **12 Hrs**

File and system structure – overall system structure – file transaction – data dictionary – indexing and hashing basic concepts and B+ tree Indices - static and dynamic hash functions

**UNIT IV     QUERY PROCESSING AND TRANSACTIONS**                                         **12 Hrs**

Overview - Measures of Query Cost - Selection Operation – Sorting - Join Operation- Transaction Concept - A Simple Transaction Model - Storage Structure – Serializability

**UNIT V     CONCURRENCY CONTROL AND RECOVERY SYSTEM**                                     **12 Hrs**

Lock-Based Protocols - Deadlock Handling - Timestamp-Based Protocols - Validation-Based Protocols - Failures Classification – Storage - Recovery and Atomicity - Recovery Algorithm - Buffer Management

**Total Hours: 60**

**TEXT BOOKS:**
1.  Abraham, Silberschatz. Henry, F. K.. Sudharshan, S. (2013) Database System Concepts (6[th]ed.) Tata McGraw Hill, New Delhi

**REFERENCE BOOKS:**
1.  Ramez, E. Shamkant, B. Navathe (2008)  Fundamentals of database systems  (5th ed.), Pearson Education
2.  Date, C. J, (2012) An Introduction to Database Systems (8th ed.), Pearson Education

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18005/BCS20005 | Subject Name :<br>**DESIGN AND ANALYSIS OF ALGORITHMS** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To Learn the algorithm analysis techniques.
- To understand the different algorithm design techniques.
- To Understand Iterative algorithms
- To Understand the limitations of Algorithm power

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Design algorithms for various computing problems |
|---|---|
| CO2 | Analyze the time and space complexity of algorithms. |
| CO3 | Critically analyze the different algorithm design techniques for a given problem. Modify existing algorithms to improve efficiency. |
| CO4 | Analysing the structure of tree and graphs to identify the limitations in solving the problem |
| CO5 | Create an algorithm for solving real world applications |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 2 |
| CO4 | 2 | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 1 |
| CO5 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 1 |
| CO3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18005/ BCS20005 | DESIGN AND ANALYSIS OF ALGORITHMS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I      INTRODUCTION**                                                          **9 Hrs**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.

**UNIT II     BRUTE FORCE AND DIVIDE-AND-CONQUER**                                     **9 Hrs**

Brute Force – Closest-Pair and Convex Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen's Matrix Multiplication-Closest-Pair and Convex Hull Problems.

**UNIT III    DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE**                               **9 Hrs**

Computing a Binomial Coefficient – Warshall's and Floyd' algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim's algorithm- Kruskal's Algorithm- Dijkstra's Algorithm-Huffman Trees.

**UNIT IV     ITERATIVE IMPROVEMENT**                                                  **9 Hrs**

The Simplex Method-The Maximum-Flow Problem – Maximm Matching in Bipartite Graphs- The Stable marriage Problem.

**UNIT V    COPING WITH THE LIMITATIONS OF ALGORITHM POWER**                           **9 Hrs**

Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP – Hard Problems – Traveling Salesman problem – Knapsack problem.

**Total Hours: 45**

**TEXT BOOK:**

1.Anany Levitin, "Introduction to the Design and Analysis of Algorithms", Third Edition, Pearson Education, 2012.

**REFERENCE BOOKS:**

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, "Introduction to Algorithms", Third Edition, PHI Learning Private Limited, 2012.

2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, "Data Structures and Algorithms", Pearson Education, Reprint 2006.

3. Donald E. Knuth, "The Art of Computer Programming", Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, 2008.

4. http://nptel.ac.in/

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BEC18I02/BEC20I02 | Subject Name :<br>MICROPROCESSORS AND MICROCONTROLLERS | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BEC18I01 | | TY | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To study the basic architectures and operational features of the processors and controllers.
- To learn the assembly language and programming of 8086.
- To design and understand the multiprocessor configuration.
- To understand the interfacing concepts of the peripheral devices with processors.

**COURSE OUTCOMES (COs) : ( 3- 5)**
**Upon the completion of the course students will be able to**

| CO1 | Ability to understand the architecture of 8086 microprocessor |
|---|---|
| CO2 | Ability to understand the architecture of 8051 microcontroller |
| CO3 | Ability to understand the interfacing of different peripheral devices with the microprocessors |
| CO4 | Understand the applications of microprocessors & microcontrollers |
| CO5 | Illustrate the applications of 8051 |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 1 | 1 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 1 |
| CO5 | 2 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ✓ | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| BEC18I02/ BEC20I02 | MICROPROCESSORS AND MICROCONTROLLERS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          16 BIT MICROPROCESSOR                                    9 Hrs**
Evolution of processors – 8086 Architecture – Functional Diagram – Register organization – Memory Addresses – Minimum mode – Maximum mode – Interrupts of 8086

**UNIT II          INSTRUCTION SET AND ALP                              9 Hrs**
Instruction Formats – Addressing modes – Instruction set – Simple programs involving logical,  branch and call instructions – sorting – string manipulations

**UNIT III          INTERFACING                                              9 Hrs**
Memory Interfacing – I/O Interfacing – Programmable Peripheral Interface 8255 – USART – DMA controller – Programmable Interval Timer 8253

**UNIT IV          MICROCONTROLLER                                      9 Hrs**
Introduction – 8051 Architecture – I/O Ports – Memory Organization – Addressing modes – Interrupts

**UNIT V          APPLICATIONS                                            9 Hrs**
Instruction set of 8051 – Applications – Simple programs – Interfacing with ADC- Interfacing with DAC- Stepper Motor – Traffic Light Controller

**Total Hours: 45**

**TEXT BOOKS:**
1. Ray A.K. & Bhurchandi K.M. (2013) Advanced Microprocessors and Peripherals, Tata McGraw Hill Education pvt Ltd
2. Douglas v Hall. (2006) Microprocessors  and Interfacing (2$^{nd}$ ed.), Tata McGraw Hill Publishing company Limited

**REFERENCE BOOKS:**
1. Badri Ram. (2006) Advanced Microprocessors and Interfacing, Tata McGraaw Hill Publishing company limited
2. Kenneth J. Ayala (2008) "The 8051 Micro Controller", 3$^{rd}$ Edition, Thomas Delmar Learning.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:BHS18NC1/BHS20NC1 | Subject Name **THEINDIAN CONSTITUTION** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 2 | 0/0 | 0/0 | NC |

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**
- To provideanoverview of thehistoryofthemakingofIndianConstitution
- To understandthepreambleandthebasic structures oftheConstitution.
- To Know the fundamentalrights, dutiesandthedirectiveprinciplesof state policy
- To understand the functionality  of the legislature ,theexecutiveand thejudiciary

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | To provideanoverview of thehistoryofthemakingofIndianConstitution |
|---|---|
| CO2 | To understandthepreambleandthebasic structures oftheConstitution. |
| CO3 | To Know the fundamentalrights, dutiesandthedirectiveprinciplesof state policy |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | - | - | - | 3 | 1 | 1 | 1 | 1 | - | - |
| CO2 | - | - | - | - | - | 3 | 1 | 1 | 1 | 1 | - | - |
| CO3 | - | - | - | - | - | 3 | 1 | 1 | 2 | - | - | - |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 1 | 2 | 1 |
| CO2 | 1 | 1 | 2 | 1 |
| CO3 | 1 | 1 | 2 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities &Social Sciences | Program core | Program Electives | Open Electives | Practical/ Project | Internships / Technical Skills | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ✓ | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BHS18NC1/ BHS20NC1 | **THEINDIAN CONSTITUTION** | Ty | 2 | 0/0 | 0/0 | NC |

**UNIT I**                                                               **3Hrs**

The HistoryoftheMakingof IndianConstitution, Preamble andthe BasicStructures

**UNIT II**                                                              **3Hrs**

FundamentalRightsand Duties , Directive Principlesof State Policy

**UNIT III**                                                            **3Hrs**

Legislature, Executive and Judiciary

**UNIT IV**                                                             **3Hrs**

EmergencyPowers

**UNIT V**                                                              **3Hrs**

Special Provisions for Jammu andKashmir, Nagalandand OtherRegions, Amendments

**Total Hours: 15**

**TEXT BOOKS:**

1. D D Basu, Introductiontothe Constitutionof India,20th Edn.,LexisnexisButterworths, 2012.

**REFERENCE BOOKS:**

1. Rajeev Bhargava (ed), Ethics and Politics of the Indian Constitution, Oxford University Press, NewDelhi, 2008.
2. GranvilleAustin,TheIndianConstitution:CornerstoneofaNation,OxfordUniversityPress, Oxford, 1966.
3. Zoya Hassan, E. Sridharan and R. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies,Permanent Black, NewDelhi, 2002.
4. SubhashC.Kashyap,OurConstitution,NationalBookTrust, NewDelhi, 2011.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:BHS18NC2/BHS20NC2 | Subject Name : **THE INDIAN TRADITIONAL KNOWLEDGE** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 2 | 0/0 | 0/0 | NC |

L : Lecture T : Tutorial   S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**
- To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System
- To understandtheTraditional Medicine, Traditional Production and Construction Technology
- To Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology
- To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | To understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System |
|---|---|
| CO2 | To understandtheTraditional Medicine, Traditional Production and Construction Technology |
| CO3 | To understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | 3 | 3 | 1 | - | 2 | - | - | - | 2 | - | 1 |
| CO2 | - | 3 | 3 | 1 | - | 2 | - | - | - | 2 | - | 1 |
| CO3 | - | 3 | 3 | 1 | - | 2 | - | - | - | 2 | - | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 1 | 2 | 1 |
| CO2 | 1 | 1 | 2 | 1 |
| CO3 | 1 | 1 | 2 | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities &Social Sciences | Program core | Program Electives | Open Electives | Practical/ Project | Internships / Technical | Soft Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb /ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| BHS18NC2/ BHS20NC2 | **THEINDIAN TRADITIONAL KNOWLEDGE** | Ty | 2 | 0/0 | 0/0 | NC |

**UNIT I**                                                         **3Hrs**

Historical Background: TKS During the Pre- colonial and Colonial Period, Indian Traditional

Knowledge System

**UNIT II**                                                         **3Hrs**

Traditional Medicine, Traditional Production and Construction Technology

**UNIT III**                                                      **3Hrs**

History of Physics and Chemistry, Traditional Art and Architecture and Vastu Shashtra, Astronomy and Astrology

**UNIT IV**                                                      **3Hrs**

Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Trade in Ancient India

**UNIT V**                                                       **3Hrs**

TKS and the Contemporary World, TKS and the Indian Union, TKS and IT Revolution

**Total Hours: 15**

**TEXT BOOKS:**

1. Amit Jha (2009) , Traditional knowledge system in india, 1ˢᵗ Edition, Delhi University (North Campus)
2. Dr.A.K.Ghosh (2011), Traditional Knowledge of Household Products

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20A02 | Subject Name : **Deep Learning and its Applications** | Ty/ Lb/ ETL | L | T/ S. Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | ETL | 1 | 0/1 | 3/0 | 3 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To understand the theoretical foundations, algorithms and methodologies of NeuralNetwork
- To design and develop an application using specific deep learningmodels
- To provide the practical knowledge in handling and analyzing real worldapplications.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Recognize the characteristics of deep learning models that are useful to solve real-worldproblems. |
|---|---|
| CO2 | Understand different methodologies to create application using deepnets. |
| CO3 | Identify and apply appropriate deep learning algorithms for analyzing the data for varietyof problems. |
| CO4 | Implement different deep learningalgorithms |
| CO5 | Design the test procedures to assess the efficacy of the developedmodel. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 2 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✔ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20AET2 | **Deep Learning and its Applications** | ETL | 1 | 0/1 | 3/0 | 3 |

**UNIT I MACHINE LEARNING BASICS**                                                  **9 Hrs**
Learning algorithms, Maximum likelihood estimation, Building machine learning algorithm, Neural Networks Multilayer Perceptron, Back-propagation algorithm and its variants Stochastic gradient decent, Curse of Dimensionality

**UNIT II DEEP LEARNING ARCHITECTURES**                                     **9 Hrs**
Machine Learning and Deep Learning, Representation Learning, Width and Depth of Neural Networks, Activation Functions: RELU, LRELU, ERELU, Unsupervised Training of Neural Networks, Restricted Boltzmann Machines, Auto Encoders, Deep Learning Applications

**UNIT III CONVOLUTIONAL NEURAL NETWORKS**                               **9 Hrs**
Architectural Overview,Motivation, Layers, Filters, Parameter sharing, Regularization, Popular CNN Architectures: ResNet, AlexNet – Applications

**UNIT IV SEQUENCE MODELLING –RECURRENT AND RECURSIVE NETS**         **9 Hrs**
Recurrent Neural Networks, Bidirectional RNNs, Encoder-decoder sequence to sequence architectures - BPTT for training RNN, Long Short Term Memory Networks.

**UNIT V AUTO ENCODERS**                                                     **9 Hrs**
Under complete Auto encoder, Regularized Auto encoder, stochastic Encoders and Decoders, Contractive Encoders.

                                                  **Total  hours:45**

**TEXT BOOKS**

1. Ian Goodfellow, YoshuaBengio and Aaron Courville, " Deep Learning", MIT Press, 2017.
2. Josh Patterson, Adam Gibson "Deep Learning: A Practitioner's Approach", O'Reilly Media, 2017
3. Umberto Michelucci "Applied Deep Learning. A Case-based Approach to Understanding Deep Neural Networks" Apress, 2018.

**REFERENCE BOOKS**

1. Kevin P. Murphy "Machine Learning: A Probabilistic Perspective", The MIT Press, 2012.
2. EthemAlpaydin,"Introduction to Machine Learning", MIT Press, Prentice Hall of India, Third Edition 2014.
3. Giancarlo Zaccone, Md. RezaulKarim, Ahmed Menshawy "Deep Learning with TensorFlow: Explore neural networks with Python", Packt Publisher, 2017.
4. Antonio Gulli, Sujit Pal "Deep Learning with Keras", Packt Publishers, 2017.
5. Francois Chollet "Deep Learning with Python", Manning Publications, 2017.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18L03/BCS20L03 | Subject Name :<br>**DATABASE MANAGEMENT SYSTEMS LAB** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18L01 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To create a database and query it using SQL, design forms and generate reports.
- Understand the significance of integrity constraints, referential integrity constraints, triggers, assertions.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand, analyze and apply common SQL statements including DDL, DML and DCL statements to perform different operations. |
|---|---|
| CO2 | Design different views of tables for different users and to apply embedded and nested queries. |
| CO3 | Design and implement a database for a given problem according to well known design principles that balance data retrieval performance with data consistency. |
| CO4 | Understand the problem and apply the programming knowledge for determining solutions. |
| CO5 | Will be able to Design a database by applying the knowledge. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 2 | 2 |
| CO3 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 1 | 3 | 2 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 1 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 2 |
| CO4 | 2 | 3 | 3 | 2 |
| CO5 | 2 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |
| | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L03/ BCS20L03 | **DATABASE MANAGEMENT SYSTEMS LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

### I. Program to learn DDL and DML commands
1. Execution of data descrption language commands
2. Execution of data manupulation language commands
3. Execution of data control language  commands
4. Execution of transation control language  commands
5. Insert command
6. Select, from and where clause
7. Set operation [union, intersection, except]
8. String operations
9. Nested queries
10. Join operation
11. Modification of the database

### II. PL / SQL programs
1. Control statements (for loop)
2. Control statements (while loop)
3. Control statements (for reverse loop)
4. Control statements (loop end loop)
5. Sum of even numbers
6. Sum of odd numbers
7. Series generation
8. Implementation of sub-program
9. Implementation of cursor using pl/sql
10. Control statement (if-else end if)

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18L04/BCS20L04 | Subject Name :<br>**DESIGN AND ANALYSIS OF ALGORITHMS LAB** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Teach the student the fundamental algorithms
- Teach the student how to analyze the performance of algorithms

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Know how to design algorithms hat employ various strategy. |
| CO2 | Can solve problems using fundamental graph algorithms. |
| CO3 | Know how analyze the average-case running times of randomized algorithms, and recite algorithms that employ randomization. |
| CO4 | Evaluate and apply classical sorting, searching, optimization and graph algorithms |
| CO5 | Create and  design programs using Back tracking and Binary search algorithm |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 1 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 2 | 3 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 1 | 3 | 1 | 2 | 3 | 2 | 2 | 1 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 1 |
| CO3 | 2 | 2 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 1 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L04/BCS20L04 | **DESIGN AND ANALYSIS OF ALGORITHMS LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Sort a given set of elements using the Quicksort method and determine the time required to sort the elements.

2. Using OpenMP, implement a parallelized Merge Sort algorithm to sort a given set of elements and determine the time required to sort the elements.

3. Implement 0/1 Knapsack problem using Dynamic Programming

4. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.

5. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.

6. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm

7. Implement N Queen's problem using Back Tracking.

8. Implementation of BINARY SEARCH algorithm

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18IL2/BES20IL2 | Subject Name : **MICROPROCESSORS AND MICROCONTROLLERS LAB** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BEC18IL1 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To learn the assembly language programming of 8086.
- To learn the assembly language programming of 8051.
- To understand the interfacing concepts of the peripheral devices with processors

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Ability to understand the Programming of 8086 microprocessor |
|---|---|
| CO2 | Ability to understand the Programming of 8051 microcontroller |
| CO3 | Understand the applications of microprocessors & microcontrollers |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO2 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BEC18IL2/BES 20IL2 | **MICROPROCESSORS AND MICROCONTROLLERS LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

**8086 Microprocessor:**
1. Arithmetic operations
2. Block Movement of Data
3. Square and square root
4. Searching and sorting

**8051 Microcontroller:**
1. Arithmetic operations
2. Block Movement of Data
3. Square and square root
4. Searching and sorting

**Interfacing:**
1. Traffic light Controller
2. Stepper Motor Controller
3. Waveform Generation
4. Matrix Display

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18TS1/ BCS20TS1 | Subject Name : **TECHNICAL SKILL I (EVALUATION))** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning   P : Project   R : Research  C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

## OBJECTIVES:
- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

## COURSE OUTCOMES (COs) : ( 3- 5)

| CO1 | Understand the domain specific knowledge. |
|---|---|
| CO2 | Able to apply idealistic, practical and moral values. |
| CO3 | Familiarize with emerging technology |

## Mapping of Course Outcomes with Program Outcomes (POs)

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 1 |

| COs /PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 |
| CO2 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 1 | 3 |

**3/2/1indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ✔ | |

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# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18TS1/ BCS20TS1 | TECHNICAL SKILL I (EVALUATION) | Lb | 0 | 0/0 | 3/0 | 1 |

**OBJECTIVES:**

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEN18SK1/ BEN20SK1 | Subject Name : SOFT SKILL I | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | ETL | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To create awareness in students, various top companies helping them improve their skill set matrix, leading to develop a positive frame of mind.
- To help students be aware of various techniques of candidate recruitment and help them prepare CV's and resume.
- To help student how to face various types of interview, preparing for HR, technical interviews.
- To help students improve their verbal reading, narration and presentation skills by performs various mock sessions.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Be aware of various top companies leading to improvement in skills amongst them. |
|---|---|
| CO2 | Be aware of various candidate recruitment techniques like group discussion, interviews and be able to prepare CV's and resumes. |
| CO3 | Prepare for different types of interviews and be prepared for HR and technical interviews. |
| CO4 | Improve their verbal, written and other skills by performing mock sessions. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO3 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO4 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 3 | 2 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 1 | 3 | 1 |
| CO2 | 1 | 1 | 3 | 1 |
| CO3 | 1 | 1 | 3 | 1 |
| CO4 | 1 | 1 | 3 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ✓ | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18SK1/ BEN20SK1 | SOFT SKILL I | ETL | 0 | 0/0 | 3/0 | 1 |

.

## UNIT I                                                                    6 Hrs

Creation of awareness of top companies / improving skill set matrix / Development of positive frame of mind / Creation of self-awareness.

## UNIT II                                                                   6 Hrs

Group discussions / Do's and don'ts – handling group discussions / what evaluators look for interpersonal relationships / Preparation of Curriculum Vitae / Resume.

## UNIT III                                                                  6 Hrs

Interview – awareness of facing questions – Do's and don'ts of personal interview / group interview, enabling students to prepare for different proce3dures such as HR interviews and Technical Interviews / self-introductions.

## UNIT IV                                                                   6 Hrs

Verbal aptitude, Reading comprehension / narration / presentation / Mock Interviews.

## UNIT V                                                                    6 Hrs

Practical session on Group Discussion and written tests on vocabulary and reading comprehension

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**

**Total Hours: 30**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**SEMESTER – V**

| Subject Code: BCS18006/ BCS20006 | Subject Name : **OPERATING SYSTEMS** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Understand the concepts of Operating System and process.
- Illustrate the Scheduling of a processor for a given problem instance, identify the dead lock situation and provide appropriate solution, analyze memory management techniques and implement page replacement Algorithm, understand the implementation of file systems and directories.
- To appreciate emerging trends in operating systems.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Master functions, structures and history of operating systems |
|---|---|
| CO2 | Master understanding of design issues associated with operating systems |
| CO3 | Master various process management concepts including scheduling, synchronization, deadlocks and multithreading |
| CO4 | Master concepts of memory management including virtual memory |
| CO5 | Master issues related to file system interface and implementation, disk management |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 | | | | |
| CO2 | 3 | 3 | 1 | 2 | | | | |
| CO3 | 3 | 3 | 1 | 2 | | | | |
| CO4 | 3 | 3 | 2 | 2 | | | | |
| CO5 | 3 | 3 | 2 | 2 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| UBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18006/BCS20006 | **OPERATING SYSTEMS** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I     CONCEPTS & PROCESSES**                                                                          **9 Hrs**

Computer system architecture-operating system  structure-operations-management of process,memory,storage-protection and security-Operating System Services-System Calls-types-System Programs-System Structure-Virtual Machines-System Design and Implementation- Process concept-Process Scheduling-Operation on Process-Cooperating Processes- Inter Process Communication

**UNIT II  PROCESS MANAGEMENT, SYNCHRONIZATION AND DEADLOCKS**

**9 Hrs**

Threads-Multithreading Models. CPU Scheduling concepts-Scheduling Criteria-Scheduling Algorithms-Threads and Multiple-Processor Scheduling-Real Time Scheduling- - Process Synchronization-The Critical Section Problem-Synchronization-Petersonsolution,mutex-Hardware-Semaphores monitor-Deadlocks-Deadlock Characterization-Methods of Handling Deadlocks-Deadlock Prevention-Deadlock Avoidance-Deadlock Detection-Recovery form Deadlock

**UNIT III     MEMORY MANAGEMENT**                                                                          **9 Hrs**

Main Memory-Swapping-Contiguous Memory Allocation -   Address Translation - Paging - Segmentation – Virtual memory-Demand paging-page replacement-thrashing-allocating Kernal memory.

**UNIT IV     STORAGE  MANAGEMENT**                                                                          **9 Hrs**

Files And Secondary Storage Management:  File Concepts - Access Methods - Directory Structure  - File System Mounting  - File Sharing  - Protection  - File System Structure -  Implementation - Recovery - Disk Structure - Disk Scheduling - Disk Management

**UNIT V     CASE STUDY**                                                                          **9 Hrs**

Special purpose systems -Open source operating systems-Operating system generation-Examples of IPC systems-threading Issues-Operating system examples- Algorithm Evaluation of scheduling algorithms- Classical Problems Of Synchronization-Synchronization examples-Intel 32 bit and 64 bit architectures-ARM architecture-STREAMS.

**Total Hours: 45**

**TEXT BOOK:**
   1.Silberschatz. Galvin. Gagne (2012) Operating System Concepts (9th ed.), John Wiley

**REFERENCE BOOKS:**
   1.  D.M.Dhamdhere. D. M. ( 2012) Operating Systems, (3 rd  ed.), Tata McGraw Hill
   2.  Tanenbaum  (2015) Modern Operating Systems,Pearson Publication.
   3.  William Stallings (2015) Operating Systems (8 th ed.)  Prentice Hall of India

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18007/BCS20007 | Subject Name : COMPUTER NETWORKS | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The students will be have knowledge of  the networks  functions
- To understand how communication takes place in various mediums
- To learn about the protocols for data communication in the network layers
- To  study about the various network  algorithms for smooth data communication

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Have knowledge on functions of  Network Devices & OSI Layers for Communication |
| CO2 | Knowledge on IP addresses and protocols. |
| CO3 | Have knowledge on how to avoid the error and congestion on network using algorithms |
| CO4 | Acquaintance to apply algorithms in networks. |
| CO5 | Will understand how layers of networks work. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18007/BCS 20007 | **COMPUTER NETWORKS** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          INTRODUCTION**                                                    **9 Hrs**

Introduction to computer networks and uses - Network: devices, topology, types - Reference model - The physical layer - The theoretical basis for data communication - Transmission media: Guided and unguided- Public Switched Telephone Network.

**UNIT II          DATA LINK LAYER**                                               **9 Hrs**

Data link layer design issues - Error detection and correction - Sliding window protocols- HDLC – Channel access on links: SDMA – TDMA - FDMA – CDMA - ETHERNET - 802.11, 802.16 - Bridges and Switches-Bluetooth

**UNIT III          NETWORK LAYER**                                               **9 Hrs**

Network layer design issues - Circuit switching – Packet switching – Virtual circuit switching- Routing algorithms – Congestion control algorithms - Internetworking- Network layer in Internet - IPV6

**UNIT IV          TRANSPORT LAYER**                                             **9 Hrs**

Transport layer design issues - Transport protocols - Simple transport protocol - Internet transport protocols UDP, TCP - Flow Control – Congestion control - Congestion avoidance

**UNIT V          APPLICATION LAYER**                                           **9 Hrs**

Domain name system - Electronic mail – Introduction to World Wide Web: HTTP, SNMP, Telnet, FTP, RTP.                                                                      **Total Hours: 45**

**TEXT BOOKS:**

1. Peterson Davie (2012) Computer Networks - A System Approach (2nd ed.), Morgan Kauffman Harcourt Publishers.
2. James F. Kurose, Keith W. Ross Computer Networking: A Top-Down Approach / Edition 6, Pearson publication, 2012.

**REFERENCE BOOKS:**

1. Andrew S. Tanenbaum. David J. Wetherall ,"Computer Networks "5th Edition PHI, 2011
2. William Stallings," Data and computer communications", PHI, 2001
3. Douglas E. comer," Internetworking with TCP/IP-Volume-I", PHI, 5th edition 2006
4. Godbole, "Data communication and networking", TMH, 2004.
5. Forouzan B. A., "Data Communications and networking", TMH, 2003.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18008/BCS20008 | Subject Name : SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18003 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the role played by system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions.
- To develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Understand about the system softwares such as assembler, interpreter, linker, loader and compilers in the development of IT solutions. |
| CO2 | Describe the design of a Compiler including its Phases and Components. |
| CO3 | Develop a large, complex, but well-structured software system that implements various phases of a compiler such as the scanner, parser, code generator, and optimizer. |
| CO4 | Identify the similarities and differences among various parsing techniques and grammar transformation techniques. |
| CO5 | Design a simple compiler using the construction tools. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 2 | 3 | 2 | 2 |
| CO3 | 2 | 1 | 1 | 1 |
| CO4 | 3 | 1 | 3 | 2 |
| CO5 | 1 | 1 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18008/ BCS20008 | **SYSTEM SOFTWARE AND PRINCIPLES OF COMPILER DESIGN** | Ty | 3 | 0/0 | 0/0 | 3 |

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**UNIT I     ASSEMBLERS & MACROS**                                                                              **6 Hrs**

Overview of Language processors – Assemblers: Design of two pass assemblers - single pass assemblers MACRO: Macro definition- macro call – macro expansion- nested macroadvanced macro facilities.

**UNIT II     LINKERS & LOADERS**                                                                              **6 Hrs**

Loaders and Linkers: Functions – design - bootstrap loader - machine dependent loader features - machine independent loader features - loader design options - Dynamic linking and Linkage Editors – Implementation Examples

**UNIT III   COMPILERS : GRAMMARS & AUTOMATA**                                                                              **9 Hrs**

Structure of compiler-Languages –Context free grammar - regular expression - Recognizing of patterns - finite automation (deterministic & non deterministic) Conversion of NDFA to DFA - Conversion of regular expression to DFA – Thompson's construction- minimization of NDFA - Lexical analysis- handles - token specification - design of lexical analysis (LEX) - Automatic generation of lexical analyzer - input buffering - A language for specifying lexical analyzers - implementation of lexical analyzer.

**UNIT IV   SYNTAX ANALYSIS – PARSING**                                                                              **12 Hrs**

Definition - role of parsers - top down parsing - bottom-up parsing - Left recursion - left factoring - Handle pruning , Shift reduce parsing - operator precedence parsing – FIRST- FOLLOW- LEADING- TRAILING- Predictive parsing - recursive descent parsing. LR parsing – LR (0) items - S.LR parsing – Canonical LR - LALR parsing - generation of LALR - error recovery

**UNIT V   SYNTAX DIRECTED TRANSLATION & CODE OPTIMIZATION**                                                                              **12 Hrs**

Intermediate Languages - prefix - postfix - Quadruple - triple - indirect triples – syntax tree- Evaluation of expression - three-address code- Synthesized attributes – Inherited attributes – Conversion of Assignment statements- Boolean expressions – Backpatching - Declaration - CASE statements

CODE OPTIMIZATION: Local optimization- Loop Optimization techniques – DAG – Dominators- Flow graphs – Storage allocations- Peephole optimization – Issues in Code Generation.                                         **Total Hours: 45**

**TEXT BOOKS:**

1. Alfred V Aho, Jeffrey D Ullman, Ravi Sethi, "Compilers, Techniques, and Tools", Addison Wesley,  2006
2. Leland L Beck, D. Manjula, "System Software",III Edition, Pearson Education -- First Impression, 2007

**REFERENCE BOOKS:**

1. D.M.Dhamdhere (2009) Systems Programming and Operating Systems,(2nd ed.), Tata McGraw-Hill Publishing Company Ltd
2. John J Donavan (2009) System Programming, Tata McGraw- Hill Publishing Company Ltd
3.  John R. Levine, "Linkers & Loaders", Morgan Kauffman, 2003.
4. Allen Holub I. (2007) Compiler Design in C, PHI
5. V Raghavan (2009) Principles of compiler, Tata Mc Graw Hill
6. Kenneth C Louden (2003) Compiler Construction Principles & Practice Thompson learning

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20A03 | Subject Name : **Big Data Analytics** | | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18E06 | | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To optimize business decisions and create competitive advantage with Big Data analytics
- To explore the fundamental concepts of big data analytics.
- To learn to analyze the big data using intelligent techniques.
- To understand the various search methods and visualization techniques.
- To learn to use various techniques for mining data stream.
- To understand the applications using Map Reduce Concepts.
- To introduce programming tools PIG & HIVE in Hadoop echo system.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the concept of big data |
|---|---|
| CO2 | Recognizetheimportanceandrelevanceof data handling Models |
| CO3 | Design the efficient method for data handling. |
| CO4 | Learn various techniques and implement in programming tools. |
| CO5 | Will understand the application of map reduce concept |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20A03 | **BIG DATA ANALYTICS** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I** **9Hrs**

Introduction to big data : Introduction to Big Data Platform — Challenges of ConventionalSystems-Intelligentdataanalysis—NatureofData-AnalyticProcesses and Tools - Analysis vsReporting.

**UNITII** **9Hrs**

Mining data streams : Introduction To Streams Concepts — Stream Data Model and Architecture - Stream Computing - Sampling Data in a Stream-Filtering Streams— CountingDistinctElementsinaStream—EstimatingMoments—CountingOnenessin aWindow—DecayingWindow-RealtimeAnalyticsPlatform(RTAP)Applications-CaseStudies-RealTimeSentimentAnalysis-StockMarketPredictions.

**UNIT III** **9Hrs**

Hadoop: History of Hadoop- the Hadoop Distributed File System-Components of HadoopAnalysingtheDatawithHadoop-ScalingOut-HadoopStreaming-Designof HDFS-JavainterfacestoHDFSBasics-DevelopingaMapReduceApplication-HowMap Reduce Works-Anatomy of a Map Reduce Job run-Failures-Job Scheduling-Shuffle and Sort — Task execution - Map Reduce Types and Formats- Map Reduce Features-Hadoopenvironment.

**UNIT IV** **9Hrs**

Frameworks:ApplicationsonBigDataUsingPigandHive—Dataprocessingoperators inPig—Hiveservices—HiveQL—QueryingDatainHive-fundamentalsofHBaseand ZooKeeper-IBMInfoSphereBigInsightsandStreams.

**UNIT V**

**9Hrs**

Predictive Analytics- Simple linear regression- Multiple linear regression- Interpretation of regression coefficients. Visualizations - Visual data analysis techniques- interaction techniques - Systems and applications.

**Total Hours :45**

**TEXT BOOKS:**

1. Chris Eaton, Dirk DeRoos, Tom Deutsch, George Lapis, Paul Zikopoulos, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data", McGrawHill Publishing,2012.
2. MichaelBerthold,DavidJ.Hand,"IntelligentDataAnalysis",Springer,2007.

**REFERENCES:**

1. TomWhite"Hadoop:TheDefinitiveGuide"ThirdEdition,O'reillyMedia,2012.
2. Anand Rajaraman and Jeffrey David Ullman, "Mining of Massive Datasets",CUP, 2012.
3. BillFranks,"TamingtheBigDataTidalWave:FindingOpportunitiesinHugeData Streams with Advanced Analytics", John Wiley& sons,2012.
4. GlennJ.Myatt,"MakingSenseofData",JohnWiley&Sons,2007.
5. Pete Warden, "Big Data Glossary", O'Reilly,2011.

6. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", $2^{nd}$ Edition, Elsevier, Reprinted2008.
7. DaRuan,GuoquingChen,EtienneE.Kerre,GeertWets,"IntelligentDataMining", Springer,2007.
8. Paul Zikopoulos, Dirkde Roos, Krishnan Parasuraman, Thomas Deutsch, James Giles , David Corrigan, "Harness the Power of Big Data The IBM Big Data Platform", Tata McGraw Hill Publications,2012.
9. ArshdeepBahga,VijayMadisetti,"BigDataScience&Analytics:AHands- On Approach ",VPT,2016
10. Bart Baesens "Analytics in a Big Data World: The Essential Guide to Data ScienceanditsApplications(WILEYBigDataSeries)",JohnWiley&Sons,2014

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code BCS18ET2/BCS20ET2 | Subject Name : COMPUTER GRAPHICS | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | X Prerequisite: BES18ET2 | | ETL | 1 | 0/1 | 3/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

## OBJECTIVES :
 **The student should be made to:**
- Understand the output primitives, two dimensional graphics and their transformations.
- Understand the three dimensional graphics and their transformations.
- Understand illumination and color models
- Learn to create animations

## COURSE OUTCOMES (COs) : ( 3- 5)

| CO1 | Transform geometrical structures, perform clipping on geometrical objects |
|---|---|
| CO2 | Analyze a 3D structure |
| CO3 |  Create and evaluate graphic projects |
| CO4 | Apply different shading,colour model and selection of colour |
| CO5 | Discuss  animation sequences and graphics realism |

## Mapping of Course Outcomes with Program Outcomes (POs)

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 2 |
| CO2 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 3 | 2 | 1 | 1 | 3 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 2 | 1 | 3 |
| CO4 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 3 | 2 | 1 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18ET2/ BCS20ET2 | COMPUTER GRAPHICS | ETL | 1 | 0/1 | 3/0 | 3 |

**UNIT I    OUTPUT PRIMITIVES                                                9 Hrs**

Output primitives-Line drawing algorithms-Loading the frame buffer-Line function-Circle generation algorithms –Ellipse generation algorithms- Attributes of output primitives-Numerical problem solving and programs on line, circle and ellipse drawing algorithms

**UNIT II    TWO DIMENSIONAL TRANSFORMATION & VIEWING                   9 Hrs**

Two dimensional transformations- Matrix representations and homogeneous coordinates - Composite transformations  – two dimensional viewing -Window to view port transformation -  Clipping operations - Point clipping - Line clipping (Cohen - Sutherland line Clipping) - Polygon clipping(Sutherland - Hodgeman algorithm) –Numerical problem solving and programming on two dimensional transformation ,viewing and clipping

**UNIT III   THREE DIMENSIONAL GRAPHICS                                   9 Hrs**

Three dimensional concepts - Three dimensional object representation -Three Dimensional Transformations - Visible surface detection methods (Back Face Detection - Depth Buffer Method - Scan Line Method) - Numerical problem solving and programming on three dimensional transformations

**UNIT IV   POLYGONRENDERING METHODS AND COLOUR MODELS              9 Hrs**

Constant-Intensity Shading – Gouraud Shading- Phong Shading- chromaticity diagram - RGB colour model - YIQ colour model - CMY colour model - Colour selection

**UNIT V   ANIMATION GRAPHICS                                             9 Hrs**

Design of Animation sequences – animation function – raster animation – key frame systems – motion specification – morphing - create Interactive animation for gamming

**Total Hours: 45**

**TEXT BOOKS:**
1. Donald, D. Hearn. Pauline, Baker, M. Warren, Carithers. (2010) Computer graphics with Open GL, (4$^{th}$ed.)
2. Computer Graphics (Special Indian Edition) (Schaum's Outline Series)  2nd Edition, 2006 (English, Paperback, Xiang, Plastock, Avadhani), McGraw Hill Education (India) Private Limited

**REFERENCE BOOKS:**
1. John F. Hughes, Andries Van Dam, Morgan Mc Guire ,David F. Sklar , James D. Foley, Steven K. Feiner and Kurt Akeley ,"Computer Graphics: Principles and Practice", 3rd Edition, Addison- Wesley Professional,2013.
2. Peter Shirley, Michael Ashikhmin, Michael Gleicher, Stephen R Marschner, Erik Reinhard, Kelvin Sung, and AK Peters, Fundamental of Computer Graphics, CRC Press, 2010.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L05/BCS20L05 | Subject Name : **NETWORK PROGRAMMING LAB** | Ty /Lb /ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: **:** | Lb | 0 | 0/0 | 3/0 | **1** |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Hands on Experience to design an application using TCP and UDP sockets.
- Hands on Experience to design an interface to transfer a file between two ends using FTP
- Hands on Experience to develop a RMI application for specific operation
- To have a knowledge to work with Network Simulators

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Ability to apply the knowledge in Socket Programming using TCP and UDP |
|---|---|
| CO2 | To design Client /Server Application Program by remembering the standards of protocol. |
| CO3 | Ability to create a Server based application using RMI and RPC concepts. |
| CO4 | Understand how network stimulator works. |
| CO5 | Can analyze the state of network. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ET | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L05/ BCS20L05 | **NETWORK PROGRAMMING  LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF  EXPERIMENTS

1. Networking Commands with options. (Case Study).
2. Socket program to extent communication between two deferent ends using TCP.
3. Socket program to extent communication between two deferent ends using UDP
4. Create a Socket (TCP) between two computers and enable file transfer between them.
5. Implementation of RPC in server-client model
6. Implementation of ARP/RARP.
7. HTTP Socket program to download a web page.
8. File transfer in Client-Server architecture using following methods
      a) Using RS232C b) Using TCP/IP
9. To implement RMI (Remote Method Invocation)
10. Write a network program to broadcast/ multicast a message to a group in the same network.
11. Demonstration of Network Simulators.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L06/BCS20L06 | Subject Name : **OPERATING SYSTEMS LAB** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | **Lb** | **0** | **0/0** | **3/0** | **1** |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/LbETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To learn to Create processes and implement IPC
- To learn to use system calls through C programs
- To learn to use the file system related system calls
- To gain knowledge to Analyze the performance of the various Page Replacement Algorithms
- To learn to  Implement File Organization and File Allocation Strategies

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Master functions, structures and history of operating systems |
|---|---|
| CO2 | Master understanding of design issues associated with operating systems |
| CO3 | Master various process management concepts including scheduling, synchronization, deadlocks and multithreading |
| CO4 | Master concepts of memory management including virtual memory |
| CO5 | Master issues related to file system interface and implementation, disk management |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 1 | 1 | 1 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 1 | 1 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 |
| CO2 | 3 | 2 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 1 | 2 | 1 |
| CO5 | 3 | 1 | 2 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L06/BCS20L06 | **OPERATING SYSTEMS LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Basic UNIX commands – learning and usage.

2. Shell Programming.

3. File system related system calls. (Learn to create, open, read, write, seek into, close files & open, read, write, search, close directories).

4. Process management – Fork, Exec (Learn to create a new process and to overlay an executable binary image on an existing process).

5. Inter-process communication between related processes using pipes.

6. Process synchronization using semaphores (Solutions to synchronization problems like producer consumer problem, dining philosopher's problem etc...).

7. Inter-process communication among unrelated processes using Shared memory.

8. Inter-process communication among unrelated processes using Message Queues.

9. CPU Scheduling algorithms.

10. Contiguous memory allocation strategies – best fit, first fit and worst fit strategies.

11. Page replacement algorithms

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20AL03 | Subject Name : **Big Data Analytics Lab** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18003 | **Lb** | **0** | **0/0** | **3/0** | **1** |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The students will be able to setup Hadoop environment.
- The students will be able to implement hbase.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Implement Hadoop and install Hadoop network. |
| CO2 | Implement file management. |
| CO3 | Implement mapb reduce |
| CO4 | Implement various algorithms |
| CO5 | Will be handling hbase. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 2 | 2 | 1 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 1 |
| CO3 | 2 | 3 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ET | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20AL1 | Big Data Analytics Lab | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Start- up scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as    Adding files and directories, Retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Implementation of K-means clustering using Map Reduce
6. Installation of Hive along with practice examples.
7. Installation of HBase, Installing thrift along with Practice examples
8. Patrice importing and exporting data from various data bases .

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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18TS2/BCS20TS2 | Subject Name : **TECHNICAL SKILL II (EVALUATION))** | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**
- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the domain specific knowledge. |
|---|---|
| CO2 | Able to apply idealistic, practical and moral values. |
| CO3 | Familiarize with emerging technology |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 1 |

| COs /PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 |
| CO2 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 1 | 3 |

**3/2/1indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ✔ | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18TS2/BCS 20TS2 | TECHNICAL SKILL II (EVALUATION) | Lb | 0 | 0/0 | 3/0 | 1 |

**OBJECTIVES:**

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code**:** BCS18009/BCS20009 | Subject Name **:** **OBJECT ORIENTED SOFTWARE ENGINEERING** | Ty /Lb /ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18002 | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Understand the phases in a software development
- Understand fundamental concepts of requirements engineering and Analysis Modelling.
- Understand the different approach for Object Oriented Design
- Learn various testing and maintenance measures

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| **CO1** | Identify the key activities in managing a software Development. |
| **CO2** | Compare different process models. |
| **CO3** | Concepts of requirements engineering and Analysis Modeling. |
| **CO4** | Apply systematic procedure for software design and deployment. |
| **CO5** | Compare and contrast the various testing and maintenance |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 2 | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| **CO1** | 3 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 |
| **CO3** | 3 | 3 | 3 | 3 |
| **CO4** | 3 | 3 | 3 | 3 |
| **CO5** | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High,  2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## SEMESTER – VI

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ET | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18009/BCS 20009 | **OBJECT ORIENTED SOFTWARE ENGINEERING** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I      SOFTWARE DEVELOPMENT LIFE CYCLE**                                    **12 Hrs**

Introduction -Software process models: The waterfall model, Incremental development, Reuse-oriented software engineering – OOSD Life cycle: Process activities Software specification – Software design and implementation – Software validation – Software evolution- Process iteration: Prototyping, Incremental delivery, Boehm's spiral model - Agile methodology - OMT – Booch Methodology – Jacobson methodology – patterns – unified approach

**UNIT II   OBJECT ORIENTED SOFTWARE REQUIREMENTS AND ANALYSIS**          **12 Hrs**

Requirements engineering: Functional and non-functional requirements – The software requirements document – System Modeling: Context models – Interaction models - Structural models - Behavioral models - **UML**: Static and Dynamic Models–Introduction to UML -Use case Diagram – Class diagrams –Dynamic modeling-Packages and Model Organization-UML Extensibility - Use case model – Creation of Classes: Noun Phrase Approach – Identifying Object Relationships, Attributes and Methods

**UNIT III    OBJECT ORIENTED SOFTWARE DESIGN**                                  **15 Hrs**

Architectural design: Architectural design decisions - Architectural views - Architectural patterns - Application architectures - Design and implementation: Object-oriented design using the UML - OO Design Axioms – Corollaries-Design Patterns-Designing Classes: Class Visibility – refining Attributes – Designing Methods – Access layer: Object Store and Persistence-OODBMS – Table Class mapping –Designing Access layer classes - View layer: Designing Interface Objects

**UNIT IV   TESTING**                                                                        **9 Hrs**

Software testing: Development testing - Test-driven development - Release testing - User testing - Quality Assurance Test – Testing strategies – Impact of OO Testing – Test Cases – Test Plan – Continuous Testing  - Myers's Debugging principles.

