Dr.M.G.R.
Educational and Research Institute
(DEEMED TO BE UNIVERSITY)
(An ISO Certified Institution)
University with Graded Autonomy Status
Maduravoyal , Chennai - 600 095

CURRICULUM & SYLLABUS

(2018-REGULATION)

BACHELOR OF TECHNOLOGY

COMPUTER SCIENCE AND ENGINEERING

(ACADEMIC YEAR – 2020- 2021 ONWARDS)

DEPARTMENT

OF

COMPUTER SCIENCE AND ENGINEERING

Department of Computer Science and Engineering
Regulation 2018

I SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BEN18001	Technical English –I	Ty	1	0/0	2/0	2
2	BMA18001	Mathematics – I	Ty	3	1/0	0/0	4
3	BPH18001	Engineering Physics –I	Ty	2	0/1	0/0	3
4	BCH18001	Engineering Chemistry –I	Ty	2	0/1	0/0	3
5	BES18001	Basic Electrical & Electronics Engineering	Ty	2	0/1	0/0	3
6	BES18002	Basic Mechanical & Civil Engineering	Ty	2	0/1	0/0	3
PRACTICALS*							
1	BES18L01	Basic Engineering Workshop	Lb	0	0/0	2/0	1
2	BES18ET1	Orientation to Entrepreneurship & Project Lab	ETL	0	0/0	2/0	1
						Credits Sub Total	**20**

II SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BMA18003	Mathematics – II	Ty	3	1/0	0/0	4
2	BPH18002	Engineering Physics –II	Ty	2	0/1	0/0	3
3	BCH18002	Engineering Chemistry –II	Ty	2	0/1	0/0	3
4	BES18003	Environmental Science*	Non credit course				
PRACTICALS*							
1	BEN18ET1	Communication Lab	ETL	1	0/0	2/0	1
2	BES18ET2	Basic Engineering Graphics	ETL	1	0/0	2/0	2
3	BES18L02	Integrated Physical Science lab	Lb	0	0/0	2/0	1
4	BES18ET3	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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III SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BMA18008	Discrete Mathematics	Ty	3	1/0	0/0	4
2	BCS18013	Data Structures	Ty	3	0/0	0/0	3
3	BCS18002	Object Oriented Programming With C++	Ty	3	0/1	0/0	4
4	BCS18014	Computer Organization and Architecture	Ty	3	0/0	0/0	3
5	BEC18I01	Digital Systems	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18L01	Data Structures Lab	Lb	0	0/0	3/0	1
2	BCS18L02	Object Oriented Programming With C++ Lab	Lb	0	0/0	3/0	1
3	BEC18IL1	Digital System Lab	Lb	0	0/0	3/0	1
4	BHS20ET5	Universal Human Values 2: Understanding Harmony	ETL	2	1/0	0/0	3
Credits Sub Total							**23**

IV SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BMA18016	Statistics for Computer Engineers	Ty	3	1/0	0/0	4
2	BCS18015	DataBase Management Systems	Ty	3	0/0	0/0	3
3	BCS18005	Design and Analysis of Algorithms	Ty	3	0/0	0/0	3
4	BEC18I02	Microprocessors and Microcontrollers	Ty	3	0/0	0/0	3
5	BHS18NC1/ BHS18NC2	TheIndian Constitution*/ TheIndian Traditional Knowledge*	Ty	2	0/0	0/0	NC
PRACTICALS*							
1	BCS18ET1	Java Programming	ETL	1	0/1	3/0	3
2	BCS18L03	Database Management Systems Lab	Lb	0	0/0	3/0	1
3	BCS18L04	Design and Analysis of Algorithms Lab	Lb	0	0/0	3/0	1
4	BEC18IL2	Microprocessors and Microcontrollers Lab	Lb	0	0/0	3/0	1
5	BCS18TS1	Technical Skill I	Lb	0	0/0	3/0	1
6	BEN18SK1	Soft Skill I (Career & Confidence Building)	ETL	0	0/0	3/0	1
Credits Sub Total							**21**

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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V SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18006	Operating Systems	Ty	3	0/0	0/0	3
2	BCS18007	Computer Networks	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective I	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective I	Ty	3	0/0	0/0	3
5	BCS18008	System Software and Principles of Compiler Design	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18ET2	Computer Graphics	ETL	1	0/1	3/0	3
2	BCS18L05	Network Programming Lab	Lb	0	0/0	3/0	1
3	BCS18L06	Operating Systems Lab	Lb	0	0/0	3/0	1
4	BCS18L07	System Software and Compiler Design Lab	Lb	0	0/0	3/0	1
5	BCS18TS2	Technical Skill II	Lb	0	0/0	3/0	1
						Credits Sub Total	**22**

VI SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18009	Object Oriented Software Engineering	Ty	3	1/0	0/0	4
2	BIT18003	Web Technology and Web Services	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective II	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective II	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18ET3	PHP/MySQL	ETL	1	0/1	3/0	3
2	BCS18L08	Object Oriented Software Engineering Lab	Lb	0	0/0	3/0	1
3	BIT18L03	Web Technology and Web Services Lab	Lb	0	0/0	3/0	1
4	BEN18SK2	Soft Skill II (Qualitative and Quantitative Skills)	ETL	0	0/0	3/0	1
5	BCS18L09	Mini Project/In plant Training/Industrial training	Lb	0	0/0	3/0	1
6	BCS18TS3	Technical Skill III	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 : Research