**UNIT V  SOFTWARE QUALITY & MANAGEMENT**                                      **12 Hrs**

Project management: Risk management- Managing people – Teamwork - Project planning: Software pricing - Plan-driven development - Project scheduling - Agile planning - Estimation techniques   Quality management: Software quality - Software standards  - Reviews and inspections - Software measurement and metrics - Configuration management: Change management - Version management - System building - Release management

**Total Hours: 60**

**TEXT BOOK:**
   **1.**   Yogesh Singh,  Ruchika Malhotra (2012), Object – Oriented Software Engineering PHI Learning Private Limited.
**REFERENCE BOOKS:**
   1.   Ian Sommerville (2008) Software Engineering (9[th]ed.) Pearson Education Asia
   2.   Ali Bahrami (2008) Object Oriented System Development McGraw Hill international
   3.   Roger S. Pressman (2010) Software Engineering: A Practitioner Approach (8[th]ed.) McGraw hill Publications
   4.   Grady Booch (2009) Object oriented Analysis & design ,Pearson Education India

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BIT18003/BIT20003 | Subject Name<br><br>**WEB TECHNOLOGY AND WEB SERVICES** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BIT18I01 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- The students will have knowledge about the HTML5 and CSS3
- To learn the concepts of XML and SOAP.
- To study about the JSP and understand to develop basic level application and advance application on web pages.
- To study about the concept of Web services.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Able to design the web page using  HTML5 and CSS3 |
|---|---|
| CO2 | Learn the fundamentals of XML , JSP and implement in the web service |
| CO3 | Understand the concept of Web service including SOAP, UDDI and WSDL |
| CO4 | Apply the concept of the server side programming to develop the application on web pages. |
| CO5 | Acquaint the latest programming language for the concepts of web services |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 1 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | ✓ | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BIT18003/BIT20003 | **WEB TECHNOLOGY AND WEB SERVICES** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          HTML 5 & CSS 3**                                                                                        **9 Hrs**

HTML – forms – frames – tables – web page design – Dynamic HTML – introduction – cascading style sheets – object model and collections –event model – filters and transition – data binding – data control – ActiveX control – handling of multimedia data

**UNIT II          XML**                                                                                                             **9Hrs**

Role of XML - XML and The Web - XML Language Basics -  Revolutions of XML - Service Oriented Architecture (SOA). XML - Name Spaces - Structuring With Schemas and DTD - Presentation Techniques - Transformation - XML Infrastructure.

**UNIT III          SOAP**                                                                                                          **9 Hrs**

Overview of SOAP - HTTP - XML-RPC - SOAP: Protocol - Message Structure - Intermediaries - Actors - Design Patterns and Faults - SOAP With Attachments. Introduction to SGML - COM – DCOM – CORBA.

**UNIT IV          SERVER SIDE PROGRAMMING**                                                             **9 Hrs**

Introduction to Servlets and Java Server Page (JSP), Servlets lifecycle, Servlet Classes and Sessions.JSP Application Design, JSP objects, sharing data between JSP pages, Sharing Session and Application Data, Database Programming using JDBC, development of java beans in JSP.

**UNIT VWEB SERVICES**                                                                                                **9 Hrs**

Overview - Architecture - Technologies - UDDI - WSDL - ebXML - SOAP and Web Services in E-Com, Rest full in Web service.

**Total Hours: 45**

**TEXT BOOKS:**

1. Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian,"Beginning HTML5 and CSS 3" @ Apress , 2012.
2. Frank. P. Coyle, "XML, Web Services and The Data Revolution", Pearson Education, 2002.
3. Phil Hanna, "JSP: The Complete Reference", McGraw-Hill, 2001

**REFERENCE BOOKS:**

1. Laura Lemay, Rafe Coburn, Jennifer Kyrnin, "Mastering HTML, CSS & JavaScript Web Publishing", Pearson Education.2015
   Sandeep Chatterjee, James Webber, "Developing Enterprise Web Services", Pearson       Education, 2004.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20A04 | Subject Name : **Natural Language Processing** | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18002 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Expand the knowledge gained in Database Management Systems in several directions like Non-Relational data models, deductive (Intelligent) database systems, distributed systems, web based systems and object oriented systems etc.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Provide the student with knowledge of various levels of analysis involved in NLP |
| CO2 | Understand the applications of NLP |
| CO3 | Gain knowledge in automated Natural Language Generation and Machine Translation |
| CO4 | Compare and contrast different types of advance database management systems. |
| CO5 | Describe database Administration and its management. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | |
| CO2 | 3 | 2 | 2 | 2 | | | |
| CO3 | 3 | 3 | 3 | 3 | | | |
| CO4 | 3 | 3 | 3 | 3 | | | |
| CO5 | 3 | 3 | 2 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20A04 | Natural Language Processing | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I- OVERVIEW AND MORPHOLOGY**          **9Hrs**

Introduction – Models -and Algorithms - -Regular Expressions Basic Regular Expression Patterns – Finite State Automata, Morphology -Inflectional Morphology - Derivational Morphology - Finite-State Morphological Parsing --Porter Stemmer

**UNIT II - WORD LEVEL AND SYNTACTIC ANALYSIS**          **9Hrs**

N-grams Models of Syntax - Counting Words - Unsmoothed N- grams- Smoothing- Backoff DeletedInterpolation – Entropy - English Word Classes - Tagsets for English - Part of Speech Tagging-Rule Based Part of Speech Tagging - Stochastic Part of Speech Tagging - Transformation-Based Tagging -

**UNIT III –CONTEXT FREE GRAMMARS**          **9Hrs**

Context Free Grammars for English Syntax- Context- Free Rules and Trees - Sentence- Level Constructions– Agreement – Sub Categorization - Parsing – Top-down – Earley Parsing - feature Structures – ProbabilisticContext-Free Grammars

**UNIT IV –SEMANTIC ANALYSIS**          **9Hrs**

Representing Meaning - Meaning Structure of Language - First Order Predicate Calculus - Representing Linguistically Relevant Concepts -Syntax- Driven Semantic Analysis - Semantic Attachments -Syntax- Driven Analyzer - Robust Analysis - Lexemes and Their Senses - Internal Struct ure - Word SenseDisambiguation -Information Retrieval

**UNIT V –LANGUAGE GENERATION AND DISCOURSE ANALYSIS**          **9Hrs**

Discourse -Reference Resolution - Text Coherence - Discourse Structure – Coherence - Dialog and Conversational Agents - Dialog Acts – Interpret ation -Conversational Agents - Language Ge n e r a t i o n – A r ch i t ec t u r e - Surface Realizations - Discourse Planning - Machine Translation -Transfer Metaphor–Interlingua – Statistical Approaches

**TEXT BOOKS**          **Total Hours : 45**

1. Daniel Jurafsky and James H Martin, "Speech and Language Processing: An introduction to Natural Language Processing, Computational Linguistics and Speech Recognition", Prentice Hall, 2nd Edition, 2008.

2. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999

**REFERENCE BOOKS**

1. C. Manning and H. Schutze, "Foundations of Statistical Natural Language Processing", MIT Press. Cambridge, MA:,1999

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18ET3/BCS20ET3 | Subject Name : **PHP / MYSQL** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18L03 | ETL | 1 | 0/1 | 3/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- The students will learn the technology about scripting languages basics.
- To learn install PHP and work on that.
- To learn the basic and advance concepts of PHP language.
- To understand install the MySQL and work with MySQL database in admin level and client to store and retrieve the data in application with PHP.
- To learn design basic and advance applications using PHP and MySQL.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Learn the fundamentals of HTML, CSS and PHP |
| CO2 | Learn the fundamentals database concept and MySQL |
| CO3 | Able to develop the Application using PHP and MySQL |
| CO4 | Apply systematic procedure for developing different databases. |
| CO5 | Build to develop an application using PHP. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 1 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 1 | 3 | 2 | 1 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18ET3/BCS 20ET3 | **PHP / MYSQL** | ETL | 1 | 0/1 | 3/0 | 3 |

**UNIT I  Introduction**         **9 Hrs**
Introduction to Web server and Web browser - Introduction to PHP - Lexical structure - Language basics - Function and String - Default parameters - Variable function, Anonymous function Printing functions - Manipulating and searching strings - Regular expressions.

**UNIT II  Arrays**         **9 Hrs**
Identifying elements of an array - Indexed Vs Associative arrays - Storing data in arrays - Multidimensional arrays - Extracting multiple values - Converting between arrays and variables - Traversing arrays - Sorting - Action on entire arrays - Using arrays.

**UNIT III Objects and Web Techniques**         **9 Hrs**
OOP – Class – Objects – Introspection – Serialization – Inheritance - Interfaces - Encapsulation
HTTP Basics – Variables – Server information – Processing Form, Setting Response headers – maintain state – SSL.

**UNIT IV Databases and Graphics**         **9 Hrs**
Using PHP to access Database – Relational Databases and SQL – MySQLi Object interface – SQLite- Direct file level manipulation – mongoDB.Embedding an image in a page – Basic Graphic concepts – Creating and drawing images.

**UNIT V  Files and Directories**         **9 Hrs**
Filter input – cross-site scripting – Escape output – Session fixation – file uploads – file access – PHP code – Shell commands – Core libraries – Templating systems – Handling output – Error Handling – Performance Tuning.

**Total Hours: 45**

**TEXT BOOKS:**
1. **www.spoken-tutorials.org**
2. Kevin Tatroe, Peter MacIntyre, etal " Programming PHP" O REILLY 3$^{rd}$ Edition – 2013
3. Luke Welling, Laura Thomson " PHP and MySQL Web Development" Person Education 5$^{th}$ Edition – 2016.
4. **REFERENCE BOOKS:**

1. Robin Nixon "Learning PHP, MySQL & JavaScript" O REILLY – 5$^{th}$ Edition - 2015.
2. Elizabeth Naramore, Jason Gerner, etal "Beginning PHP5, Apache, MySQL web development" Wrox Publishing – 2005.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BCS18L08/BCS20L08 | Subject Name :<br>**OBJECT ORIENTED SOFTWARE<br>ENGINEERING LAB** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18L02 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Identify Use Cases and develop the Use Case model.
- Identify the business activities and develop an UML Activity diagram.
- Identity the conceptual classes and develop a domain model with UML Class diagram.
- Using the identified scenarios find the interaction between objects and represent them using UML Interaction diagrams.
- Draw the State Chart diagram.
- Identify the User Interface, Domain objects, and Technical services. Draw the partial layered, logical architecture diagram with UML package diagram notation.
- Implement the Technical services layer.
- Implement the Domain objects layer.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Show the importance of systems analysis and design in solving complex problems. |
|---|---|
| CO2 | Show how the object-oriented approach differs from the traditional approach to systems analysis and design. |
| CO3 | Construct various UML models (including use case diagrams, class diagrams, interaction diagrams, state chart diagrams, activity diagrams, and implementation diagrams) using the appropriate notation. · |
| CO4 | Recognize the difference between various object relationships: inheritance, association, whole-part, and dependency relationships. · |
| CO5 | Show the role and function of each UML model in developing object-oriented software. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering | Humanities and | Program Core | Program Electives | Open Electives | Practical / Project | Internshi | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L08/B CS20L08 | **OBJECT ORIENTED SOFTWARE ENGINEERING LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**EXERCISES**

1. Study of case tools such as rational rose or equivalent tools
2. Railway reservation system
3. Student Mark Analysis system
4. Payroll processing application
5. Inventory system
6. Automating the Banking process
7. Course Registration System
8. Library management system
9. Passport Automation System

**SOFTWARE REQUIRED**:

Languages: C/C++/JDK 1.3, JSDK, WEB BROWSER & UML

Any Front End Tools (Like VB, VC++, Developer 2000)

Any Back End Tools (Like Oracle, MS-Access, SQL, DB2)

Modelling and Design : Rational Rose

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20AL04 | Subject Name **Natural Language Processing Lab** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:BIT18IL01 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn about to develop an own web site.
- To have knowledge to design webpage using CSS.
- To have knowledge to design a dynamic web site using XML and XSLT.
- To learn and develop to design mail communication.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | To tag a given text with basic Language features |
| CO2 | To design an innovative application using NLP components |
| CO3 | To implement a rule based system to tackle morphology/syntax of a language |
| CO4 | To design a tag set to be used for statistical processing for real-time applications |
| CO5 | To compare and contrast the use of different statistical approaches for different types of NLP applications. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20AL2 | Natural Language Processing Lab | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Word Analysis

2. Word Generation

3. Morphology

4. N-Grams

5. N-Grams Smoothing

6. POS Tagging: Hidden Markov Model

7. POS Tagging: Viterbi Decoding

8. Building POS Tagger

9. Chunking

10. Building Chunker

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BEN18SK2<br>/BEN20SK2 | Subject Name :<br>**SOFT SKILL – II** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BEN18SK1 | ETL | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The  main objective is to strengthen the logical and arithmetic reasoning skills of the students.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Recognize and apply arithmetic knowledge in a variety of contexts. |
|---|---|
| CO2 | Ability to identify and critically evaluate philosophical arguments and defend them from criticism. |
| CO3 | Define data and interpret information from graphs. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 2 | 3 | 3 |
| CO2 | 2 | 2 | 2 | 3 | 1 | 3 | 1 | 3 | 3 | 3 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 3 |
| CO2 | 2 | 1 | 3 | 3 |
| CO2 | 2 | 1 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | ✓ | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BEN18SK2 /BEN20SK2 | **SOFT SKILL - II** | ETL | 0 | 0/0 | 3/0 | 1 |

**UNIT I Logical Reasoning I**

Logical Statements – Arguments – Assumptions – Courses of Action.

**UNIT II Logical Reasoning II**

Logical conclusions – Deriving conclusions from passages – Theme detection.

**UNIT III Arithmetical Reasoning I**

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

**UNIT IV Arithmetical Reasoning II**

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

**UNIT V Data Interpretation**

Tabulation – Bar graphs – Pie graphs – Line graphs.

**REFERENCE BOOK:**

1. R.S.Agarwal, A modern approach to Logical Reasoning, S.Chand & Co., (2017).

2. R.S.Agarwal, A modern approach to Verbal and Non verbal Reasoning, S.Chand & Co., (2017).

3. R.S.Agarwal, Quantitative Aptitude for Competitive Examinations, S.Chand & Co., (2017).

4. A.K.Gupta, Logical and Analytical Reasoning, Ramesh Publishing House, (2014).

5. B.S.Sijwali, Indu sijwali, A new approach to Reasoning (Verbal and Non verbal), Arihant Publishers, (2014).

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code**:** BCS18L09/ BCS20L09 | Subject Name **:** **INPLANT TRAINING / INTERNSHIP / MINI PROJECT (EVALUATION)** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite : NIL | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :** The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | To get an insight of an industry / organization/company pertaining to the domain of study. |
| CO2 | To acquire skills and knowledge for a smooth transition into the career. |
| CO3 | To gain field experience and get linked with the professional network. |
| CO4 | To equip the students with industry knowledge and understanding of various possible technologies. |
| CO5 | To impart the knowledge of various technologies form the industry resources |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO4 | 2 | 1 | 3 | 1 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 |
| CO5 | 1 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 2 | 3 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ✓ | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L09/ BCS20L09 | INPLANT TRAINING / INTERNSHIP / MINI PROJECT (EVALUATION) | Lb | 0 | 0/0 | 3/0 | 1 |

**OBJECTIVE :**

- The main objective of the In-plant training is to provide a short-term work experience in an Industry/ Company/ Organization

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18TS3/ BCS20TS3 | Subject Name : TECHNICAL SKILL III (EVALUATION) | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the domain specific knowledge. |
|---|---|
| CO2 | Able to apply idealistic, practical and moral values. |
| CO3 | Familiarize with emerging technology |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 1 | 1 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 1 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 1 |

| COs /PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 |
| CO2 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 1 | 3 |

**3/2/1indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | ✔ | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ET | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18TS3/ BCS20TS3 | **TECHNICAL SKILL III (EVALUATION)** | Lb | 0 | 0/0 | 3/0 | 1 |

**OBJECTIVES:**

- To make the students expert in domain specific knowledge.
- To develop professionals with idealistic, practical and moral values.
- To facilitate the students with emerging technology.

From the list of skill development courses declared by the department, the students are expected to acquire the skill and get certified. This will be evaluated at the end of the semester by the faculty.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## SEMESTER – VII

| Subject Code: BCS18010/BCS20010 | Subject Name : DATA WAREHOUSING AND DATA MINING | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | Ty | 3 | 00 | 0/3 | 4 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Provide an overview of the methodologies and approaches to data mining
- Gain insight into the challenges and limitations of data mining techniques and data warehousing
- Applying data mining solutions using common data mining tools

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the difference between Data Warehousing and general databases |
|---|---|
| CO2 | Understand the different steps followed in Data mining and pre-processing techniques using tools |
| CO3 | Able to apply Association Rule mining and Clustering approaches |
| CO4 | Familiarize with multi-dimensional data cubes and related analysis |
| CO5 | Compare different approaches of data ware housing and data mining with various technologies. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 1 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 1 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 1 | 3 | 3 | 2 | 3 | 1 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 1 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18010/BCS20010 | DATA WAREHOUSING AND DATA MINING | Ty | 3 | 0/0 | 0/3 | 4 |

**UNIT I    DATA WAREHOUSING                                          12 Hrs**

Introduction to Data Warehousing- Advantages- What makes Data Warehousing a reality- Data warehousing Components- Building a Data Warehouse-mapping Data Warehouse to a Multiprocessor-Architecture-DBMS Schemas for Design Support

**UNIT II    ETL AND BUSINESS TOOLS                                   12 Hrs**

Data Extraction-Cleaning and Transformation tools- Meta data. Reporting and Query tools and Application-OLAP Patterns and Models- Statistics

**UNIT III   DATA MINING                                              12 Hrs**

Introduction – Data – Types of Data – Data Mining Functionalities – Interestingness of Patterns – Classification of Data Mining Systems – Data Mining Task Primitives – Integration of a Data Mining System with a Data Warehouse – Issues – Data Preprocessing.- Data Cleaning –Missing Values-Noisy Data-Inconsistent Data-Data Integration and Transformation-Data Reduction -Dimensionality Reduction – Evaluation criteria of Various Mining Techniques

**UNIT IV  ASSOCIATION RULE MINING AND CLASSIFICATION                 12 Hrs**

Mining Frequent Patterns, Associations and Correlations – Mining Methods – Mining Various Kinds of Association Rules – Constraint Based Association Mining – Classification and Prediction - Decision Tree Induction - Entropy and Classification Algorithms -Bayesian Classification – Rule Based Classification

**UNIT V   CLUSTERING TECHNIQUES                                      12 Hrs**

Cluster Analysis - Types of Data – Categorization of Major Clustering Methods - Kmeans – Partitioning Methods – Hierarchical Methods - Density-Based Methods –Grid Based Methods – Model-Based Clustering Methods – Clustering High Dimensional Data - Constraint – Based Cluster Analysis – Outlier Analysis –Genetic Algorithm For Mining - Data Mining Applications

**Total Hours: 60**

**TEXT BOOKS:**
1. Alex Berson and Stephen J.Smith, "Data Warehousing, Data Mining and OLAP", Tata McGraw – Hill Edition, Thirteenth Reprint 2008.
2. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.

**REFERENCE BOOKS:**
1. Arun K Pujari (2017) Data Mining Techniques 4th edition, Universities Press (India) Ltd.
2. Sam Anahory, Dennis Murry (2004) Data Warehousing in the real world, Pearson Education
3. Margaret H. Dunham (2006) Data Mining: Introductory and Advanced Topics, Pearson

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18011/BCS20011 | Subject Name :<br>**DOT NET FRAMEWORK** | | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|
| | Prerequisite:  BIT18I02 | | | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture  T : Tutorial     S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn the concepts of C# Dot Net language and ability to write programs.
- To understand the concepts of VB Dot Net, ADO.NET language and learn to develop an application.
- To develop knowledge to design web based application using ASP.Net.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | To develop, implement and creating Applications with C#. |
| CO2 | Integrate selected advanced topics in a Visual Basic .NET project |
| CO3 | Create web forms with ASP.NET controls |
| CO4 | Document the approach to be implemented in any language in VB.NET frame work |
| CO5 | Design and apply to the problem solving techniques on real world problems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 1 | 3 | 3 | 1 | 3 |
| CO2 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18011/ BCS20011 | **DOT NET FRAMEWORK** | Ty | 3 | 1/0 | 0/0 | 4 |

**UNIT I   DOT NET FRAMEWORK**                                                                 **12 Hrs**

.NET platform, .NET Frame work, Common Language Runtime, Namespace, assemblies, .NET memory management Introduction to C#.net, Introduction to VB.NET

**UNIT II   C#.NET**                                                                           **12 Hrs**

Introduction to C# , Understanding C# in .NET, Overview of C#, literals, Variables, Data Types. Operators, Expressions, Branching and Looping Operations- Methods, Arrays Strings. Structures and Enumerations – Classes and Objects-inheritance and Polymorphism ,Multiple Inheritance, Operator Overloading, Events, Console I/O Operations and Exception

**UNIT III   VB.NET**                                                                          **12 Hrs**

Introduction, Windows application, Web application, Building Blocks, programming Fundamentals, Creation of Windows Forms, SDI Vs MDI, Crating run time Windows Controls. File handling, Interaction with other Applications, Creating and using reports, Debugging and Packaging

**UNIT IV   ADO.NET**                                                                          **12 Hrs**

ADO.NET, Connected Objects, Disconnected Objects, Data Form Wizard, Data Bound Form, Various Connection Methodologies for Database, Querying database, usage of Data Adapter class. Working with data off-line, Data view object, strongly typed Dataset Objects. Working with XML data, Building Windows based and web based application, .Net data providers

**UNIT V   ASP.NET& WEB SERVICES**                                                             **12Hrs**

Creation of web services, web service with ASP.NET, ASP.NET applications with databases, cookies and session handling

**Total Hours: 60**

**TEXT BOOKS:**
1. ThuanL.Thai, Hoang Lam, (2003).NET Framework Essentials, (3rd ed.) O'reilly Media Inc.
2. Balagurusamy,  E. (2010) Programming in C#(3rd ed.)  Tata McGraw-Hill

**REFERENCE BOOKS:**
1. Kogent Solutions Inc (2009) C# 2008 Programming: Covers .Net 3.5 Black Book, (Platinum ed.)     Dreamtech Press
2. Kip R Irvine Tony Gaddis (2009) Starting Out with Visual Basic 2008 (4th ed.) Addison Wesleypublication
3. Evjen, Hanselman, Rader (2005)  Profesional ASP.NET 2.0 , John Wiley & Sons
4. David Sceppa  (2013) Programming Microsoft ADO.NET4, Amazon.com
5.  web reference http://msdn.microsoft.com/en-us/vstudio/default.aspx

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BMG18002/ BMG20002 | Subject Name : MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BES18ET3 Basic Knowledge such as Statistical Techniques and Probability Theory | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    P : Project  C: Credits

**OBJECTIVE :**
- This course is aimed at addressing the contemporary issues, which fall under the broad title of  management, and its functions.
- There will also be an attempt to analyze the behavior of individuals within an organization and the issues of working with other group or teams.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Effective leadership skills |
|---|---|
| CO2 | Accommodating with co workers and at Work environment |
| CO3 | Enhanced leadership skills |
| CO4 | Understanding and implementing good policies for the welfare of management and workers |
| CO5 | Analyse the behavior of individuals within an organization |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 1 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 1 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 1 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 2 |
| CO5 | 1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 2 |
| CO2 | 2 | 2 | 1 | 1 |
| CO3 | 2 | 1 | 2 | 2 |
| CO4 | 1 | 2 | 2 | 1 |
| CO5 | 1 | 2 | 2 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | Management Science | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✔ | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BMG18002/ BMG20002 | **MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        INTRODUCTION TO MANAGEMENT                                                   9 Hrs**

Definition of Management – Science or Art or Profession – Manager $v_s$ Entrepreneur vs Leader – Types of Managers – Managerial roles and skills – Evolution of Management – Scientific, Human relations and system approaches

**UNIT II        PLANNING AND ORGANIZING                                                         9 Hrs**

Nature and purpose of planning – planning process – types of planning – planning premises – Nature and purpose of organizing – Formal and Informal organization – organization chart – organization structure – types - Line and staff authority

**UNIT III        DIRECTING AND CONTROLLING                                                    9 Hrs**

Leadership – Types and theories of leadership – communication – process of communication – barriers in communication – System and process of controlling – Budgetary and non budgetary control techniques – Direct and preventive control – reporting

**UNIT IV        INDIVIDUAL BEHAVIOR                                                                9 Hrs**

Diversity - Attitudes and Job satisfaction – Emotions and Moods – personality and values – perception – Decision making – Motivation concepts – Motivation Applications

**UNIT V        GROUP BEHAVIOR                                                                       9 Hrs**

Foundations of Group Behavior – Understanding Teams – power and politics – Conflict and Negotiation – Stress Management

**Total Hours: 45**

**TEXT BOOKS:**

1.  Harold Koontz and Heinz Weihrich "Essentials of Management" Tata McGraw Hill Education 2015
2.  Stephen. P. Robbins, Timothy A. Judge and Seema Sanghi  "Essentials of Organizational Behavior" Pearson  10<sup>th</sup> Edition 2010

**REFERENCE BOOKS:**

1.  Tripathi PC  & Reddy PN "Priciples of Management" Tata McGraw Hill 2012
2.  Stephen P. Robbins, David A.De.Cenzo, Mary Coulter "Fundamentals of Management" Pearson Education 2016

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20A05 | Subject Name : **Data Visualization Techniques** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/3 | 4 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Be exposed with the basic rudiments of business intelligence system
- understand the modeling aspects behind Business Intelligence
- understand of the business intelligence life cycle and the techniques used in it
- Be exposed with different data analysis tools and techniques

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand different types of analysis |
|---|---|
| CO2 | Know various behind business intelligence |
| CO3 | Understand lifecycle method used in business intelligence |
| CO4 | Able to work with different tools and techniques |
| CO5 | Ability to apply knowledge representation, reasoning, and machine learning techniques to real-world problems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | | |
| CO2 | 3 | 3 | 3 | 3 | | |
| CO3 | 3 | 3 | 3 | 3 | | |
| CO4 | 3 | 3 | 2 | 3 | | |
| CO5 | 3 | 2 | 3 | 3 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✔ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20A05 | **Data Visualization Techniques** | Ty | 3 | 0/0 | 0/3 | 4 |

**UNIT I CORE SKILLS FOR VISUAL ANALYSIS**                                                   **12Hrs**
Information visualization – effective data analysis – traits of meaningful data – visual perception – making abstract data visible – building blocks of information visualization – analytical interaction – analytical navigation – optimal quantitative scales – reference lines and regions – trellises and crosstabs – multiple concurrent views – focus and context – details on demand – over-plotting reduction – analytical patterns – pattern examples

**UNIT II TIME-SERIES, RANKING, AND DEVIATION ANALYSIS**                                **12Hrs**
Time-series analysis – time-series patterns – time-series displays – time-series best practices – part-to-whole and ranking patterns – part-to-whole and ranking displays – best practices – deviation analysis – deviation analysis displays – deviation analysis best practices

**UNIT III DISTRIBUTION, CORRELATION, AND MULTIVARIATE ANALYSIS**                **12Hrs**
Distribution analysis – describing distributions – distribution patterns – distribution displays –distribution analysis best practices – correlation analysis – describing correlations – correlation patterns – correlation displays – correlation analysis techniques and best practices – multivariate analysis – multivariate patterns – multivariate displays – multivariate analysis techniques and best practices

**UNIT IV INFORMATION DASHBOARD DESIGN I**                                              **12Hrs**
Information dashboard – categorizing dashboards – typical dashboard data – dashboard design issues and best practices – visual perception – limits of short-term memory – visually encoding data – Gestalt principles – principles of visual perception for dashboard design

**UNIT V INFORMATION DASHBOARD DESIGN II**                                             **12Hrs**
Characteristics of dashboards – key goals in visual design process – dashboard display media – designing dashboards for usability – meaningful organization – maintaining consistency – aesthetics of dashboards – testing for usability – case studies: sales dashboard, CIO dashboard,Telesales dashboard, marketing analysis dashboard
                                                                                      **Total Hours: 60**

**TEXT BOOK:**
 1.  Stephen Few, "Now you see it: Simple Visualization techniques for quantitative analysis",
Analytics Press, 2009.
2.Nathan Yau, "Data Points: Visualization that means something", Wiley, 2013.
**REFERENCES:**
 1.  Stephen Few, "Information dashboard design: The effective visual communication of data",O'Reilly, 2006.
 2.  Edward R. Tufte, "The visual display of quantitative information", Second Edition, GraphicsPress, 2001.
 3.  Ben Fry, "Visualizing data: Exploring and explaining data with the processing environment",O'Reilly, 2008.
 4.  Gert H. N. Laursen and Jesper Thorlund, "Business Analytics for Managers: Taking business intelligence beyond reporting", Wiley, 2010.
 5.  Evan Stubbs, "The value of business analytics: Identifying the path to profitability", Wiley, 2011.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L11/BCS20L11 | Subject Name : **DATA MINING LAB** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18ET3 | | **Lb** | **0** | **0/0** | **3/0** | **1** |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Identify and categories the various risks face by an organization;
- Explain the various risk control measures available
- Design a risk management program for a business organization.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Demonstrate knowledge of the range of financial and financial related risks facing organizations |
|---|---|
| CO2 | understand the approach to risk management through risk identification, risk measurement and risk management (or mitigation) |
| CO3 | understand operational risk and how to manage it. |
| CO4 | Effective Presentation of solutions to problems by choosing appropriate visualization tools |
| CO5 | Create a application from any suitable domain by incorporating all the core concepts |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 1 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 2 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 1 | 1 | 2 | 2 | 3 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | 2 |
| CO2 | 2 | 2 | 2 | 2 |
| CO3 | 2 | 2 | 2 | 2 |
| CO4 | 3 | 1 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L11/ BCS20L11 | **DATA MINING LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Introduction to the Weka machine learning toolkit
2. Classification Introduction to exploratory data analysis using Rattle an open source Tool(R)
3. Introduction to regression using Rattle an open source Tool. ( R)
4. using the Weka toolkit – Part 1
5. Classification using the Weka toolkit – Part 2
6. Performing data preprocessing for data mining in Weka
7. Performing clustering in Weka
8. Association rule analysis in Weka
9. Data mining case study using the CRISP-DM standard
10. Data mining case study using the CRISP-DM standard

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L12/ BCS20L12 | Subject Name : DOT NET LAB | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  BIT18L08 | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn write console application and web based applications in C#.net
- To learn the windows application in VB.net
- To have knowledge to develop web form application ASP.net
- To learn end user application using data base connection using ADO.Net.
- To have knowledge to develop a web service using net frame work.
- To have knowledge to design platform independent application using Dot net framework

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Display proficiency in C# by building stand-alone applications in the .NET framework using C#. |
|---|---|
| CO2 | Create distributed data-driven applications using the .NET Framework, C#, SQL Server and ADO.NET |
| CO3 | Create web-based distributed applications using C#, ASP.NET, SQL Server and ADO.NET |
| CO4 | Able to connect frontend and backend using database connectivity. |
| CO5 | Design and develop the distributed applications using Dotnet framework |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 3 | 2 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L12/ BCS20L12 | **DOT NET LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

**C# .NET**
    1. Implementation of Operator Overloading
        a. Complex Number
        b. Matrix
        c. Time(+.-)
    2. Implementation of Multiple Inheritance
        a. Employee
        b. Area of an Object
    3. Implementing Multithreading
    4. Exception Handling

**VB .NET**
    5.Designing a Calculator
    6. Implement File Handling (Read,Delete,Modify)
    7. Implement Exception Handling
        a. Voter problem
        b. Student Status

**ASP .NET**
    8. Super Market
    9. Hotel Management System

**ADO. NET**
    10. Student Attendance Calculation
    11.  Hospital management System

**WEB SERVICE**
    12. Income tax calculation

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| BCS18L13/ BCS20L13 | **PROJECT PHASE - I** | | | | | | |
| | Prerequisite: NIL | | Lb | 0 | 0/0 | 3/3 | 2 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**   The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| **CO1** | Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue. |
| **CO2** | To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions |
| **CO3** | To refine research skills and demonstrate their proficiency in communication skills. |
| **CO4** | To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents. |
| **CO5** | Equip the students with industry knowledge and understanding of various possible technologies. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L13/ BCS20L13 | **PROJECT PHASE – I** | Lb | 0 | 0/0 | 3/3 | 2 |

**LIST OF EXPERIMENTS**

B.Tech CSE Project carries 12 credits of which , Phase I carries 2 credit.
In Phase I ,Students are expected to

(i) Identify a Problem.

(ii) Have the feasibility explored.

(iii) Freeze the Requirement specification (both user and system).

(iv) Construct the architectural model (as many as required).

(v) Design the solution.

(vi) If possible publish the Feasibilty study as a survey paper

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BHS18FLX/ BHS20FLX | Subject Name : **FOREIGN LANGUAGE (EVALUATION)** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**  To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Achieve functional proficiency in listening, speaking, reading, and writing. |
|---|---|
| CO2 | Develop an  insight into the nature of language itself, the process of language and culture acquisition. |
| CO3 | Decode, analyze, and interpret authentic texts of different genres. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 1 |
| CO2 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 3 | 3 | 3 | 3 | 1 |
| CO3 | 1 | 1 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 3 | | |
| CO2 | 1 | 2 | 3 | 1 | | |
| CO3 | 3 | 2 | 1 | 2 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | ✓ | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : **FOREIGN LANGUAGE (EVALUATION)** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BHS18FLX/ BHS20FLX | Prerequisite: NIL | **Lb** | 0 | 0/0 | 3/0 | 1 |

**OBJECTIVE :**

To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language

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| SUBJECT CODE | SUBJECT NAME COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE) | | Ty/ Lb/ | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|

**SEMESTER - VIII**

| Subject Code: BCS20A06 | Subject Name : Machine Learning | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS20A01 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- The students will have knowledge about the scripting languages
- To learn the JavaScript language and ability to write program on it.
- To learn the PERL language and ability to write program on it.
- To study about the Python language and understand to write basic level program and advance program on networking, web scripting on web pages.
- To study about RUBY language and have knowledge to write programs.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the concept of Machine Learning |
|---|---|
| CO2 | RecognizetheimportanceandrelevanceofMachine Learning Models |
| CO3 | Design the efficient Machine Learning Application . |
| CO4 | Applying group of data in Cluster and Nonparametric Methods |
| CO5 | Identify  theimportanceandrelevanceofMachine Learning Models |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | ✓ | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| BCS20A06 | Machine Learning | Ty | 3 | 0/0 | 0/0 | 3 |
|---|---|---|---|---|---|---|

**UNIT I         Introduction to Machine Learning                                   9Hrs**
Machine Learning – Machine learning applications – learning association – supervised learning – learning a class from examples – learning multiple classes – regression – model selection and generation – Bayestan decision theory – losses and risk – discriminant functions – association rules.

**UNIT II         Parametric and Multivariate Methods                                   9Hrs**
Parametric methods – maximum likelihood estimation – Baye's estimator – parametric classification –regression – tuning model – multivariate methods – multivariate data – multivariate normal distribution – multivariate regression – dimensionality reduction – subset selection – factor analysis – multidimensional scaling – Isomap

**UNIT III         Clustering and Nonparametric Methods                                   9Hrs**
Clustering - Mixtures densities – k mean clustering – special and hierarchal clustering – Nonparametric density estimation – generalization to multivariate data – nonparametric classification – outlier data – decision trees – univariate trees – pruning – rule extraction from trees – multivariate trees.

**UNIT IV         Linear Discrimination and Multilayer Perceptrons                                   9Hrs**
Linear discrimination – generalizing the linear model – pair wise separation – logistic discrimination – discrimination by regression – multilayer preceptrons – MLP – back propagation algorithms – training procedures – tuning – dimensionality reduction – deep learning – local models – competitive learning – radial basis – normalized basis – learning vector quantization - mixture of experts.

**UNIT V         Kernel Machines and Graphical Models                                   9Hrs**
Kernel machine – optimal separating hyper plane – v SVM – multiple kernel learning – large margin nearest neighbour classifier – graphical models  – generative models – d Separation -
belief propagation – Hidden morkov models – Bayesten estimation – combining multiple learners – reinforcement learning.

**Total Hours: 45**

**TEXT BOOKS:**
1. Ethem Alpaydin, 2014 "Introduction to Machine Learning" 3r.d Edition PHI
2. Snila Gollapudi, 2016 "Practical Machine Learning" PACKT.

**REFERENCE BOOKS:**
1. Tom M Mitchell, 2013 "Machine Learning" McGraw-Hill.
2. David Barber, 2015 "Bayesian Reasoning and Machine Learning" Cambridge University Press.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18L14/ BCS20L14 | Subject Name : **PROJECT (PHASE – II)** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18L13 | | Lb | 0 | 0/0 | 12/12 | 8 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**   The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue. |
|---|---|
| CO2 | To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions |
| CO3 | To refine research skills and demonstrate their proficiency in communication skills. |
| CO4 | To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents. |
| CO5 | To validate the implementation of the software/Hardware system |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 2 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 1 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 1 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 2 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18L14/ BCS20L14 | **PROJECT (PHASE – II)** | Lb | 0 | 0/0 | 12/12 | 8 |

**LIST OF EXPERIMENTS**

Students are expected to carry out the following :

      (i)      Implement the Design using suitable technologies.

      (ii)      Generate the test cases.

      (iii)      Demonstrate the solution with suitable user interface.

      (iv)      Prepare a project report consolidating the phase-I and II activities.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

### 8th SEMESTER ELECTIVES E-I& E-2  (CSE)

| Subject Code:<br>**BCS18E24/<br>BCS20E24** | Subject Name :<br>**INFORMATION  STORAGE MANAGEMENT** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  BCS18004 | **Ty** | **3** | **0/0** | **0/0** | **3** |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T / L/ ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**

- Provides a comprehensive understanding of the various storage infrastructure components in data center environments.
- It enables participants to make informed decisions on storage-related technologies in an increasingly complex IT environment
- The adoption of software-defined infrastructure management and third platform technologies.
- It provides a strong understanding of storage technologies and prepares participants for advanced concepts, technologies, and processes.
- To learn the architectures, features, and benefits of intelligent storage systems
- Includes block-based, file-based, object-based, and unified storage; software-defined storage; storage networking technologies such as FC SAN, IP SAN, and FCoE SAN; business continuity solutions such as backup and replication; the highly-critical area of information security; and storage infrastructure management.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Evaluate storage architectures, including storage subsystems, DAS, SAN, NAS, CAS |
| CO2 | Define backup, recovery, disaster recovery, business continuity, and replication |
| CO3 | Understand logical and physical components of a storage infrastructure |
| CO4 | Identify components of managing and monitoring the data center |
| CO5 | Define information security and identify different storage virtualization technologies |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CO2 | 3 | 2 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 3 |
| CO5 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 1 | 3 |
| CO3 | 3 | 3 | 1 | 3 |
| CO4 | 3 | 3 | 1 | 3 |
| CO5 | 3 | 2 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E24/ BCS20E24 | INFORMATION STORAGE MANAGEMENT | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I             Storage Systems                                                    9Hrs**
Information Storage - Evolution of Storage Technology and Architecture – Data Centre –Infrastructure – ILM – Components of Storage System Environment – Logical Components of Host RAID: Implementation, levels & comparison – ISS components, Intelligent Storage Array.

**UNIT II        Storage Technologies                                              9Hrs**
Networking Technologies & Virtualization DAS – SCSI – SAN – NAS –IPSAN – CAS –Forms of Virtualization.

**UNIT III        Business Continuity                                               9Hrs**
Information availability – BC Planning Life Cycle failure analysis – Backup & Recovery – Local Replication – Remote Replication.

**UNIT IV        Storage Security                                                     9Hrs**
Storage Security Framework – Risk Triad – Storage Security Domains – Security Implementationin Storage Networking.

**UNIT V        Managing Storage Infrastructure                              9Hrs**
Infrastructure – Storage Management Activities and Challenges – Developing an Ideal solution.

**Total Hours: 45**

**TEXT BOOK:**
    1. EMC Corporation, Information Storage and Management, Wiley India, 2$^{nd}$ edition 2012

**REFERENCE BOOKS:**
    1. Robert Spalding, "Storage Networks: The Complete Reference", Tata McGraw Hill , Osborne,2003.
    2. Marc Farley, "Building Storage Networks", Tata McGraw Hill, Osborne, 2001.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18E25/ BCS20E25 | Subject Name : NETWORK INFRASTRUCTURE MANAGEMENT | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BIT18I01 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn Network Layers functionality
- To acquire knowledge about and  VLANs
- To understand IP routing, EIGRP and OSPF
- To test Network security and wireless security

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the use of network infrastructure |
|---|---|
| CO2 | RecognizetheimportanceandrelevanceofVLANs and EIGRP |
| CO3 | Troubleshoot the network infrastructure |
| CO4 | Analyze and solve the problems in the network infrastructure |
| CO5 | Compare and contrast various network infrastructures |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 2 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ET | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E25/ BCS20E25 | NETWORK INFRASTRUCTURE MANAGEMENT | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        Internetworking & Ip Addressing                                             9Hrs**
Internetworking Models – Layered Approach – OSI Reference Models – Ethernet Networking – Cabling – Data Encapsulation – Three Layer Hierarchical model – core layer – distribution layer – Access layer – TCP/IP and DoD Model – IP Addressing – Hierarchical IP Addressing scheme -  Broadcast Address.

**UNIT II        Subnetting, VLSMAnd Ios                                                      9Hrs**
Subnetting basics – CIDR – VLSM Design – Summarization – Troubleshooting IP Addressing – IOS user interface – CLI – Router and switch Administrative Configuration – Router Interfaces – viewing, saving, and erasing configuration

**UNIT III        Managing Internetwork And Ip Routing                                 9Hrs**
Internal component of a Router – routing boot sequence – configuration register – backing up and restoring configuration – CDP – resolving hostnames – Checking network connectivity – IP routing basics – Static routing – default routing – dynamic routing – RIP – IGRP

**UNIT IV        Eigrp, OSPF, STP and VLANS                                               9Hrs**
EIGRP features – RTP – DUAL – EIGRP to support large Networks –Configuring EIGRP - Load balancing – OSPF terminology – Configuring and verifying OSPF – DR and BDR elections – Loopback interfaces – troubleshooting – STP spanning tree terms and operations – VLANs Basics – memberships – VTP – Configuring VLAN – Inter VLAN routing.

**UNIT V        ACLS, NAT and Wireless Technologies                                   9Hrs**
Access Lists, VTY access, advanced Access List, Named ACLs, monitoring Access List, configuring access list – NAT names – PAT configuration – NAT using SDM – Wireless technologies – Unified wireless solutions – split MAC architecture – MESH and LWAPP - wireless security

**Total Hours: 45**

**TEXT BOOKS:**
1. Todd Lammle, 2011 "CCNA Cisco Certified Network Associate study guide – Wiley India.
2. Brian Hill, 2013 "The complete Reference - Cisco " Tata McGraw-Hill.

**REFERENCE BOOKS:**
1. Richard Deal, 2013 "CCNA Cisco Certified Network Associate study guide" Tata McGraw-Hill.
2. Steven Latre et al 2015 "Intelligent Mechanism for Network Component and Security" Springer.

| Subject Code: **BCS18E26/ BCS20E26** | Subject Name : **FOUNDATIONS OF PARALLEL PROGRAMMING** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18007 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
**T / L/ ETL**: Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Fundamental concepts of Multi threaded, Parallel and Distributed Computing paradigms of parallel programs.
- Systematic methods for developing parallel programs.
- Techniques typical for parallel programming in Java.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understanding of Concurrent Programming Concepts |
|---|---|
| CO2 | Understand and handle Semaphores and Monitors |
| CO3 | Learn the Message Passing methods  and Process Interaction for  Parallel  Programming |
| CO4 | Understand the practical parallel programming scenarios and  possibilities |
| CO5 | Analyze parallel programming libraries and apply parallel programming tools |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |
| CO2 | 3 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 3 | 1 |
| CO4 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 1 | 1 |
| CO5 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 |
| CO2 | 3 | 3 | 1 | 2 |
| CO3 | 3 | 2 | 1 | 2 |
| CO4 | 3 | 3 | 1 | 2 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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|---|---|---|---|---|---|---|
| BCS18E26/ BCS20E26 | FOUNDATIONS OF PARALLEL PROGRAMMING | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I****Concurrent Programming Concepts**9Hrs
**Concurrent programming concepts,** Techniques for parallelizing programs, Shared Variable Programming: Process and Synchronisation - Synchronization, atomic actions, and await statements, Semantics of concurrent programs; ways to avoid interference, Safety and liveness properties; Critical sections: spin locks , efficient spin locks; fair solutions , Parallel programming concepts; bag of tasks paradigm; Pthreads library , Barriers: counter, coordinator, combining tree , Symmetric barriers; data parallel algorithms , Parallel scientific computing

**UNIT II****Semaphores And Monitors**9Hrs
**Semaphores:** mutual exclusion, signaling, split binary, resource counting, dining philosophers, readers/writers , passing the baton, resource allocation and scheduling, Implementations of Semaphores in kernels, multiprocessors;
**Monitors:** basic concepts, signaling disciplines, synchronization techniques, larger examples; use in Java, Pthreads, Implementation of Monitors in Kernel

**UNIT III****Message Passing And RMI**9Hrs
**Message passing**: basic concepts and examples , clients and servers , file servers, interacting peers, Synchronous, Message passing in MPI, and Java; **Remote operations**; RPC; Java RMI , **Rendezvous, distributed readers and writers**

**UNIT IV****Process Interaction And Distributed Programming**9Hrs
**Process interaction Paradigms**: Managers/Workers, heartbeat algorithms; pipeline algorithms, Probe/Echo Algorithm, Broadcast Algorithm, Token Passing Algorithms - **Distributed programming**: replicated files, dining philosophers, distributed file systems

**UNIT V****Parallel Programming**9Hrs
Speed and Efficiency, Overhead and Challenges – **Scientific Computing** : Grid Computations, Particle Computations, Matrix Computations – **Case Study of Parallel Programming Libraries** in Pthread, MPI and OpenMP – **Parallelizing Compilers** – Other Parallel Programming Models – **Parallel Programming Tools**

**Total Hours: 45**

**TEXT BOOK:**
1. Greg Andrews ,2000, Foundations of Multithreaded, Parallel, and Distributed Programming. Addison-Wesley, Digitized in 16 Nov 2007, ISBN 0201357526, 9780201357523

**REFERENCE BOOK:**
1. Zbigniew J. Czech, 2016, Introduction to Parallel Computing, Cambridge University Press, ISBN 1316802787, 9781316802786

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18E27/ BCS20E27 | Subject Name : VIRTUALIZATION | Ty /Lb /ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BIT18007 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Candidates should know and understand the general concepts, theory and terminology of Virtualization.
- Work in Network virtualization

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | To know the concept of virtualization technology. |
|---|---|
| CO2 | To distinguish desktop ,Server ,network and storage Virtualization |
| CO3 | To demonstrate  Network and  storage architecture |
| CO4 | To Compare the different storage Model |
| CO5 | To Explain the different Virtual Machines Products |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 |
| CO2 | 3 | 2 | 1 | 2 |
| CO3 | 3 | 2 | 1 | 2 |
| CO4 | 3 | 1 | 2 | 2 |
| CO5 | 3 | 1 | 2 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E27/ BCS20E27 | VIRTUALIZATION | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          Overview of Virtualization                                                  9Hrs**

Basics of Virtualization - Virtualization Types – Desktop Virtualization – Network Virtualization – Server and Machine Virtualization – Storage Virtualization – System-level or Operating Virtualization – Application Virtualization-Virtualization Advantages - Virtual Machine Basics – Taxonomy of Virtual machines - Process Virtual Machines - System Virtual Machines – Hypervisor - Key Concepts

**UNIT II          Server Consolidation                                                        9 Hrs**

Hardware Virtualization – Virtual Hardware Overview - Sever Virtualization – Physical and Logical Partitioning - Types of Server Virtualization – Business cases for Sever Virtualization – Uses of Virtual server Consolidation – Planning for Development – Selecting server Virtualization Platform

**UNIT III          Network Virtualization                                                       9Hrs**

Design of Scalable Enterprise Networks - Virtualizing the Campus WAN Design - WAN Architecture - WAN Virtualization - Virtual Enterprise Transport Virtualization–VLANs and Scalability - Theory Network Device Virtualization Layer 2 - VLANs Layer 3 VRF Instances Layer 2 - VFIs Virtual Firewall Contexts Network Device Virtualization - Data-Path Virtualization Layer 2: 802.1q - Trunking Generic Routing Encapsulation - IPsec L2TPv3 Label Switched Paths - Control-Plane Virtualization–Routing Protocols- VRF - Aware Routing Multi-Topology Routing.

**UNIT IV          Virtualizing Storage                                                        9Hrs**

SCSI- Speaking SCSI- Using SCSI buses – Fiber Channel – Fiber Channel Cables – Fiber Channel Hardware Devices – iSCSI Architecture – Securing iSCSI – SAN backup and recovery techniques – RAID – SNIA Shared Storage Model – Classical Storage Model – SNIA Shared Storage Model – Host based Architecture – Storage based architecture – Network based Architecture – Fault tolerance to SAN – Performing Backups – Virtual tape libraries.

**UNIT V          Virtual Machines Products                                                    9Hrs**

Xen Virtual machine monitors- Xen API – VMware – VMware products - Vmware Features – Microsoft Virtual Server – Features of Microsoft Virtual Server

**Total Hours: 45**

**TEXT BOOKS:**
1. William von Hagen (2008) Professional Xen Virtualization, Wrox Publications
2. Chris Wolf , Erick M. Halter (2005) Virtualization: From the Desktop to the Enterprise, APress
3.

**REFERENCE BOOKS:**
1. Reddy, Victor Moreno (2006) Network virtualization, Cisco Press
2. James E. Smith, Ravi Nair (2005) Virtual Machines: Versatile Platforms for Systems and Processes, Elsevier/Morgan Kaufmann
3. David Marshall, Wade A. Reynolds (2006) Advanced Server Virtualization: VMware and Microsoft Platform in the Virtual Data Center, Auerbach Publications

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18E28/<br>BCS20E28 | Subject Name :   HADOOP DISTRIBUTED FILE SYSTEM | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  BCS18006 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the concepts of  Distributed file system
- To acquire knowledge about Hbase, YARN, PIG and OOZIE
- To understand MapReduce types and formats
- To examine Hadoop Usage

To understand the concepts of NoSQL, Flume and Sqoop

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Able to recollect the recent computing technology |
|---|---|
| CO2 | Apprehend the concepts of distributed file system. |
| CO3 | Able to understand the importanceandrelevanceofHDFS. |
| CO4 | Apply the various concepts of Hadoop |
| CO5 | Able to analyze the types and formats of MapReduce |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO3 | 2 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 1 |
| CO4 | 3 | 2 | 3 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |
| CO5 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 2 |
| CO2 | 2 | 1 | 2 | 2 |
| CO3 | 2 | 2 | 1 | 2 |
| CO4 | 1 | 2 | 2 | 1 |
| CO5 | 2 | 2 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E28/ BCS20E28 | HADOOP DISTRIBUTED FILE SYSTEM | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        Hadoop Introduction                                                                       9Hrs**
Distributed and parallel computing  - HDFS  and MapReduce – Hadoop function – cloud deployment and delivery model – In memory computing technology – Hadoop ecosystem – Hadoop distributed file system – HDFS architecture – HDFS files – HDFS high availability – Hadoop YARN – Hbase and HDFS – Hive – Pig – Sqoop – ZooKeeper – Flume – Oozie.

**UNIT II        MapReduce, HBase And Big Data Technology                                  9Hrs**
MapReduce framework – optimaize MapReduce job – roles of HBase in Big Data Processing.Big Data stack – Virtualization and Big Data – Virtualization Approaches – CAP Theorem – non-relational database – polyglot persistence – Big Data analytics and Data warehouse – simple MapReduce application – designing MapReduce.

**UNIT III        YARN And Hive                                                                             9hrs**
Background of YARN – Advantages – Architecture –schedulers – configurations – commands – YARN containers – Registry – Hive Services – data types – built in functions – Hive DDL – data manipulation in Hive – Data retrieval Queries – using JOINS in Hive.

**UNIT IV        Pig And Oozie                                                                               9Hrs**
Pig architecture – running Pig – Pig Latin – working with operators in Pig – Debugging Pig – functions in pig – Error Handling in Pig – Oozie – benefits – configuration – Oozie workflow – Oozie coordinator – Oozie bundle – Oozie parameterization – Oozie job execution model – Oozie SLA.

**UNIT V        NosQL, Flume And Sqoop                                                             9Hrs**
Characteristics of NoSQL – Types of NoSQL data Models – Schema less databases – materialized view – distribution models – sharding – Flume – Flume Architecture – Sqoop – importing data – Mahout – machine learning – collaborative filtering – clustering – classification – Mahout algorithms – Environment for Mahout

**Total Hours: 45**

**TEXT BOOKS:**
1. DT Editorial Services, 2016 "Big Data Black Book" dreamteck press .
2. Alex Holmes, 2015 " Hadoop in Practice"  dreamteck press.

**REFERENCE BOOKS:**
1. Tom White, 2015 " Hadoop – The Definitive Guide 4th edition Oreilly.
2. Shiva Achari 2015 " Hadoop Essentials"  Packt Publishing.
3. Henry H Liu, 2014 "Hadoop 2 Essential" Creative Independent Publishing.
4. Jeffrey Aren, 2017 "Sams Teach Yourself Hadoop in 24 hours" Pearson.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18E29/ BCS20E29 | Subject Name :<br>MOBILE  DATABASES | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn about the fundamentals of distributed databases
- To understand Data Processing and mobility models
- To learn about the Data Consistency and Concurrency Control mechanisms
- To study mobile Database Recovery techniques and Wireless Information Broadcast schemes

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Understand the concepts of Mobile Communication. |
| CO2 | Recite the Basic concepts of distributed databases. |
| CO3 | Outline the concepts of  execution model in Mobile databases. |
| CO4 | Apply the concurrency and consistency topics in mobile databases. |
| CO5 | Develop different Mobile database recovery techniques. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CO2 | 3 | 2 | 3 | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 1 | 3 | 2 |
| CO4 | 3 | 2 | 2 | 1 | 2 | 2 | 1 | 2 | 2 | 2 | 1 | 3 |
| CO5 | 3 | 2 | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 1 | 2 | 3 | 3 |
| CO3 | 1 | 2 | 2 | 3 |
| CO4 | 2 | 2 | 2 | 3 |
| CO5 | 2 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E29/ BCS20E29 | MOBILE DATABASES | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I Introduction                                                                                                    9Hrs**
Fully connected information space – Types of Mobility – Wireless Network Communication. Radio Frequency: Spectrum and Band – Cellular Communication - Continuous Connectivity – Structure of a Channel – Absence of Free Channel – Signal Fading – Frequency Reuse – PCS and GSM – PCS Personal Communication Service – Interface – Call Processing – GSM Global System for Mobile Communication – Location and Handoff Management – Location Management – Handoff Management – Roaming.

**UNIT II          Fundamentals of Distributed Databases                                          9Hrs**
Conventional Database Architecture – Database Partition and Distribution – Database Processing – Transaction Structure – Serialization of Transactions – Serializability – Based Correctness Criteria – Serializability Theory – Degree of Isolation – Advanced Transaction Model – Nested Transaction Model – SAGA – Cooperative Transaction – ConTract – Flex Transaction – Introduction to Concurrency Control Mechanisms – Ways of Locking Data Items – The Phantom Problem – Multigranularity Locking – Heuristic Approach in Locking Schemes – Non-Locking Based Schemes

**UNIT III          Data Processing and Mobility                                                       9Hrs**
Effect of Mobility on the Management of Data – Transaction Management in Mobile Database Systems – Mobile Database System – Transaction Execution in MDS – Mobile Transaction Model – Execution Model based on ACID Transaction 230 CS-Engg&Tech-SRM-2013 Framework – Pre-write Transaction Execution Model – Mobile Transaction Models – HiCoMo – Moflex - Kangaroo – MDSTPM Transaction Execution Model – Mobilaction – Atomicity for Mobilaction – Isolation for Mobilaction – Consistency and Durability for Mobilaction

**UNIT IV          Data Consistency and Concurrency                                               9Hrs**
 Data Consistency in intermittent |Connectivity - The Consistency Model – Weak Connectivity Operation – A Consistency Restoration Schema – Concurrency Control Mechanism – Transaction Commit – Commitment of Mobile Transactions – Transaction Commitment in Mobile Database Systems.

**UNIT V          Mobile Database Recovery                                                             9Hrs**
Log Management in Mobile Database Systems – Mobile Database Recovery Schemes – Wireless information Broadcast – introduction – Broadcast Disk – Broadcast Infrastructure – Exponential Index – Location-Based Indexing – OnDemand Data Scheduling – Data Dissemination System.

**Total Hours: 45**

**TEXT BOOK:**
   1. Vijay Kumar , 2006  "Mobile Database Systems", Wiley Inderscience Publication, 2006
**REFERENCE BOOKS:**
   1. Leong (Hong VA) , 1999 Lee (Wang Chen), "Mobile Data Access", Springer.
   2. Rifaat A. Dayem, 1997 "Mobile Data & Wireless LAN Technologies", Prentice Hall Inc.
   3. TAN(Kian Lee), Franklin(Michael J), "Mobile Data Management", Springer.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18E30/ BCS20E30 | Subject Name : WEB ENGINEERING | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BIT18I02 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To be able to analyze and design comprehensive systems for the creation, dissemination, storage, retrieval, and use of electronic records and documents
- To learn and use some of the client-side and server-side languages used to manipulate information on the World Wide Web – i.e. ASP.NET, and Javascript.
- To learn techniques and evaluation metrics for ensuring the proper operability, maintenance and security of a web application.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Remembering the web components |
|---|---|
| CO2 | Analyse the web framework and activities |
| CO3 | Applying the communication concepts into web engineering |
| CO4 | Understanding and planning the development of a web design stages |
| CO5 | Classify the different modelling for web application development |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 2 | 2 | 3 | 2 | 2 | 1 | 1 | 2 | 2 |
| CO2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | 1 | 2 | 3 | 1 | 1 |
| CO4 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |

| COs/PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 3 |
| CO2 | 2 | 2 | 1 | 2 |
| CO3 | 1 | 1 | 2 | 2 |
| CO4 | 2 | 2 | 1 | 3 |
| CO5 | 2 | 3 | 1 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E30/ BCS20E30 | WEB ENGINEERING | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          Web-Based Systems**                                                          **9 Hrs**
The Web-Web Applications-Web Engineering-The Components of Web Engineering

**UNIT II          A Web Engineering Process**                                              **9 Hrs**
Defining the Framework-Incremental Process Flow- Generic Actions and Tasks for the Web Framework-Umbrella Activities

**UNIT III          Communication**                                                           **9 Hrs**
The Communication Activity –  Formulation – Elicitation- Identifying Web App Increments- Negotiation

**UNIT IV          Planning**                                                                   **9 Hrs**
 Refining Framework Activities-Building a Web Team - Managing Risk - Developing a Schedule

**UNIT V          The Modelling Activity**:                                              **9 Hrs**
Modelling as a Concept - Modelling Frameworks - Modelling Languages - Existing Modelling Approaches

**Total Hours: 45**

**TEXT BOOK:**
1. Web Engineering: A Practitioner's Approach by Roger Pressman and David Lowe, McGraw- Hill, 2009.

**REFERENCE BOOKS:**
1. Denise M. Woods and William J. Dorin 2012 HTML and CSS: Comprehensive 7th edition,. Publisher: Cengage Learning; ISBN-10: 1133526144
2. Paul J. Deitel, Harvey M. Deitel, Abbey Deitel, 2012 Internet & World Wide Web How to Program, 5/e Pearson Education.

| Subject Code:<br>**BCS18E31/**<br>**BCS20E31** | Subject Name :<br><br>**4G NETWORKS** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BIT18I01 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T / L/ ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the latest technology in mobile communication.
- To know recent development in wireless communication.
- To understand the high speed data communication through wireless network

To learn the technology behind VoLTE, VoIP technology

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Recall LTE Network Architecture and protocols for new invention in wireless communication. |
|---|---|
| CO2 | Comprehend LTE Air Interface and their functioning for developing mobile devices |
| CO3 | Predict LTE System Performance incorporating optimization techniques for high speed communication. |
| CO4 | Demonstrate the coverage and capacity of 4G Networks for effective throughput |
| CO5 | Investigate evolution of voice for further enhancements in 4G Networks |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 1 | 3 | 3 | 3 |
| CO2 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |
| CO3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation  3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E31/ BCS20E31 | 4G NETWORKS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          LTE Network Architecture and Protocols                                    9 Hrs**
Evolution of 3GPP Standards-Radio Interface Techniques in 3GPP Systems-Radio Access Mode Operations-Spectrum Allocation in UMTS and LTE-EPS Interfaces-EPS Protocols and Planes-EPS Procedures.

**UNIT II          LTE Air Interface and Procedures                                            9 Hrs**
LTE Protocol Stack - SDU and PDU - LTE Radio Resource Control (RRC) - LTE Packet Data Convergence Protocol Layer (PDCP)- LTE Radio Link Control (RLC)- LTE Medium Access Control (MAC) - LTE Physical Layer (PHY)- Channel Mapping of Protocol Layers- LTE Air Interface

**UNIT III          Analysis and Optimization of LTE System Performance                  9Hrs**
Deployment Optimization Processes - LTE Performance Analysis Based on Field Measurements - LTE Case Studies and Troubleshooting- LTE Inter-RAT Cell Reselection- Inter-RAT Cell Reselection Optimization Considerations- LTE to LTE Inter-frequency Cell Reselection- LTE Connected Mode Discontinuous Reception - Circuit Switch Fallback (CSFB) for LTE Voice Calls- Multiple-Input, Multiple-Output (MIMO) Techniques.

**UNIT IV          Coverage And Capacity Planning Of 4G Networks                        9 Hrs**
LTE System Foundation- PCI and TA Planning- PRACH Planning- Coverage Planning- LTE Throughput and Capacity Analysis.

**UNIT V          Voice Evolution in 4G Networks                                              9 Hrs**
Voice over IP Basics- Voice Options for LTE- IMS Single Radio Voice Call Continuity- VoLTE Features- Deployment Considerations for VoLTE. Carrier Aggregation- Enhanced MIMO.

**Total Hours: 45**

**TEXT BOOK:**
1. Design, Deployment and Performance of 4G-LTE Networks- A Practical Approach- Ayman Elnashar Emirates Integrated Telecomms Co., UAE- Mohamed A. El-saidny QUALCOMM Technologies, Inc., USA- Mahmoud R. Sherif Emirates Integrated Telecomms Co., UAE. Wiley Publication.

**REFERENCE BOOK:**
1. Clint Smith, P.E., Daniel Collins, Wireless Networks: Design and Integration for TE,EVDO,HSPA and WiMax Third Generation.

| Subject Code:<br>**BCS18E16 / BCS20E16** | Subject Name :<br>**DATABASE SECURITY** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | **Ty** | **3** | **0/0** | **0/0** | **3** |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To provide a foundation in database security
- Understand the various database vulnerabilities
- Learn to audit the databases.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Able to define the fundamentals of security process. |
| CO2 | Discover the difference database perspective  and vulnerabilities in operating system |
| CO3 | Describe the security policies and techniques |
| CO4 | Understand the various  Database Application in  Security Models |
| CO5 | Able to develop the database project in real time process |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 1 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BCS18E16 / BCS20E16** | **DATABASE SECURITY** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I**      **Security Architecture & Operating System Security Fundamentals**      **9 Hrs**
Security Architecture: Introduction-Information Systems- Database Management Systems-Information Security Architecture- Database Security–Asset Types and value-Security Methods Operating System Security Fundamentals: Introduction-Operating System Overview-Security Environment – Components- Authentication Methods-User Administration-Password Policies-Vulnerabilities-E-mail Security.

**UNIT II**      **Administration of Users, Profiles, Password Policies, Privileges and Roles**      **9 Hrs**
Administration of Users: Introduction-Authentication-Creating Users, SQL Server User-Removing, Modifying Users-Default, Remote Users-Database Links-Linked Servers-Remote Servers-Practices for Administrators and Managers-Best Practices Profiles, Password Policies, Privileges and Roles: Introduction-Defining and Using Profiles-Designing and Implementing Password Policies-Granting and Revoking User Privileges-Creating, Assigning and Revoking User Roles-Best Practices.

**UNIT III**      **Database Application Security Models**      **9 Hrs**
Introduction-Types of Users-Security Models: Access Matrix model, Access mode model- Application Types: Client/Server Applications, Web Applications, Data ware house applications- Application Security Models-Data Encryption.

**UNIT IV**      **Virtual Private Databases**      **9 Hrs**
Virtual Private Databases: Introduction-Overview of VPD-Implementation of VPD using Views, Application Context in Oracle-Implementing Oracle VPD-Viewing VPD Policies and Application contexts using Data Dictionary, Policy Manager Implementing Row and Column level Security with SQL Server.

**UNIT V**      **Security and Auditing Project Cases**      **9 Hrs**
Case Studies : Developing an online database, payroll management, tracking database changes, developing a secured authorization repository.

**Total Hours: 45**

**TEXT BOOK:**
1. Hassan A. Afyouni, 2009 "Database Security and Auditing", Third Edition, Cengage Learning.

**REFERENCE BOOKS:**
1. *Charu C. Aggarwal, Philip S Yu, 2008, "Privacy Preserving Data Mining": Models and Algorithms, Kluwer Academic Publishers.*
2. *Ron Ben Natan, 2005, "Implementing Database Security and Auditing", Elsevier Digital Press.*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>**BCS20E01** | Subject Name :<br>**VIDEO ANALYTICS** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: -- | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To understand the need for video Analytics
- To understand the basic configuration of video analytics
- To understand the functional blocks of a video analytic system
- To get exposed to the various applications of video analytics

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Design video analytic algorithms for security applications |
| CO2 | Design video analytic algorithms for business intelligence |
| CO3 | Design custom made video analytics system for the given target application |
| CO4 | Design video analytic algorithms for security applications |
| CO5 | Design video analysis for business Intelligence and Traffic Monitoring |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 1 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20E01 | VIDEO ANALYTICS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        Introduction                                                                 9Hrs**

Image Processing ,Computer Vision, Spatial/ Frequency Domain Processing , Background Modeling, Local Features (Harris/SIFT/KB/STIP) , Object Detection and Recognition (Eigen Faces, Sparse Representation) , Face Detection and Recognition

**UNIT  II        Foreground Extraction :                                                 9Hrs**

Background estimation- Averaging- Gaussian Mixture Model- Optical Flow based- Image Segmentation- Region growing- Region splitting-Morphological operations- erosion-DilationTracking in a multiple camera environment

**UNIT III        Classifiers :**

Neural networks (back propagation) – Deep learning networks- Fuzzy Classifier- Bayesian classifier-HMM based classifier

**UNIT IV                                                                                         9Hrs**

Kalman, Particle Filter based tracking, Multi-target/Multi-camera tracking, Motion Estimation,  Action Recognition, Stereo and MonoDepth Estimation, Decision Trees/Random Forest

**UNIT V                                                                                          9Hrs**

Video Analytics for Business Intelligence and Traffic Monitiring and Assistance Customer behavior analysis – people counting- Traffic rule violation detection- traffic congestion identification for route planning- driver assistance- lane change warning

**Total Hours: 45**

**TEXT BOOK:**

1. Graeme A. Jones (Editor), Nikos Paragios (Editor), Carlo S. Regazzoni (Editor) Video-Based Surveillance Systems: Computer Vision and Distributed Processing , Kluwer academic publisher, 2001
2. Nilanjan Dey (Editor), Amira Ashour (Editor) and Suvojit Acharjee (Editor), Applied Video Processing in Surveillance and Monitoring Systems (IGI global) 2016
3. Zhihao Chen (Author), Ye Yang (Author), Jingyu Xue (Author), Liping Ye (Author), Feng Guo (Author), The Next Generation of Video Surveillance and Video Analytics: The Unified Intelligent Video Analytics Suite, CreateSpace Independent Publishing Platform, 2014

**REFERENCE BOOK**

1. Computer Vision: Algorithms and Applications, by Richard Szeliski. A free electronic copy is available online (Link)
2. Introductory techniques for 3-D Computer Vision, by Emanuele Trucco and Alessandro Verri
3. Multiple View Geometry in Computer Vision (2nd edition) by Richard hartley and Andrew Zisserman
4. Computer Vision: A Modern Approach by David Forsyth and Jean Ponce
5. Digital Image Processing (Rafael Gonzalez and Richard Woods)
6. Caifeng Shan (Editor), Fatih Porikli (Editor), Tao Xiang (Editor), Shaogang Gong (Editor) Video Analytics for Business Intelligence, Springer, 2012

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18E34/ BCS20E34 | Subject Name :<br>**MAIN FRAME COMPUTING** | | | | | | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | | | | | | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the concepts of MVS, JCL, VSAM and IDCAMS
- To study the details of COBOL and DB2
- To understand CICS and supply transactions

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the concepts of MVS, JCL, VSAM and IDCAMS |
|---|---|
| CO2 | Write moderately complex COBOL programs to process files. |
| CO3 | Understand CICS and supply transactions |
| CO4 | Knowledge about different database design |
| CO5 | Capable to optimize algorithm for better performance |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 1 | 3 | 2 | 1 | 2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 2 |
| CO4 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 2 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 |
| CO2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 2 | 1 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

*CSE - ARTIFICIAL INTELLIGENCE - REGULATION  2020-2021*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E34/ BCS20E34 | **MAINFRAME COMPUTING** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I         MVS Concepts                                                          9 Hrs**
Main frame in Todays Business -Introduction to Z series H/W , Z/OS .- MVS overview-system initialization-storage management-job management ISPF Editor ISPF Data Utility Functions -managing work-data management-I/O processing-termination and recovery.TSO commands-general syntax of JCL statements

**UNIT II        JCL and VSAM                                                        9 Hrs**
Explanation of job statements-explanation of EXEC statements-explanation of DD statements-additional parameters on JOB,EXEC,DD statements-classification-instream and catalog procedures-utilities-abend codes.VSAM data set organization structure-IDCAMS commands-JCL for VSAM-buffering-alternative index-repro-backup and recovery-export and import.

**UNIT III       COBOL/370                                                          9Hrs**
Structured programming constructs-fundamentals of COBOL-data definition-conditional statements-perform statements-compiler option-table definition-COBOL call and parameter passing-file handling.

**UNIT IV       DB2                                                                 9Hrs**
RDBMS concepts-structural query language-normalisation-DB2 architecture-DB2 objects-locks-program preparation-cursors-null indicators-optimisation - utilities.

**UNIT V        CICS                                                                9Hrs**
CICS introduction-terminal control-application house keeping-EXEC,interface locks-supply transactions – CESM,CESF,CEMT,CEDF-NMDS-BMS-abend codes-file control-program control-TSQ-TDQ-pseudo conversation-recovery and roll back.

                                                                                    **Total Hours: 45**

**TEXT BOOKS:**
1. Mike Ebbers, John Kettner,WayneO'Brien,Bill Ogden,(2011) Introduction to the New Mainframe: z/OSBasics, IBM Redbooks(SG24-6366-01)
2. Alexis Leon , IBM Mainframe Handbook, vikas Publishing, 2014

**REFERNCE BOOKS:**
1. M.K. Roy and D.GoshDastidar ,(2006) COBOL PROGRAMMING,John Wiley And Sons
2. Stern & Stern (2007) STRUCTURED COBOL PROGRAMMING,(8th ed.),JOHN Wiley India
3. Grant Allen(2008) Beginning DB2 : from Novice to Professional , Apress
4. Mary Lovelace, Jose Dovidauskas, Alvaro Salo, Valerio Sokai, (2012) VSAM Demystified (SG246105)IBM Red Books
5. Doug Lowe ,(1994) MVS JCL,(2nd ed.),MIKE MURACH ASSOCIATE

Saba Zamir, ChandanRanade , (2007) MVS JCLPrimer,McGrawhil

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BCS18E35/<br>BCS20E35 | Subject Name :<br>**NEURO FUZZY COMPUTING** | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18E06 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture  T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research  C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The students will be able to design and develop neuro fuzzy modeling and will have the ability to understand Neural Network.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Identify and describe fuzzy and soft computing techniques and also their use in some real life situations |
| CO2 | To solve the problems using neural networks techniques. |
| CO3 | Discuss about regression and optimization |
| CO4 | Using different fuzzy logic techniques find a solution |
| CO5 | Analyse about the neural network hardware |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 1 | 3 | 3 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 1 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 3 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BCS18E35/ BCS20E35** | **NEURO FUZZY COMPUTING** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          Neuro – Fuzzy and Soft Computing Fuzzy Systems                          9 Hrs**
Introduction to Fuzzy Sets – Fuzzy Rules and -    - Fuzzy Reasoning  and - Inference- Fuzzy Inference Systems - Compositional Rules of Inference in Fuzzy System – Defuzzification Strategies , Fuzzy Models– System Identification – Several Least Square Methods – Optimization Techniques- Derivative-based Optimization, Derivative and Free Optimization.

**UNIT II          Regression and Optimization                                                         9 Hrs**
System Identification – Several Least Square Methods – Optimization Techniques- Derivative-based and Derivative Free Optimization.

**UNIT III          Neural Network                                                                            9 Hrs**
Neural Network Architecture -Network Inputs and Outputs – Feed back Inter Connections and Network Stability – Feed Forward Networks –Back Propagation Networks- Learning Methods-  Adaptive Networks – Supervised Learning Neural Networks –RBFN – Unsupervised Learning Networks - Self Organizing maps,  Adaptive Resonance Architectures, Radial Basis Networks- LVQM , Principle Component Anlaysis.

**UNIT IV          Neuro Fuzzy Modelling                                                                 9 Hrs**
Neural Component of a Fuzzy System – Fuzzy neural Network Controllers – Adaptive Neuro Fuzzy Inference System(ANFIS) – CANFIS – Neural Networks based Fuzzy Inference System - Classification and Regression Tests – Data Clustering Techniques and Algorithms – Rule base Structure Identification

**UNIT V          Artificial Neural Networks Hardware                                             9 Hrs**
Implementation Issues – Evaluation of Neural network Architectures – Hardware Realization – VLSI approach – Optical techniques.

                                                                                                            **Total Hours: 45**

**TEXT BOOK:**
1. Jyh-shing roger Jang, Chnesy-tasi sur, Eiji Miziltazui," Neuro and Soft Computing: A Computational Approach to Learning and machine Intelligence", Pearson Education 2004, Digitized in 2007 ISBN 0132610663, 9780132610667

**REFERENCE BOOKS:**
1. Timothy J.rass (2011), " Fuzzy Logic with Engineering Application", (3$^{rd}$ ed.)Wiley India,
2. S.Rajasekaran , G.A.Vijayalakshmi Pai , Neural N/Ws, Fuzzy Logic and Genetic Algorithm Sysnthesis and Applications, PHI (2004)

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS20E02 | Subject Name : AI AND CYBER SECURITY | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: BCS18004 | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To familiarize various types of cyber-attacks and cyber-crimes
- To give an overview of the cyber laws
-  To study the defensive techniques against these attacks

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Illustrate different types of cyber security attacks  and crimes |
|---|---|
| CO2 | Ability to inference the knowledge cyber law |
| CO3 | Discuss the techniques used for attacks |
| CO4 | Evaluate the  problems |
| CO5 | Learns how artificial intelligence support expert systems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 1 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20E02 | AI AND CYBER SECURITY | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT - I     Introduction to Cyber Security:**                                      **9 Hrs**

Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threat, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc., Comprehensive Cyber Security Policy.

**UNIT - II     Cyberspace and the Law & Cyber Forensics:**                          **9 Hrs**

Introduction, Cyber Security Regulations, Roles of International Law. The INDIAN Cyberspace, National Cyber Security Policy. Introduction, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

**UNIT - III     Cybercrime in Mobile and Wireless Devices:**                       **9 Hrs**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops

**UNIT - IV     Learning:**                                                        **9 Hrs**

What Is Learning? Rote Learning, Learning by Taking Advice, Learning in Problem Solving, Learning from Examples, Winston's Learning Program, Decision Trees.

**UNIT - V     Expert Systems:**                                    **9 Hrs** Representing and
Using Domain Knowledge, Shell, Explanation, Knowledge Acquisition.

                                                       **Total Hours: 45**

**TEXT BOOKS:**

1. Nina Godbole and Sunit Belpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley 2018
2. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.
3. Russell, S. and Norvig, P, Artificial Intelligence: A Modern Approach, Third Edition, PrenticeHall, 2010.

| Subject Code:<br>BCS20E03 | Subject Name :<br>**BUSINESS INTELLIGENCE** | | | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Be exposed with the basic rudiments of business intelligence system
- Understand the modeling aspects behind Business Intelligence
- understand of the business intelligence life cycle and the techniques used in it
  Be exposed with different data analysis tools and techniques

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Explain the fundamentals of business intelligence. |
| CO2 | Link data mining with business intelligence. |
| CO3 | Apply various modeling techniques. |
| CO4 | Explain the data analysis and knowledge delivery stages. |
| CO5 | Explain the emerging technology and visualization |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 1 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 3 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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NAAC
ACCREDITED WITH GRADE

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS20E03 | BUSINESS INTELLIGENCE | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        BUSINESS INTELLIGENCE                                        9 Hrs**

Effective and timely decisions – Data, information and knowledge – Role of mathematical models – Business intelligence architectures: Cycle of a business intelligence analysis – Enabling factors in business intelligence projects – Development of a business intelligence system – Ethics and business intelligence.

**UNIT II        KNOWLEDGE DELIVERY                                        9 Hrs**

The business intelligence user types, Standard reports, Interactive Analysis and Ad Hoc Querying, Parameterized Reports and Self-Service Reporting, dimensional analysis, Alerts/Notifications, Visualization: Charts, Graphs, Widgets, Scorecards and Dashboards, Geographic Visualization, Integrated Analytics, Considerations: Optimizing the Presentation for the Right Message.

**UNIT III        EFFICIENCY                                        9 Hrs**

Efficiency measures – The CCR model: Definition of target objectives- Peer groups – Identification of good operating practices; cross efficiency analysis – virtual inputs and outputs – Other models. Pattern matching – cluster analysis, outlier analysis

**UNIT IV        BUSINESS INTELLIGENCE APPLICATIONS                9 Hrs**

Marketing models – Logistic and Production models – Case studies.

**UNIT V        FUTURE OF BUSINESS INTELLIGENCE                        9 Hrs**

Future of business intelligence – Emerging Technologies, Machine Learning, Predicting the Future, BI Search & Text Analytics – Advanced Visualization – Rich Report, Future beyond Technology.

**Total Hours: 45**

**TEXT BOOK:**
1. Efraim Turban, Ramesh Sharda, Dursun Delen, "Decision Support and Business Intelligence
   Systems", 9 th Edition, Pearson 2013.
2. Larissa T. Moss, S. Atre, "Business Intelligence Roadmap: The Complete Project Lifecycle of Decision
   Making", Addison Wesley, 2003.
3. Carlo Vercellis, "Business Intelligence: Data Mining and Optimization for Decision Making",
   Wiley Publications, 2009.
4. David Loshin Morgan, Kaufman, "Business Intelligence: The Savvy Manager"s Guide", Second Edition, 2012.
5. Cindi Howson, "Successful Business Intelligence: Secrets to Making BI a Killer App", McGraw- Hill, 2007.
6. Ralph Kimball , Margy Ross , Warren Thornthwaite, Joy Mundy, Bob Becker, "The Data Warehouse Lifecycle
   Toolkit", Wiley Publication Inc.,2007

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18E39/ BCS20E39 | Subject Name :<br>REAL TIME SYSTEMS | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: BCS18006 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Real-time scheduling and schedulability analysis
- Formal specification and verification of timing constraints and properties
- Design methods for real-time systems
- Development and implementation of new techniques to advance the state-of-the-art real-time systems research

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Recall the basic concepts of operating system |
|---|---|
| CO2 | Illustrate various task assignment and scheduling algorithms |
| CO3 | Apply the knowledge of programming languages and tools for real time systems |
| CO4 | Analyze the problems in computing |
| CO5 | Identify the solution to the computing problems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 3 | 1 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 1 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E39/ BCS20E39 | REAL TIME SYSTEMS | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        Introduction                                                                                                  9 Hrs**

Architecture of real time systems/embedded systems-operating systems issues-performance measures-estimating program run times.

**UNIT II        Task Assignment and Scheduling                                                          9 Hrs**

Uniprocessor scheduling-IRIS tasks-task assignment algorithms- mode changes –fault tolerance scheduling.

**UNIT III        Programming Languages and Tools                                                     9 Hrs**

Desired characteristics based on ADA-data typing-control structures-packages-exception handling-overloading-multitasking-timing specification-task scheduling-just in time compilation-run time support.

**UNIT IV        Real Time Databases                                                                            9 Hrs**

Basic definitions-main memory databases -transaction processing-concurrency control-disk scheduling algorithms-serialization and consistency-real time communication

**UNIT V        Fault Tolerance, Reliability and Synchornization                              9 Hrs**

Fault types-fault detection and containment-redundancy-data diversity-reversal checks-obtaining parameter values-reliability models for hardware redundancy-software error models-clocks-fault tolerance synchronization-synchronization and software.

**Total Hours: 45**

**TEXT BOOK:**
1. C.M.Krishna, Kang.G.Shin, 2010, Realtime Systems, McGraw Hill.

**REFERENCE BOOKS:**
1. Rajib Mall, 2007  ”Real-time systems: theory and practice”, Pearson Education.
2. Phillip A.Laplante 2011 Real Time System Design  and Analysis,4 th edition,Wiley.
3. Alan burns and andy wellings,2009 ”Real time systems and prog. Languages”, 4 thedition,pearson.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : | | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| **BCS18E40/ BCS20E40** | **DISTRIBUTED COMPUTING** | | | | | | |
| | Prerequisite: BIT18I01 & BCS18006 | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The students will be able to understand the design of distributed systems
- To understand communication concepts of distributed systems
- To apply the memory management design of distributed systems to design a new memory

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the design of distributed computing systems |
|---|---|
| CO2 | Understand the communication concepts of distributed systems |
| CO3 | Design a new memory by applying the memory management design of distributed systems |
| CO4 | Understand the distributed file system security |
| CO5 | Analyze the security of the distributed file system |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 2 | 3 |
| CO2 | 2 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 1 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 2 |
| CO2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 |
| CO5 | 2 | 2 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SUBJECT CODE | SUBJECT NAME | Ty/Lb/ET | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BCS18E40/ BCS20E40 | DISTRIBUTED COMPUTING | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I          Fundamentals                                                                                                 9 Hrs**
Introduction to distributed computing system, Evolution, Different models, Gaining popularity, Definition, Issues in design, DCE, Message passing-Introduction, Desirable features of a good message passing system, Issues in IPC, Synchronization, Buffering, Multidatagram, Process addressing, Failure handling, Group communication.

**UNIT II          Remote Procedure Call                                                                              9 Hrs**
Introduction, RPC model, transparency of RPC, Implementing RPC mechanism, Stub generation, RPC messages, Marshalling arguments and results, Sever management, parameter-passing semantics, Call semantics, Communication protocols for RPCs, Complicated RPC, Client-server binding, exceptional handling, security, Lightweight RPC.

**UNIT III          Distributed Shared Memory and Synchronization                                9 Hrs**
Introduction, General architecture of DSM systems, Design and implementation issues of DSM, Granularity, Structure of shared memory space, Consistency model, Replacement strategy, Thrashing, Different approaches to DSM, Advantages of DSM, Clock synchronization, Event ordering, Mutual exclusion, Deadlock, Election algorithm.

**UNIT IV          Resource and Process Management                                                       9 Hrs**
Introduction, Desirable features of a good global scheduling algorithm, Task assignment approach, Load balancing approach, Load sharing approach, Process migration, Threads.

**UNIT V          DFS/DCE Security                                                                                   9 Hrs**
Desirable features of good DFS, File models, File accessing, models, File sharing semantics, File cachingschemes, File replication, Fault tolerance, Atomic Transaction, Design principles, Authentication, Access control, Digital signatures, DCE security service.

**Total Hours: 45**

**TEXT BOOK:**
1. Pradeep K. Sinha (2012 Reprint) , Distributed Operating System Concepts and Design PHI

**REFERENCE BOOKS:**
1. Andrew S. Tenenbaum (2012), Modern Operating System (3rd ed.) PHI
2. Ajay D. Kshemkalyani , Mukesh Singhal (2008), Distributed computing : principles,   algorithms and systems – Cambridge University Press
3. Andrew S. Tenenbaum &Maatren Vansteen (2012) Distributed systems: Principles & Paradigms (2nd ed.),PHI
4. Hagit Attiya And Jennifer Welch (2004) Distributed computing fundamentals, simulations and Advanced Topics (Digitized in 2007) (2nd ed.), Wiley
5. Jean Dollimore, Tim Kindberg, And George Coulouris (2005) Distributed Systems: Concepts and Design (4th ed.) Pearson Education

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## Open Electives

| Subject Code:<br>BCS18OE1/<br>BCS20OE1 | Subject Name :<br>CYBER SECURITY & FORENSICS | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: **Computer Network, Software Quality** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial  S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn the Basics of cyber crime.
- To Understand the infrastructure, information security and risk management.
- To ability to work with digital evidence, information collection and information protection.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understanding the cyber crime fundamental |
|---|---|
| CO2 | Will be able to understand the infrastructure, information security and risk management. |
| CO3 | Will have ability to inspect with the digital evidence, information collection and information protection. |
| CO4 | To learn about cyber forensics preventions |
| CO5 | To apply information security risk |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 2 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 3 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 2 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 3 | 2 | 1 | 1 |
| CO5 | 3 | 1 | 1 | 1 |

**3/2/1 indicates strength of correlation  3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| **BCS18OE1/ BCS20OE1** | **CYBER SECURITY & FORENSICS** | Ty | 3 | 0/0 | 0/0 | 3 |

.

**UNIT I  Introduction to Cyber Crime** **9 Hrs**
Overview, what is Cybercrime?, Computer Intrusions and Attacks (Unauthorized Access) Computer Viruses, Time Bombs, Trojans, Malicious Code (Malware),Online Fraud and Identity Theft; Intellectual Property Theft; Virtual Crime, Online Vice: Gambling; Pornography; Child Exploitation, International Aspects and Jurisdiction

**UNIT II  Information security** **9 Hrs**
Infrastructure and Information Security; Risk Management

**UNIT III: Instigation and digital evidence** **9 Hrs**
Investigating Cybercrime: Digital Evidence and Computer Forensics,Interception, Search and Seizure, and Surveillance

**UNIT IV Information Welfare** **9 Hrs**
Information Warfare, Cyber terrorism, and Hacktivism,Terrorism, Radicalization, and The War of Ideas, Trade Secret Theft and Economic Espionage, National Security.

**UNIT V Data Prevention** **9 Hrs**
Desktop Security, Data and file Security, Network resources Security, Firewall, Mobile data Security.

**Total Hours: 45**

**Text Books**

1. David J. Loundy, COMPUTER CRIME, INFORMATION WARFARE, AND ECONOMIC ESPIONAGE, Carolina Academic Press (2003) (ISBN:0890891109).
2. Jack Balkin, et al. eds., CYBERCRIME: Digital Cops in a Networked World (NYU Press 2007) (ISBN:0814799833).

**Reference books**

1. Hacking for Dummies by by Kevin Beaver Published by  Wiley Publishing, Inc.2004
2. Kenneth C.Brancik "Insider Computer Fraud" Auerbach Publications Taylor & Francis Group–2008.
3. AnkitFadia " Ethical Hacking" second edition Macmillan India Ltd, 2006
4. Live Hacking: The Ultimate Guide to Hacking Techniques & Countermeasures for Ethical Hackers &      IT Security Experts... by Ali Jahangiri (Oct 21, 2009)
5. Ethical hacking countermeasures - An Ultimate Guide For Ethical Hackers [Paperback]Mr. Lomeaskeshkumar (Author), September 1, 2014.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18OE2/ BCS20OE2 | Subject Name : ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: **Linear algebra, Calculus, Basic probability theory.** | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Study the concepts of Artificial Intelligence.
- Learn the methods of solving problems using Artificial Intelligence.
- Introduce the concepts of Expert Systems and machine learning.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Illustrate different types of AI agents |
| CO2 | Classify various AI search algorithms(uninformed, informed and A* Heuristic) |
| CO3 | Discuss on the fundamentals of knowledge inference on Forward , Backward chaining algorithm and Bayesian Network. |
| CO4 | Analyze various types of planning related to state space search and partial order planning |
| CO5 | Exhibit the knowledge of various expert system tools. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| CO2 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 1 | 3 | 2 | 1 | 3 |
| CO3 | 2 | 3 | 2 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 3 |
| CO5 | 1 | 1 | 1 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 2 | 3 |
| CO4 | 2 | 3 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OE2/ BCS20OE2 | **ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEM** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: Introduction and Problem Solving**　　　　　　　　　　　　　　　**9 Hrs**
Introduction – Types of agents – Agent Structure – Problem solving agents – Problem Formulation - Uninformed search strategies.

**UNIT II: Informed Search and Game Playing**　　　　　　　　　　　　　**9 Hrs**
Informed search Strategies – A* Heuristic function – Hill Climbing –Constraint Specification problem - Optimal decisions in games – Pruning

**UNIT III:  Knowledge Inference**　　　　　　　　　　　　　　　　　　**9 Hrs**
Knowledge representation - Inference – Backward chaining, Forward chaining, Fuzzy reasoning – Certainty factors-Bayesian Theory-Bayesian Network-Dempster – Shafer theory.

**UNIT IV:  Planning and Machine Learning**　　　　　　　　　　　　　**9 Hrs**
Planning-STRIPS-planning with state space search-partial order planning –Learning- Machine learning, adaptive Learning.

**UNIT V: Expert Systems**　　　　　　　　　　　　　　　　　　　　　**9 Hrs**
Expert systems – Architecture of expert systems, Roles of expert systems – Knowledge Acquisition –Meta knowledge, Heuristics. Typical expert systems – MYCIN, DART, XOON, Expert systems shells.

　　　　　　　　　　　　　　　　　　　　　　　　　　　　　　**Total Hrs:45**

**Text Books:**
1. Stuart Russel and Peter Norvig "AI – A Modern Approach", 2nd Edition, Pearson Education 2007.
2. Kevin Night and Elaine Rich, Nair B., "Artificial Intelligence (SIE)", McGraw Hill- 2008. (Unit-1,2,4,5).
3. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007. (Unit-III)

**References:**
1. Peter Jackson, "Introduction to Expert Systems", 3rd Edition, Pearson Education, 2007.
2. Deepak Khemani "Artificial Intelligence", Tata Mc Graw Hill Education 2013.
3. http://nptel.ac.in/

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : PYTHON PROGRAMMING | | T / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| BCS18OE3/ BCS20OE3 | Prerequisite: **C, C++** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The students will be able to do programming in Python.
- Develop a basic understanding of *programming* and the *Python programming* language.
- See the value of *programming* in a variety of different disciplines—especially as it relates in engineering.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Will remember the syntax and semantics of python programming. |
|---|---|
| CO2 | Will understand how functional and operations are to be utilized. |
| CO3 | Reproduce a working knowledge of concepts and terminology related to programming language by developing student's creativity. |
| CO4 | Students will analyze the problem and provide solutions for the problem. |
| CO5 | Will able to incorporate the knowledge for various problems. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OE3/ BCS20OE3 | **PYTHON PROGRAMMING** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: INTRODUCTION**                                              **9 Hrs**

History of Python, Need of Python Programming, Applications Basics of Python Programming Using the REPL(Shell), Running Python Scripts, Variables, Assignment, Keywords, Input-Output, Indentation.

**UNIT II: TYPES, OPERATORS AND EXPRESSIONS**                        **9 Hrs**

Types - Integers, Strings, Booleans; Operators- Arithmetic Operators, Comparison (Relational) Operators, Assignment Operators, Logical Operators, Bitwise Operators, Membership Operators, Identity Operators, Expressions and order of evaluations Control Flow- if, if-elif-else, for, while, break, continue, pass.

**UNIT III: FUNCTIONS**                                              **9 Hrs**

Defining Functions, Calling Functions, Passing Arguments, Keyword Arguments, Default Arguments, Variable-length arguments, Anonymous Functions, Fruitful Functions (Function Returning Values), Scope of the Variables in a Function - Global and Local Variables.

**UNIT IV: DATA STRUCTURES**                                         **9 Hrs**

Lists - Operations, Slicing, Methods; Tuples, Sets, Dictionaries, Sequences.Comprehensions.

**UNIT V: OBJECT ORIENTED PROGRAMMING OOP IN PYTHON**                **9 Hrs**

Classes, 'self variable', Methods, Constructor Method, Inheritance, Overriding Methods, Data hiding.

**Total Hours: 45**

**TEXT BOOKS:**
1. Python Programming: A Modern Approach, Vamsi Kurama, Pearson.
2. Learning Python, Mark Lutz, Orielly.

**REFERENCE BOOKS:**
1. Think Python, Allen Downey, Green Tea Press
2. Core Python Programming, W.Chun, Pearson.
3. Introduction to Python, Kenneth A. Lambert, Cengage.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18OE4/ BCS20OE4 | Subject Name : **COMPUTER HARDWARE AND MAINTENANCE** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: **Basics of computer.** | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn about basics of computers hardware & software
- To aware the basics of operating system installation and application installation
- Understand the basics of hardware, Software and network  troubleshooting

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Student will have the basic knowledge on computer hardware components. |
|---|---|
| CO2 | Able to analyze the problem in hardware |
| CO3 | Able to apply solution for the problems by troubleshoot the problems. |
| CO4 | Analyze the functionality and components of the software based on the concepts of hardware. |
| CO5 | Able to provide solutions for the hardware, software and networking problems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 3 | 3 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 3 | 3 |
| CO3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 |
| CO4 | 2 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 |
| CO5 | 2 | 3 | 3 | 2 | 1 | 1 | 1 | 3 | 2 | 3 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 1 |
| CO3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 1 |
| CO5 | 3 | 1 | 2 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OE4/ BCS20OE4 | **COMPUTER HARDWARE AND MAINTENANCE** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: Introduction** 9 Hrs

Evolution of Computers - Generations, Types of computers, Computer system characteristics, Basic components of a Digital Computer - Control unit, ALU, Input/output functions and memory, Memory addressing capability of a CPU, Word length of a computer, processing speed of a computer, Computer Classification. Number Systems: Definition of Number system, necessity of binary number system, binary, decimal, octal and hexadecimal number system, inter conversion of numbers, Representation of integers, fixed and floating points, BCD codes, Error detecting and correcting codes, character Representation-ASCII, EBCDIC, Binary arithmetic

**UNIT II:Input /Output devices** 9 Hrs

Input /Output devices-: Keyboard, Mouse, Trackball, Joystick, Digitizing tablet, Scanners, Digital Camera, MICR, OCR, OMR, Bar-code Reader, Voice Recognition, Light pen, Touch Screen, Display unit and it types -Digital, Analog, Size, Resolution, Refresh Rate, Dot Pitch, Video Standard - VGA, SVGA, XGA etc, Printers & types - Daisy wheel, Dot Matrix, Inkjet, Laser, Line Printer, Plotter, Sound Card and Speakers.

Memory - RAM, ROM, EPROM, PROM and other types of memory, Storage fundamentals - Primary Vs Secondary Data Storage, Various Storage Devices - Magnetic Tape, Magnetic Disks, Cartridge Tape, Hard Disk Drives, Floppy Disks (Winchester Disk), Optical Disks, Zip Drive, flash drives , Blue Ray Disc,

**UNIT III:Software Concepts** 9 Hrs

Software Concepts: Introduction, types of software - System & Application software; Definition of Operating System, Types of Operating System, features of Unix, Basic Architecture of Unix/Linux system, features of Kernel and Shell. Introduction to Unix File system – History of Microsoft Windows operating system, File system in Windows, introduction to MAC operating system and file system.

**UNIT IV: Computer assembling** 9 Hrs

Computer assembling – Operating System Installation, install/upgrading new hardware, device driver configuration. Installing and configure various type of Application software. Data Backup – automatic , Manual – Data / File recovery. Configuring various type of system services. Software upgrade and Maintenance.

**UNIT V: Case study** 9 Hrs

Case study on troubleshooting in Hardware, Software (System and Application) and Networking.

**Total Hours: 45**

**TEXT BOOK**
1. Computer Fundamentals – B. Ram – New Age International Publishers
2. PC Hardware: A Beginner's Guide - RON GILSTER- McGraw-Hill

**REFERENCE BOOKS**
1. Computer Fundamentals – P. K. Sinha – BPB Publication
2. PC Software – Shree Sai Prakashan, Meerut

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18OE5/<br>BCS20OE5 | Subject Name :<br>**DATA BASE CONCEPTS** | | | | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | Prerequisite:  **Data Structures.** | | | | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn the Basics of DBMS concepts.
- To Understand the DDL, DML and SQL Procedures.
- To ability to work with the Database software.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Able to learn the basic concepts of DBMS |
| CO2 | Understand the concepts of DBMS |
| CO3 | Understand the DDL, DML and SQL procedures |
| CO4 | The students will have knowledge how the backend database is been maintained. |
| CO5 | Able to create and maintain the database software |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 3 | 3 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 2 | 1 | 3 | 2 | 2 | 2 | 3 | 1 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 |
| CO4 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 3 | 2 | 2 |
| CO2 | 2 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 2 | 3 | 3 | 2 |
| CO5 | 1 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OE5/ BCS20OE5 | **DATA BASE CONCEPTS** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: Fundamentals of Database**                                                       **9 Hrs**
DBMS Definition, Characteristics of DBMS ,Application and advantages of DBMS, Instances, Schemas and Database States, Three Levels of Architecture, Data Independence, DBMS languages, Data Dictionary, Database Users, Data Administrators.

**UNIT II: ER Model**                                                                                 **9 Hrs**
Data Models, types and their comparison, Entity Relationship Model, Entity Types, Entity Sets, Attributes and its types, Keys, E-R Diagram, Data Integrity RDBMS –Concept, Components and Codd's rules.

**UNIT III: Relational Model**                                                                   **9 Hrs**
 Relational Algebra (selection, projection, union, intersection, Cartesian product, Different types of join like theta join, equi-join, natural join, outer join) Functional Dependencies, Good & Bad Decomposition, Anomalies as a database: A consequences of bad design, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF 5NF.

**UNIT IV: SQL**                                                                                        **9 Hrs**
Introduction to SQL, DDL, DML, and DCL statements, Creating Tables, Adding Constraints, Altering Tables, Update, Insert, Delete & various Form of SELECT- Simple, Using Special Operators for Data Access. Aggregate functions, Joining Multiple Tables (Equi Joins), Joining a Table to itself (self Joins) Functions

**UNIT V: PL / SQL**                                                                                **9 Hrs**
Introduction to PL/SQL (blocks of PL/SQL, Variables, constants), Control Structure Introduction to Stored Procedures, Functions, Cursor and Triggers.

                                                                           **Total Hours: 45**

**Text Book:**
1. H. F. Korth & A. Silverschatz, Database Concepts, Tata McGraw Hill, New Delhi

**References:**
1. C. J. Date, Database Systems, Prentice Hall of India, New Delhi.
2. Ivan Bayross, SQL,PL/SQL, The programming language of Oracle.

| Subject Code: BCS18OE6/ BCS20OE6 | Subject Name : INTRODUCTION TO MACHINE LEARNING | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: **Data warehousing, Data mining.** | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Introduce the concept of learning patterns from data and develop a strong theoretical foundation for understanding state of the art Machine Learning algorithms.
- This course is broad in scope and gives the student a holistic understanding of the subject

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Recite the basic concepts of Data mining and Data warehousing |
|---|---|
| CO2 | Understand the basic theory underlying machine learning. |
| CO3 | Explain different machine learning algorithms along with their strengths and weaknesses. |
| CO4 | Apply machine learning algorithms to solve problems of moderate complexity. |
| CO5 | Formulate machine learning problems corresponding to different applications. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 2 | 3 | 2 | 1 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 3 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 2 |
| CO2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OE6/ BCS20OE6 | **INTRODUCTION TO MACHINE LEARNING** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITt I: Introduction**          **9 Hrs**

Introduction -Idea of Machines learning –Issues in machine learning-Concept Learning task-search-version spaces-candidate elimination algorithm.

**UNIT II: Classification Learning**          **9 Hrs**

Decision tree Learning-Hypothesis space search-Inductive bias-Issues-Artificial Neural Networks-representaion-learning-Back propagation algorithm-Face recognition-advanced topics-Evaluating Hypotheses.

**UNIT III: Statistical Learning**          **9 Hrs**

Bayesian Learning-Bayes Theorem-Bayesian belief networks-EM algorithm-Computational learning theory-Finite and Infinite hypothesis spaces.

**UNITIV: Clustering**          **9 Hrs**

Instance Based learning-K-Nearest neighbor learning-Genetic algorithms-Learning set of rules-FOIL-Inverted resolution.

**UNIT V: Analytical Learning**          **9 Hrs**

Analytical Learning-PROLOG-Combinative learning-KBANN-EBNN-FOCL-Reinforcement Learning-Qlearning.

        **Total Hours: 45**

**Text Books:**

1. Machine Learning, Tom M. Mitchell McGraw-Hill Science/Engineering/Math.

**Reference Books:**

1. Building Machine Learning Systems with Python, Richert &Coelho ,2013.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**Open Lab**

| Subject Code: | Subject Name : **VISUAL PROGRAMMING LAB** | T / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL1/ BCS20OL1 | Prerequisite: **C,C++.** | Lb | 0 | 0/0 | 0/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- The objective is to review the basics of Visual programming.
- Students will also understand the concepts of Visual Basic programming.
- Getting more knowledge about windows programming.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Describe the concept of Visual Programming. |
| CO2 | Demonstrate  the proficiency in program design |
| CO3 | Apply and synthesize knowledge of user interface design |
| CO4 | Analyze the fundamental concepts of computer programming |
| CO5 | Create  User interface design |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 |
| CO2 | 3 | 3 | 1 | 3 | 2 | 1 | 1 | 2 | 1 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 1 | 1 |
| CO4 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 |
| CO5 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 2 | 2 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 |
| CO2 | 3 | 1 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 2 |
| CO4 | 3 | 2 | 1 | 1 |
| CO5 | 3 | 2 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL1/ BCS20OL1 | **VISUAL PROGRAMMING LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

### LIST OF EXPERIMENTS
1. VISUAL BASIC
    1. Adding menus to forms
    2. Creating dialog boxes with various options
    3. MDI applications
    4. Writing code for various keyboard and mouse events
    5. OLE container control
    6. Data access through Data control and DAO.
    7. Active X control
    8. Active X Document
    9. Active X DLL 2.

2. VISUAL C++
    1. Creating applications with App wizard
    2. Working with MFC
    3. Exception handling
    4. Loading - Editing and - Adding resources - Linking resources to applications
    5. Drawing bitmaps
    6. Threads
    7. OLE
    8. Graph Applications

LEARNING OUTCOMES: Upon completion of this course, the student will be able to:

a. Design, create, build, and debug Visual Basic applications.

b. Explore Visual Basic's Integrated Development Environment (IDE).

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18OL2/ BCS20OL2 | Subject Name : **WEB DESIGN LAB** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | **Lb** | **0** | **0/0** | **3/0** | **1** |

L : Lecture T : Tutorial S.Lr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- Overview Object Web Technologies
- Basic Concept of Web Technologies
- Advance Programming.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the concepts of HTML,XML,XHTML |
|---|---|
| CO2 | Remember the concepts of web technologies |
| CO3 | Understand the problem and apply the programming knowledge for determining solutions. |
| CO4 | Able to analyze the web programming |
| CO5 | Able to design the web programming |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 3 |
| CO2 | 3 | 3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 1 | 2 | 3 | 3 | 3 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 1 | 2 | 3 | 1 |
| CO5 | 3 | 3 | 3 | 1 | 2 | 1 | 1 | 2 | 1 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 1 |
| CO5 | 3 | 3 | 3 | 1 |

**3/2/1 indicates strength of correlation 3 – High, 2 – Medium, 1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ET L | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL2/ BCS20OL2 | **WEB DESIGN LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Practice Internet applications.

2. Explore Web browsers, search engines

3. Familiarise with web portals, e-commerce sites, blogs etc

4. Basic Html Tags

5. Hyper Links, Tables & Multimedia

6. Frames & iFrames

7. Inline, Internal and External Style sheets

8. Design a web page to display your full bio-data.

9. Simple Validating Form (a) HTML forms, (b) JavaScript

10. Registration Form with Multi-Validating

11. Design a web page to select the elective subject through online with registration form.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18OL3/<br>BCS20OL3 | Subject Name :<br>**PYTHON PROGRAMMING LAB** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Basic knowledge on computers, C. | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Read and write data from/to files in Python.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| **CO1** | Understand, write and test simple python program. |
| **CO2** | Execute Python programs with conditionals and circles. |
| **CO3** | Use capacities for organizing Python programs. |
| **CO4** | Students can Create own python program. |
| **CO5** | Classify the basic data type and structure in python program |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO2 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO3 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO4 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 2 |
| CO5 | 3 | 2 | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 1 | 1 |
| CO3 | 3 | 2 | 2 | 1 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 1 | 1 | 1 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL3/ BCS20OL3 | **PYTHON PROGRAMMING LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Write a python program to perform all arithmetic operation.

2. Write a python program to change the last character in a word.

3. Write a python program to check for palindrome.

4. Write a python program to check for prime number.

5. Write a python program to find the length of the word and display either the length is odd or even.

6. Write a python program to perform Fibonacci series for n numbers.

7. Write a python program to display the words using Dictionaries.

8. Write a python program to to change the alternative characters of a word.

9. Write a python program to find the ASCII value for your name.

10. Write a python program to to perform stack operation using array.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCS18OL4/ BCS20OL4 | Subject Name : **COMPUTER NETWORK LAB** | | | T / L/ ETL | L | T / S.Lr | P/ R | | C |
|---|---|---|---|---|---|---|---|---|---|
| | Prerequisite: C++, java. | | | Lb | 0 | 0/0 | 3/0 | | 1 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To understand the working difference between straight cable and cross over cable.
- To use the packet tracer to simulate various networks.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Remember the color codes of networking cable and crimping the cable. |
|---|---|
| CO2 | Understand and analyze the concept of network devices. |
| CO3 | Students will analyze how firewall works. |
| CO4 | Remember the preexisting topology concept and analyze how topology works. |
| CO5 | Understand the standard address code of network devices. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | 3 | 1 | 3 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 1 | 2 | 2 | 3 | 3 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 1 | 3 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 2 | 3 | 1 | 3 | 1 | 3 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 2 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 |
| CO5 | 3 | 2 | 3 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL4/ BCS20OL4 | **COMPUTER NETWORK LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Study of different types of Network cables and Practically

implement the cross-wired cable

2. Study of Network Devices in Detail.

      2a. Study of Network Devices in layer1( HUB, REPEATER)

      2b.Study of Network Devices in layer2(Swith)

      2c.Study of Network Devices in layer3( Router)

3. Study of FIREWALL

4. Connect the computers in Local Area Network.

5. Study of Network IP.

      5a. IPV4

      5b. IPV6

6. Study of Network Topologies

      6a. Bus Topology

      6b. Ring Toplogy

      6c. Star Topology

7. Study of MAC address and port numbers.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BCS18OL5/<br>BCS20OL5 | Subject Name :<br>**PHP / MySQL PROGRAMMING LAB** | | Ty/<br>Lb/<br>ETL | L | T/<br>S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Basic of computers, DBMS, HTML, XML. | | **Lb** | **0** | **0/0** | **3/0** | **1** |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- To Become a Web Site developer / Programmer
- To Enable the Students to become expert in MySQL.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Know to Install and configure a PHP and MySQL package ( ). |
|---|---|
| **CO2** | Write code for Database concepts (Database concepts: Fields, records, relational database, types of relationships, normalization ). |
| **CO3** | Apply Knowledge in advanced SQL topics like embedded SQL, procedures connectivity through JDBC. |
| **CO4** | Create indexes for databases for efficient retrieval. |
| **CO5** | Create GUI Programming and Databases operations in SQL . |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 2 | 3 | 2 | 1 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 2 |
| **CO2** | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 1 | 3 | 3 | 2 | 2 |
| **CO3** | 2 | 2 | 3 | 2 | 3 | 3 | 1 | 1 | 3 | 2 | 2 | 3 |
| **CO4** | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 1 | 3 | 2 | 3 | 2 |
| **CO5** | 3 | 3 | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 1 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| **CO1** | 2 | 3 | 3 | 3 |
| **CO2** | 3 | 3 | 3 | 3 |
| **CO3** | 2 | 3 | 3 | 2 |
| **CO4** | 2 | 3 | 3 | 2 |
| **CO5** | 2 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCS18OL5/ BCS20OL5 | **PHP / MySQL PROGRAMMING LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Use of select statements for queries

2. Nested queries using SQL

3. Built in functions in SQL

4. Update operations using SQL.

5. Use of index, creating views and querying in views

6. Create a php program to find odd or even number from given number

7. Write a php program to find maximum of three numbers.

8. Write a PHP program to swap two numbers.

9. Write a PHP Program to demonstrate the variable function: Gettype():

10. Write a PHP program to drop table using MySQL.

11. Create a student Registration in PHP and Save and Display the student Records

12. Write a program to Develop student registration form and display all the submitted data on another page.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## OPEN ELECTIVES -CIVIL

| Subject Code: BCE18OE1/B CE20OE1 | Subject Name : WATER POLLUTION AND ITS MANAGEMENT | | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

| L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits |
|---|
| T/L/ETL : Theory/Lab/Embedded Theory and Lab |

| **OBJECTIVE :** |
|---|
| • Tolearnthefundamentalconceptsinthefieldofwaterpollutionanditsmanagement |

| **COURSE OUTCOMES (COs) : ( 3- 5)** At the end of the course, Students will be able to | |
|---|---|
| CO1 | To study the various Effects of Water pollution |
| CO2 | To learn the importance of methods of control of Water Pollution |
| CO3 | To understand the various Water Pollution control Act |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | - | 2 | 3 | 3 | - | - | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | - | 2 | 3 | 3 | - | - | 2 | 1 |
| CO3 | 3 | 3 | 3 | 3 | - | 2 | 3 | 3 | - | - | 2 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | |
| CO2 | 3 | 3 | 3 | 3 | | |
| C03 | 3 | 3 | 3 | 3 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code | Subject Name | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCE18OE1/BCE20OE1 | WATER POLLUTION AND ITS MANAGEMENT | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I SOURCES&CHARACTERISTICSOFWATERPOLLUTION**　　　　　　　**9 Hrs**

Waterpollution-Sources&typesofwaterpollution–Physical,chemical&biological–Effectofwater pollution.DrinkingwaterqualitystandardswasteWatertreatment–Primary,secondary,tertiary-water pollution prevention & control act –1974.

**UNIT II WATER QUALITY&STANDARDS**　　　　　　　**9 Hrs**

Quality of surface waters, Water quality in flowing waters, Water quality in impounded waters, Groundwater quality, Water quality standard Microbiological quality of drinking water, and Chemical quality of drinking water

**UNIT III INDUSTRIALACTIVITY&MITIGATIONMEASURES**　　　　　　　**9 Hrs**

Role of water in different industries-Effluent discharge characteristics-Discharge Standards for Rivers and Streams-Role of stakeholders, Public NGOS, Government in Protection of Water bodies-Control Measures-Mitigation Measures for Industrial Water Contamination due to industries.

**UNIT IV WATERPOLLUTIONREGULATIONS**　　　　　　　**9 Hrs**

Administrative regulation under recent legislations in water pollution control.Water (Prevention & control of pollution) Act 1974 as amended by Amendment Act 1988. Water (Prevention &control of pollution) Rules 1975 Water (Prevention & control of pollution) Cess Act. 1977 as amended by Amendment Act1991.

**UNIT V ROLE OFREGULATORYBOARDS**　　　　　　　**9 Hrs**

SustainableDevelopment,RainWaterHarvesting-Methods-WaterPollution-CausesandEffects-   RoleofRegulatorybodiesandLocalbodies-CPCB-TWADBoard–CMWSSBetc-CaseStudies related to Effective WaterManagement

**Total  Hours: 45**

**TEXT BOOKS**

1.Fair.G.M,"WaterandWastewaterengineeringVol.I&II".JohnWileyandsons,Newyork. 2010.

**REFERENCES**

1.  Metcalf & Eddy, "Wastewater engineering, Treatment and Reuse", Tata MacGrawhill publications,2008.
2. Eckenfelder,W.W.,""IndustrialWaterPollutionControl",McGraw-Hill,2009.
3. Arceivala.S.J,"WastewaterTreatmentforPollutionControl",TataMcGraw-Hill,2008.
4.  "Aruna Venkat Environmental Law and Policy", PHI learning private limited New Delhi, 2011.
5. WaterManagementInIndia,"ConceptPublishingCompany",NewDelhi,2004.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE2/BCE20OE2 | Subject Name ENVIRONMENT,HEALTHANDSAFETY ININDUSTRIES | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**
- Tounderstandthebasicneedsofsafetyin humanhealth,environmentalsafety,electricalsafety,safetyagainst accidents and fire
safety in various industries

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Students learn the occupational safety and hygiene |
|---|---|
| CO2 | They understand the workplace safety and their responsibility. |
| CO3 | Student possesses an awareness on environment, health and safety in industries |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 3 |
| CO2 | 3 | 2 | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 3 |
| CO3 | 3 | 2 | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCE18OE2/BCE20OE2 | ENVIRONMENT,HEALTHANDSAFETY ININDUSTRIES | Ty | 3 | 0/0 | 0/0 | 3 |

## UNITI   INTRODUCTION                                         9Hrs

Need for developing Environment, Health and Safety systems in work places, Status and relationship of Acts, Regulations and Codes of Practice, Role of trade union  safety representatives .International initiatives, Ergonomics and workplace.

## UNITII   OCCUPATIONALHEALTHANDHYGIENE                         9 Hrs

Definition of the term occupational health and hygiene, Categories of health hazards, Exposure pathways and human responses to hazardous and toxic substances, Advantages and limitations of environmental monitoring and occupational exposure limits, Hierarchy of control measures for occupational health risks, Role of personal protective equipment and the selection criteria.

## UNITIII   WORKPLACESAFETYANDSAFETYSYSTEMS                     9 Hrs

Features of the satisfactory design of work premises HVAC, ventilation. Safe installation and use of electrical supplies, Fire safety and first aid provision, Significance of human factors in the establishment and effectiveness of safe systems, Safe systems of work for manual handling operations, Control methods to eliminate or reduce the risks arising from the use of work equipment, Requirements for the safe use of display screen equipment, Procedures and precautionary measures necessary when handling hazardous substances, Contingency arrangements for events of serious and imminent danger.

## UNITIV  TECHNIQUESOF ENVIRONMENTALSAFETY                     9Hrs

Functions and techniques of risk assessment, inspections and audits, Investigation of accidents- Principles of quality management systems in health and safety management.

## UNITV  EDUCATIONANDTRAINING                                  9 Hrs

Factors to be considered in the development of effective training programmes, Principles and methods of effective training, Feedback and evaluation mechanism.
                                                                  **Total Hours: 45**

### REFERENCE

1. EnvironmentalandHealthandSafetyManagementbyNicholasP.CheremisinoffandMadelyn L. Graffia, William Andrew Inc. NY, 1995

2. The Facility Manager's Guide to Environmental Health and Safety by Brian Gallant, Government Inst Publ. Effective Environmental, Health, and Safety Management Using the TeamApproachbyBillTaylor,CulinaryandHospitalityIndustryPublicationsServices2005

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE3/BCE20OE3 | Subject Name **GREEN BUILDING AND VASTU CONCEPTS** | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**
- Toexposethenecessityofgreenbuildingandacquireknowledgeonvastu-shastra

**COURSE OUTCOMES (COs) : ( 3- 5)** On completion of the course the students would have

| CO1 | Students should be able to describe the importance and necessity of green building. |
|---|---|
| CO2 | Students should be able to assess a building on the norms available for green building. |
| CO3 | Students should be able to suggest materials and technologies to improve energy efficiency of building. |
| CO4 | Students should be able to design and assess building with norms of vastu-shastra |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 2 |
| CO2 | 3 | - | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 2 |
| CO3 | 3 | - | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 2 |
| CO4 | 3 | - | - | - | 3 | 3 | 3 | 3 | - | - | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |
| CO4 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BCE18OE3/BCE20OE3 | **GREEN BUILDING AND VASTU CONCEPTS** | Ty | 3 | 0/0 | 0/0 | 3 |

### UNITI INTRODUCTION OF GREEN BUILDING                    9Hrs

Concept of green building, History of green building, Need of green building in present scenario, Importance of green building Merits and demerits, Classification of green building, Assessment methods Global assessment and certification, Local assessment, LEED India GRIHA (Green Rating for Integrated Habitat Assessment)

### UNITII PRINCIPLES AND ELEMENTS OF DESIGN OF GREEN BUILDING    9Hrs

Sustainability: concept and reality 2. Climate responsive process of design: Climatic zones, design sequence, shelter or form, land form, vegetation, water bodies, street widths, open spaces, ground character, plan form, orientation, roof form 3. Shading devices and their effect

### UNITIII THERMAL COMFORT INSIDE THE BUILDING                9Hrs

Factors affecting, indices, cooling and heating requirement, Heat transmission through building sections, thermal performance of building sections, simple calculation for U value and insulation thickness .Day lighting. Ventilation

### UNITIV WATER CONSERVATION AND BUREAU OF ENERGY EFFICIENCY 9Hrs

3 R's for water conservation, rain water harvesting, low flow fixtures, grey water recycling Material conservation: concept of embodied energy, low energy materials, sustainable materials, alternative materials Concept of carbon emission and its reduction Functions, policies, guidelines, Energy Conservation Building Code, Study of existing green buildingsIntroduction to Energy efficiency softwares, carbon calculators

### UNIT V VASTU CONCEPT                                    9Hrs

History, scientific approach, importance of shapes size and direction, vastu of a plot, elements of vastu for selecting a plot, vastu of a residence, vastu of existing building

                                                    **Total Hours: 45**

### TEXT BOOKS

1. Climate responsive architecture (A design hand book for energy efficient buildings), Arvind Krishnana,SimosYannas,NickBaker,SVSzokolay,McGrawhillEducation,Seventhreprint, 2013
2. Renewable Energy and Environment -A Policy Analysis for India, H, Ravindranath, K Usha Rao, B Nataraja n, P Monga, Tata McGraw Hill,2000
3. EnergyandtheEnvironment,JMFowler,McGrawHill,NewYork,2ndEdition,1984

### REFERENCE

1. Handbookonfunctionalrequirementsofbuildings(SP41),BIS,NewDelhi,1987
2. EnergyConservationbuildingcode(ECBC),Bureauofenergyefficiency,2011

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE4/BCE20OE4 | Subject Name CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT | | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: None | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial      SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory andLab

## OBJECTIVE

- TounderstandtheEarth'sClimateSystemandtheconceptofGlobalWarming,theimpactofclimate change on society and its mitigationmeasures.

## COURSE OUTCOMES (COs) : ( 3- 5)
**At the end of the course the student will be able to**

| CO1 | Understand the global climate change and its effects |
|---|---|
| CO2 | Learn about climate change adaptation and various mitigation measures |
| CO3 | Understand the concept of clean energy and energy conservation |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | | 3 | 3 | 3 | 3 | | | 3 | 3 |
| CO2 | 3 | 2 | | | 3 | 3 | 3 | 3 | | | 3 | 3 |
| CO3 | 3 | 2 | | | 3 | 3 | 3 | 3 | | | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE4/ BCE20OE4 | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI EARTH'SCLIMATESYSTEM** 9Hrs

Introduction-Climate in the spotlight -– Climate Classification - Global Wind Systems -Cloud Formation and Monsoon Rains – Storms and Hurricanes – The Hydrological Cycle – Global Ocean Circulation – Solar Radiation –The Earth's Natural Green House Effect – Green House Gases and Global Warming – CarbonCycle.

**UNITII OBSERVEDCHANGESANDITSCAUSES** 9 Hrs

Observation of Climate Change – Changes in patterns of temperature, precipitation and sea level rise – Observed effects of Climate Changes – Patterns of Large Scale Variability – Drivers of ClimateChange–ClimateSensitivityandFeedbacks–TheMontrealProtocol–UNFCCC–IPCC.

**UNITIII IMPACTS OFCLIMATECHANGE** 9Hrs

Impacts of Climate Change on various sectors -Methods and Scenarios – Projected Impacts for Different Regions– Uncertainties in the Projected Impacts of Climate Change – Risk of Irreversible Changes.

**UNITIV CLIMATECHANGEADAPTATIONANDMITIGATIONMEASURES** 9Hrs

Adaptation Strategy/Options in various sectors -Key Mitigation Technologies and Practices –Carbonsequestration – Carbon capture and storage (CCS)- Waste (MSW & Bio waste, Biomedical, Industrial waste – International and Regionalcooperation.

**UNITV CLEAN TECHNOLOGYANDENERGY** 9Hrs

Clean Development Mechanism –Carbon Trading examples of future Clean Technology – Biodiesel– Natural Compost – Eco- Friendly Plastic – Alternate Energy – Hydrogen – Bio-fuels – Solar Energy – Wind – Hydroelectric Power.

**Total Hours: 45**

**REFERENCES**

1. AnilMarkandya,ClimateChangeandSustainableDevelopment:ProspectsforDeveloping Countries, Routledge,2002
2. Heal, G. M., Interpreting Sustainability, in Sustainability: Dynamics and Uncertainty, Kluwer Academic Publ.,1998
3. Jepma, C.J., and Munasinghe, M., Climate Change Policy – Facts, Issues and Analysis, Cambridge University Press,1998
4. Munasinghe, M., Sustainable Energy Development: Issues and Policy in Energy, EnvironmentandEconomy:AsianPerspective,KleindorforP.R.et.al(ed.),EdwardElgar,1996
5. DashSushilKumar,"ClimateChange–AnIndianPerspective",CambridgeUniversityPress India Pvt. Ltd,2007.

| Subject Code: BCE18OE5/BCE20OE5 | Subject Name<br>INTELLIGENT TRANSPORTATION SYSTEMS | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**

- ToexposetherecentadvancementsinTransportSystems

**COURSE OUTCOMES (COs) : ( 3- 5)** On completion of the course the students would have

| CO1 | Knowledge on the various principles and aspects of Intelligent Transport System. |
|---|---|
| CO2 | Knowledge on intersection management |
| CO3 | Knowledge on advanced transport system |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 1 | 3 | 1 | 3 | | 3 | | | 3 | 3 |
| CO2 | 3 | 3 | 1 | 3 | 1 | 3 | | 3 | | | 3 | 3 |
| CO3 | 3 | 3 | 1 | 3 | 1 | 3 | | 3 | | | 3 | 3 |

| COs / PSOs | PSO1 | | PSO2 | | PSO 3 | | PSO 4 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 3 | | 3 | | 3 | | | | | |
| CO2 | 3 | | 3 | | 3 | | 3 | | | | | |
| CO3 | 3 | | 3 | | 3 | | 3 | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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Maduravoyal , Chennai - 600 095

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE5/BCE20OE5 | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **INTELLIGENT TRANSPORTATION SYSTEMS** | Ty | 3 | 0/0 | 0/0 | 3 |

## UNITI      INTRODUCTIONTOINTELLIGENTTRANSPORTSYSTEM          8Hrs

Definition–RoleandResponsibilities–AdvancedTravellerInformationSystem–FleetOrientedITS Services– Electronic Toll Collection – Critical issues – Security - Safety 21

## UNITII    ITS ARCHITECTUREANDHARDWARE                                9Hrs

Architecture–ITSArchitectureFramework–HardwareSensors–VehicleDetection–Techniques– DynamicMessage Sign – GPRS – GPS – Toll Collection

## UNITIII    INTERSECTIONMANAGEMENT                                      10Hrs

VideoDetection–VirtualLoop-Cameras-ANPR–IRLighting–IntegratedTrafficManagement– ControlCentre – Junction Management Strategies

## UNITIV    ADVANCEDTRANSPORTMANAGEMENTSYSTEM            10Hrs

ATMS–RouteGuidance–Issues-TravelInformation–PreTripandEnrouteMethods–Historical– Current– PredictiveGuidance–DataCollection–Analysis–DynamicTrafficAssignment(DTA)– Components–Algorithm

## UNITV    ADVANCEDTRAVELLERANDINFORMATIONSYSTEM          8Hrs

Basic ATIS Concepts – Smart Route System – Data Collection – Process – Dessemination to Travelers

–Evaluation of Information – Value of Information – Business Opportunities


**Total Hours: 45**

**REFERENCES**

1. IntelligentTransportSystems,IntelligentTransportationPrimer,Washington,US,2001
2. HenryF.Korth,andAbrahamSiberschatz,DataBaseSystemConcepts,McGrawHill,1992
3. E.Turban,"DecisionSupportandExportSystemsManagementSupportSystems",Maxwell Macmillan,1998
4. SitausuS.Mittra,"DecisionSupportSystems–ToolsandTechniques",JohnWiley,NewYork, 19865.CycleW.HalsappleandAndrewB.Winston,"DecisionSupportSystems–Theoryand Application", Springer Verlog, New York,1987

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE6/BCE20OE6 | Subject Name GEOGRAPHICAL INFORMATION SYSTEM AND MAPPING | | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**:
- Introducingstudentstotheuseofgeographicinformationsystemsintheurban/suburban/metropolitan environment

**COURSE OUTCOMES (COs) : ( 3- 5)** On completion of the course the students would have

| CO1 | To understand the GIS, background, development and components of GIS |
|---|---|
| CO2 | To study the data capturing for GIS techniques and data base management |
| CO3 | To study the analysis of various spatial and non-spatial data in GIS |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 3 | | 3 | | 3 | | 2 | | 3 | 2 |
| CO2 | 3 | | 3 | | 3 | | 3 | | 2 | | 3 | 2 |
| CO3 | 3 | | 3 | | 3 | | 3 | | 2 | | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE6/BCE20OE6 | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **GEOGRAPHICAL INFORMATION SYSTEM AND MAPPING** | Ty | 3 | 0/0 | 0/0 | 3 |

## UNITI    INTRODUCTIONTOGIS                                     9Hrs
Definition of GIS, Historical background Concepts and Basic Requirements. GIS Softwares Elements of GIS Cartography – definition and importance Map definition - Types Map Analysis Coordinate system Different Coordinatesystem

## UNITII   DATABASEMANGEMENT                                    9Hrs
Introduction – Types of data Spatial data – Nonspatial data. Data input - Methods Data Output - Methods Software Modules Vector data – Structure - Topology Raster data - Structure Raster data – Structure – Merits and Demerits

## UNITIII  DATAANALYSIS                                          9Hrs
Spatial data analysis Non Spatial Data analysis Manipulation – Spatial interpolation Data retrieval – Reclassification Techniques. Buffer analysis Vector and Topological Overlay analysis Raster overlay analysis Measurement - Query Record Modeling and Expert System

## UNITIV   DIGITALELEVATIONMODEL                                9Hrs
Introduction – Data Capture Generation of DEM - Parameters Modeling Surface Applications of DEM Cost and Path analysis Digital Terrain Visualization TIN Generation DTM and DEM advantages DTM and DEM advantages

## UNITV    APPLICATIONOFGIS                                      9Hrs
Use of GIS in Resource Mapping Use of GIS in Ground Water and Runoff Modeling Use of GIS in Flood monitoring and Wetland Management. Use of GIS in  Forest Management. Land use and  Land cover analysis Use of GIS in Geology Use of GIS in Regional and Urban Planning  Use of  GIS in Agriculture andsoil Integrated with remote sensing

                                    **Total  Hours: 45**

**TEXT BOOKS**

1. AnjiReddy.M,"RemotesensingandGeographicalinformationsystem",B.SPublications, 2011.

**REFERENCES**
1. Chestern, "Geo Informational Systems - Application of GIS and Related Spatial InformationTechnologies
2. », ASTER Publication Co.,1992.
3. Jeffrey Star and John Estes, "Geographical Information System - An Introduction", Prentice Hall,1990.
4. Burrough .P.A,  "Principles of   GIS for Land    Resources Assessment", Oxford Publication,1980
5. SatheeshGopi, "Global Positioning System - Principles and Applications," Tata McGrawHillPublishing
6. Company Limited, New Delhi (India),2005

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE7/B CE20OE7 | Subject Name **INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION** | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**

- GeteducatedoncompletemanagementprinciplesrelatedtotheCleanerProductionandControlindustrial Pollution

**COURSE OUTCOMES (COs) : ( 3- 5)** On completion of the course the students would have

| CO1 | Know the Basics of sustainable development and about prevention against pollution |
|---|---|
| CO2 | Know the concept of pollution prevention and cleaner production |
| CO3 | Get educated on Life cycle assessment concept. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 3 | 3 | 3 | 3 | 3 | 2 | - | - | 2 |
| CO2 | 3 | - | - | 3 | 3 | 3 | 3 | 3 | 2 | - | - | 2 |
| CO3 | 3 | - | - | 3 | 3 | 3 | 3 | 3 | 2 | - | - | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE7/B CE20OE7 | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION** | TY | 3 | 0/0 | 0/0 | 3 |

### UNIT I        SUSTAINABLE DEVELOPMENT                                    9 Hrs

Sustainable Development-Indicators of Sustainability-Sustainability Strategies-Barriers to Sustainability-Industrial activity and Environment. Industrialization and sustainable development Industrial Ecology-Cleaner Production (CP) in Achieving Sustainability-Prevention versusControl of Industrial Pollution Environmental Policies and Legislations Regulations to Encourage Pollution Prevention and Cleaner Production-Regulatory versus Market BasedApproaches

### UNITII        POLLUTIONPREVENTION                                        9 Hrs

Definition-Importance-Historical evolution Benefits-Promotion-Barriers-Role of Industry, Government and Institutions - Environmental Management Hierarchy Source Reduction Techniques- Process and equipment optimization, reuse, recovery, recycle Raw material substitution-Internet Information and Other CP Resources.

### UNITIII        CONCEPT OFCLEANERPRODUCTION                        9 Hrs

Overview of CP Assessment Steps and skills, Preparing for the site visit, Information Gathering, and process flow diagram, material balance , CP Option Generation Technical and Environmental feasibility analysis-Economic valuation of alternatives-total cost analysis Financing- Establishing a program-Organizing a program-preparing a program plan- Measuring progress Pollution prevention and cleaner production Awarenessplan – Waste audit-Environmental Statement

### UNITIV        LIFECYCLEASSESSMENT                                    9 Hrs

Elements of LCA-Life Cycle Costing Eco Labeling –Design for the Environment International Environmental Standards-ISO 14001- Environmental audit.

### UNITV        CASESTUDIES                                            9 Hrs

Industrial application of CP, LCA, EMS Environmental Audits.

**Total Hours: 45**

**TEXT BOOKS**

1. PaulLBishop,"PollutionPreventionFundamentalandPractice",McGraw-Hill International,2009.
2. Prasad modak, C.Visvanathan and Mandarparasnis"Cleaner Production Audit", Environmental SystemReviews,No.38,AsianInstituteofTechnology,Bangkok,2005.
3. S.P.Mahajan,"PollutionControlInProcessIndustries",McGraw-HillInternational,2005.

**REFERENCES**

1. World Bank Group, "Pollution Prevention and Abatement Handbook-Towards Cleaner Production",WorldBankandUNEP,WashingtonD.C,2005.
2. Arceivala,S.J.,"WastewaterTreatmentforPollutionControl",TataMcGraw-Hill,2008.

| Subject Code: BCE18OE8/BCE20OE8 | Subject Name AIR POLLUTION AND CONTROL | | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**
- To take up the basic concepts of airpollution.
- Thecontentsinvolvedtheknowledgeofcausesofair pollution
- Thecontentsinvolvedtheknowledgeofhealthrelatedtoair pollution

**COURSE OUTCOMES (COs) : ( 3- 5)** On completion of the course the students would have

| CO1 | Concepts of air pollution. |
|---|---|
| CO2 | How to estimate the quantity of air pollutant. |
| CO3 | Be able to develop control technologies. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | 3 | 3 | 3 | 3 | 2 | | 3 | 3 |
| CO2 | 3 | | | | 3 | 3 | 3 | 3 | 2 | | 3 | 3 |
| CO3 | 3 | | | | 3 | 3 | 3 | 3 | 2 | | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OE8/BCE20OE8 | Subject Name | TY / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **AIR POLLUTION AND CONTROL** | TY | 3 | 0/0 | 0/0 | 3 |

## UNITI     INTRODUCTION                                    9 Hrs

History of Air pollution and episodes, Sources of air pollution and types,Introduction to meteorology and transport of air pollution: Global winds, Headley cells, wind rose terrestrial wind profile, Effects of terrain and topography on winds, lapse rate, maximum mixing depths, plume rise

## UNITII     TRANSPORTOFPOLLUTIONINATMOSPHERE         9 Hrs

Plume behavior under different atmospheric conditions, Mathematical models of dispersion of air pollutants, Plume behavior in valley and terrains. Plume behavior under different meteorological conditions, Concept ofisoplates

## UNITIII    EFFECTS OFAIRPOLLUTION                       9 Hrs

Effects of Air Pollution on human beings, plants and animals and Properties. Global Effects- Green house effect, Ozone depletion, heat island, dust storms, Automobile pollution sources and control, Photochemical smog, Future engines and fuels

## UNITIV    AIRPOLLUTIONCONTROL                         9 Hrs

Air Pollution control- at source-equipments for control of air pollution-For particulate matter-Settling chambers-Fabric filters-Scrubbers-Cyclones-Electrostatic precipitators, For Gaseous pollutants-control by absorption-adsorption-scrubbers-secondary combustion after burners, Working principles advantages and disadvantages, design criteria and examples.

## UNITV     AIRQUALITYSAMPLINGANDMONITORING         9 Hrs

Stack sampling, instrumentation and methods of analysis of SO2, CO etc, legislation for control of air pollution and automobile pollution

**Total Hours: 45**

### REFERENCE:

1. H.CParkins,AirPollutionMcGrawHillPublication
2. H.S.Peavy,D.R.Row&G.Tchobanoglous,EnvironmentalEngineering,McGraw Hill InternationalEdition
3. MartinCrawford,AirPollutionControlTheory,TMHPubl.

### WEB MATERIALS:

1. http://www.epa.gov
2. http://www.indiaenvironmentportal.org.in
3. http://nptel.iitm.ac.in
4. http://www.filtersource.com
5. https://dgserver.dgsnd.gov

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## OPEN LAB

| Subject Code: BCE18OL1/BCE 20OL1 | Subject Name : BUILDING DRAWING PRACTICE USING AUTOCADD | Ty/Lb /ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Basic Engineering Graphics | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Tointroducethestudentstodrafttheplan,elevationandsectionalviewsofbuildingsinaccordancewith developmentandcontrolrulessatisfyingorientationandfunctionalrequirementsasperNationalBuilding Code.

**COURSE OUTCOMES (COs) : ( 3- 5)** At the end of the course, the student will be able to:

| CO1 | know about the basic principles of Building Drawing |
|---|---|
| CO2 | know Basic commands of a popular drafting package |
| CO3 | Acquire knowledge on plan, elevation and section of buildings |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | 2 | | 2 | | | 2 | |
| CO2 | 3 | | | | | | | 2 | | | 2 | |
| CO3 | 3 | | | | | 2 | | 2 | | | 2 | |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Cate gory | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OL1/BCE20OL1 | Subject Name : | Ty/Lb /ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **BUILDING DRAWING PRACTICE USING AUTOCADD** | Lb | 0 | 0/0 | 3/0 | 1 |

### LIST OF EXPERIMENTS

1. Learn and use basic AutoCAD commands - manage drawing using layers, colour and line types- completebasiccaddrawings,withborders,textanddimensions-useandedittextand textstyles–Methodofscalesinvariousdrawing-understandandtheuseofblocks.

2. Developmentoflineplanforresidentialbuilding.oneforsinglestoriedbuilding

3. Developmentoflineplanforresidentialbuilding.onefortwostoriedbuilding

4. Submission drawing for residential building including its planning and with area and parkingstatementsandallotherdetailsasperthenormsandlocalbye-laws.

5. Industrial buildings with rooftruss.

6. Todrawthe3Dviewofresidentialbuilding.

**Total Hours:  30**

### TEXT BOOKS

1. CivilEngg.Drawing&Houseplanning– B.P.Verma,Khannapublishers,Delhi,1990

2. Buildingdrawing&detailing– Dr.Balagopal&T.S.Prabhu,Spadespublishers,Calicut,1989.

### REFERENCES

1. 1.Buildingdrawing–Shah,TataMcGraw-Hill,NewDelhi,2000.

2. 2.Building planning & drawing – Dr. N.Kumaraswamy, A.Kameswara Rao, Charotarpublishing house.Mumbai,1997.

3.Shah,KaleandPatki,Buildingdrawing,TataMcGraw-HillNewDelhi,,1998.

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OL2/BCE 20OL2 | Subject Name : GEOGRAPHICALINFORMATIONSYSTEMAND MAPPINGLAB | | Ty/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: None | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Theexercisesaredesignedtogivepracticalexposuretothestudentstodatainput,datastorage☐
- Data analyses and data output capabilities of a standard GISsoftware.

**COURSE OUTCOMES (COs) : ( 3- 5)** At the end of the course, the student will be able to:

| CO1 | know about the basic principles of Building topology |
|---|---|
| CO2 | know Basic commands of a onscreen digitilization |
| CO3 | Acquire knowledge on generations of DEM |
| CO4 | Be able to develop vector analysis and data output |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | | | 2 | 2 | | | | | |
| CO2 | 3 | | | | | 2 | 2 | | | | | |
| C03 | 3 | | | | | 2 | 2 | | | | | |
| C04 | 3 | | | | | 2 | 2 | | | | | |

| COs / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 3 | | 3 | | 3 | | | | | |
| CO2 | 3 | | 3 | | 3 | | 3 | | | | | |
| C03 | 3 | | 3 | | 3 | | 3 | | | | | |
| C04 | 3 | | 3 | | 3 | | 3 | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OL2/BCE20OL2 | Subject Name : | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | GEOGRAPHICALINFORMATIONSYSTEMAND MAPPINGLAB | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Digitization - Point, Line, Polygon and SurfaceData

2. Buildingtopology–measuringdistanceandarea

3. Addingattributedata–queryingonattributedata

4. Onscreen digitization - Data Conversion – Vector to Raster, Rasterto Vector

5. Generation of DEM: from contours, spotheights

6. Vector Analysis – Buffering, Overlay and Networkanalysis

7. Data Output: Bar charts, Mapcompilation

**Total Hours: 30**

REFERENCES

1. QGIS-1.8-UserGuide,http://docs.qgis.org/pdf/QGIS-1.8-UserGuide-en.pdf,2013

2. Getting to Know ArcGIS for Desktop,ISBN: 97815894830882013

3. Understanding GIS: An ArcGIS Project Workbook, ISBN: 97815894824252011

| Subject Code: BCE18OL3/BCE20OL3 | Subject Name : ENVIRONMENTAL ENGINEERING LABORATORY | | Ty/Lb /ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: None | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL :

Theory/Lab/Embedded Theory and Lab

**OBJECTIVE** :
- Toimpartknowledgeonpreparationofreagents,testingvariouswaterandwastewaterqualityparameters.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Togethand-onexperienceintheoperationofequipmentslikepHmeter,TDSmeter,turbiditymeter, etc. |
|---|---|
| CO2 | To analyze water and wastewater volumetrically and using certain equipments |
| CO3 | The students completing the course will be able to characterize wastewater and conduct treatability studies. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | | 3 | | 3 | 3 | 2 | | 2 | |
| CO2 | 3 | 2 | 2 | | 3 | | 3 | 3 | 2 | | 2 | |
| CO3 | 3 | 2 | 2 | | 3 | | 3 | 3 | 2 | | 2 | |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCE18OL3/BCE200L3 | Subject Name : | Ty/Lb /ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **ENVIRONMENTAL ENGINEERING LABORATORY** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. a) Determination ofpH.
   b) Determination of Turbidity.
2. Determination ofHardness.
3. Determination of
4. Alkalinity.
   Determination of ResidualChlorine.
5. Estimation ofChlorides.
6. Estimation of AmmoniaNitrogen.
7. Estimation ofSulphate.
8. Determination of optimumcoagulant dose.
9. Determination of specificconductivity.
10. EstimationofavailablechlorineinBleachingPowder.
11. Determination of dissolvedOxygen.
12. Determinationofsuspendedsettleable,volatileandfixed solids
13. B.O.D.Test.
14. C.O.D.Test.

**REFERENCE BOOKS**
1. Trivedi and Goel – Chemical and biological methods for waterpollution studies. New Delhi,2000.
2. A course Manual – Water and wastewater analysis. National Environmental Engineering Research Institute. Nagpur – publication.

**Total  Hours: 30**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

### OPEN ELECTIVE CHEMICAL DEPARTMENT:

| Subject Code: BCT18OE1/BCT20OE1 | Subject Name : Fundamentals of Nanoscience | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nanomaterial | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE**:
- To enable the students to learn about basis of nanomaterial science, preparation method, types andapplication.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Will familiarize about the science of nanomaterials |
|---|---|
| CO2 | Will develop knowledge in characteristic nanomaterial |
| CO3 | Will demonstrate the preparation of nanomaterials |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | - | - | - | 2 | - | - | - | - | - |
| CO2 | 2 | 3 | 3 | - | - | - | - | - | - | 1 | - | 3 |
| CO3 | 3 | 3 | 3 | - | 1 | - | - | - | - | - | - | - |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | - |
| CO2 | 3 | 1 | 3 | - |
| CO3 | 3 | 1 | 3 | - |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE1/BCT20OE1 | Subject Name | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Fundamentals of Nanoscience | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI        INTRODUCTION                                    9Hrs**
Nanoscale Science and Technology- Implications for Physics, Chemistry,Biology and Engineering- Classifications of nanostructured materials- nanoparticles- quantum dots, nanowires-ultra-thinfilms- multilayered materials.Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

**UNITII        GENERAL METHODSOFPREPARATION                     9Hrs**
Bottom-up Synthesis-Top-down Approach: Co-Precipitation, Ultrasonication,Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition,MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

**UNITIII        NANOMATERIALS                                   9Hrs**
Nanoforms of Carbon - Buckminster fullerene- graphene and carbon nanotube,Single wall carbon Nanotubes (SWCNT) and Multi wall carbon nanotubes (MWCNT)- methods of synthesis(arc-growth, laser ablation, CVD routes,Plasma CVD), structure-property Relationships applications- Nanometal oxides-ZnO, TiO2,MgO, ZrO2, NiO, nanoalumina, CaO, AgTiO2, Ferrites, Nanoclays functionalization and applications-Quantum wires, Quantum dots- preparation,properties and applications.

**UNITIV        CHARACTERIZATIONTECHNIQUES                        9Hrs**
 xray diffraction technique, Scanning Electron Microscopy – environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA,SIMSNanoindentation.

**UNITV        APPLICATIONS                                     9Hrs**
NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, nanocrystal, Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging – Microelectro Mechanical Systems (MEMS), Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition,Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

**Total Hours: 45**

**TEXT BOOKS:**

1.A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties andApplications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.

2.N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd edition, Weinheim Cambridge, Wiley-VCH,2000

## REFERENCES:

1.G Timp (Editor), "Nanotechnology", AIP press/Springer,1999.
2.Akhlesh Lakhtakia (Editor),"The Hand Book of NanoTechnology,Nanometer Structure, Theory, Modeling and Simulations".Prentice-Hall of India (P) Ltd, New Delhi,2007.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE2/BCT20OE2 | Subject Name: Electrochemical Engineering | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Moral science and general English | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- To solve problems related to the production, storage, distribution and utilization of electrochemical energy and the associated environmentalissues

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | Student would be able to integrate professional, ethical, social and environmental factors in electrochemical engineering design and problem solving and understand the impact of these factors on global energy issues. |
| CO2 | The students completing the course will be able to characterize electrodeposition and water corrosion |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | - | - | 2 | - | - | - | - | - | 3 | - | - |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | | | | |
| CO2 | 2 | 1 | - | - | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE2/BCT20OE2 | Subject Name | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| | Electrochemical Engineering | Ty | 3 | 0/0 | 0/0 | 3 |

### UNITI                                                                                              9Hrs

Review basics of electrochemistry: Faraday's law -Nernst potential –Galvanic cells – Polarography, The electrical double layer: It's role in electrochemical processes –Electro capillary curve –Helmoltz layer –Guoy –Steven's layer –fields at the interface.

### UNITII                                                                                             9Hrs

Mass transfer in electrochemical systems: diffusion controlled electrochemical reaction –the importance of convention and the concept of limiting current. Over potential, primary-secondary current distribution –rotating discelectrode.

### UNITIII                                                                                            9Hrs

Introduction to corrosion, series, corrosion theories derivation of potentialcurrent relations of activities controlled and diffusion controlled corrosion process. Potential-pH diagram, Forms of corrosion- definition, factors and control methods of various forms of corrosion-corrosion control measures industrial boiler water corrosion control –protective coatings –Vapor phase inhibitors –cathodic protection, sacrificialanodes

–Paint removers.

### UNITIV                                                                                            9Hrs

Electro deposition –electro refining –electroforming –electro polishing –anodizing –Selective solar coatings, Primary and secondary batteries –types of batteries, Fuel cells.

### UNITV                                                                                             9Hrs

Electrodes used in different electrochemical industries: Metals-Graphite –Lead dioxide –Titanium substrate insoluble electrodes –Iron oxide –semi conducting type etc. Metal finishing-cell design.types of electrochemical reactors, batch cell, fluidized bed electrochemical reactor, filter press cell, Swiss roll cell, plug flow cell, design equation, figures of merits of different type of electrochemical reactors.

**TotalHours:45**

**TEXTBOOKS:**

Eckenfelder, W. W, Jr. "Industrial Water Pollution Control" McGraw-Hill: New York,1966.
*1.* P. L. Ballaney, "Thermal Engineering", Khanna Publisher New Delhi,1986.
*2.* Perry R. H. Green D. W. "Perry's chemical Engineer's Handbook", McGraw Hill, New York,2007.

**REFERENCES:**
1. P. N. Ananthanarayan, "Basic Refrigeration & Air conditioning", Tata McGraw Hill, New Delhi,2007

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE3/BCT20OE3 | Subject Name: Alternative Fuels And Energy Systems | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Moral science and general English | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- To know about the types of alternative fuels and energy sources for ICengines.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | On completion of the course, the student will understand the various alternative fuels available, its properties, performance characteristics, combustion characteristics, emission characteristics, engine modifications required etc., |
|---|---|
| CO2 | Students can able to understand hoe to use hydrogen,]vegetable oils as fuels |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | - | - | 2 | - | - | - | - | - | 3 | - | - |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | | | | | | | | |
| CO2 | 2 | 1 | - | - | | | | | | | | |

3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BCT18OE3/B<br><br>CT20OE3 | Subject Name:<br><br>Alternative Fuels And Energy Systems | Ty / Lb/ ETL<br><br>Ty | L<br><br>3 | T / SLr<br><br>0/0 | P/ R<br><br>0/0 | C<br><br>3 |
|---|---|---|---|---|---|---|

## UNIT I : ALCOHOLS AS FUELS                                            9Hrs

Introduction to alternative fuels. – Need for alternative fuels – Availability of different alternative fuels for SI and CI engines. Alcohols as fuels.Production methods of alcohols.Properties of alcohols as fuels.Methods of using alcohols in CI and SI engines. Blending, dual fuel operation, surface ignition and oxygenated additives. Performance emission and combustion characteristics in CI and SI engines.

## UNIT II : VEGETABLE OILSASFUELS                                       9Hrs

Various vegetable oils and their important properties. Different methods of using vegetable oils engines – Blending, preheating Transesterification and emulsification of Vegetable oils – Performance in engines – Performance, Emission and Combustion Characteristics in dieselengines.

## UNIT III : HYDROGEN ASENGINEFUEL                                      9Hrs

Production methods of hydrogen.Combustive properties of hydrogen. Problems associated with hydrogen as fuel and solutions. Different methods of using hydrogen in SI and CI engines.Performance, emission and combustion analysis in engines.Hydrogen storage – safety aspects of hydrogen.

## UNIT IV : BIOGAS, NATURAL GAS AND LPGASFUELS                          9Hrs

Production methods of Biogas, Natural gas and LPG.Properties studies. $CO_2$ and $H_2S$ scrubbing in Biogas., Modification required to use in SI and CI Engines- Performance and emission characteristics of Biogas, NG and LPG in SI and CI engines.

## UNIT V : ELECTRIC, HYBRID AND FUELCELLVEHICLES                        9Hrs

Layout of Electric vehicle and Hybrid vehicles – Advantages and drawbacks of electric and hybrid vehicles. System components, Electronic control system – Different configurations of Hybrid vehicles. Power split device. High energy and power density batteries – Basics of Fuel cell vehicles.

**TEXT BOOK:**                                               **Total Hours:45**

1. Ayhan Demirbas, 'Biodiesel A Realistic Fuel Alternative for Diesel Engines', Springer- Verlag London Limited 2008.

**REFERENCES:**
1. Gerhard Knothe, Jon Van Gerpen, Jargon Krahl, The Biodiesel Handbook, AOCS Press Champaign, Illinois2005.
2. Richard L Bechtold P.E., Alternative Fuels Guide book, Society of Automotive Engineers, 1997 ISBN 0-76- 80-0052-1.
3. Transactions of SAE on Biofuels (Alcohols, vegetable oils, CNG, LPG, Hydrogen, Biogasetc.).
4. Science direct Journals (Biomass & Bio energy, Fuels, Energy, Energy conversion Management, Hydrogen Energy, etc.) onbiofuels.
5. Devaradjane. Dr. G., Kumaresan. Dr. M., "Automobile Engineering", AMK Publishers,2013.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name: Petrochemical Unit Processes | | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|---|
| BCT18OE4/B CT20OE4 | Prerequisite: Moral science and general English | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- To design and conduct experiments and analyze and interpret data related to petrochemical Unitprocesses.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Students would be able to understand the principles of various unit processes in the petrochemical industry. |
|---|---|
| CO2 | Students will able to understand  the production of steam reforming of Natural gas |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | - | - | 2 | - | - | - | - | - | 3 | - | - |

| COs / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 2 | | - | | - | | | | | |
| CO2 | 2 | | 1 | | - | | - | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name: | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| BCT18OE4/BCT20OE4 | Petrochemical Unit Processes | Ty | 3 | 0/0 | 0/0 | 3 |

## UNIT I   FEED STOCK AND SOURCEOFPETROCHEMICALS                    9Hrs

Overview of Petrochemical Industry – The key growth area of India, Economics – Feed stock selections for Petrochemicals – Steam cracking of Gas and Naphtha to produce Olefins, Diolefins and Production of Acetylene – Cracker product separation and BTX separation.

## UNIT II   SYNTHESISGASPRODUCTION                    9Hrs

Steam reforming of Natural gas – Naphtha and Heavy distillate to produce Hydrogen and Synthesis gas – Production of Methanol – Oxo process.

## UNIT III   UNITPROCESSES I                    9Hrs

Fundamental and Technological principled involved in Alkylation – Oxidation – Nitration and Hydrolysis.

## UNIT IV UNITPROCESSESII                    9Hrs

Fundamental and Technological principled involved in Sulphonation, Sulfation and Isomerisation.

## UNIT V   UNITPROCESSESIII                    9Hrs
Fundamental and Technological principles involved in Halogenation and Esterification

                    **Total  Hours:45**

### TEXT BOOKS:

1. Bhaskara Rao, B.K., "A Text on Petrochemicals", Khanna Publishers,2000.
2. Sukumar Maiti, "Indroduction to Petrochemicals", 2nd Edition, Oxford and IBHPublishers,2002.

### REFERENCES:
1. Margaret Wells, "Handbook of Petrochemicals and Processes", 2nd Edition, Ash GatePublishing Limited,2002.
2. Sami Matar, and Lewis F. Hatch., "Chemistry of Petrochemical Processes", 2nd Edition,Gulf Publishing Company, 2000.
3. Dryden, C.E., "Outlines of Chemical Technology", 2nd Edition, Affiliated East-WestPress,1993

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject | Subject Name: Principles of Desalination Technologies | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| Code: BCT18OE5/ BCT20OE5 | Prerequisite: Moral science and general English | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:** Understand the techniques and technologies of desalination, Correlate the core curriculum to practical applications, Learn to select the right type of desalination system for a given location and purpose.

## COURSE OUTCOMES (COs) : ( 3- 5)

| CO1 | Understand the relevance and need for desalination |
|---|---|
| CO2 | Learn the science behind desalination |

## Mapping of Course Outcomes with Program Outcomes (POs)

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | 1 | - | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | - | - | 2 | - | - | - | - | - | 3 | - | - |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | - | - |
| CO2 | 2 | 1 | - | - |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name: | Ty / Lb/ ETL | L | T / SLr | P/ R | C |
|---|---|---|---|---|---|---|
| BCT18OE5/B CT20OE5 | Principles of Desalination Technologies | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI:INTRODUCTION** **9Hrs**

Water Scenario around the world and India – need and relevance of desalination - water sources for desalination – typical seawater composition – brackish water compositional changes- contaminants: anthropogenic and geogenic- drinking water standards – WHO and Indian Standards – Mineral Water standards (indian). Desalination –meaning and description – relation to natural components of desalination - general descriptionminimum energy requirement – review of fundamentals of physical chemistry aspects relevant to desalination, solution properties – estimating the minimum energy requirement - based concept of de-mixing – exergy - estimation from colligative properties – Performance assessment parameters for desalination for thermal and membrane. Different types of Desalination techniques basic resources required for desalination – energy options – relative characteristics of different types of energy options.

**UNIT II:MEMBRANEDESALINATION** **9Hrs**

General features of Pressure Driven Membrane Processes – classification –Micro-filtration(MF) Ultrafiltration (UF), Nano-Filtration (NF) – pore-size – performance relationship. Pretreatment System – Need and relevance – different unit operations including membrane pretreatment (UF) – scaling calculations – dosing systems – treated water quality monitoring – SDI concept. Reverse Osmosis – basic principle – characteristics of membranes used – Nano-filtration – basic principle – comparative features of NF and RO – concentration polarization - transport mechanism and equations (no derivation required)- energy recovery. Performance characteristics of Reverse Osmosis and Nano-filtration – solute rejection - recovery- water flux – relationship amongst them –effect of temperature – performance of lab experiments – interpretation of lab data.- application of RO and NF for desalination.

**UNIT III:THERMALDESALINATION** **9Hrs**

Basic Components of thermal Desalination – Heat Source – Sensible heat vs latent heat for use in desalination – features of isothermal and adiabatic processes. Thermodynamic properties – pressure vs temperature for steam, change of latent, Cp and BPE with temperature. – corrosion of materials and normal material of construction.Description of Flashing and Boiling: single effect evaporation and flashing – Need for multiple effects / stages – accessories for thermal desalination – ejectors – demisters - vacuum systems – pretreatment systems –Pumps. Principles of MSF/ MED : MED with TVC and MVC : Basic design considerations for thermal systems –operational features.

**UNIT IV:NON CONVENTIONAL DESALINATION SYSTEMS** **9Hrs**

Membrane based Systems :Electrodialysis, Membrane. Distillation, Forward Osmosis.- Basic Principles – performance characteristics – Energy requirements – Challenges. Low temperature thermal desalination including ocean thermal energy and waste heat – Solar desalination including solar stills, solar thermal and solar photovoltaic– limitations and advantages. Hybrid Desalination systems, combined power and water dual purpose plants – examples of working desalination plants.

**UNIT V: SOCIETAL, COMMERCIAL, ECONOMICS AND ENVIRONMENTAL ASPECTS** **9Hrs**

Selection of Desalination System – considerations based on capacity – local resources (including power, water etc.)– ultimate use– scale up – brackish water systems – considerations for societal cause / industrial water recycle. Economic Aspects of esalination – water cost calculation– capital cost/operating costs – feasibility analysis- Environmental issues – challenges – spent membrane, disposal- discharge concentrated stream – use of concentrate stream – recovery of values.

**REFERENCE BOOKS:** **Total Hours:45**

*1* Fundamentals of Salt Water Desalination: Hisham T. El-Dessouky and Hisham M. Ettouney, ISBN:978-0-444- 50810-2 Elsevier(2009)

*2* A Desalination Primer: Introductory Book for Students and Newcomers to Desalination :K.S.Spiegler and Y.M. El-Sayed, ISBN 086689 034 3, Desalineation Publications Elsevier(1994)

*3* Kirk &Othmer :Encyclopaedia of ChemicalTechnology

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE6/BCT20OE6 | Subject Name : Piping Design Engineering | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:

Credits T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- To secure position of the Chief Piping Engineer in a reputed engineering firm where the sound technical experience and prowess in installation of piping can help in executing projects at a faster pace throughreduced costs.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Supervising team of designers and engineers to execute piping work as well as checking various details related to piping materials and its thickness . |
|---|---|
| CO2 | Develop skill in Work analysis and material management that could help in efficient management of an enterprise. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | - | - | 2 | 1 | - | - | 3 | - | 2 | 3 | - | 2 |
| CO2 | 2 | - | - | 2 | - | - | 2 | - | - | 3 | 2 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | - |
| CO2 | 3 | 1 | 3 | - |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE6/BCT20OE6 | Subject Name : | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **Piping Design Engineering** | Ty | 3 | 0/0 | 0/0 | 3 |

## UNITI  INTRODUCTION TOPIPINGENGINEERING                                        9Hrs

Fluid flow, types of fluids and examples, different pipe fittings. Friction factor, pressure drop for flow Newtonian and non-Newtonian fluids, pipe sizing, economic velocity.Pipe line networks and their analysis for flow in branches, restriction orifice sizing.Pressure drop calculations for non-Newtonian fluids.two phase flow, types of two phase flow, two phase flow as encountered in piping for steam, distillation column, pressure drop, vibrations in two phase flow.

## UNITII  MATERIALSFORPIPING                                                     9Hrs

Selection of material for piping, desirable properties of piping materials, materials for various temperature and pressure conditions, materials for corrosion resistance. Common ASTM and IS specifications for: Seamless / ERW pipes, pipe fittings, flanges, and fasteners, materials for valves. Gaskets: Functions and properties, types of gaskets and their selection.

## UNIT III  CONTROL & SAFETYINPIPING                                             9Hrs

Types of valves, control valves, safety valves, constructional features, criteria for selection.Piping components, pressure relieving devices, constructional features, selection criteria and application, safety features. Calculations for line sizing, steam traps, P.R.V. & condensive systems.

## UNITIV  PIPINGSYSTEMDESIGN                                                     9Hrs

Design principles, calculation of pipe diameter, thickness, important system characteristics and design principles related to steam flow at high and low pressures. Design principles and line sizing for vacuum pipelines, slurry pipelines, surge drums and flare stacks, vacuum devices including ejector system. Considerations governing pump selection, analysis of system and pump characteristics in connection with series, parallel flow, and minimum flow and equalizing lines, NPSH, allowable nozzle loads in various codes. Design principles and line sizing of pneumatic conveying of solids, components of conveying systems, dust and fume extraction systemsprinciples.

## UNITV  INSULATION AND COSTINGOFPIPING                                          9Hrs

Purposes of thermal insulation, principles of conductive and convective heat transfer to the extent of application to heat loss / gain through bare pipe surfaces. Critical thickness of insulation, estimating thickness of insulation, optimum thickness of insulation.Insulation for hot and cold materials and their important properties, insulation material selection criteria, typical insulation specification – hot and cold materials. Introduction to P & I Diagrams, Process flow diagrams, standard symbols and notations. Introduction to various facilities required guidelines for Plot Plan / Plant Layout. Introduction to equipment layout, piping layout, piping isometrics and bill of material. Typical piping system layout considerations for following systems: (i) Distillation columns andheatexchangers,(ii)Reactors,(iii)Piperacks,(iv)Storagetanks,(v)Pumps

**Total Hours: 45**

## REFERENCE BOOKS:

1. Piping Design Handbook by John J. Mcketta, by Marcel Dekker, Inc, NewYork.
2. Process plant layout and piping design by Ed Bausbacher & Roger Hunt (PTK Prentice HallPublication)
3. Piping Handbook, Edited by Mohinder Nayyar, McGraw-HillEducation
4. Pipe Drafting and Design by Roy A Parisher & Robert A. Rhea. ASME Codes31

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE7/BCT20OE7 | Subject Name : E-Waste Management | | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**

- To secure position of the Chief Piping Engineer in a reputed engineering firm where the soundtechnical experience and prowess in installation of piping can help in executing projects at a faster pace through reduced costs.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Supervising team of designers and engineers to execute piping work as well as checking various details related to piping materials and its thickness . |
|---|---|
| CO2 | Develop skill in Work analysis and material management that could help in efficient management of an enterprise. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | - | 1 | - | - | 3 | - | - | 3 | - | 2 |
| CO2 | 2 | 3 | - | 2 | - | - | 2 | - | - | 3 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | - | | | |
| CO2 | 3 | 1 | 3 | - | | | |

3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Ski | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BCT18OE7/BCT20OE7 | Subject Name | T y/ Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | E-Waste Management | Ty | 3 | 0/0 | 0/0 | 3 |

## UNITI  INTRODUCTION                                                                    6Hrs
Composition – e-waste generation in global context – growth of electrical and electronic industry- Environmental concerns.- Effects on Environment and Human Health.

## UNITIITHEBASELCONVENTION                                                              12Hrs
Compliance and implementation- Scheme to control the movement of hazardous waste - Technical assistance offered by the Convention -Other important highlights of the Basel Convention - Waste Electrical and Electronic Equipment (WEEE)- Obligations of the producer under the WEEE.

## UNITIII MANAGEMENTE-WASTE                                                             9Hrs
Hazardous waste isolation- Guidelines for environmentally sound management- compliance and implementation – inventory management- reduction- process modification- volume reduction- recovery and reuse- Concerns/ Challenges for e-waste management

## UNITIV RECYCLINGE-WASTE                                                               12Hrs
 Global trade in hazardous waste - Rising illegal e-waste exports - Main factors in global waste trade economy Waste trading as a quintessential part of electronic recycling - Free trade agreements as a means of waste trading Import of hazardous e-waste - Porous ports and lack of checking facilities - Illegal waste imports seized in ports

## UNITV RECOMMENDEDOPTIONS                                                              6Hrs

Creating awareness-Training for the management and minimization of hazardous wastes –sustainable product design –role of government – Responsibility of Industries andpublic.

**Total  Hours: 45**

## REFERENCES:

1. K. Satyamurty, 'Managing e-waste without harming environment', The Hindu, 03 April,2006.
2. Marwaan Macan- Markar, 'Free Trade Cannot Include Toxic Waste', Toxic Trade News, Basel Action Network (BAN), February, 2007.

3. Freeman M. H. 1989. Standard Handbook of Hazardous Waste Treatment and Disposal, McGraw-Hill Company.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

## OPEN ELECTIVE- ELECTRICAL AND ELECTRONICS ENGINEERING

| Subject Code: BEE18OE1/ BEE20OE1 | Subject Name: ELECTRICAL SAFETY FOR ENGINEERS | T /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **Prerequisite:** | T | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- To attain knowledge on ElectricalSafety
- To know about the operation of Electrical SafetyEquipments
- To learn about the safetyprocedures
- To know about the electrical safetycodes
- To train the students on the Safetytraining.

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Attained knowledge on the basics of Electrical Safety |
|---|---|
| CO2 | Knowledge about the operation of the Safety equipments |
| CO3 | Knowledge on the safety procedures |
| CO4 | Familiarity on the electrical safety codes |
| CO5 | Ability to become consultant and to attend the Vendors. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 2 | 1 | 3 | 3 | 2 | 2 | 1 | 2 | 2 |
| CO2 | 3 | 3 | 1 | 2 | 2 | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| CO3 | 2 | 2 | 2 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 1 |
| CO4 | 3 | 1 | 3 | 2 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 2 |
| CO5 | 1 | 2 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | | | | |
| CO2 | 3 | 2 | 2 | 2 | | | | |
| CO3 | 2 | 3 | 3 | 1 | | | | |
| CO4 | 3 | 2 | 2 | 2 | | | | |
| CO5 | 2 | 1 | 2 | 2 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Approval | | | | | | |
|---|---|---|---|---|---|---|
| **Subject Code:** BEE18OE1/ BEE20OE1 | **Subject Name:** | **T /L/ ETL** | **L** | **T / S.Lr** | **P / R** | **C** |
| | **ELECTRICAL SAFETY FOR ENGINEERS** | T | 3 | 0 | 0 | 3 |

### UNIT I   HAZARDSOF ELECTRICITY                                          9Hrs

Introduction – Hazards Analysis – Shock – Shock Effect – Arc –arc energy release-Arc energy-Arcing voltage-Arc surface Area-Incident Energy-Arc Flash Effect – Blast – Affected body parts – Summary of causes –Injury and Death – Protective Strategies.

### UNIT II   ELECTRICALSAFETYEQUIPMENT                                    9 Hrs

General Inspection and Testing Requirement for Electrical Safety Equipment – Flash and Thermal Production – Head and Eye Protection – Rubber Insulating Equipment –Hot Sticks-Barrier and signs-Insulated Tools –Safety Grounding Equipment – Electricians Safety Kit.

### UNIT III SAFETYPROCEDURES ANDORGANIZATIONALMETHODS          9Hrs

Six Step Safety Methods – Safe Switching of Power System – Voltage measurement Techniques – Placement of Safety Grounds – Tools And Test Equipment – One Minute Safety Audit-Electrical Safety program Development – Employee Electrical Safety Teams – Safety Meetings – Outage Reports – Safety Audits.

### UNIT IVREGULATORY AND LEGAL SAFETY REQUIREMENTS ANDSTANDARDS
### 9Hrs

Regulatory Bodies-ANSI-IEEE-Electrical safety code –Standards for Electrical safety in the workplace-Accident prevention-first aid –Rescue Techniques-accident invention.

### UNIT V  SAFETY TRAINING METHODSANDSYSTEMS                          9Hrs

Introduction – Elements of a good Training Program – On the Job Training – Training Consultants and Vendors- Training Program Setup – Step by Step Method          **Total  hours: 45**

### Text Book:

1. Electrical safety handbook - john cadick - McGRAW-HILL, Third Edition

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE2/BEE 20OE2 | Subject Name: ENERGY CONSERVATION TECHNIQUES | | T / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
 - ➢ To study about introduction to the Energy ConservationTechnology
 - ➢ To know the working Principle of energyconservation
 - ➢ To impart knowledge on energyefficiencies
 - ➢ To analyse various economicaspects
 - ➢ To have a wide spread knowledge on advancedtopics

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Attain Knowledge on Energy Conservation Technology |
|---|---|
| CO2 | Knowledge on the working principle of energy conservation |
| CO3 | Knowledge on energy efficiencies |
| CO4 | Ability to analyse various economic aspects |
| CO5 | Knowledge on advanced topics |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 1 |
| CO5 | 3 | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 2 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | | | |
| CO2 | 2 | 2 | 1 | 2 | | | |
| CO3 | 2 | 1 | 2 | 3 | | | |
| CO4 | 2 | 2 | 2 | 2 | | | |
| CO5 | 2 | 3 | 3 | 2 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE2/BEE 20OE2 | Subject Name: ENERGY CONSERVATION TECHNIQUES | T / L/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | | Ty | 3 | 0/0 | 0/0 | 3 |

### UNIT I  INTRODUCTION                                          9Hrs

Historical uses–Components of the energy conseervation system – Power output from an ideal system –

Power output from practical system

### UNIT II ENERGY CONSERVATION                               9Hrs

Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities

### UNIT III ENERGY EFFICIENCIES                             9Hrs

Efficiencies- Rate Processes in Energy Conversion- Energy Conversion Reactions- Energy Conversion Devices and Their Efficiency- Heat Transfer Devices and Their Efficiency- Deviations from the Ideal and Component Efficiencies

### UNIT IV ECONOMIC ASPECTS                                 9 Hrs

Economics of power factor improvement – power capacitors – power quality. Importance of electrical energy conservation – methods – energy efficient equipments.Introduction to energy auditing.

### UNIT V ADVANCED TOPICS                                   9Hrs

Introduction to energy auditing- Other conversion technologies- Modeling of micro-grids and distributed generation system- Energy source and energy yield of wind turbine generators- Interfacing issues of renewable energy system

to conventional power grid                        **Total hours: 45**

## Text books:

1. Manwell, J.F. Mcgowan, J.G. Rogers, A.L.(2002) Wind Energy Explained – Theory, Design & Application. John Wiley &Sons
2. Gray L. Johnson,(1985) Wind Energy Systems. Prentice HallInc

## Reference books:

1. Epenshaw Taylor, (2009) Utilization Of Electric Energy. 12th Impression. UniversitiesPress
2.  Wadhwa, C.L. (2003) Generation, Distribution and Utilization of Electrical Energy. NewAge International Pvt. Ltd.

| Subject Code: BEE18OE3/ BEE20OE3 | Subject Name: **ELECTRIC VEHICLE TECHNOLOGY** | | | | | | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | | | | | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- To study about Electric VehicleTechnology
- To study the concept of Microgrid and the controlmodes
- To impart knowledge on DistributedGeneration
- To analyse the impact of GridIntegration.
- To understand various power quality issues and the protection schemes forMicrogrid.

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Understanding of various conventional and Nonconventional source of energy resources |
|---|---|
| CO2 | Familiar to Electric Vehicles and the control modes |
| CO3 | knowledge on Hybrid Vehicle |
| CO4 | Familiar to Grid Integration |
| CO5 | Acquire knowledge on various power quality issues and the protection schemes in Electric Vehicle |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 |
| CO2 | 2 | 1 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 1 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | | | |
| CO2 | 2 | 1 | 3 | 3 | | | |
| CO3 | 3 | 2 | 3 | 3 | | | |
| CO4 | 3 | 3 | 3 | 3 | | | |
| CO5 | 3 | 3 | 3 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities a | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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| Approval | | | | | | | | | | | | |

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| Subject Code: BEE18OE3/ BEE20OE3 | Subject Name: | T /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **ELECTRIC VEHICLE TECHNOLOGY** | T | 3 | 0 | 0 | 3 |

## UNITI:INTRODUCTION                                     9 Hrs

Advanced Energy Storage Systems - Types of PEVs - Charging Techniques - V2G and G2V - Alternative Fuel and HEV Vehicle Technology

## UNIT II:AUTOMOTIVESYSTEMS                         9 Hrs

Introduction to today's automobiles – Basic Automotive Components - A working knowledge of basic automotive components - general maintenance necessary for vehicle operations f

## UNIT III: ELECTRIC & HYBRID

## VEHICLETECHNOLOGY19Hrs Fundamentals of Electric and Gas-Electric Hybrid Vehicles - EV and HEV batteries, Fuel Cells, Electric Motor Controllers Invertors - AuxiliaryAccessories

## UNIT IV: ELECTRIC & HYBRID VEHICLETECHNOLOGY2         9 Hrs

Battery Electric Vehicles (BEV) - Hybrid Electric Vehicles (HEV) - Plug-in Hybrid Electric Vehicles (PHEV) – Trouble Shooting PHEVTechnologies

## UNIT V: EV DATA ACQUISITION &CONTROLSYSTEMS         9 Hrs

Vehicle Network Theory, Vehicle Embedded Controllers - Communications Protocols - Sensors, Actuators – Internal Combustion in Electric Assist Vehicles - Vehicle Emissions - Emission Control Systems - PowerControl

                                                **Total  Hours: 45**

## REFERENCE BOOKS:

1. SumedhaRajakaruna, FarhadShahnia, Arindham Ghosh, "Plug-in-ElectricVehicles in SmartGrid – Integration Techniques", Springer,2015
2. SumedhaRajakaruna, FarhadShahnia, Arindham Ghosh "Plug-in-ElectricVehicles in SmartGrid – Integration Techniques – Energy Management", Springer,2015
3. SumedhaRajakaruna, FarhadShahnia, Arindham Ghosh, "Plug-in-ElectricVehicles in SmartGrid – Charging Strategies", Springer,2015

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# COMPUTER SCIENCE AND ENGINEERING
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| Subject Code: BEE18OE4/ BEE20OE4 | Subject Name: BIOMEDICAL INSTRUMENTATION | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- Thestudentwillstudyaboutcommunicationmechanicsinabiomedicalsystemwithfewexamples
- The student will acquire basic knowledge in life assisting and therapeuticdevices

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | The graduate is capable of knowing the human physiology. |
|---|---|
| CO2 | The graduate will be able to study about communication mechanics in a biomedical system with few examples |
| CO3 | Understands the basic principles in imaging techniques |
| CO4 | Acquires basic knowledge in life assisting and therapeutic devices |
| CO5 | Familiar with Bio medical instruments |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 |
| CO2 | 2 | 1 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 1 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | | | | |
| CO2 | 2 | 1 | 3 | 3 | | | | |
| CO3 | 3 | 2 | 3 | 3 | | | | |
| CO4 | 3 | 3 | 3 | 3 | | | | |
| CO5 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE4/ BEE20OE4 | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **BIOMEDICAL INSTRUMENTATION** | Ty | 3 | 0 | 0 | 3 |

**UNIT I: ANATOMY, PHYSIOLOGYANDTRANSDUCERS**　　　　　　　**9Hrs**

Brief review of human physiology and anatomy – cell and their structures – electrical mechanical and  chemical activities – action and resting potential – different types of electrodes – sensors used in biomedicine – selection criteria for transducers and electrodes – necessity for low noise pre- amplifiers– difference amplifiers – chopper amplifiers – electrical safety – grounding andisolation

**UNIT II: ELECTRO –PHYSIOLOGICALMEASUREMENT**　　　　　　　**9Hrs**

ECG – EEG – EMG– lead system and recording methods – typical waveforms

**UNIT III: NON – ELECTRICALPARAMETERMEASUREMENT**　　　　　**9Hrs**

Measurement of blood pressure – blood flow cardiac output – cardiac rate – heart sound measurement  of gas volume – flow rate of $CO_2$ and $O_2$ in exhaust air – PH ofblood

**UNIT IV: MEDICAL IMAGINGPARAMETERMEASUREMENTS**　　　　**9Hrs**

X-RAY machine – computer tomography – magnetic resonance imaging system – ultra sonography – endoscopy – different types of telemetry system – laser inbiomedicine.

**UNIT V: ASSISTING ANDTHERAPEUTICDEVICES**　　　　　　　　**9Hrs**

Cardiac pacemakers – defibrillators ventilators – muscle stimulators – diathermy – introduction to artificial kidney artificial heart – heart lung machine – limb prosthetics– elements of audio and visual  aids.

**Total  Hours: 45**

## Text Books

1. Webster, J.G. (1999) Medical Instrumentation: Application and Design.3rd Ed. John Wiley andSon.
2. Khandpur R.S.(1987) Hand book of Biomedical Instrumentation and Measurements. New Delhi: Tata McGraw-Hill.

## References

1. Geddes and Baker, (1975) Principles of Applied Biomedical Instrumentation. USA:John Wiley and Sons.
2. Well, G.(1980) Biomedical Instrumentation and Measurements. New Jersey: PrenticeHall.
3. Koryla, J. (1980) Medical and Biological Application of electro chemical devices. Chichester: John Wiley andSons.
4. Wise, D. L. (1989) Applied Bio- sensors,Butterworth.USA:

*CSE - ARTIFICIAL INTELLIGENCE - REGULATION  2020-2021*

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE5/ | Subject Name: **INTRODUCTION TO POWER ELECTRONICS** | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|
| BEE20OE5 | **Prerequisite:** | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial   SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- ➢ Togetanoverviewofdifferenttypesofpowersemi-conductordevicesandtheirswitching characteristics.
  To understand the operation, characteristics and performance parameters of controlled rectifiers.
- ➢ To study the operation, switching techniques and basic topologics of DC-DC switchingregulators
- ➢ Tolearnthedifferentmodulationtechniquesofpulsewidthmodulatedinvertersandto understand the harmonic reductionmethods
- ➢ To study the operation of AC voltage controller and Matrixconverters

**COURSE OUTCOMES (Cos): (3-5)**

| | |
|---|---|
| CO1 | Understanding of characteristics of power semi –conductors |
| CO2 | Capable of understand operation of controlled rectifiers. |
| CO3 | Capable of understand operation of Choppers. |
| CO4 | Capable of understand operation of PWM Inverters |
| CO5 | Capable of understand operation of AC voltage controller and Matrix converters. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 |
| CO2 | 2 | 1 | 2 | 3 | 1 | 1 | 3 | 1 | 3 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | **3** | 3 | 3 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 2 | | | | |
| CO2 | 2 | 1 | 3 | 3 | | | | |
| CO3 | 3 | 2 | 1 | 3 | | | | |
| CO4 | 3 | 3 | 1 | 3 | | | | |
| CO5 | 3 | 3 | 2 | 3 | | | | |

**3/2/1 indicates strength of correlation  3 – High, 2 – Medium, 1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | √Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | | | |
| Approval | | | | | | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE5/ BEE20OE5 | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **INTRODUCTION TO POWER ELECTRONICS** | Ty | 3 | 0 | 0 | 3 |

## UNIT I POWERSEMI-CONDUCTORDEVICES                                         9 Hrs

Study of switching devices, - Frame, Driver and snubber circuit of SCR, TRIAC,BJT, IGBT, MOSFET,-

Turn-on and turn-off characteristics, switching losses, Commutation circuits
for SCR, IGBT.

## UNIT IIPHASE-CONTROLLEDCONVERTERS                                         9 Hrs

2-pulse, 3-pulse and 6-pulse converters – Effect of source inductance – performance parameters –

Reactive power control of cnverters – Dual converters - Battery charger.

## UNIT III DC TODCCONVERTER                                                 9Hrs

Step-down and step-up chopper - Time ratio control and current limit control – Buck, boost, buckboost converter, concept of Resonant switching - SMPS.

## UNITIVINVERTERS                                                           9 Hrs

Single phase and three phase (both 1200 mode and 1800 mode) inverters -PWM techniques: Sinusoidal            PWM,modifiedsinusoidalPWM            -multiplePWM            – Introductiontospacevectormodulations-Voltage and harmonic control - Series resonant inverter - Current sourceinverter.

## UNIT V AC TOACCONVERTERS                                                  9Hrs

Single phase AC voltage controllers – Multistage sequence control - single and three phase cycloconverters –Introduction to Integral cycle control, Power factor control and Matrix converters.                                                **Total  hours: 45**

### TEXT BOOKS

1. M.H. Rashid, 'Power Electronics: Circuits, Devices and Applications', Pearson Education, PHI Third edition, New Delhi2004.
2. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004Edition.

## REFERENCES

1. Ashfaq Ahmed Power Electronics for Technology Pearson Education, Indian reprint,2003.
2. P.S.Bimbra "Power Electronics" Khanna Publishers, third Edition2003.
3. NedMohan,Tore.M.Undeland,William.P.Robbins,'PowerElectronics: Converters,Applications and Design', John Wiley and sons, third edition,2003.

| Subject Code: BEE18OE6/ BEE20OE6 | Subject Name: INDUSTRIAL INSTRUMENTATION | | | | | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | | | | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- ➢ To know about force, torque,velocity
- ➢ To learn the measurement of acceleration, vibration, density andviscosity
- ➢ To understand the Pressure and Temperaturemeasurement

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Attain knowledge on Force, Torque and velocity |
|---|---|
| CO2 | Ability to measure the acceleration, vibration etc |
| CO3 | Capable to use the techniques for temperature and pressure measurement |
| CO4 | Attain knowledge on Thermocouple and pyrometers |
| CO5 | Ability to work in an Instrumentation Industry |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 |
| CO2 | 2 | 1 | 3 | 3 | 1 | 2 | 1 | 3 | 3 | 1 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | | | |
| CO2 | 2 | 1 | 3 | 3 | | | |
| CO3 | 3 | 2 | 3 | 3 | | | |
| CO4 | 3 | 3 | 3 | 3 | | | |
| CO5 | 3 | 3 | 3 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE6/ BEE20OE6 | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **INDUSTRIAL INSTRUMENTATION** | Ty | 3 | 0 | 0 | 3 |

**UNIT I: MEASUREMENT OF FORCE, TORQUEANDVELOCITY**　　　　　　**9Hrs**

Electric balance – Different types of load cells – Magnets – Elastic load cells - Strain gauge load cell – Different methods of torque measurement – Strain gauge, relative regular twist – Speed measurement – Revolutioncounter

**UNITII: MEASUREMENT OF ACCELERATION, VIBRATION,DENSITYANDVISCOSITY**　　**9Hrs**

Accelerometers – LVDT, piezoelectric, strain gauge and variable reluctance type accelerometers – Mechanical type vibration instruments – Calibration of vibration pick-ups – Units of density, specific gravity and viscosity used in industries – Types of density meter – Viscosityterms – Saybolt viscometer– Rotameter type.

**UNIT III:PRESSUREMEASUREMENT**　　　　　　　　　　　　　　　　**9Hrs**

Unitsofpressure-Manometers–Differenttypes–Elastictypepressuregauges–Bourdontypebellows – Diaphragms – Electrical methods – Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor –Testing and calibration of pressure gauges – Dead weight tester.

**UNIT IV:TEMPERATUREMEASUREMENT**　　　　　　　　　　　　　　**9Hrs**

Definitions and standards – Primary and secondary fixed points – Calibration of thermometer, different types of filled in system thermometer – Sources of errors in filled in systems and their compensation – Bimetallic thermometers – Electrical methods of temperature measurement

**UNIT V: THERMOCOUPLESANDPYROMETERS**　　　　　　　　　　　**9Hrs**

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block reference functions – Radiation methods of temperature measurement – Radiation fundamentals – Total radiation & selective radiation pyrometers – Optical pyrometer – Two colour radiation pyrometers.

**Total  Hours: 45**

## Text Books

1. Doebelin, E.O.(2003) Measurement Systems – Application and Design. Tata McGraw Hill publishing company.
2. Jain, R.K. (1999) Mechanical and Industrial Measurements. New Delhi: KhannaPublishers.

## References

1. Patranabis,D.(1996)PrinciplesofIndustrialInstrumentation.TataMcGrawHillPublishingCompany Ltd.
2. Sawhney, A.K. and Sawhney, P.(2004) A Course on Mechanical Measurements, Instrumentation and Control Dhanpath Rai andCo.
3. Nakra, B.C. &Chaudary, B.C.Instrumentation Measurement &Analysis.Tata McGraw Hill PublishingLtd.
4. Singh, S.K.(2003) Industrial Instrumentation and Control.Tata McGrawHill.
5. Eckman, D.P. Industrial Instrumentation. Wiley EasternLtd.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE7/ BEE20OE7 | Subject Name: SOLAR ENERGY CONVERSION SYSTEM | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- ➢ To study about Solar Radiation and the collectortypes
- ➢ To impart knowledge on the Application of Solar thermalTechnology
- ➢ To understand the fundamentals of Solar Photovoltaiccells
- ➢ To design the Solar cells in cost effectivemanner.
- ➢ To learn about the solar passiveArchitecture

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Students understand Solar Radiation and the collector types |
|---|---|
| CO2 | Acquire knowledge on the Application of Solar thermal Technology |
| CO3 | Understand the fundamentals of Solar Photovoltaic cells |
| CO4 | Familiar to design the Solar cells in cost effective manner |
| CO5 | Incorporate the knowledge about the solar passive Architecture |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | | | |
| CO2 | 2 | 3 | 3 | 3 | | | |
| CO3 | 2 | 3 | 3 | 3 | | | |
| CO4 | 2 | 3 | 3 | 3 | | | |
| CO5 | 2 | 3 | 3 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE7/ BEE20OE7 | Subject Name: SOLAR ENERGY CONVERSION SYSTEM | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | | Ty | 3 | 0 | 0 | 3 |

### UNIT I   SOLAR RADIATIONANDCOLLECTORS                                    9 Hrs

Solar Radiation- Solar angles - Sun path diagrams - shadow determination – Solar Collectors - flat plate collector thermal analysis - heat capacity effect - testing methods-evacuated tubular collectors - concentrator collectors

### UNIT II  APPLICATIONS OF SOLARTHERMALTECHNOLOGY               9 Hrs

Principle of working, types - design and operation of - solar heating and cooling systems - solar water heaters – thermal storage systems – solar still – solar cooker – domestic, community – solar pond – solar drying

### UNIT III  SOLARPVFUNDAMENTALS                                                      9Hrs

Solar cells - p-n junction: homo and hetro junctions - metal-semiconductor interface - dark and illumination characteristics - efficiency limits - variation of efficiency with band-gap and temperature - efficiency measurements - high efficiency cells

### UNIT IV  SOLAR PHOTOVOLTAIC SYSTEM DESIGNANDAPPLICATIONS     9Hrs

Solar cell array system analysis and performance prediction- Shadow analysis: reliability - solar cell array design concepts - PV system design - design process and optimization -voltage regulation - maximum tracking – use of computers in array design - quick sizing method - array protection and troubleshooting - stand alone

### UNIT V SOLARPASSIVEARCHITECTURE                                                9 Hrs

Thermal comfort - heat transmission in buildings- bioclimatic classification – passive heating concepts: direct heat gain - indirect heat gain - isolated gain and sunspaces - passive cooling concepts: evaporative cooling - application of wind, water and earth for cooling; shading - paints and cavity walls for cooling - roof radiation traps - earth air-tunnel. – energy efficient landscape design

**Total Hours: 45**

## Text Books:

1. Sukhatme S P, (1984), Solar Energy, Tata McGrawHill
2. Kreider, J.F. and Frank Kreith, (1981), Solar Energy Handbook, McGrawHill
3. Goswami, D.Y., Kreider, J. F. and & Francis.,(2000),Principles of SolarEngineering

## Reference Books:

1. Garg H P., Prakash J., (2000), Solar Energy: Fundamentals & Applications, Tata McGrawHill
2. Duffie, J. A. and Beckman, W. A., (1991), Solar Engineering of Thermal Processes, JohnWiley
3. Alan L Fahrenbruch and Richard H Bube, (1983), Fundamentals of Solar Cells: PV Solar Energy Conversion, AcademicPress
4. Larry D Partain,(1995), Solar Cells and their Applications, John Wiley and Sons,Inc.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE8/B EE20OE8 | Subject Name: WIND ENERGY CONVERSION SYSTEM | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:**
- ➢ To know the basics of Wind Energy ConversionSystem
- ➢ To solve the Energycrisis.
- ➢ To know the Power Electronic Devices and itscharacteristics.
- ➢ To understand differentconverters
- ➢ To design wind Energy conversion system such as subsystems and itscomponents

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Knowledge on Wind Energy Systems |
|---|---|
| CO2 | Capability to find solution for Energy Crisis |
| CO3 | Attained knowledge on various types of converters |
| CO4 | Familiarity in Power Electronics Devices and its performance. |
| CO5 | Ability to design Electrical Machines for Wind Energy Conversion System |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 2 | 2 | 3 | 2 | 1 | 1 | 3 | 3 | 1 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 3 | 2 |
| CO4 | 2 | 2 | 2 | 2 | 1 | 3 | 2 | 2 | 3 | 2 | 3 | 1 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 3 | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 1 | 2 | | | |
| CO2 | 1 | 3 | 2 | 3 | | | |
| CO3 | 1 | 2 | 3 | 2 | | | |
| CO4 | 2 | 2 | 3 | 2 | | | |
| CO5 | 3 | 3 | 3 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

**COMPUTER SCIENCE AND ENGINEERING**
**(ARTIFICIAL INTELLIGENCE)**

| Subject Code: BEE18OE8/B | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| EE20OE8 | **WIND ENERGY CONVERSION SYSTEM** | Ty | 3 | 0 | 0 | 3 |

## UNIT I   INTRODUCTION TOWINDSYSTEMS                    9Hrs

Historical uses of wind – History of wind turbines – Horizontal axis wind turbines – Darreius Wind Turbines – Innovative wind turbines – Components of the wind energy conversion system – Power output from an ideal wind turbine – Power output from practical wind turbines

## UNIT II   WIND CHARACTERISTICS&MEASUREMENTS        9Hrs

Meteorology of wind  – Wind speed statistics  – Weibull Statistics  – Rayleigh and normal  distribution–

Windmeasurements–Eolianfeatures–BiologicalIndicators–Typesofanemometersandtheiroperation

– Wind direction – Wind measurements with balloons

## UNIT III   WIND TURBINE SUBSYSTEMS&COMPONENTS        9Hrs

Rotor – Blades – Aerodynamic design – Structural Design – Fabrication – Aerodynamic ControlSurfaces

– Hub – Types- Drive Train – Coupling – Gearbox – Brake – Types – Main frame & Nacelle – Tower

## UNIT IV   ELECTRICAL MACHINESFORWECS                9Hrs

Induction Machine – Theory of IM operation - Dynamic dq Modeling - Doubly fed Induction Generator – Synchronous Machines – Theory of operation – Starting wind turbines with IG - Variable Reluctance Machine – Effect of Harmonics

## UNIT V   OVERVIEWOFCONVERTERS                      9 Hrs

Six Pulse Converter – 12 Pulse Converter – Sequential control of converters – Converter Control – EMI and Power Quality Problems – Control of Cycloconverter – Matrix Converters – High Frequency Cycloconverter, VFC and CFC

**Total  Hours: 45**

**Text books:**

1. Manwell, J.F. Mcgowan, J.G. Rogers, A.L.(2002) Wind Energy Explained – Theory, Design & Application. John Wiley &Sons
2. Gray L. Johnson,(1985) Wind Energy Systems. Prentice HallInc
3. Bose, B.K. (2001) Modern Power Electronics & AC Drives. PrenticeHall

## Reference Books:

1. Vaughn Nelson, (2009) Wind Energy – Renewable Energy & the Environment. CRC Press

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE9/B EE20OE9 | Subject Name: ENERGY STORAGE TECHNOLOGY | | | | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | | | | Ty | 3 | 0 | 0 | 3 |

L : Lecture T:Tutorial      SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- To study about the Energy StorageTechnology
- To know the working Principle of Batteries and itstypes
- To impart knowledge on Fuel Cells along with its advantage anddisadvantages
- To analyse various types of energy storagedevices.
- To have a wide spread knowledge on ElectricVehicle

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Attain Knowledge on Energy Storage Technology |
|---|---|
| CO2 | Knowledge on the working principle of batteries and its types |
| CO3 | Knowledge n Fuel cells |
| CO4 | Ability to analyse various types of energy storage devices |
| CO5 | Knowledge on Electric vehicles |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 | 1 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 |
| CO4 | 2 | 1 | 1 | 1 | 2 | 3 | 2 | 3 | 1 | 1 | 2 | 1 |
| CO5 | 3 | 1 | 2 | 2 | 1 | 1 | 3 | 2 | 3 | 2 | 3 | 1 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 1 | | | | |
| CO2 | 2 | 2 | 1 | 2 | | | | |
| CO3 | 2 | 1 | 2 | 3 | | | | |
| CO4 | 2 | 2 | 2 | 2 | | | | |
| CO5 | 2 | 3 | 3 | 2 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OE9/B EE20OE9 | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **ENERGY STORAGE TECHNOLOGY** | Ty | 3 | 0 | 0 | 3 |

## UNITI INTRODUCTION TOENERGYSTORAGE 9Hrs

Energy storage – Utilization of Energy storage devices - Need for Energy Storage – Types of energy Storage – Comparison of Energy Storage technologies – Applications.

## UNITII ELECTRICALENERGYSTORAGE 9Hrs

Concept of batteries – Measurement of Battery performance – Charging and Discharging- Storage Density – Safety issues. Types of Batteries – Lead Acid, Nickel-Cadmium, Zinc manganese dioxide and modern batteries- Zinc Air, Nickel Hydride, lithiumbattery.

## UNITIII FUELCELL 9Hrs

Fuel Cell – History of fuel cell – Principle of electrochemical Storage – Types – Hydrogen oxygen cells, Hydrogen air cell – Hydrocarbon air cell –alkaline fuel cell – detailed analysis – advantage and drawback of each cell.

## UNIT IV ALTERNATE ENERGYSTORAGETECHNOLOGIES 9Hrs

Solar Photovoltaics – Wind Power - Flywheel – Super Capacitors – Principles & applications, Compressed Air Energy Storage- Concept of Hybrid Storage -Applications

## UNIT V ELECTRICVEHICLE 9Hrs

ElectricVehicle–Types–HybridVehicle–BatteringCharging–UsageofbatteriesinHybridvehicle–

Fundamentals of Electric vehicle modeling - EV and the Environment – Pollution effect.

**Total Hours: 45**

### Text Books:

1. IbrabimDincer, marc A,Rosen, (2011) Thermal Energy Storage Systems and Applications, 2nd Ed, JohnWiley
2. James Larminie, John Lowry (2003), Electric Vehicle Technology Explained, John Wiley &Sons

## References

1. Seth Leitman, Bob Brant (2013) Build Your Own Electric Vehicle, 3rd Ed, McGrawHill
2. James larminie, Andrew Dicks, (2003), Fuel Cell Systems Explained,Wiley

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL1/ BEE20OL1 | Subject Name: **TRANSDUCER LAB** | | | | | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | | | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- ➢ To learn practically about transducers and about the types ofTransducers
- ➢ To study various transducers used for the measurement of various physicalQuantities
- ➢ To identify suitable instruments to meet the requirements of industrialapplications
- ➢ To measure Resistive, Capacitive and Inductivetransducers
- ➢ To calibrate varioustransducers

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Enables the students to practically know about transducers and about the types of Transducers |
|---|---|
| CO2 | various transducers used for the measurement of various physical Quantities |
| CO3 | The student can identify suitable instruments to meet the requirements of industrial applications |
| CO4 | The graduate can measure Resistive, Capacitive and Inductive transducers |
| CO5 | Graduate can calibrate various transducers |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 3 | 3 | 2 | 2 | 1 | 3 | 2 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 1 | 2 | 3 | 2 | 1 |
| CO3 | 3 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 3 | 3 | 2 | 1 |
| CO4 | 2 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 1 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | | | |
| CO2 | 3 | 3 | 3 | 2 | | | |
| CO3 | 3 | 3 | 3 | 2 | | | |
| CO4 | 3 | 3 | 2 | 3 | | | |
| CO5 | 2 | 2 | 3 | 1 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL1/ BEE20OL1 | Subject Name: | Ty /L/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **TRANSDUCER LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Displacement versus output voltage characteristics of a Potentiometrictransducer.
2. Strain gaugecharacteristics.
3. Load cellcharacteristics.
4. Photoelectrictachometer.
5. Hall effecttransducer.
6. Characteristics ofLVDT.
7. Characteristic of LDR, Thermistor andthermocouple.
8. Ramp response characteristic of filled in systemthermometer.
9. Step response characteristic of RTD andthermocouple.
10. Flapper nozzle system.
11. P/I and I/Pconverters.
12. Study of smarttransducers

**Total Hours: 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BEE18OL2/BEE20OL2 | Subject Name:<br>**PLC AND SCADA LAB** | | Ty /<br>Lb/<br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture  T:Tutorial      SLr : Supervised Learning  P : Project  R : Research  C:Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
➢  To understand the programming inPLC.
➢  The students will be able to understand various faults usingSCADA.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Acquire programming knowledge in PLC |
|---|---|
| CO2 | Student can understand various faults using SCADA |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 3 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 3 | 1 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | |
| CO2 | 3 | 3 | 3 | 3 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BEE18OL2/BEE<br>20OL2 | Subject Name: | Ty /<br>Lb/<br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **PLC AND SCADA LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Interfacing of lamp and button with PLC forON/OFFoperation.
2. Perform Delayed Operation Of Lamp By Using PushButton.
3. Multiple push button operation with delayed lamp forON/OFFoperation.
4. Combination of Counter & Timer for Lamp ON/OFFoperation
5. To study Set and Reset operation oflamp.
6. .DOL Starter & Star Delta Starter operation by usingPLC.
7. PLC based temperature sensing usingRTD.
8. PLC based thermal ON/OFFcontrol.
9. PLC interfaced with SCADA and status read/ commandtransferoperation.
10. Parameter reading of PLC inSCADA.
11. Alarm annunciation usingSCADA.
12. Reporting and Trending in SCADASystem.
13. Temperature sensing usingSCADA
14. Pressure sensing usingSCADA

**Total Hours: 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL3/BEE20OL3 | Subject Name: ELECTRICAL MAINTENANCE LAB | | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- ➢ To acquire knowledge on ElectricalWiring
- ➢ To know about energymeter
- ➢ To study about theInsulators
- ➢ To know about the Neutral andEarthing
- ➢ To learn about the DistributionTransformers

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Capable of designing a Electrical wiring circuit for Residence. |
|---|---|
| CO2 | Acquired knowledge o how to calibrate Energy meter |
| CO3 | Knowledge on Insulators and its types |
| CO4 | Ability to calculate the earthing of a particular area |
| CO5 | Familiarity in Distribution Transformers |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 |
| CO4 | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 1 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 2 |
| CO2 | 3 | 1 | 2 | 3 |
| CO3 | 3 | 2 | 1 | 3 |
| CO4 | 1 | 2 | 3 | 1 |
| CO5 | 1 | 2 | 1 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL3/B EE20OL3 | Subject Name: | Ty /Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **ELECTRICAL MAINTENANCE LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

### LABORATORY LIST OF EXPERIMENTS

1. Residential House Wiring Using switches, Fuse, Indicator, Lamp and EnergyMeter
2. Types ofWiring
3. Study Troubleshooting of ElectricalEquipment
4. To study earthing of electricalinstallation.
5. To study types ofinsulators.
6. To study maintenance schedule for distribution transformer, testing, maintenance and protection of distributiontransformer.
7. To study of measurement of insulation resistance andcapacitance.
8. To study of maintenance schedule for storagebatteryswitchgear       and control equipment.
9. To study fault occurring in an induction motor to troubleshootthem.
10. To study the types of neutral earthing and substationearthing.
11. To study construction and types ofearthing.
12. Calibration of Energy meter

**Total  Hours: 45**

| Subject Code: BEE18OL4/ BEE20OL4 | Subject Name: **POWER ELECTRONICS LAB** | | Ty /Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|---|
| | **Prerequisite:** | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
➢ To obtain an overview of different types of power semiconductor devices and their switching characteristics with different triggeringmethods.
➢ To understand the operation , characteristics and performance parameters of controlled Rectifiers and Inverters.
➢ Tounderstandthe techniquestocontrolthespeedofBrushlessDCMotorandSRMotor
➢ To understand the operation of AC VoltageControllers
➢ To understand the applications of Power Electronic devices and Electric drives in PowerSystem

**COURSE OUTCOMES (Cos): (3-5)**

| CO1 | Students will understand the operation of power electronics devices and gain knowledge of the comparative study of different devices based on their switching characteristics . |
|---|---|
| CO2 | Students will understand the operation , characteristics and performance parameters of controlled Rectifiers and Inverters |
| CO3 | Students capable to understand the techniques to control the speed of Brushless DC Motor and SR Motor |
| CO4 | Students able to understand the operation of AC Voltage Controllers |
| CO5 | Students able to understand the operation of different converters and incorporate in designing the HVDC transmission System |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 2 | 1 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 |
| CO4 | 1 | 1 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 3 | 2 |
| CO5 | 3 | 2 | 2 | 1 | 3 | 3 | 2 | 2 | 3 | 2 | 2 | 1 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 2 | 2 | | | | |
| CO2 | 3 | 1 | 2 | 3 | | | | |
| CO3 | 3 | 2 | 1 | 3 | | | | |
| CO4 | 1 | 2 | 3 | 1 | | | | |
| CO5 | 1 | 2 | 1 | 2 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities | Program Core | Program Electives | √ Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL4/ BEE20OL4 | Subject Name: POWER ELECTRONICS  LAB | Ty /Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENT

1. SCR TriggeringCircuits.
2. Phase control usingTRIAC
3. Phase control usingSCR.
4. Characteristics ofSCR.
5. Characteristics ofIGBT.
6. Single phaseconverters.
7. Parallel Inverters.
8. Seriesinverters.
9. IGBT based PWM Inverters withfilters.
10. IGBT based PWM Inverters withoutfilters.
11. Step upChopper.
12. Step DownChoppers.

**Total  Hours : 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL5/BEE20OL5 | Subject Name: BIOMEDICAL INSTRUMENTATION LAB | Ty /Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE:**
- ➤ Study of BiologicalPreamplifiers.
- ➤ To learn Recording of ECG signal andAnalysis.
- ➤ To learn Recording ofAudiogram.
- ➤ To study Recording ofEMG
- ➤ To study the safety aspects of surgicaldiathermy

**COURSE OUTCOMES (Cos): (3-5)**

| | |
|---|---|
| CO1 | Understands Biological Preamplifiers. |
| CO2 | Capable of Recording of ECG signal and Analysis. |
| CO3 | Capable of Recording of Audiogram. |
| CO4 | Capable of Recording of EMG |
| CO5 | Understands Biological Preamplifiers. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 2 | 1 | 3 | 2 | 1 |
| CO2 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 3 | 1 | 2 | 3 | 1 |
| CO3 | 2 | 2 | 2 | 1 | 3 | 2 | 1 | 3 | 2 | 1 | 2 | 3 |
| CO4 | 1 | 2 | 3 | 2 | 1 | 2 | 3 | 1 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 2 | 1 | 2 | 1 | 2 | 3 | 3 | 2 | 1 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | | | |
| CO2 | 3 | 3 | 3 | 2 | | | |
| CO3 | 2 | 3 | 3 | 2 | | | |
| CO4 | 3 | 3 | 2 | 3 | | | |
| CO5 | 2 | 2 | 3 | 1 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and SocialSciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | √ | | | | | | |
| Approval | | | | | | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEE18OL5/B EE20OL5 | Subject Name: | Ty /Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| | **BIOMEDICAL INSTRUMENTATION LAB** | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Study of BiologicalPreamplifiers.
2. Recording of ECG signal andAnalysis.
3. Recording ofAudiogram.
4. Recording of EMG,EEG
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
6. Measurement of pH, pO2 andconductivity.
7. Study and analysis of functioning and safety aspects of surgicaldiathermy.
8. Acquisition of Heart sounds usingPCG
9. Biotelemetrysystem
10. BP measuringtechniques
11. Glucosesensor
12. Heart Lung machine

**Total Hours : 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BBT18OE1/BBT20OE1 | Subject Name : FOOD AND NUTRITION | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** Understanding relationship between food, nutrition and health

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | Understand about the nutritional significance of carbohydrate |
|---|---|
| CO2 | Understand the nutritive and caloric value of  food |
| CO3 | Know about the deficiency of  vitamins , micro and macro nutrients |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | |
| CO2 | 3 | 3 | 3 | 3 | | |
| CO3 | 3 | 3 | 3 | 3 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

# OPEN ELECTIVES- BIOTECHNOLOGY

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# COMPUTER SCIENCE AND ENGINEERING
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| Subject Code: BBT18OE1/BBT20OE1 | Subject Name : FOOD AND NUTRITION | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT-I: BASIC TERMS USED IN STUDY OF FOOD AND NUTRITION**          **9Hrs**

**Understanding** relationship between food, nutrition and health. Concept of Balanced Diet, Food Groups, Food Pyramid

**UNIT-II:NUTRITIONAL SIGNIFICANCE OF CARBOHYDRATES**          **9Hrs**

Definition and classification of carbohydrates. Digestion and absorption of carbohydrates, Metabolism of carbohydrates (Glycolysis, glycogenesis and Glycogenolysis)

**UNIT-III:NUTRITIONAL SIGNIFICANCE OF PROTEINS**          **9Hrs**

Definition for proteins, building blocks of proteins (Amino acid classification) functions of proteins, Metabolism of proteins (Synthesis and degradation)

**UNIT-IV:NUTRITIONAL SIGNIFICANCE OF   LIPIDS**          **9Hrs**

Definition for lipids.Formation of lipids from fatty acids, Classification of lipids.Lipoproteins and their biological role. Biochemical functions of lipids.

**UNIT-V NUTRITIONAL SIGNIFICANCE OF VITAMINS AND MINERALS**          **9Hrs**

 Classification, Biochemical function and deficiency diseases of Vitamins and minerals

                              **Total Hours: 45**

**TEXT BOOK**
  1. Anita Tull (1996). Food and Nutrition.Third Edition.Oxford University Press.
  2. Jenny Ridgwell (1996). Examining Food and Nutrition.Heinemann.
  3. Paul Fieldhouse (1995). Food and Nutrition.Second Edition, Published by Chapman & Hall.
**REFERENCE**
 1. Bamji MS, Krishnaswamy K, Brahmam GNV (2009). Textbook of Human Nutrition, 3rd Edition.
 Oxford and IBH Publishing Co. Pvt. Ltd.
 2. Srilakshmi (2007). Food Science, 4th Edition. New Age International Ltd.
 3. Srilakshmi,(2005), Dietetics, Revised 5th edition. New Age International Ltd.
 4. Wardlaw MG, Paul M Insel Mosby (1996). Perspectives in Nutrition, Third Edition. Core
    Course ICMR.
 5. Sumati R.Mudambi, M.V. Rajagopal (2001). Fundamentals  of Foods and Nutrition. Fourth
Edition.New Age International Publishers.

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE2/BBT 20OE2 | Subject Name : HUMAN PHYSIOLOGY | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES** :To learn about the various physiological mechanism involved in the human system

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | Understand the basic respiratory mechanism , circulatory and digestive system |
|---|---|
| CO2 | Understand the excretory system |
| CO3 | Understand the Endocrine and Nervous system |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | |
| CO2 | 3 | 3 | 3 | 3 | | |
| CO3 | 3 | 3 | 3 | 3 | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**Dr.M.G.R.**
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE3/BBT20OE3 | Subject Name : CLINICAL BIOCHEMISTRY | | Ty/Lb/ETL | L | T /S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** To study the basic concept of clinical biochemistry and to gain knowledge about the inborn error of metabolism. To have knowledge on the clinical enzymology study

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | Understand the disease related and inborn error in the metabolism |
|---|---|
| CO2 | Understand the different organ test like  liver test and  gastric function test etc |
| CO3 | Understand the Enzyme patterns in various function |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | |
| CO2 | 3 | 3 | 3 | 3 | | | |
| CO3 | 3 | 3 | 3 | 3 | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✔ | | | | | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE2/BBT20OE2 | Subject Name : HUMAN PHYSIOLOGY | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Biochemistry | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT-I: RESPIRATORY SYSTEM** 　　　　　　　　　　　　　　　　　　　**9Hrs**
Components of transport of Oxygen and Carbon dioxide, Role hemoglobin in transport. Mechanism of respiration, Chloride shift, Bhor's effect.

**UNIT-II: CIRCULATORY SYSTEM:** 　　　　　　　　　　　　　　　　　　**9Hrs**
Introduction, function, types, of Circulatory organ. Design of Blood vessels, Blood Flow, blood pressure, Cardiac cycle

**UNIT-III:DIGESTIVE SYSTEM** 　　　　　　　　　　　　　　　　　　　**9Hrs**
Components of Digestive system, Digestion, absorption of carbohydrates, protein, lipids. Role of various enzymes involved in digestive process

**UNIT-IV: EXCRETORY SYSTEM** 　　　　　　　　　　　　　　　　　　**9Hrs**
Structure and function of kidney, Structure of a nephron Mechanism of urine formation and other functions of kidney.

**UNIT-V: ENDOCRINE AND NERVOUS SYSTEM** 　　　　　　　　　　　**9Hrs**
Brief outline of various endocrine glands and their secretion, physiological role of hormones.Nervous system - Brain, spinal cord, nerve cells, and nerve fibers. Synapse, chemical and electrical synapses, nerve impulses, action potential and neurotransmission.

　　　　　　　　　　　　　　　　　　　　　　　　　　**Total Hours: 45**

**TEXT BOOK**

1. BJ Mejer, HS Meij, AC Meyer ,Human physiology, 2nd edition- AITBs publishers abd

distributers.

2. K. Saradha subramanyam, S, A Hand Book of Basic Human physiology. Chand & Co., Ltd.

3. Y. Rajakshmi, S , Guide to physiology. Chand & Co., Ltd.

**REFERENCE**

1. Gillian Pocock, Christopher D. Richards, David A. Richards. Third Edition 2006. Oxford University Press.
2. David Wright,(2000) Human Physiology and Health. Heinemann Educational Publishers.
3.Laurence A. Cole, Peter R. Kramer (2016) Human Physiology, Biochemistry and Basic Medicine Academic Press –Elsevier.
4.Indu Khurana,(2009) Textbook  of Medical Physiology. Published by Elsevier.
5.Joseph Feher, (2017) Quantitative Human Physiology an Introduction. Second Edition, Academic Press- Elsevier

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE3/BBT20OE3 | Subject Name CLINICAL BIOCHEMISTRY | Ty / Lb/ETL | L | T / S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

### UNIT-I: BASIC CONCEPTS OF CLINICAL BIOCHEMISTRY                              9Hrs

Specimen collection and processing (Blood, urine, faeces).Anti-coagulant and preservatives for blood and urine.Transport of specimens.

### UNIT-II: DISEASES RELATED TO CARBOHYDRATE METABOLISM                      9Hrs

Regulation of blood sugar, Glycosuria - types of glycosuria. Oral glucose tolerance test in normal and diabetic condition. Diabetes mellitus and hyperglycemia hypoglycemia, Ketonuria and ketosis,Glucogen storage diseases

### UNIT-III: DISEASES RELATED TO PROTEIN AND AMINOACID METABOLISM            9Hrs

Diseases related to protein calorie malnutrition (Kwashiorkorand marasmus).Inborn errors of metabolism phenyl ketonuria, alkaptonuria and albinism

### UNIT-IV: DISEASES RELATED TO LIPID METABOLISM                          9Hrs

Lipid and cholesterol, Classifications, mode of action. Factors affecting blood cholesterol level. Dyslipoproteinemias, IHD, atherosclerosis, and fatty liver.

### UNIT-V: CLINICAL ENZYMOLOGY                                          9Hrs

Enzymes a definition.Isoenzymes with examples.Role of marker enzymes in diseases. Enzyme patterns in acute pancreatitis, liver damage, bone disorder, myocardial infarction and muscle wasting.

**Total Hours: 45**

**TEXTBOOK**

1. H. Varley, A. H. Gowenlock, and M. Bell (2006) Practical Clinical Biochemistry (6th Ed)
   London: Heinemann Medical Books,New Delhi (India) : CBS
2.Ramakrishnan(2001) Clinical biochemistry(3rd Ed) Orient Longman private Ltd.
3.Text book of Medical Biochemistry - Dr. M.N. Chatterjee and Rane Shinde
**REFRENCES**
1.Clinical chemistry – William Hoffman
2. Clinical Biochemistry with clinical correlation – Devin, Wiley
3. Practical clinical biochemistry – Harold Varley, CBS, New Delhi
4. Nessar Ahmed ( 2017) Fundamentals of Biomedical Science, Second Edition, Oxford Press.
5. R.Swaminathan (2011) Handbook of Clinical Biochemistry,Second Edition,World Scientific
   Publishing Co.Pte.Ltd

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE4/BBT20OE4 | Subject Name  : BIOPROCESS PRINCIPLES | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: NIL | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** To study the basic concept of Bioprocess concepts and to gain knowledge about the various industrial products produced by bioprocess technology.

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | Understand the concept of biotranformtion reactions |
|---|---|
| CO2 | Understand the requirements for the bioprocess reactions |
| CO3 | Understand the industrial applications of  bioprocess systems |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 1 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE4/BBT20OE4 | Subject Name  BIOPROCESS PRINCIPLES | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI: INTRODUCTION TO INDUSTRIAL BIOPROCESS**                                      **9 Hrs**
A brief survey of organisms, processes, products relating to modern biotechnology, General requirements of fermentation process

**UNIT II: RAW MATERIALS AND MEDIA DESIGN FOR FERMENTATION PROCESS**        **9 Hrs**

Medium requirements for fermentation processes, Media optimization, simple and complex media, design of various commercial media for industrial fermentation

**UNIT III: DESIGN OF A FERMENTOR**                                                       **9 Hrs**
Basic functions of a fermentor for microbial or animal cell culture, Bioreactors: Batch, fed batch reactor, continuous stirred tank reactors, residence time distribution.

**UNIT IV: STERILIZATION KINETICS**                                                       **9 Hrs**

Thermal death kinetics of microorganisms, batch and continuous heat sterilization, filter sterilization , air sterilization and design of sterilization equipment  for  batch and continuous.

 **UNIT V: APPLICATIONS**                                                                  **9 Hrs**

Production of Industrially important enzymes (Cellulase and Protease) and Antibiotics (Penicillin and Streptomycin)

                                                                    **Total Hours: 45**

**TEXT BOOKS**

1. Peter F. Stanbury, Stephen J. Hall & A. Whitaker, Principles of Fermentation Technology, Science & Technology Books.

**REFERENCES:**
1. Bailey and Ollis, " Biochemical Engineering Fundamentals", McGraw Hill (2nd Ed.), 1986.
2. Shule and Kargi, " Bioprocess Engineering ", Prentice Hall, 1992.
3. Harvey W. Blanch, Douglas S. Clark, Biochemical Engineering, Marcel Dekker, Inc.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE5/BBT20OE5 | Subject Name :BIOSENSORS AND BIOMEDICAL DEVICES IN DIAGNOSTICS | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES** : To study the biosensors based on DNA conformation changes, Biosensors based on protein conformation changes

**COURSE OUTCOMES (COs) : After studying this course the student would be able to**

| CO1 | Understand the biosensors as functional analogs of chemo receptors |
|---|---|
| CO2 | Gain knowledge on the types of biosenors and its application in the clinical field |
| CO3 | Understand the basic principles involved in the non clinical biosensors in various field and other reagent less biosensors and array based chips |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 1 | 1 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 |

**3/2/1 indicates strength of correlation  3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BBT18OE5/BBT20OE5 | Subject Name :BIOSENSORS AND BIOMEDICAL DEVICES IN DIAGNOSTICS | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI: FUNDAMENTALS OF BIOSENSORS**                                         **9Hrs**

Biosensors as Functional Analogs of Chemo receptors- Immobilization and biosensor construction, Biosensor instrumentation-Transduction principles used in a biosensor, Biocomponent of the sensor. Biological sensing elements and transducer systems- their sensitivity specificity and linearity.

**UNIT II: TYPES OF BIOSENSORS**                                         **9Hrs**

Thermometric Indication with Thermistors, Opto electronic Sensors, Piezoelectric Sensors, Electrochemical Sensors, Potentiometric Electrodes, Amperometric Electrodes, Conductometric Measurement. Flow injection analysis based biosensors, fiber optics biosensors,Bioluminescence biosensors, Microbial biosensors, Affinity biosensors, immunosensors.DNA Probes, organic acid probes, antigen-antibodies reaction, biochemical detection of organelles, receptors, sensors for pollution gases stability and reusability of sensors.

**UNIT III: BIOSENSORS FOR CLINICAL ANALYSIS**                                         **9Hrs**

Biosensors for personal diabetes management (Glucose, Galactose, Gluconate, Lactate, Pyruvate Sensors) Noninvasive Biosensors in Clinical analysis and health care.

**UNIT IV: NON CLINICAL APPLICATION OF BIOSENSORS**                                         **9 Hrs**

Applications in Veterinary, Agriculture, Food production, Environmental control and pollution monitoring, and bioprocess industry.

**UNIT V: REAGENTLESS BIOSENSORS & ARRAY-BASED CHIPS**                                         **9Hrs**

Surface Dielectric Enhancement, Gold nanoparticle enhanced surface plasmon resonance, carbon nanotube and silicon nanowire enhanced conductivity, catalytic activation, electro catalytic detection, catalytically enabled optical and magnetic detection, Reagent less Immunoelectrodes, biomolecule conformational modulated effects, Biosensors based on DNA conformation changes, Biosensors based on protein conformation changes

                                                                **Total Hours: 45**

**TEXT BOOK**
1.Turner A.P.F, Karube I and Wilson G.S, (1987) Biosensors- Fundamentals and applications, Oxford Univ.Press.
2.Yang V.C. and T.T.Ngo,(2000) Biosensors and their Applications, Academic/Plenum Publishers.
3.Ashok Mulchandani and Kim R Rogers,(1998)Enzyme and Microbial bio sensors: Techniques and Protocols,Humana Press Totowa, NJ.

**REFERENCE BOOKS**

1. Turner A.P.F and Wilsons G.S, (1997) Biosensors: Fundamentals and Applications, Oxford Science Publications
2. Zoraida P.Aguilar (2013),Nanomaterials for Medical Applications,Elsevier
3. Roger J Narayan (2017), Medical Biosensors for Point of care  (POC) applications, Wood Publishing –Elsevier.
4.Ashutosh Tiwari, Murugan Ramalingam,Hisatoshi Kobayashi, Anthony P.F Turner (2013), Biomedical Materials and Diagnostic Devices

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OE6/BBT20OE6 | Subject Name :Basic Bioinformatics | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  NIL | Ty | 3 | 1/0 | 0/0 | 4 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE:** To learn nucleotide, protein and genome databases and know about the file formats . To understand pairwise and multiple sequence alignment and the principle and to gain knowledge on approaches for gene prediction methods in prokaryotes and eukaryotes

**COURSE OUTCOMES (COs) : Upon completion of this course, students will be able to**

| CO1 | Develop bioinformatics tools with programming skills. |
|---|---|
| CO2 | Apply computational based solutions for biological perspectives. |
| CO3 | Pursue higher education in this field. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Approval | |
|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BBT18OE6/BBT20OE6 | Subject Name : Basic<br>Bioinformatics | Ty / Lb/<br>ETL | L | T /<br>S.Lr | P/<br>R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Ty | 3 | 0/0 | 0/0 | 3 |

## UNIT I:BIOLOGICAL DATABASES AND DATA RETRIEVAL          9 Hrs

Nucleotide databases (Genbank, EMBL), Sequence submission Methods and tools (Sequin, Sakura), Sequence retrieval systems (Entrez), Protein (Swiss-Prot, Tr-EMBL, Expasy), Genome (NCBI, EBI, TIGR), Metabolic Pathway DB (KEGG)

## UNIT II: PAIRWISE SEQUENCE ALIGNMENT          9 Hrs

Similarity, Identity and Homology, Global Alignment, Local Alignment, Database Search methods & tools, Scoring Matrices,

## UNIT III: MULTIPLE SEQUENCE ALIGNMENT          9 Hrs

Significance of MSA, Scoring of MSA, PSI/PHI-BLAST.

## UNIT IV: GENE PREDICTION          9 Hrs

Structure in Prokaryotes and Eukaryotes, Gene prediction methods, Neural Networks, Pattern Discrimination methods, Signal sites Predictions (Promoter, Splice, UTR, CpG-islands) Methods of Construction of Phylogenetic trees

## UNIT V:NUTRIGENOMICS          9 Hrs

Introduction to Nutrigenomics and Nutraceuticals

**Total  Hours: 45**

## REFERENCES

1. Introduction to Bioinformatics - A. Lesk 2002, Oxford University Press
2. Fundamental concepts of Bioinformatics by D.E. Krane and M.L Raymer, Pearson Education 2003 ISBN 81-297-0044-1
3. Current Protocols in Bioinformatics, Edited by A.D. Baxevanis et. al., Wiley Publishers 2005
4. Introduction to Computational Molecular Biology by Joao Carlos Setubal, Joao

# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : Basic Biochemistry Lab | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| BBT18OL1/B BT20OL1 | Prerequisite: NIL | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**.To learn the basic  knowledge about different types of Biomolecules and their identification by chemical reactions

**COURSE OUTCOMES (COs) : After finishing this course  the  students  would be able to**

| CO1 | Acquire knowledge about the basics of Nutrition |
|---|---|
| CO2 | Know about the different types of Biomolecules |
| CO3 | Understand  the applications of Bio chemistry |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | open lab | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Subject Code: BBT18OL1/BBT 20OL1 | Subject Name : Basic Biochemistry Lab | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  NIL | Lb | 0 | 0/0 | 3/0 | 1 |

## OPEN   LAB

**LIST OF EXPERIMENTS**

1.  Laboratory Safety and Hygiene

2. Preparation of Molar solution

3. Preparation of percentage  solution

4. Preparation of Normal solution

5. Qualitative analysis of  carbohydrates ( any one sample)

6. Qualitative analysis of Proteins (any one sample)

7. Isolation of Casein

8. Isolation of starch

**TEXT BOOKS:**

1. Gupta R.C. and Bhargavan S. Practical Biochemistry.
2. David T. Phummer. Introduction of Practical Biochemistry (II Edition).

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BBT18OL2/B<br>BT20OL2 | Subject Name : Basic Bioprocess lab | Ty / Lb/<br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: NIL | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits

T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**.To learn the basic  knowledge about different types of biotransformation reactions for the production of commercially important products

**COURSE OUTCOMES (COs) : After finishing this course  the  students  would be able to**

| CO1 | Acquire knowledge about the basics  Bioprocess reactions |
|---|---|
| CO2 | Know about the culturing techniques |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |

| COs /<br>PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | open lab | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✓ | | |

| Approval | |
|---|---|
| | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:  BBT18OL2/BBT20OL2 | Subject Name : Basic Bioprocess lab | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  NIL | Lb | 0 | 0/0 | 3/0 | 1 |

### LIST OF EXPERIMENTS

1. Pure culture techniques
2. Determination of growth curve of the given organism
3. Screening of amylase producing microorganism
4. Screening of protease producing microorganism
5. Determination of TDP (Thermal death point)
6. Determination of  TDT (Thermal death time)
7. Production of ethanol using batch fermentation

### Reference

1.  Manual of industrial microbiology and Biotechnology, Demain A.L. Solomon, J.J., 1986. ASM press.
2. Industrial Microbiology, Reed C., Prescott and Dann's, 1982. Macmillan publishers.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OL3/BBT20OL3 | Subject Name : Basic Microbiology Lab | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**.To learn the basic  knowledge about different types of Microorganisms  identification by  staining methods

**COURSE OUTCOMES (COs) : After finishing this course  the  students  would be able to**

| CO1 | Acquire knowledge about the basics  of microbiology |
|---|---|
| CO2 | Know about the staining methods |
| CO3 | Understand  the staining methods and identification |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 2 | 1 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | open lab | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✓ | | |
| Approval | | | | | | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BBT18OL3/BBT 20OL3 | Subject Name : Basic Microbiology  Lab | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

### LIST OF EXPERIMENTS

1. Sterilization technique – Moist heat, dry heat

2. Preparation of culture media (a) Solid medium (b) liquid medium

3. Sterilization of media

4. Pure culture technique

5. Use of microscope

6. Identification of microbes - simple Staining

7. Identification of microbes – Gram staining

8. Hanging drop preparation for motility test

### TEXT BOOKS

1. Monica Chessbrough(1999) Laboratory Manual in Microbiology(Vol I & II)Cambridge University Press
2. collee, J.G. etal., "Mackie & McCartney Practical Medical Microbiology" 4th Edition, Churchill Livingstone, 1996.

### REFERENCE BOOKS

1. Cappucino (1999) Microbiology - A laboratory Manual Benjamin Cumming

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BBT18OL4/BBT20OL4 | Subject Name : Basic Bioinformatics Lab | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Molecular Biology & Protein Science | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits  T/L/ETL :

Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :** To enable the students to understand  To understand basic commands in UNIX OS.To understand different biological databases.To carry out sequence and phylogenetic analysis.

**COURSE OUTCOMES (COs) : After completing this course students were able**

| CO1 | To demonstrate the protein/DNA sequence search methods and sequence alignment databases. To understand and hands-on-training on the genome sequence analysis and annotation. |
|---|---|
| CO2 | To analyze the comparative genomics. |
| CO3 | To use various computational tools for expression analysis to identify open reading frames, mutations, conserved region |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | Open lab | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✓ | | |

| Approval | |
|---|---|

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name :Basic Bioinformatics  Lab | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| **BBT18OL4/ BBT20OL4** | Prerequisite: Molecular Biology  & Protein Science | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Demonstration of Entrez

2. Demonstration of SRS

3. Exploring nucleotide database Gen Bank

4.  Exploring Protein Database Uniprot

5.  Database Searches with BLASTP

6. Pair wise Sequence Alignment -EMBOSS

7. Multiple sequence alignment – CLUSTAL OMEGA

## REFERENCE BOOK

1. Bioinformatics and Functional Genomics by Jonathan Pevsner
2. Bioinformatics Data Skills: Reproducible and Robust Research with Open by Vince Buffalo

3. Introduction to Bioinformatics Using Action Labs by Jean-Louis Ryan Rossi, Stephen Sheel

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)
# OPEN ELECTIVES- MECHANICAL ENGINEERING

| Subject Code: BME18OE1/BME20OE1 | Subject Name : INDUSTRIAL ENGINEERING | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial      S.Lr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab./Embedded Theory and Lab.

**OBJECTIVE**: Students will learn:
- ➢ Various techniques of workmeasurement
- ➢ Details of plant layout and material handlingdevices
- ➢ Basic concepts ofERP.

**COURSE OUTCOMES (COs) :**

| CO1 | Various techniques of Work Measurement |
|---|---|
| CO2 | Details of Plant Layout and Material Handling devices |
| CO3 | Human factor design |
| CO4 | Understand wages and incentives |
| CO5 | Basic concepts of ERP |

**Mapping of Course Outcomes(COs) with Program Outcomes (Pos) & Program Specific Outcomes (PSOs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 2 | | 2 | | 1 | | | 2 | 1 | | 1 |
| CO2 | 1 | 1 | 2 | 2 | | 2 | 1 | | 1 | 2 | 1 | 1 |
| CO3 | 1 | 1 | | | | 2 | 1 | | 1 | 2 | 1 | 2 |
| CO4 | 1 | 1 | | | | 2 | | 2 | | | | 1 |
| CO5 | 1 | 1 | | | 3 | 2 | | | 1 | 2 | | 1 |

| COs / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | 1 | | 1 | | | | | |
| CO2 | | | 1 | | 2 | | 1 | | | | | |
| CO3 | | | 1 | | 2 | | 1 | | | | | |
| CO4 | | | | | | | 1 | | | | | |
| CO5 | | | | | 2 | | 1 | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships /Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BME18OE1/<br>BME20OE1 | Subject Name : INDUSTRIAL ENGINEERING | Ty / Lb/<br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT- I: WORK STUDY & WORK MEASUREMENT**                                9 Hrs

Work study – Techniques – Productivity, Improving productivity by reducing work content- Human factors in work study.Method study – Basic procedure – Recording techniques - Micro–motion study, Threbligs, SIMO chart, Principles of motion economy.Work Measurement – Techniques – Time study – Allowances – Work sampling – PMTS – MTM.

**UNIT- II: SITE SELECTION, PLANT LAYOUT & MATERIAL HANDLING**        9Hrs

Site Selection: Importance of plant location – choice of site for location –State  regulations  on location – Industrial Estates. Plant layout: Types of factory buildings, OBJECTIVES of good plant layout, Principles, Techniques used, Types, Flow pattern, Line Balance, computerized plant layout. Material Handling: Functions, OBJECTIVES, principles, Devices used, Relation between plant layout and material handling.

**UNIT- III: ERGONOMICS**                                                        9Hrs

Techniques – Analysis – Equipment Design – Fatigue – Motivation theory of Fatigue – Fatigue tests- Duties of a human factor Engineer – Human effectiveness improvement through ergonomics.

**UNIT- IV: WAGES & INCENTIVES**                                            9Hrs

Wages: Wage & salary policies, systems of wage payments, Principles of wage administration, National Wage Policy, Fair wage committee report, Need based minimum wage Incentives: Need, Incentive plans, Comparison of various Incentive plans, Administration of wage incentives.

**UNIT- V: ENTERPRISE RESOURCE PLANNING (ERP)**                          9Hrs

Need for optimal use of Resources, MRP I & II, Supply chain Management, Evolution of ERP, BPR, Lean Manufacturing, Popular ERP Packages, Implementation of ERP, Benefits of ERP.

                                                        **Total Hour:    45**

**TEXT BOOKS**

1)      O.P. Khanna, (2005) "Industrial Engineering and Management", Khanna Publishers.
2)      K.KAhuja, "Industrial Management", Khanna Publishers.
3)      Martand Telsang, "Industrial Engineering and Production Management".

**REFERENCES**

1) M.Mahajan, "Industrial Engineering and Production Management", Dhanpat Rai &CO.,
2) B. Kumar, (2005) "Industrial Engineering", Khanna Publishers.
3) International Labour Organization (ILO), (2004) "Introduction to Work study", Universal Publishing Corporation.
4) H. B. Maynard, "Industrial Engineering, Handbook", McGraw Hill Book Company, International Edition.
5) Marvin E. Mandel, "Time & Motion study", Prentice Hall, Private Limited, International Edition.
6) James M Apple, "Principles of Layout & Materials Handling", Ronalds Press, International Edition.
7) V. K. Garg & N.K. Venkatakrishnan, (2004) "Enterprise Resource Planning, Concepts & Practice", Prentice Hall of India Private Limited.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>**BME18OE2**/BME 20OE2 | Subject Name :<br>**FINITE ELEMENT METHOD** | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | **Prerequisite: Nil** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial          SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE**: The student will learn
  ➤ Fundamentals of finite element analysis and theirapplications.
  ➤ Method of solving one, two and iso-parametricelements.

**COURSE OUTCOMES (COs) :**

| CO1 | To Impart Knowledge about  Introduction to Finite Element Analysis |
|---|---|
| CO2 | To impart knowledge about one-dimensional problems |
| CO3 | To impart knowledge about two dimensional scalar variable problems |
| CO4 | To impart knowledge about two dimensional vector variable problems |
| CO5 | To impart knowledge about isoparametric formulation and advanced topics |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO2 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO3 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO4 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |
| CO5 | 2 | 3 | 3 | 3 | 3 | 2 | 1 | 1 | 1 | 2 | 1 | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 3 | 3 | 2 | | | | |
| CO2 | 2 | 3 | 3 | 2 | | | | |
| CO3 | 2 | 3 | 3 | 2 | | | | |
| CO4 | 2 | 3 | 3 | 2 | | | | |
| CO5 | 2 | 3 | 3 | 2 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>**BME18OE2**/BME20OE2 | Subject Name :<br>**FINITE ELEMENT METHOD** | Ty / Lb/<br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **Prerequisite: Nil** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT- I INTRODUCTION**                                                          **9 Hrs**

Historical Background – Mathematical Modeling of field problems in Engineering –Governing Equations – Discrete and continuous models – Boundary, Initial and Eigen Value problems– Weighted Residual Methods – Variational Formulation of Boundary Value Problems – Ritz Technique – Basic concepts of the Finite Element Method.

**UNIT- II ONE-DIMENSIONAL PROBLEMS**                                          **9 Hrs**

One Dimensional Second Order Equations – Discretization – Element types- Linear and Higher order Elements – Derivation of Shape functions and Stiffness matrices and force vectors-Assembly of Matrices - Solution of problems from solid mechanics including thermal stresses-heat transfer.

**UNIT- III TWO DIMENSIONAL SCALAR VARIABLE PROBLEMS**                          **9Hrs**

Second Order 2D Equations involving Scalar Variable Functions – Variational formulation –Finite Element formulation – Triangular elements and Quadrilateral elements- Shape functions and element matrices and vectors. Torsion of Non circular shafts.

**UNIT- IV TWO DIMENSIONAL VECTOR VARIABLE PROBLEMS**                          **9Hrs**

Equations of elasticity – Plane stress, plane strain and axisymmetric problems – Constitutive matrices and Strain displacement matrices – Stiffness matrix – Stress calculations - Plate and shell elements.

**UNIT- V ISOPARAMETRIC FORMULATION AND ADVANCED TOPICS**                      **9Hrs**

Natural co-ordinate systems – Isoparametric elements – Shape functions for isoparametric elements – – Numerical integration - Matrix solution techniques – Solutions Techniques to Dynamic problems – Introduction to Analysis Software- Introduction to Non Linearity.

                                                                              **Total Hours: 45**

**TEXT BOOKS:**

1.J.N.Reddy, "An Introduction to the Finite Element Method", 3rd Edition, Tata McGrawHill,2005

2.Seshu, P, "Text Book of Finite Element Analysis", Prentice-Hall of India Pvt. Ltd., NewDelhi, 2007.

**REFERENCES:**

1.Logan, D.L., "A first Subject in Finite Element Method", Thomson Asia Pvt. Ltd., 2002.

2.Robert D. Cook, David S. Malkus, Michael E. Plesha, Robert J. Witt, "Concepts and Applications of Finite Element Analysis", 4th Edition, Wiley Student Edition, 2002.

3.Rao, S.S., "The Finite Element Method in Engineering", 3rd Edition, Butter worth Heinemann,

2004.

4.Chandrupatla and Belagundu, "Introduction to Finite Elements in Engineering", 3rd Edition,

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OE3/BME20OE3 | SubjectName: ADVANCED AUTOMOBILEENGINEERING | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial        SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory andLab

**OBJECTIVE**: The student will learn
➢ Various automobile parts, power transmission from engine to various parts of the automobile, engine cooling, lubrication and also about various pollutants and itscontrol.
.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| | |
|---|---|
| CO1 | I.C engine parts and different chassis |
| CO2 | Engine cooling, lubrication and ignition  system |
| CO3 | Working of transmission system like gear box, propeller shaft and differential. |
| CO4 | Knowledge on Steering, suspension system. |
| CO5 | Knowledge on working of braking system and Hybrid Vehicles and Fuel cells |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 2 | | 1 | | 3 | | | | | |
| CO2 | | 1 | | 2 | | | | | | | | |
| CO3 | 3 | | | | | | 2 | | | | | |
| CO4 | 3 | | 2 | | 1 | | 3 | | | | | |
| CO5 | 3 | | 2 | | 1 | | 3 | | | | | |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | | 2 | |
| CO2 | 2 | | 2 | |
| CO3 | 2 | 2 | 1 | |
| CO4 | 2 | 2 | 1 | |
| CO5 | 2 | 2 | 1 | 2 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✔ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OE3/BM E20OE3 | SubjectName: ADVANCED AUTOMOBILEGINEERING | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **Prerequisite: Nil** | **Ty** | **3** | **0/0** | **0/0** | **3** |

**UNIT- I: VEHICLE STRUCTURE AND ENGINES**                              **9Hrs**

Vehicle Chassis –types- layout- body-integral and chassis mounted body- vehicle specifications- power and torque requirements- choice of engine for different applications. Engine types and construction –- Cylinder- cylinder head-Crank case-Piston- connecting rod – crank shaft-valves- liners-manifolds.

**UNIT- II: ENGINE AUXILIARY SYSTEMS AND POLLUTION CONTROL**          **9Hrs**

Fuel supply system to SI and CI engines–Electronic. Lubrication system-cooling system-ignition system-spark timing-firing order, electronic fuel injection system-types. Pollution from engines and their control-Exhaust gas recirculation - Catalytic converters, Indian emission standards**.**

**UNIT- III: TRANSMISSION SYSTEMS**                                     **9Hrs**

Clutches –single& multi plate –diaphragm-fluid coupling-torque converter Gear boxes-manual-sliding mesh- constant mesh-synchro mesh- automatic transmission. Universal joints-propeller shaft-Hotchkiss drive-torque tube drive. Differential-types- construction. Four wheel drive.

**UNIT- IV: STEERING AND SUSPENSION SYSTEMS**                          **9Hrs**

Principle of steering-steering geometry and wheel alignment-steering linkages-steering gear boxes-power steering. Wheel and tyre construction-type and specification-tyre wear and causes-front axles arrangements. Suspension system-need and types-independent systems-coil-leaf spring-torsion bar-shock absorbers-air suspension.

**UNIT- V: BRAKE SYSTEMS**                                             **9Hrs**

Auto Electrical Components and Alternative Power Plants. Brake –need –types-mechanical-hydraulic-pneumatic-power brake-trouble shooting of brakes. Principles of modern electrical systems-battery-dynamo- starting motor- lighting- automobile conditioning. Electric hybrid vehicle and fuel cells.

## Total Hours: 45

**TEXT BOOKS**

1) K.K.Ramalingam, (2007) "Automobile Engineering", SciTechPublications.
2) Kirpal Singh, (2012) "Automobile Engineering Vol-I&II".
3) R.B.Gupta, (2013) "Automobile Engineering", Satya PrakashanPublishing

**REFERENCES**

1) Joseph Heitner, "Automotive Mechanics", Affiliated East West PressLtd.
2) "Newton and Steeds, Motor Vehicles", ELBS –13EDITION.
3) William Crouse, (2007) "Automotive Mechanics", Tata McGrawHill.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : INDUSTRIAL ROBOTICS | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| **BME18OE4**/ BME20OE4 | **Prerequisite: Nil** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial    SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**: **OBJECTIVES:** Students will learn
  ➢ Basic components of an industrial robot and Sensors used inrobots
  ➢ Robot programming methods and Robotapplications

## COURSE OUTCOMES (COs) : ( 3- 5)

| CO1 | Knowledge of basic concepts of a robot. |
|---|---|
| CO2 | Knowledge of different components and operation with respect to robot design. |
| CO3 | Knowledge of aware of sensing and machine vision concepts and its applications. |
| CO4 | Knowledge of writing programme for robot. |
| CO5 | Knowledge of  able to design robot cell and its applications. |

## Mapping of Course Outcomes with Program Outcomes (Pos)

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 1 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 1 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 1 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 1 | 3 |
| CO5 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 1 | 3 | 2 | 1 | 3 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 1 | 1 | 3 | | | | |
| CO2 | 1 | 1 | 1 | 3 | | | | |
| CO3 | 1 | 1 | 1 | 3 | | | | |
| CO4 | 1 | 1 | 1 | 3 | | | | |
| CO5 | 1 | 1 | 1 | 3 | | | | |

3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Techni | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OE4/BM E20OE4 | Subject Name : INDUSTRIAL ROBOTICS | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Ty | 3 | 0/0 | 0/0 | 3 |

### UNIT- I: INTRODUCTION                                                                          9 Hrs

Definition of a Robot – Basic Concepts –- Robot components –manipulator-configurations – joints- degree of freedom. Types of Robot Drives – Basic Robot Motion types – Point to Point Control – Continuous Path Control.

### UNIT- II:COMPONENTSANDOPERATIONS9 Hrs

Basic Control System Concepts – open loop and closed loop control-Control System Analysis – Robot Actuation and Feed Back, Manipulators – Direct and Inverse Kinematics, Co- ordinate Transformation – Brief Robot Dynamics, Types of Robot and Effectors – Grippers – Tools as End Effectors – Robot / End Effort Interface.

### UNIT- III: SENSING ANDMACHINEVISION                                          9Hrs

Range Sensing – Proximity Sensing – Touch sensing – Force and Torque Sensing. Introduction to Machine Vision – functions and applications.

### UNIT-IV:ROBOTPROGRAMMING 9Hrs

Methods – Languages –programming for pick and place applications-palletizing. Capabilities and Limitation – Artificial Intelligence – Knowledge Representation – Search Techniques – AI and Robotics.

### UNIT- V:ROBOT CELL DESIGNANDAPPLICATIONS                  9Hrs

Robot cell design-types and control. Applications of Robots –process Applications in welding and painting – Assembly applications– Material Handling applications.

## Total Hours: 45

### TEXT BOOK
1) K. S. Fu, R. C. Gonalez, C.S.G. Lee, "Robotics Control Sensing Vision and Intelligence", McGraw Hill International Edition,10987.

### REFERENCES
1) Mikell P. Groover, Mitchell Weiss, (2008) "Industrial Robotics, Technology, Programming and Application", Tata McGraw Hill International Editions,10986.
2) Richard D. Klafter, Thomas A. Chonieleswski and Michael Negin, (1989) "Robotic Engineering – An Integrated Approach", Prentice Hall Inc., Englewoods Cliffs, NJ, USA,109809.

*CSE - ARTIFICIAL INTELLIGENCE - REGULATION  2020-2021*

| Subject Code: | SubjectName: RENEWABLE SOURCESOF ENERGY | | Ty / Lb/ ETL | L | T / S.L r | P / R | C |
|---|---|---|---|---|---|---|---|
| BME18OE5/ BME20OE5 | **Prerequisite: Nil** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial    S Lr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** Students will learn
  ➢ The concept, principles and characteristics of different renewable energysystems.
  ➢ Energy conversiontechniques

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Knowledge on principles of solar energy and its measurement. |
|---|---|
| CO2 | Knowledge on Solar energy applications in various fields. |
| CO3 | Knowledge on Biomass and bioenergy conversions and wind energy. |
| CO4 | Knowledge on, Ocean Thermal energy, Geothermal energy |
| CO5 | Knowledge on Direct energy conversions like Thermo electric generator, MHD and Fuel cells |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | | | | | | | | | | |
| CO2 | | 3 | 3 | | | | | | | | | |
| CO3 | | | 2 | | | | | | | | | |
| CO4 | | | 2 | 2 | | 2 | 3 | | | 2 | 2 | 2 |
| CO5 | | | 2 | 2 | | 2 | 3 | | | 3 | 3 | 3 |

| COs / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 2 | | | | | |
| CO2 | 3 | | 3 | | 2 | | | |
| CO3 | 3 | | 2 | | | | | |
| CO4 | 3 | | 2 | | 2 | | | |
| CO5 | 3 | | 2 | | 2 | | 2 | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Techni | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | SubjectName: RENEWABLE SOURCESOF ENERGY | Ty / Lb/ ETL | L | T / S.Lr | P / R | C |
|---|---|---|---|---|---|---|
| BME18OE5/ BME20OE5 | **Prerequisite: Nil** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT- I PRINCIPLES OFSOLARRADIATION** 9Hrs

Role and Potential of new and renewable source, the solar energy option, Environmental impact of solar power,Solar constant, extra-terrestrial and terrestrial solar radiation, solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, solar radiation data.

**UNIT- IISOLARENERGY** 9Hrs

**SOLAR ENERGY** COLLECTION**:** Flat plate and concentrating collectors- classification- orientation and thermal analysis-advanced collectors.

**SOLAR ENERGY STORAGE:** Different methods, sensible, latent heat and stratified storage, solar ponds. Solar applications-solarheating/coolingtechniques,solardistillationanddrying,photovoltaicenergyconversion.

**UNIT- III WIND ENERGYANDBIOMASS** 9Hrs

WIND ENERGY: Sources and potentials, horizontal and vertical axis windmills, erformance characteristics. BIOMASS: Principles of Bio-Conversion, Anaerobic/aerobic digestion, types of Bio-Gas digestors, gas yield, combustion characteristics of bio-gas, utilization for cooking, I.C.Engine operation, economic aspects.

**UNIT- IV GEOTHERMAL, TIDAL ANDWAVEENERGY** 9Hrs

**GEOTHERMAL ENERGY**: Resources, types of wells, methods of harnessing OTEC: Principles, utilization, setting of OTEC plants, thermodynamic cycles.

**TIDAL AND WAVE ENERGY**: Potential and conversion techniques, mini hydel power plants, and their economics**.**

**UNIT- V: DIRECTENERGYCONVERSION** 9Hrs

Need for DEC, Carnot cycle, limitations, principles of DEC. Thermo-electric generators, MHD Power generators, principles, working, Fuel cells: principle, working -types - Selection of fuels and operating conditions.

## Total Hours: 45

**TEXT BOOKS**

1) G.D.Rai, (2004) "Non-Conventional Energy Sources" KhannaPublishers.
2) Ashok V Desai, (2003) "Non-Conventional Energy", Wiley Eastern.
3) K.M.Mittal, (2007) "Non-Conventional Energy Systems", WheelerPublishing.
4) Ramesh & Kumar, (2007) "Renewable Energy Technologies", Narosa PublishingHouse.

**REFERENCES**

1) Twidell & Weir, (2006) "Energy Sources", Taylor &Francis
2) Sukhame, (2009) "SolarEnergy".

# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br>BME18OE6/BME20OE6 | Subject Name : REFRIGERATION AND AIR CONDITIONING | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture  T:Tutorial     SLr : Supervised Learning  P : Project  R : Research  C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** Students will learn
- ➢ The working principle of refrigerators and air conditioningsystems.
- ➢ Different cycles used inrefrigeration.
- ➢ Alternate refrigerants to reduce global warming **.**

## COURSE OUTCOMES (COs) : ( 3- 5)

| CO1 | Knowledge on different type of refrigeration systems and properties of refrigerants. |
|---|---|
| CO2 | Knowledge on different types of controlling and balancing of refrigerating system components |
| CO3 | Knowledge on Pressure and temperature controlling and system balancing |
| CO4 | Knowledge on Psychometric properties and A/C systems |
| CO5 | Knowledge of Applications of cryogenic engineering in various Mechanical engineering fields |

## Mapping of Course Outcomes with Program Outcomes (POs)

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 | | 2 | 3 | 2 | | 1 | | |
| CO2 | 3 | 2 | 2 | 2 | | 2 | 3 | 2 | | 1 | | |
| CO3 | 3 | 2 | 2 | 2 | | 2 | 3 | 2 | | 1 | | |
| CO4 | 3 | 2 | 2 | 2 | | 2 | 3 | 2 | | 1 | | |
| CO5 | 3 | 2 | 2 | 2 | | 2 | 3 | 2 | | 1 | | |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | |
| CO2 | 3 | 2 | 2 | |
| CO3 | 3 | 2 | 2 | |
| CO4 | 3 | 2 | 2 | |
| CO5 | 3 | 2 | 2 | |

3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OE6/BME20OE6 | Subject Name : REFRIGERATION AND AIR CONDITIONING | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **Prerequisite: Nil** | **Ty** | **3** | **0/0** | **0/0** | **3** |

**UNIT- I: REFRIGERATION CYCLES AND REFRIGERANTS**                                           **9 Hrs**

Vapour Compression Réfrigération Cycle-Simple Saturated Vapour Compression Refrigeration Cycle. Thermodynamic Analysis of the above. Refrigerant Classification, Designation, Alternate Refrigerants, Global Warming Potential & Ozone Depleting Potential Aspects.

**UNIT- II: SYSTEM COMPONENTS**                                                              **9 Hrs**

Refrigerant Compressors – Reciprocating Open & Hermetic Type, Screw Compressors and Scroll Compressors – Construction and Operation Characteristics. Evaporators – DX Coil, Flooded Type Chillers Expansion Devices - Automatic Expansion Valves, Capillary Tube & Thermostatic Expansion Valves. Condensing UNIT-s and Cooling Towers.

**UNIT- III: CYCLING CONTROLS AND SYSTEM BALANCING**                                          **9 Hrs**

Pressure and Temperature Controls. Range and Differential Settings. Selection and Balancing of System Components-Graphical Method.

**UNIT- IV: PSYCHROMETRY & AIR CONDITIONING**                                                 **9 Hrs**

Moist Air Behavior, Psychrometric Chart, Different Psychrometric Process Analysis. Summer and Winter Air-conditioning, Cooling Load Calculations, Air Distribution Patterns, Dynamic and Frictional Losses in Air Ducts, Equal Friction Method, Fan Characteristics in Duct Systems.

**UNIT- V: INTRODUCTION TO CRYOGENIC ENGINEERING**                                            **9 Hrs**

Introduction to cryogenic engineering-applications of cryogenics in various fields-low temperature properties of materials- mechanical, thermal, electrical and magnetic properties- properties of cryogenic fluids-cryogenic fluid storage and transfer systems- cryogenic insulation.

## Total Hours: 45

**TEXT BOOKS**
1) W.F.Stocker and J.W.Jones, (2009) "Refrigeration & Air Conditioning", McGraw Hill Book. Company.
2) Randall F.Barron, (1985) "Cryogenic systems", Oxford University press.
**REFERENCES**

1) R.J.Dossat, (2005) "Principles of Refrigeration", John Wiley and Sons Inc., 6th edition.

2) Manohar Prasad, (2009) "Refrigeration and Air Conditioning", Wiley Eastern Ltd.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : COMPOSITE MATERIALS | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| BME18OE7/B ME20OE6 | **Prerequisite: Nil** | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** Students will learn
 ➤ Different composites and their manufacturingmethods
 ➤ Design parameters of composites
 ➤ To gain knowledge in need and applications of compositematerials.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Aware of different composites and their manufacturing methods |
|---|---|
| CO2 | Know the mechanics and performance of composite materials |
| CO3 | Understand the design parameters of composites |
| CO4 | Knowledge on moulding pultrusion ,filament winding |
| CO5 | Knowledge of Applications of statics mechanical in various Mechanical engineering fields |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | | 3 | | | 3 | | 3 | | | 2 |
| CO2 | 2 | 2 | 2 | 3 | | | | | 3 | | | 2 |
| CO3 | 2 | 2 | 2 | 3 | | | 3 | 3 | 3 | | | 2 |
| CO4 | | | | | | | | | | | | |
| CO5 | | | | | | 1 | | | | | | |

| Cos / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | | 3 | | 3 | | 2 | |
| CO2 | | | 3 | | 3 | | 3 | |
| CO3 | 1 | | 3 | | 3 | | | |
| CO4 | | | | | | | | |
| CO5 | | | | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Tech | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | ✓ | | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : COMPOSITE MATERIALS | Ty / Lb/ ETL | L | T / S. Lr | P / R | C |
|---|---|---|---|---|---|---|
| BME18OE7/ BME20OE6 | **Prerequisite: Nil** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT-I:INTRODUCTION9Hrs**                                                                    **9 Hrs**

Limitations of Conventional Materials- Definition of Composite Materials- Types and            Characteristics Applications.

**UNIT-II:MATERIALS**                                              **9Hrs**

Fibers- Materials- Fiber Reinforced Plastics- Thermo set Polymers- Coupling Agents, Fillers and Additives- Metal Matrix and Ceramics Composites.

**UNIT-III:MANUFACTURING**                                                          **9Hrs**

Fundamentals- bag moulding- compression moulding pultrusion- filament winding- other manufacturing process-quality inspection and non-destructive testing.

**UNIT- IV: MECHANICSANDPERFORMANCE**                                   **9Hrs**

Introduction to Micro-mechanics- Unidirectional Lamina-Laminates- Inter laminar Stress- Statics Mechanical Properties- Fatigue Properties- Impact Properties- Environmental Effects- Fracture Mechanics and Toughening mechanisms, Failure Modes

**UNIT-V:DESIGN**                                                               **9Hrs**

Failure Predictions- Design Considerations- Joint Design- Codes- Design Examples. Optimization of Laminated Composites- Application of FEM for Design.

# Total Hours: 45

**TEXT BOOKS**

1) P.K.Mallick, (2006) "Fiber-Reinforced Composites", Monal Deklatr Inc., NewYork.
2) B.D.Agrawal and L.J.Broutmam, (2006) "Analysis and Performance of Fiber Composites", John Wileyand Sons, New York.

**REFERENCES**

1)      Micael hyer, (1998) "Stress Analysis of Fiber- Reinforced Composite Materials", Tata McGrawHill.
2)      Ronald Gibson, (2007) "Principles of Composite Material Mechanics", Tata McGrawHill.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)
# OPEN ELECTIVE

# LABS

*CSE - ARTIFICIAL INTELLIGENCE - REGULATION  2020-2021*

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OL1/B ME20OL1 | SubjectName: INTERNALCOMBUSTION ENGINES & STEAMLAB | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Nil | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:** The student will learn
  ➢ To evaluate the performance of steam turbines and ICengines.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Knowledge on performance of steam turbines |
|---|---|
| CO2 | Knowledge on performance and heat balance test of diesel engines |
| CO3 | Knowledge on performance test of Petrol engines |
| CO4 | Knowledge on multi cylinder engine performance and Morse test |
| CO5 | Knowledge on performance  test of diesel engines with different fuels |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | P O9 | PO10 | PO11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | | 2 | 1 | | 2 | | | | | |
| CO2 | 3 | 1 | | 2 | | | 2 | | | | | |
| CO3 | 2 | | | 3 | | | 3 | | | | | |
| CO4 | 3 | 1 | | 2 | | | 2 | | | | | |
| CO5 | 2 | | | 3 | | | 3 | | | | | |

| Cos / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | 2 | | | | | |
| CO2 | 2 | | 2 | | | | | |
| CO3 | 2 | | 2 | | | | | |
| CO4 | 2 | | 2 | | | | | |
| CO5 | 2 | | 2 | | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | Open Elective Lab/ Practical | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✓ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code:<br><br>BME18OL1/<br>BME20OL1 | SubjectName: **INTERNALCOMBUSTION ENGINES & STEAMLAB** | Ty / Lb/<br><br>ETL | L | T /<br>S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | **Prerequisite: Nil** | **Lb** | **0** | **0/0** | **3/0** | **1** |

**LIST OF EXPERIMENTS:**

1. Study of IC engines components and loadingdevices.

2. Valve timing and port timing diagrams of 2stroke and 4stroke petrol and dieselengines

3. Performance test on single cylinder 4-stroke petrolengine.

4. Performance test on single cylinder 4-stroke dieselengine.

5. Heat balance test on 4-stroke single cylinder dieselengine.

6. Study of steam generators andturbines.

7. Performance and energy balance test on a steamgenerator.

8. Performance and energy balance test on a steamturbine.

9. Performance test on a steamcondenser

**Total  Hours: 45**

# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name : COMPUTER AIDED DESIGN AND ANALYSIS LAB | | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|---|
| BME18OL2/ BME20OL2 | Prerequisite: Nil | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES:**
- ➢ To get practical knowledge of modeling of various machine parts using Auto CAD and other modelingsoftware.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the benefits of computer aided design |
|---|---|
| CO2 | Understand the method of dimensioning and symbols |
| CO3 | Able to draw the machine parts in CATIA Software. |
| CO4 | Understand the knowledge on design packages (Solid works and CATIA Software's) |
| CO5 | To analyze the material properties and deflections (Ansys) |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 3 | | 2 | 2 | 3 | 3 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | H | | 2 | 2 | 3 | 3 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | | 2 | 2 | 3 | 3 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | | 2 | 2 | 3 | 3 | 2 |
| CO5 | 3 | 3 | 3 | 3 | 3 | H | | 2 | 2 | 3 | 3 | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | |
|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | | | | |
| CO4 | 3 | 3 | 3 | | | | |
| CO5 | 3 | 3 | 3 | | | | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic | Soft Skills | Open Elective Lab/ Practical | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✓ | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BME18OL2/ BME20OL2 | Subject Name : COMPUTER AIDED DESIGN AND ANALYSIS LAB | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Introduction to computer Aided Design and Drafting packages. 2D – Drawing using Auto CAD

2. Basic commands in AUTOCAD-Utility, draw, modify, and display commands. 2D sectional views, part drawing, assembly drawing, detailed drawing.

3. Dimensioning, annotations, symbols – Welding, Surface finish, threads, Text, Bill of Materials, Title Block.

4. Exercises – Knuckle joint, Gib & Cotter joint, Screw Jack, Foot step bearing. Orthographic views, Isometric views.

5. Solid modeling features-Boolean operations**.**

**Structural analysis of beams with different boundary conditions using FEA software**

**Total  Hours: 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| SubjectCode: BME18OL3/BME20OL3 | Subject Name: MECHANICAL MEASUREMENTS & METALLURGY LAB | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Nil | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T:Tutorial     SLr : Supervised Learning P : Project R : Research C:Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE**:
OBJECTIVES: Students will learn
- ➢ Linear and angular measurement methods
- ➢ Calibration of measuring instruments
- ➢ Micro structures of various ferrous and non ferrous materials using microscopes.
- ➢ Heat treatment processes of materials.

**course outcomes (cos) : ( 3- 5)**

| | |
|---|---|
| CO1 | Understand and apply the various instruments for linear measurements. |
| CO2 | Understand and apply the various instruments for angular measurements. |
| CO3 | Recent advances in metrology & Practical skill in handling precision instruments |
| CO4 | Knowledge of  microstructure analysis of  ferrous and non-ferrous materials |
| CO5 | Knowledge of  various  heat treatment process. |

**Mapping of Course Outcomes with Program Outcomes (Pos)**

| Cos/Pos | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | | | 2 |
| CO2 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | | | 2 |
| CO3 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | | | 2 |
| CO4 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | | | 2 |
| CO5 | 3 | 2 | 2 | 1 | 2 | 2 | 2 | 2 | 2 | | | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | | 2 | 2 | 3 |
| CO2 | | 2 | 2 | 3 |
| CO3 | | 2 | 2 | 3 |
| CO4 | | 2 | 2 | 3 |
| CO5 | | 2 | 2 | 3 |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | Open Elective Lab/ Practical | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | | | ✓ | | |

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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| SubjectCode: | Subject Name: MECHANICAL MEASUREMENTS & METALLURGY LAB | Ty / Lb/ ETL | L | T / S.Lr | P/ R | C |
|---|---|---|---|---|---|---|
| BME18OL3/BME20OL3 | Prerequisite: Nil | Lb | 0 | 0/0 | 3/0 | 1 |

## MEASUREMENTS LAB EXPERIMENTS
1. Measurement of Dimensions using Vernier HeightGauge
2. Measurement of Dimensions using Vernier DepthMicrometer
3. Measurement of Gear Nomenclature using Gear ToothVernier
4. Angular Measurement using Vernier Height Gauge and SineBar
5. Angular Measurement using Sine Bar, Slip Gauge and DialGauge
6. Thread Measurement using ProfileProjector
7. Measurement of Dimensions using Tool MakersMicroscope
8. Angular measurement using BevelProtractor
9. Calibration of Dial Gauge using SlipGauge
10. Flatness of given work piece usingAutocollimator

## STUDY EXPERIMENTS
1. Introduction tometallurgy
2. Specimenpreparation
3. Metallurgical microscope
4. Iron carbonsystem
5. Time temperature transformation diagram(TTT)

## MICROSTRUCTURE ANALYSIS
1. Brass
2. Copper
3. Graycast-iron
4. Malleablecast-iron
5. Nodular iron
6. Mild-steel, Stainless-steel and High speedsteel

## HEAT TREATMENT PROCESS
1. Jominey quenchtest
2. Hardness ofsteel
3. Creeptest

**Total  Hours: 45**

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# COMPUTER SCIENCE AND ENGINEERING (ARTIFICIAL INTELLIGENCE)
## Dr APJ Abdul Kalam Center for Research

**Dr.A.P.J Abdul Kalam CoE in Innovation & Entrepreneurship**

| Subject Code : BMG18OE1/BMG20OE1/ BMG13E12/BMG20E12 | Subject Name : **TECHNICAL ENTREPRENEURSHIP** | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite : None | ETL | 2 | 0/1 | 2/0 | 3 |

L : Lecture  T : Tutorial  SLr : Supervised Learning  P : Project  R : Research  C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES : At the end of the course the learner will be able to
- **Identify their flow & run interview to understand customers views.**
- **Do market analysis & create solutions for the identified problems**
- **Differentiate start up and small business & Understand the basics of lean approach**
- **Study the expectations of customers and investors, and interpret the revenue streams**
- **Articulate an effective pitch and understands how to manage risks.**

**COURSE OUTCOMES (Cos) : (3 – 5)Students completing the course were able to**

| | |
|---|---|
| CO1 | **Identify Business Opportunity, Understand Problems & Provide solutions & carry out Design Thinking Process.** |
| CO2 | **Differentiate Customer & Consumer and prepare Value proportion canvas, types of Business models** |
| CO3 | **Interpret Industrial needs, carry out competitive analysis & perform product market fit test** |
| CO4 | **Analyze primary & secondary revenue streams & opt for different pricing strategies** |
| C05 | **Compose positioning statement for the product & build digital presence, planning & budgeting** |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | | | | | | 2 | | | 2 | | | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | | 3 | 2 | 3 | |
| CO3 | 3 | 3 | 3 | 2 | 2 | 2 | | | | 2 | 1 | |
| CO4 | 2 | | 2 | | 2 | 1 | | 3 | | 3 | | |
| CO5 | 3 | 3 | 3 | 3 | 3 | 2 | | | 2 | 2 | | |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | | 2 | 2 | |
| CO2 | | 2 | 2 | |
| CO3 | | 2 | 2 | |
| CO4 | | 2 | 2 | |
| CO5 | | 2 | 2 | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | √ | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code : BMG18OE1/BMG20OE1/ | Subject Name : **TECHNICAL ENTREPRENEURSHIP** | Ty/ Lb/ ETL | L | T/ SL r | P/R | C |
|---|---|---|---|---|---|---|
| BMG13E12/BMG20E12 | Prerequisite : None | ETL | 2 | 0/1 | 2/0 | 3 |

**UNIT –I        DISCOVER YOURSELF & IDENTIFY PROBLEMS WORTH SOLVING        9 hrs**

Effectuation – Find your flow – Entrepreneurial style – How to identify Business opportunity -  find problems worth solving – Methods of finding & understanding problems -  How to run problem interview to understand customer's world view – Design thinking – Process & examples – Idea Generation (DISRUPT) – GOOTB
.

**UNIT –II        CUSTOMER SEGMENT, VALUE PROPORTION & LEAN CANVAS        9 hrs**

Difference between consumer and customer – Market types – Segmentation & Targeting – Defining the personas – understanding early adopters & customer adoption pattern – early innovators for startups – creative solutions for identified problems – Deep dive into gains, pains & jobs to be done (value proportion canvas) – identify UVP using VPC – outcome driven innovation (I min customer pitch) – Basics of Lean approach & Canvas – Types of business models.

**UNIT –III        SIZING THE OPPURTUNITY & MVP        9 hrs**

Introduction to risks –Documents & assumptions – Build solution – Does the solution solve customer problems – Problem – solution test – Difference between a start up venture & small business – industry analysis – competition analysis – Blue ocean strategy – building MVP (document & validation of assumptions – lean feedback loop & MVP/Javelin board – MVP interviews – product market fit test

**UNIT –IV        REVENUE STREAMS        9 hrs**

Basics of how companies make money – income, cost, gross and net margin – primary and secondary revenue streams – value, price & costs – different pricingstrategies – product costs & unit costs – basics of unit costs – finance for business ideas – various sources of funds & its pros and cons – investor expectations – pitching to investors & corporates – shared leadership – role of good team venture's success – roles & responsibilities – pitch a candidate to join a start up – collaboration tools and techniques

**UNIT – V        MARKETING & SALES        9 hrs**

Difference between product brand & link between them – positioning statement for the product – building digital presence and leveraging social media – creating company profile page – measure effectiveness of  selected channels – budgeting and planning – sales planning – targets – USP – art of sales pitch     - follow  up  and  closing sale – importance of project management – work flow – delegation of tasks – basics of business regulationsof starting and operating business – compliance and proper documentation.

PRACTICAL COMPONENT : CAPSTONE PROJECT PRESENTATION & EVALUATION

ADDITIONAL SKILL REQUIREMENT :ONE MODULE THROUGH UEDEMYSUCH AS PYTHON OR .ASP OR ROBOTICS OR ANY OTHER COURSE THAT IS DEEMED ESSENTIAL.

**TotalHours : 45**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code : BMG18OE2/BMG20OE2 | Subject Name :**ADVANCED PROGRAM IN ENTREPRENEURSHIP** | Ty/ Lb/ ETL | L | T/ SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite : WF201 | ETL | 2 | 0/1 | 2/0 | 3 |

L : Lecture T : Tutorial  SLr : Supervised Learning P : Project  R : Research  C: Credits
T/L/ETL : Theory / Lab / Embedded Theory and Lab

OBJECTIVES :
- **Understand basics of budgeting and planning**
- **Relook the problem statement and refine the solution**
- **Understand the need for sales pitching**
- **Analyze optimizing cost and operational expenses**
- **Identify the financial, technological needs to develop the business**

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course were able to

| CO1 | **Revisit their business models and improve their business ideas.** |
|---|---|
| CO2 | **Explore various revenue streams, new channels & partnerships** |
| CO3 | **Test the price elasticity & analyze financial modeling** |
| CO4 | **Understand how to build teams beyond founders** |
| C05 | **Use technology to build and grow business** |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 2 | | 3 | | 3 | 3 | | 1 |
| CO2 | | | 3 | 2 | | | 2 | | | | 3 | |
| CO3 | | | 3 | | 2 | | | | | | 3 | |
| CO4 | | | 3 | 2 | 2 | 2 | 2 | 2 | 3 | | | 1 |
| CO5 | 3 | | 3 | 2 | 3 | 2 | | 1 | | 3 | | 2 |

| Cos / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | | 2 | 2 | |
| CO2 | | 2 | 2 | |
| CO3 | | 2 | 2 | |
| CO4 | | 2 | 2 | |
| CO5 | | 2 | 2 | |

**3/2/1 indicates strength of correlation   3 – High, 2 – Medium,  1 – Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | √ | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code : BMG18OE2/BMG20OE2 | Subject Name :**ADVANCED PROGRAM IN ENTREPRENEURSHIP** | Ty/ Lb/ ETL | L | T/ SL r | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite : WF201 | ETL | 2 | 0/1 | 2/0 | 3 |

**UNIT –I        GROWTH, EXPANSION & SCALING                         9 hrs**

        Growth stage and start up phase – revisiting business model and develop few variants – additional customer segments – evaluation of business models for new customer segments – relook of problem statement and repositioning for scalability – additional ways to monetize.
.

**UNIT –I          SCALING & STRATEGY                              9 hrs**

        Gain traction beyond early customer – defining and measuring traction – cost of new customer acquisition – customer life time value – identify wastes and what's important  for traction – bullseye framework – identifying channels – measurement of effectiveness of selected channels

**UNIT –III     SALES PLANNING                                  9 hrs**

        Budgeting & Planning – stabilizing key revenue streams – additional revenue streams – exploring new channels and partnerships – sales planning and setting targets – unique sales proportion – art of sales pitch – building a professional team – sales compensation and incentives

**UNIT – IV        FINANCIAL MODELLING                          9 hrs**

        testing price elasticity – optimizing cost and operational expenses – advanced concepts in unit costing – financial modeling of venture growth – analyzing competitor and peer's financial models – various sources of funding – investors and lenders expectations - pitch practice – Building teams beyond founders – basics of compensation, incentives and stock options

**UNIT – V        TECHNOLOGY PLANNING                              9 hrs**

        Identify technology needs – cost of using technology to build and grow the business – Technology as a differentiator and competitive weapon – overview of legal issues – importance of getting professional help – importance of being compliant and keeping  proper documentation – patents and intellectual property  - trademarks

PRACTICAL COMPONENT : CAPSTONE PROJECT – PITCH YOUR VENTURE

                                        **Total Hours: 45 Hrs**

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

**Open Electives-ECE**

| Subject Code: BEC18OE1/BES20OE1 | Subject Name :Internet of Things and its Applications | | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | T | 3 | 0/0 | 0/0 | 3 |

L : Lecture  T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To study basics of IoT.
- To study IoT with Cloud environment.
- To study IoT applications.

**COURSE OUTCOMES (COs) : ( 3- 5)**
The students will be able to

| CO1 | Explore basics concepts of technology of IoT |
|---|---|
| CO2 | Understand different IoT domains. |
| CO3 | Manage system data in cloud environment |
| CO4 | Interface embedded system with IoT |
| CO5 | Learn new applications based on IoT. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 1 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | | | | |
| CO2 | 3 | 3 | 2 | 3 | | | | |
| CO3 | 3 | 3 | 2 | 3 | | | | |
| CO4 | 3 | 3 | 2 | 3 | | | | |
| CO5 | 2 | 3 | 1 | 3 | | | | |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills | Category | Basic Sciences | Engg Sciences |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE1/BEC20OE1 | Subject Name :Internet of Things and its Applications | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | T | 3 | 0/0 | 0/0 | 3 |

**UNIT I    INTRODUCTION TO INTERNET OF THINGS                              9 Hrs**

Definition and Characteristics of IoT – Things in IoT – IoT Protocols – Logical Design of IoT – IoT enabling technologies – IoT Levels.

**UNIT II     DOMAIN SPECIFIC IoT                                                  9 Hrs**

Home Automation – Cities – Environment – Energy – Retail – Logistics – Agriculture – Industry – Health and Life style–SDN and NFV for IoT.

**UNIT III    IoT SYSTEM MANAGEMENT AND CLOUD                           9Hrs**

Need for IoT System Management  - SNMP – NETOPEER – IoT design methodology -  Xively – Django- Amazon Web for IoT – SkyNetIoT.

**UNIT IV     IoT PHYSICAL DEVICES                                              9Hrs**

Raspberry Pi - Raspberry Pi Interfaces – Arduino boards – Other IoT devices –Intel Galileo Arduino board Specification.

**UNIT V           IoT APPLICATIONS              9 Hrs**

 Applications based on IoT - Smart Cities -Smart Home and Buildings -Smart Energy and the Smart Grid - Smart Health-  Smart Transportation and Mobility

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**

                                                                        **Total Hours: 45**

**Textbooks:**

1. ArshdeepBahga.Vijaymadisetti ,*" Internet of things – A hands- on approach "* , Universities press, First Editon, 2015.
2. Adrian McEwen and Hakim Cassimally, "*Designing the Internet of Things*",Wiley,First edition 2014.
3. C HillarGastn, "*Internet of Things with Python*",Packt publishing, first edition ,2016.

**Reference Books:**

1. *Dominique D. Guinard and Vlad M. Trifa "Building the Web of Things With examples in Node.js and Raspberry Pi",June 2016 ISBN 9781617292682*
2. *CharalamposDoukas, "Building Internet of Things with the Arduino" ISBN/EAN13:1470023431 / 9781470023430*
3. *Gastón C. Hillar, "Internet of Things with Python", May 2016 , PACKT Publishing limited.*
4. *Marco Schwartz "Internet of Things with the Raspberry Pi: Build Internet of Things Projects Using the Raspberry Pi Platform", Kindle Edition.*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE2/BEC20OE2 | Subject Name : Cellular Mobile Communication | T /L/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Communication system, Computer Networks | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial  SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- It deals with the fundamental cellular radio concepts such as frequency reuse and hand off.
- It presents different ways to radio propagation models and predict the large scale effects of radio propagation in many operating environment.

**COURSE OUTCOMES (COs) : ( 3- 5)**
The students will be able to

| | |
|---|---|
| CO1 | Interpret basic concepts in mobile communication. |
| CO2 | Apply the concepts in establishing a PSTN. |
| CO3 | Recognize basic concepts in cellular technology. |
| CO4 | Analyze different propagation models for improving system coverage. |
| CO5 | Examine the latest wireless systems and standards. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 1 | 3 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 1 | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 1 | 1 | 3 | 3 | 2 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 | 3 | 3 |
| CO5 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 2 |
| CO2 | 3 | 3 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 3 | 2 | 3 |
| CO5 | 3 | 3 | 3 | 3 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engg Sciences | Humanities & Social Sciences | Program core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skills | Soft Skills | Category | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE2/BEC20OE2 | Subject Name : Cellular Mobile Communication | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: Communication system, Computer Networks | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        INTRODUCTION TO MOBILE COMMUNICATION                9 Hrs**
History and Evolution of mobile radio system – Types of mobile wireless system/services – Paging, cellular, WLL , FTTH, Wi-Fi, and Future trends in Personal wireless system.

**UNIT II      PSTN TECHNOLOGY                                                             9 Hrs**
Difference between simplex, half-duplex and duplex transmissions – basic understanding of telephone set – history and evolution of Central Exchange Switching – Operator Switch Boards (PBX) – intraoffice and interoffice calls – Extended Area Service (EAS) – circuit switching, packet switching & TDM switching – DTMF signaling – dial register – in band & out-of-band signaling.

**UNIT III    CELLULAR CONCEPT                                                           9 Hrs**
Structure of a cell – Basic cellular terminologies – Principle of Frequency Reuse – Principle of Channel assignment and its types – Types of channel interference – Different types of handoff strategies

**UNIT IV        INTERFERENCE AND MOBILE RADIO COMMUNICATION        9 Hrs**
Interferences in Cellular Systems – Methods to improve cell coverage - Free space propagation model, reflection, diffraction, scattering, link budget design, Outdoor Propagation models and Indoor propagation models

**UNIT V          WIRELESS SYSTEMS AND STANDARDS                        9 Hrs**
GSM, IS-95, DECT, AMPS, GPRS, UMTS, WLAN, WPAN, WMAN, Ultra Wideband communications, 4G/LTE and beyond 4G.Telecom standards and wireless standards.

**Practical component P : Include case studies / application scenarios**
**Research component R : Future trends / research areas / Comparative Analysis**

**Total Hours: 45**

**TEXT BOOKS**

1.    Marion Cole, "Introduction to Telecommunications: Voice, Data and Internet", Pearson Education, 2nd edition, 2008.
2.    Anu A. Gokhale, "Introduction to Telecommunications", Delmar, 2nd edition, 2005.
3. T.S. Rappaport, "Wireless Communication, Principle and Practice", Prentice Hall, NJ, 1996
4. Roy Blake," Wireless Communication technology", Thomson Learning, 1st Edition 2001

**REFERENCES**

1.   *Pete Moulton, Jason Moulton, "The Telecommunication Survival Guide", Pearson Education, 2001.*
2.   *Roger L. Freeman, "Telecommunication System Engineering", Wiley-India, 4th edition, 2004.*
3.   *W.C.Y.Lee, "Mobile Communication Engineering", (2/e), McGraw- Hill, 1998.*
4.   *Dharma P. Agarwal," Introduction to wireless and Mobile systems", Thomson Learning, II Edition, 2006*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE3/BEC20OE3 | Subject Name :Satellite and its Applications | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To learn the basics of spacecraft subsystem
- To understand the operation of domestic satellite system
- To apply the principle of satellite in remote sensing technology

**COURSE OUTCOMES (COs) :**
The students will be able to

| CO1 | Understand the principle of orbital mechanics |
|---|---|
| CO2 | Understand the elements of satellite system |
| CO3 | Analyze the various domestic satellite systems |
| CO4 | Apply the concepts in designing earth station |
| CO5 | Appraise the applications of satellites in remote sensing |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | | | 2 | | 3 | | | | 2 | 3 | |
| CO2 | 3 | 3 | | | | | 3 | | 3 | | | 2 |
| CO3 | 3 | | | | | 2 | | 3 | | 3 | | |
| CO4 | 3 | | 3 | | 2 | | | | | | | 3 |
| CO5 | 3 | | | 3 | | | | | 2 | | | |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | | 2 | |
| CO2 | 3 | 3 | | 2 |
| CO3 | 3 | | 2 | |
| CO4 | | 3 | | 3 |
| CO5 | 3 | | | 3 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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*CSE - ARTIFICIAL INTELLIGENCE - REGULATION  2020-2021*

# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

Dr.M.G.R.
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE3/BEC20OE3 | Subject Name :Satellite and its Applications | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I    ELEMENTS OF ORBITAL MECHANICS**                     **9 Hrs**

Kepler's laws of planetary motion - Newton's laws of gravitation- Orbital Equation- Orbital Elements- Orbital Perturbation; Tracking and Orbital Determination- Orbital Correction / Control

**UNIT II ELEMENTS OF SATELLITE SYSTEM**                     **9 Hrs**

Space Environment- Spacecraft Configuration- Spacecraft Subsystem- Payload- Reliability Consideration – Spacecraft Integration and Testing.

**UNIT III    DOMESTIC SATELLITE SYSTEMS AND LAUNCH VEHICLES**        **9 Hrs**

The INSAT System- International System: INTELSAT- IMMARSAT- Satellite Based Personal Communication- LEO- MEO- GEO Systems- PSLV and GSLV

**UNIT IV EARTH STATION DESIGN**                     **9 Hrs**

Earth Station Configuration- Receiver and Transmitter Subsystems- Terminal Equipment: Telephone / Video Interface-Echo Suppressor- FM Digitizers- Elements of Frequency Co-ordination and Control.

**UNIT V APPLICATIONS OF SATELLITES**                     **9 Hrs**

Satellite Broadcasting- Satellite TV Systems.Remote sensing satellites - satellite remote sensing in various important areas- such as environmental issues- agriculture- forestry- urban issues and water management - usage of satellite data models in remote sensing- analysis of data from various climate zones and applications in research and society.

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**

**Total Hours: 45Hrs**

**TEXT BOOKS:**
        1. T. Pratt and C.W. Bostian, "*Satellite Communication*"  John Wiley & Son- 1986.
        2. A. Abdul Namith, "*Satellite Communication*" Lakshmi Publications.
**REFERENCES:**
        1. *B.N. Agarwal, "Design of Geosynchronous Spacecraft" ,prentice Hall- 1986.*
        2. *D. Roddy,  "Satellite Communication" , Prentice Hall- 1989.*
        3. *M. Richharia "Satellite Communication Systems Design Principles" Macmillan Press Ltd.Second Edition 2003.*
        4. *http://www.ceinsys.com/blog/applications-of-satellite-imagery-remote-sensing-data/*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name :Fundamentals of Sensors | T / L/ ETL | L | T/S Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BEC18OE4/ BEC20OE4** | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Tounderstandbasic fundamentals of sensor.
- To study sensor characteristics.
- To understand sensor properties of elements.

**COURSE OUTCOMES (COs) :**
The students will be able to

| CO1 | Interpret basics of sensors. |
|---|---|
| CO2 | Recognize sensor characteristics. |
| CO3 | Demonstrate sensor properties. |
| CO4 | Explain principles of sensing. |
| CO5 | Study various sensor elements. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PO 12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 | 2 | 1 | 2 | 1 | 1 | 2 | 2 | 2 |
| CO2 | 3 | 2 | 2 | 3 | 2 | 1 | 2 | 1 | 2 | 2 | 2 | 2 |
| CO3 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 3 |
| CO4 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 3 |
| CO5 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 2 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | |
|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 | | |
| CO2 | 3 | 2 | 2 | 3 | | |
| CO3 | 3 | 3 | 2 | 3 | | |
| CO4 | 3 | 3 | 2 | 3 | | |
| CO5 | 2 | 2 | 3 | 3 | | |

**3/2/1 indicatesM Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: | Subject Name :Fundamentals of Sensors | T / L/ ETL | L | T/S Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BEC18OE4/ BEC20OE4** | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI        SENSOR FUNDAMENTALS**                                                        **9 Hrs**

Basic Sensor Technology - Sensor Systems - Sensor Characteristics - Signals, and Systems    - Sensor Classification

**UNITII        SENSOR CHARACTERISTICS**                                                   **9 Hrs**

Transfer Function - Span (Full-Scale Input) - Full-Scale Output – Accuracy- Calibration  --Calibration Error –Hysteresis – Nonlinearity - Saturation

**UNITIII    SENSOR PROPERTIES**                                                          **9 Hrs**

Repeatability  -  Dead Band – Resolution -Special Properties - Output Impedance - Excitation .- Dynamic Characteristics - Environmental Factors - Reliability

**UNITIV    PHYSICAL PRINCIPLES OF SENSING**                                          **9 Hrs**

Electric Charges, Fields, and Potentials -  Capacitance – Magnetism – Induction – Resistance - Piezoelectric Effect -

**UNITV   SENSOR ELEMENTS**                                                              **9 Hrs**

Mechanical Elements  - Thermal Elements  - Electrical Elements   - Application Characteristic  - Uncertainty

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**


                                                        **Total Hours: 45**


 **TEXTBOOKS:**
1) Jacob Fraden, "Handbook Of Modern Sensors Physics, Designs, And Applications"
2) Jon S. Wilson," Sensor Technology Handbook
 **REFERENCEBOOKS:**
1*) Ian Sinclair , " Sensors and Transducers" eBook ISBN: 9780080516998
Hardcover ISBN: 9780750649322*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE5 /BEC20OE5 | Subject Name :Basics of Microprocessor and Microcontroller | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To study the architecture, addressing modes, and assembly language program of 8085 microprocessor.
- To understand the concepts of different peripherals and their applications
- To learn the functions of 8051 microcontroller.

**COURSE OUTCOMES (COs) :**
The students will be able to

| | |
|---|---|
| **CO1** | Write assembly language program in 8085 and 8086 and understand the design of advanced processors. |
| **CO2** | Show their ability to interface peripherals with microprocessors |
| **CO3** | Done the inferenceof advanced peripheral with 8085. |
| **CO4** | Demonstrate their skills in writing an ALP in 8051. |
| **CO5** | Apply their understanding to do a project to develop an application using8085. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 2 | 2 | 3 | | - | | 2 | 2 | - |
| **CO2** | 3 | 3 | 3 | 3 | 3 | 3 | | 2 | | 2 | 2 | 2 |
| **CO3** | 2 | 2 | 2 | 2 | 3 | 3 | 2 | 3 | | 2 | 3 | 2 |
| **CO4** | 3 | 3 | 3 | 3 | 3 | - | 2 | 3 | | 2 | - | 3 |
| **CO5** | 3 | 2 | - | 2 | 2 | 2 | 3 | - | 3 | 2 | 3 | 3 |

| COs / PSOs | PSO1 | | PSO2 | | PSO3 | | PSO4 | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | | 3 | | 2 | | | | | | | |
| **CO2** | 3 | | 3 | | | | 2 | | | | | |
| **CO3** | 2 | | 3 | | | | | | | | | |
| **CO4** | 3 | | 2 | | | | 3 | | | | | |
| **CO5** | | | | | 2 | | 3 | | | | | |

**3/2/1 indicatesM Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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| Approval | | | | | | | | | | | | |

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# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE5/BEC20OE5 | Subject Name :Basics of Microprocessor and Microcontroller | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT-I       8085 CPU                                    9 Hrs**
Internal Architecture of 8085 microprocessor – Instruction set – Addressing modes – 8085 interrupts – Timing diagram – Assembly level programming.

**UNIT  II      PHERIPHERALS INTERFACING                  9 Hrs**
USART (8251) – Programmable interval timer (8353/8254) programmable peripheral interface (8255) – CRT controller (8275/6845) – Floppy disk controller (8272).

**UNIT III      ADVANCED PHERIPHERALS INTERFACING          9 Hrs**
Programmable DMA controller (8257) – Programmable Interrupt controller (8259) – Keyboard display interface (8279) – ADC/DAC interfacing.

**UNIT IV8051 MICROCONTROLLER                              9 Hrs**
 8051 Microcontroller hardware  and Architecture –I/O pins, Ports and circuits–Counters and

 Timers-Serial Data I/O – Interrupts - 8051 Instruction set – Addressing Modes –Assembly

 Language Programming.

**UNIT V       8085 APPLICATIONS                           9 Hrs**
Typical application of 8085 – Stepper motor controls – Traffic light controls – waveform generation – Analog interfacing and industrial control – Microcomputer based system with seven segment displays and switches.

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**

**Total  Hours: 45**

**TEXT BOOKS :**
1. Ramesh s. Gaonkar, Microprocessor Architecture Programming and Applications with 8085. Fourth edition, Penram international publishing 2000.
2. Douglas V. Hall, microprocessor and interfacing, programming and hardware, Tata McGraw Hill, second edition 1999.

**REFERENCES:**
1. *A.K.Ray and K.M.Burchandi ,"Intel Microprocessors Architecture Programming and Interfacing" McGraw Hill International edition, 2000.*
2. *Kenneth Jayala, "The 8051 Microcontroller Architecture Programming andAapplication" ,2nd edition ,Penram International publishers (India), New Delhi,1996.*
3. *M.RafiQuazzaman, "Microprocessors Theory and Applications", Intel and Motorola prentice Hall of India*

, *Pvt. Ltd., New Delhi, 2003*

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE6/BEC20OE6 | Subject Name :Industry 4.0 Concepts | | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Students will demonstrate an understanding of the fundamentals of the core areas in Industry 4.0.
- Students will gain deep insights into how smartness is being harnessed in industries

**COURSE OUTCOMES (COs) : ( 3- 5)**
The Students will be able to

| CO1 | Understand the opportunities and challenges in the fourth industrial revolution. |
|---|---|
| CO2 | Describe, discuss and relate IoT techniques adopted for an industry. |
| CO3 | Demonstrate the importance of various technologies involved in enabling industry 4.0. |
| CO4 | Analyze the power of Cloud Computing in a networked economy. |
| CO5 | Interpret technologies available in IoT. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO4 | 3 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |
| CO5 | 2 | 2 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | | | | |
| CO2 | 2 | 2 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |
| CO4 | 2 | 2 | 3 | 3 | | | | |
| CO5 | 2 | 2 | 3 | 3 | | | | |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OE6/BEC20OE6 | Subject Name :Industry 4.0 Concepts | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I        Introduction to Industry 4.0                                         9 Hrs**

The various Industrial Revolutions – Digitalization and the Networked Economy – Drivers, Enablers, Compelling Forces and Challenges for Industry 4.0 – The Journey so far: Developments in USA, Europe, China and other countries – Comparison of Industry 4.0 Factory and Today's Factory – Trends of Industrial Big Data and Predictive Analytics for Smart Business Transformation.

**UNIT II        Road to Industry 4.0                                                   9 Hrs**

Internet of Things (IoT) & Industrial Internet of Things (IIoT) & Internet of Services – Smart Manufacturing – Smart Devices and Products – Smart Logistics – Smart Cities – Predictive Analytics

**UNIT III        Technologies for enabling Industry 4.0                        9 Hrs**

Cyber physical systems – Robotic Automation and Collaborative Robots – Support System for Industry 4.0 – Mobile Computing – Related Disciplines – Cyber Security.

**UNIT IV        Resources                                                                  9 Hrs**

Resource- based view of a firm – Data as a new resource for organizations – Harnessing and sharing knowledge in organizations – Cloud Computing Basics – Cloud Computing and Industry 4.0 – Smart Factories

**UNIT V        IoT Technologies                                                          9 Hrs**

Industry 4.0 laboratories –IIoT Reference Architecture – Designing Industrial Internet Systems – Examining the Middleware Transport Protocols – IIoT WAN Technologies and Protocols  - Securing the Industrial Internet.

**Practical component P : Include case studies / application scenarios**

**Research component R : Future trends / research areas / Comparative Analysis**

**Total  Hours: 45**

**TEXT BOOKS:**
1. Alp Ustundag and Emre Cevikcan, "*Industry 4.0: Managing the Digital Transformation*", Springer Series in Advanced Manufactruing.
2. Alasdair Gilchrist, "*Industry 4.0: The Industrial Internet of Things*", Apress Publications.

**REFERENCES:**
1. *Rajesh Agnihotri and Samuel New, "Industry 4.0 Data Analytics" , Createspace*Independent Pub (US)

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)
## OPEN LAB

| Subject Code: BEC18OL1/BEC20OL1 | Subject Name :Sensors and IoT Lab | | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Lb | 0 | 0/0 | 3/0 | 1 |

**L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits**
**T/L/ETL : Theory/Lab/Embedded Theory and Lab**

**OBJECTIVE :**
- **To design experiments based on sensor with IOT.**
- **To design experiments based on IOT with cloud environment.**

**COURSE OUTCOMES (COs) : ( 3- 5)**
**The Students will be able to**

| CO1 | Implement C source code to interface sensors with IOT. |
|---|---|
| CO2 | Design simple projects using different types sensors. |
| CO3 | Interface sensor date with cloud environment. |
| CO4 | Implement using sensors an application. |
| CO5 | Design new applications using different sensors. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 3 |
| CO2 | 3 | 2 | 2 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 3 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 2 | 3 | 3 |
| CO5 | 3 | 2 | 3 | 3 | 3 | 1 | 2 | 1 | 2 | 2 | 3 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | | | | |
| CO2 | 3 | 3 | 2 | 3 | | | | |
| CO3 | 3 | 3 | 2 | 3 | | | | |
| CO4 | 3 | 3 | 1 | 3 | | | | |
| CO5 | 3 | 3 | 1 | 3 | | | | |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OL1/BEC20OL1 | Subject Name :Sensors and IoT Lab | T /L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. To familiarize with Intel Galileo Gen2 board and understand the procedure of creation and compilation of C source code. (Pre-Loaded Examples)

2. Write a code to control the Brightness of LED usingIntel Galileo Gen 2 board.

3. To write C source code to Interface Temperature Sensor with Intel Galileo Gen 2 and display the temperature on serial Monitor.

4. To write C source code to Interface Humidity Sensor with Intel Galileo Gen 2 and display the temperature on serial Monitor.

5. Interface Motion sensor, with Intel Galileo Gen 2 to give alert when motion is detected.

6. To write C source code to Interface Sound Detector with Intel Galileo Gen.

7. To write C source code to Interface accelerometer with Intel Galileo Gen 2 and display the values in serial monitor.

8. To write C source code to Perform Gas Sensor Interfacing with Intel Galileo Gen2 Board.

9. To Interface a Flame and Smoke sensor with Intel Galileo Gen 2 in cloud service.

10. Design a smart Lighting system using Light sensor, Motion sensor and indicate the status of the light in cloud service.

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## COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OL2/BEC20OL2 | Subject Name :Robotics Control Lab | | T /L/ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial   SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- To understand the different robotic configurations and their subsystems.

**COURSE OUTCOMES (COs) : ( 3- 5)**
The Students will be able to

| CO1 | Built  simple robots using motor driver IC and sensor module. |
|---|---|
| CO2 | Apply programming knowledge to interface various devices with arduino. |
| CO3 | Design robots using timer and delay |
| CO4 | Develop and measure the performance of robots. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 2 | 2 | 2 | 2 | 2 | 3 | 2 | 1 | 2 |
| CO2 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 1 | 2 | 2 |
| CO3 | 3 | 3 | 3 | 2 | 3 | 2 | 2 | 1 | 3 | 2 | 2 | 2 |
| CO4 | 3 | 3 | 3 | 3 | 3 | 1 | 2 | 2 | 3 | 1 | 2 | 2 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 3 |
| CO2 | 3 | 3 | 2 | 3 |
| CO3 | 3 | 2 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 |

**3/2/1 indicates Strength of Correlation    3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OL2/BEC20OL2 | Subject Name :Robotics Control Lab | T /L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

**LIST OF EXPERIMENTS**

1. Simple Robot circuit

2. Build a Light-Tracking Robot

3. Simple Insect Robot

4. Line follower Robot

5. Two-Legged Walking Robot

6. Robot Control using 555 Timer

7. Study of AVR Studio and code Debugging

8. Interfacing Switch to turn on Bar graph LEDs. (Implementing a "Push to ON" indicator)

9. LCD Interfacing to display alphanumeric characters.

10. LCD Interfacing to displaying integer values on the LCD.

11. Generation of delay using timer and turning 'ON' the buzzer

12. Indication of the value of counter on LCD

13. DC Motor Interfacing

14. PWM control of the DC motor

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OL3/B EC20OL3 | Subject Name : Basics of  MATLAB | | T / L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: | | Lb | 0 | 0/0 | 3/0 | 1 |

L : Lecture T : Tutorial    SLr : Supervised Learning  P : Project  R : Research C: Credits
T/L/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVE :**
- Be familiar with the MATLAB GUI and basic tool boxes
- Be exposed to vector and matrix operations
- Be familiar with arithmetic, logical and relational operations on matrix

**COURSE OUTCOMES (COs) : ( 3- 5)**
The Students will be able to

| | |
|---|---|
| CO1 | Adopt the MATLAB GUI and basic tool boxes |
| CO2 | Identify vector and matrix operations |
| CO3 | Illustrate withprogramming  arithmetic, logical and relational operations on matrix |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 2 | 3 | 1 | 2 | 2 | 3 | 3 | 3 | 2 |
| CO2 | 3 | 2 | 3 | 2 | 3 | 1 | 2 | 1 | 3 | 3 | 3 | 2 |
| CO3 | 3 | 2 | 3 | 3 | 3 | 2 | 2 | 2 | 3 | 3 | 3 | 3 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 | | | | |
|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 2 | 3 | | | | |
| CO2 | 3 | 3 | 3 | 3 | | | | |
| CO3 | 3 | 3 | 3 | 3 | | | | |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and  Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
## (ARTIFICIAL INTELLIGENCE)

| Subject Code: BEC18OL3/BEC20OL3 | Subject Name : Basics of  MATLAB | T /L/ ETL | L | T/SLr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite: | Lb | 0 | 0/0 | 3/0 | 1 |

## LIST OF EXPERIMENTS

1. Introduction to SDK of MATLAB

2. Basic Syntax and scalar arithmetic operations and calculations

3. Working with formulas

4. Arithmetic operations in matrix data

5. Matrix operations (Inverse, Transpose)

6. Reading an image file

7. Reading from and writing to a text file

8. Introduction to toolboxes

9. Data visualization and plotting

10. Relational operators in data

11. Logical operation in data

12. Loops in MATLAB

13. Computing Eigen value for a matrix

14. Random number generation - Monte Carlo methods

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)
## Open Electives-Information Technology

| Subject Code: **BIT18OE1/BIT20OE1** | Subject Name : **WEB DESIGN** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite:  Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- The students will learn the Network and Internet works.
- To learn the HTML program structure, elements and Tags.
- To have knowledge to design basic website for their own.
- To learn how to design an effective website using CSS.
- To learn and develop a dynamic web sites using scripting languages.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Basics of Network and Internet works. |
|---|---|
| CO2 | Able to evaluate a web site |
| CO3 | Ability to make a well interactive online applications. |
| CO4 | Have knowledge to analysis and evaluate on web site and design a quality web site. |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 3 | 1 | 1 | 3 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 2 | 3 | 1 | 3 | 2 | 3 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 3 | 2 | 1 | 1 |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BIT18OE1/BIT20OE1** | **WEB DESIGN** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: Introduction to Network** **9 Hrs**
Introduction to computer networks and uses - Network: devices, topology and types – Communication media. Introduction to OSI layers, Port and Protocols, Network applications. Client / Serverarchitecture.Internet server provider, DNS and Hosting.

**UNIT II: Web Design Principles** **9 Hrs**
Brief History of Internet - What is World Wide Web - Why create a web site - Web Standards - Audience requirement. Basic principles involved in developing a web site - Planning process - Five Golden rules of web designing -  Designing navigation bar -  Page design - Home Page Layout - Design Concept.

**UNIT III: HTML** **9 Hrs**
Introduction to HTML- HTML version-  Basic structure of an HTML document – Creating HTML document – HTML Elements - HTML Tags - Working with Text - Working with Lists, Tables and Frames  - Working with Hyperlinks, Images and Multimedia  - Working with Forms and controls .

**UNIT IV: Cascading Style Sheet** **9 Hrs**
Concept of CSS - Creating Style Sheet - CSS Properties - CSSStyling (Background, Text Format, Controlling Fonts)  -  Working with block elements and objects - Working with Lists and Tables - CSS Id and Class - Box Model(Introduction, Border properties, Padding Properties, Margin properties) -  CSS Advanced(Grouping, Dimension, Display, Positioning, Floating, Align, Pseudo class, Navigation Bar, Image Sprites, Attribute sector)  -  CSS Color - Creating page Layout and Site Designs.

**UNIT IV: Scripting Languages** **9 Hrs**
JavaScript introduction – control structures – functions – arrays – objects – simple web applications. Web hosting and maintenance.

**Total Hours: 45**

**Text Books:**
1. Computer Networks by A Tanenbaum - 5th edition , Pearson Education
2. Mastering HTML, CSS &  JavaScript Web Publishing by Laura Lemay, Rafe Coburn, Jennifer Kyrnin , Pearson Education.
3. HTML & CSS: The Complete Reference, Fifth Edition by Thomas A. Powell, McGraw-Hill publication.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: **BIT18OE2/BIT20OE2** | Subject Name : **DIGITAL MARKETING** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite:  Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
- This course helps the students to understand the fundamental principles of Digital marketing, the past, present and future potential of Digital marketing.
- At the end of the course students will be able to identify the role of e-marketing in the present context and develop an e-marketing plan with appropriate e-marketing strategies.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the concepts and  uses of Digital Marketing |
|---|---|
| CO2 | Develop  Strategic Planning for the Market |
| CO3 | Evaluate the Ethical and Legal Values |
| CO4 | Predict the Marketing Trends |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 3 | 1 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 1 | 1 |
| CO4 | 3 | 2 | 1 | 1 |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social  Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | ✔ | | | | | | |

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| **BIT18OE2/BIT20OE2** | **DIGITAL MARKETING** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I: INTRODUCTION**            **9 Hrs**

Digital-Marketing Past, Present & Future – Digital-Marketing Landscape, Digital-marketing's Past - Web 1.0, Digital Marketing Present - Web 2.0, Future -Web 3.0, Strategic Digital-Marketing, and Digital -Business Models – Online Revenue Models, Value Models, and Strategic Digital-Business Models.

**UNIT II: DIGITAL MARKETING PLAN**            **9 Hrs**

Process, Creating a Digital-Marketing Plan, Seven Steps –Situation Analysis, Strategic Planning, Objectives, Digital-Marketing Strategies – Product, Price, Distribution, Communication, Relationship Management; Implementation plan, Budget, Evaluation.

**UNIT III: DIGITAL -MARKETING ENVIRON MENT**       **9 Hrs**

Overview of Digital-Marketing Environment, Global Digital -Markets, Wireless Internet Access, Digital divide, Building inclusive Digital markets, social networking, Ethical and Legal Issues – Overview, Digital Property, Emerging issues.

**UNIT IV:DIGITAL-MARKETING MANAGEMENT**       **9 Hrs**

Online offer – Creating customer value online, Product Benefits, Digital Marketing enhanced product development, Payment options, Pricing Strategies; Internet as distribution, Digital Marketing Communication – Owned Media, Paid media, Earned Media.

**UNIT V: EMERGING TRENDS**            **9 Hrs**

Emerging trends in Digital-marketing, Content Marketing, Social Media Marketing, Email Marketing, Affiliate Marketing, Video Marketing, Mobile Marketing, Interactive advertising, International Online Marketing, Search Engine Marketing, Online Partnership, Viral Marketing, E-CRM, E-Business, E-Tailing.

                                            **Total Hours: 45**

**TEXT BOOK:**
1. Strauss Judy, Frost Raymond (2013), E-Marketing, 7/e; New Delhi: Prentice Hall.
2.

**REFERENCE BOOKS:**
1. Chaffey Dave and Smith PR (2013), Emarketing Excellence: Planning and Optimizing your Digital Marketing; 4/e; Routledge.
2. Ryan Damian, (2014), Understanding Digital Marketing: Marketing Strategies for Engaging the Digital Generation, 3/e; Kogan Page Limited.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: **BIT18OE3/BIT20OE3** | Subject Name : **INFORMATION SECURITY MANAGEMENT** | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|---|
| | Prerequisite: Nil | | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial   S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**

➢ To provide an understanding of the principles of information security management commonly used in business

➢ Introduce the commonly used frameworks and methods

➢ Explore critically the suitability and appropriateness of security needs.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | To Understand the Security and  classification of Components. |
|---|---|
| CO2 | Concept of Security Analysis, Design and Implementation |
| CO3 | Develop the security plan methodology and follow policy procedures |
| CO4 | Using ISO to enhance security |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO 11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 1 | 1 | 1 | 3 | 1 | 1 | 2 | 1 | 3 |
| CO2 | 3 | 2 | 1 | 3 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 |
| CO3 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 3 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 3 | 2 | 1 | 1 | 2 | 2 | 1 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 3 |
| CO2 | 1 | 3 | 1 | 1 |
| CO3 | 3 | 2 | 3 | 1 |
| CO4 | 3 | 2 | 1 | 1 |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty/Lb/ETL | L | T/S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BIT18OE3/BIT20OE3 | INFORMATION SECURITY  MANAGEMENT | Ty | 3 | 0/0 | 0/0 | 3 |

**UNIT I : INTRODUCTION TO INFORMATION SECURITY  AND MANAGEMENT        9 Hrs**
Information sensitivity classification-governance-computing environment- security of various components – Management Concepts: traditional management skills and security literacy, managerial skills, redefining Mintzberg's Managerial roles, IS Security management activities- information security management life cycles- security management vs functional management

**UNIT II : INFORMATION SECURITY LIFECYCLE                                9 Hrs**
Introduction-Security planning in SLC-Security analysis-security design- security implementation – design- continual security

**UNIT III : SECURITY PLAN AND POLICY                                     9 Hrs**
Security plan: Development guidelines-security plan methodologies- Policy: security policy, standards and guidelines- security policy methodologies

**UNIT IV:  SECURITY RISK MANAGEMENT                                      9 Hrs**
Introduction- risk management life cycle- preparation efforts- security culture-factors affecting security risk- ALE risk methodology- operational, functional and strategic risks- ABLE methodology

**UNIT V: SECURITY DESIGN AND IMPLENTATION                                9 Hrs**
ISO/IEC 27002- Using ISO/IEC 27002 to enhance security- measurement and implementation- general ISMS Framework- ISMS Model and design- integration of ISMS Subsystems-self assessment for compliance- Security solutions: security management, access control, security analysis

**Total Hours: 45**

**Text Book**
1. "Information Security Management: Concepts and Practice "Bell G. Raggard, CRC Press 2010

**Reference Books:**
1. "Information Security Management Principles" David Alexander, Amanda Finch, BCS Learning and Development Ltd, 2013
2. "Security Analysis and Portfolio Management" Ronald E Fischer, S.Kevin  PHI Learning Pvt Ltd, 2015.

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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Subject Code: **BIT18OE4/BIT20OE4** | Subject Name : **INTRODUCTION TO MULTIMEDIA** | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| | Prerequisite:  Nil | Ty | 3 | 0/0 | 0/0 | 3 |

L : Lecture T : Tutorial    S.Lr : Supervised Learning  P : Project  R : Research C: Credits
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

**OBJECTIVES :**
1. To learn about Basics of Computer Graphics.
2. To understand the difference between normal, 2D and 3D Dimensional Graphics
3. To understand the conversion of 2D to 3D Pictures.

**COURSE OUTCOMES (COs) : ( 3- 5)**

| CO1 | Understand the various types of Display |
|---|---|
| CO2 | Transform geometrical structures, perform clipping on geometrical objects |
| CO3 | Concept of Various Clipping Operations |
| CO4 | Analyze a 3D structure |

**Mapping of Course Outcomes with Program Outcomes (POs)**

| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 3 | 3 | 1 | 1 | L | 1 | 2 | 1 | 1 |
| CO2 | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 3 |
| CO3 | 2 | 2 | 3 | 1 | 1 | 2 | 3 | 3 | 2 | 2 | 1 | 1 |
| CO4 | 2 | 2 | 3 | 1 | 1 | 2 | 1 | 1 | 2 | 2 | 3 | 1 |

| COs / PSOs | PSO1 | PSO2 | PSO3 | PSO4 |
|---|---|---|---|---|
| CO1 | 1 | 3 | 1 | 1 |
| CO2 | 1 | 3 | 3 | 1 |
| CO3 | 3 | 2 | 1 | 3 |
| CO4 | 3 | 2 | 1 | 1 |

**3/2/1 indicates Strength of Correlation   3- High, 2- Medium, 1-Low**

| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | |
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# COMPUTER SCIENCE AND ENGINEERING
# (ARTIFICIAL INTELLIGENCE)

| Course Code | Course Title | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | C |
|---|---|---|---|---|---|---|
| BIT18OE4/BIT20OE4 | **INTRODUCTION TO MULTIMEDIA** | Ty | 3 | 0/0 | 0/0 | 3 |

**UNITI Types of Display**          **9 Hrs**
Video display device: Cathode ray tube, Raster scan displays, Random scan displays. Raster scan systems, Random scan systems, Input devices, Graphics software.

**UNIT II      Basic Algorithm of Drawings**          **9 Hrs**
Output Primitives: Points & Lines, Line drawing Algorithms, Loading the frame buffer, Circle & Ellipse generating Algorithms, Pixel addressing & Object geometry, Fill area primitives, Character generation

**UNIT III      Types of Transformation**          **9 Hrs**
2-D Geometric Transformations : Basic Transformations , Matrix representation & Homogeneous Coordinates, Composite Transformations, Other Transformations, Transformations between Coordinate Systems, Raster methods for Transformations

**UNIT IV      Clippings Operation**          **9 Hrs**
2- Dimensional Viewing: Viewing pipeline, Viewing Coordinate reference frame, Window-to-view port coordinate transformation, Line clipping, Polygon Clipping, Curve Clipping.

**UNIT V      3D Effects**          **9 Hrs**
3 -D Concepts: 3 -D display methods. 3-D Geometric & Modeling Transformations: Translation, Rotation, Scaling, Other Transformations, Composite Transformations, Modeling & Coordinate.
         **Total Hours: 45**

**Text Book:**
1. D.Hearn &M.P.Becker , "Computer graphics"; 2 nd Ed., Prentice Hall India- 1995

**References:**
1. Foley Vandam & Hughes, " Computer Graphics"; Addision Wesly.
2. Angel Edward., "Interactive Computer Graphics – A Top-down Approach with OpenGL" ,Addison-Wesley 1996.
3. Newmann W and Sproull R.F., Principles of Interactive Computer Graphics, McGraw-Hill, 1980