Ty/Lb/ETL: Theory/Lab/Embedded Theory and Lab *Internal evaluation

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VII SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18010	Data Warehousing and Data Mining	Ty	3	0/0	0/3	4
2	BXX18EXX	Elective III	Ty	3	0/0	0/0	3
3	BCS18011	Dot Net Framework	Ty	3	1/0	0/0	4
4	BMG18002	Management Concepts and Organizational Behavior	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BXX18OLX	Open Lab	Lb	0	0/0	3/0	1
2	BCS18L11	Data Mining Lab	Lb	0	0/0	3/0	1
3	BCS18L12	Dot Net Lab	Lb	0	0/0	3/0	1
4	BCS18L13	Project Phase – I	Lb	0	0/0	3/3	2
5	BHS18FLX	Foreign Language	Lb	0	0/0	3/0	1
						Credits Sub Total	**20**

VIII SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BXX18EXX	Elective IV	Ty	3	0/0	0/0	3
2	BCS18012	Open Source Scripting Languages	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective V	Ty	3	0/0	0/0	3
PRACTICALS*							
1	BCS18L14	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

Credit Summary

Semester : 1 : 20
Semester : 2 : 16
Semester : 3 : 23
Semester : 4 : 21
Semester : 5 : 22
Semester : 6 : 21
Semester : 7 : 20
Semester : 8 : 17
Total Credits : 160

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ELECTIVE -I (Common to CSE&IT)							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18E01	Image Processing	Ty	3	0/0	0/0	3
2	BCS18E02	Geographical Information Systems	Ty	3	0/0	0/0	3
3	BCS18E03	Database Tuning	Ty	3	0/0	0/0	3
4	BCS18E04	Component Based Technology	Ty	3	0/0	0/0	3
5	BCS18E05	E-Commerce	Ty	3	0/0	0/0	3
6	BCS18E06	Artificial Intelligence	Ty	3	0/0	0/0	3
7	BCS18E07	Human Computer Interaction	Ty	3	0/0	0/0	3
8	BCS18E08	Wireless and Mobile Networking	Ty	3	0/0	0/0	3

ELECTIVE -II							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18E09	Web Mining	Ty	3	0/0	0/0	3
2	BCS18E10	Web Data Design and Management	Ty	3	0/0	0/0	3
3	BCS18E11	Risk Management	Ty	3	0/0	0/0	3
4	BCS18E12	Cryptography and Network Security	Ty	3	0/0	0/0	3
5	BCS18E13	Mobile Adhoc Networks	Ty	3	0/0	0/0	3
6	BCS18E14	TCP/IP Design and Implementation	Ty	3	0/0	0/0	3
7	BCS18E15	Cyber Forensics and Internet Security	Ty	3	0/0	0/0	3
8	BCS18E16	Database Security	Ty	3	0/0	0/0	3
9	BCS18E17	Management Information Systems	Ty	3	0/0	0/0	3

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ELECTIVE –III							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18E41	Mobile Application Development(only for CSE)	Ty	3	0/0	0/0	3
2	BCS18E18	Data Science and Big Data Analytics	Ty	3	0/0	0/0	3
3	BIT18006	Cloud Technology (only for CSE)	Ty	3	0/0	0/0	3
4	BCS18E19	Network Forensics	Ty	3	0/0	0/0	3
5	BCS18E20	Internet of Things	Ty	3	0/0	0/0	3
6	BCS18E21	Social Computing	Ty	3	0/0	0/0	3
7	BCS18E22	Enterprise Architecture	Ty	3	0/0	0/0	3
8	BCS18EXX	Subject based on Industry Demand	Ty	3	0/0	0/0	3
9	BCS18E23	Optimization Techniques	Ty	3	0/0	0/0	3

ELECTIVE –IV & V							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BCS18E24	Information Storage Management	Ty	3	0/0	0/0	3
2	BCS18E25	Network Infrastructure Management	Ty	3	0/0	0/0	3
3	BCS18E26	Foundations of Parallel Programming	Ty	3	0/0	0/0	3
4	BCS18E27	Virtualization	Ty	3	0/0	0/0	3
5	BCS18E28	Hadoop Distributed File System	Ty	3	0/0	0/0	3
6	BCS18E29	Mobile Databases	Ty	3	0/0	0/0	3
7	BCS18E30	Web Engineering	Ty	3	0/0	0/0	3
8	BCS18E31	4G Networks	Ty	3	0/0	0/0	3
9	BCS18E32	Enterprise Resource Planning	Ty	3	0/0	0/0	3
10	BCS18E33	Supply Chain Management	Ty	3	0/0	0/0	3
11	BCS18E34	Mainframe Computing	Ty	3	0/0	0/0	3
12	BCS18E35	Neuro Fuzzy Computing	Ty	3	0/0	0/0	3
13	BCS18E36	Web Content Management	Ty	3	0/0	0/0	3
14	BCS18E37	Machine Learning	Ty	3	0/0	0/0	3
15	BCS18E38	M-Commerce	Ty	3	0/0	0/0	3
16	BCS18E39	Real Time Systems	Ty	3	0/0	0/0	3
17	BCS18E40	Distributed Computing	Ty	3	0/0	0/0	3

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Open Electives -CIVIL							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BCE18OE1/BCE20OE1	Water Pollution And Its Management	Ty	3	0/0	0/0	3
2	BCE18OE2/BCE20OE2	Environment,HealthAndSafety In Industries	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

OPEN ELECTIVES- CHEMICAL ENGINEERING							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
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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OPEN ELECTIVE- Electrical and Electronics Engineering							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/ R**	**C**
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

	OPEN ELECTIVES-Biotechnology						
S.No	**Course Code**	**Course Title**	**Ty/Lb/ETL**	**L**	**T/SLr**	**P/R**	**C**
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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OPEN ELECTIVES- MECHANICAL ENGINEERING							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
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

OPEN ELECTIVES- Dr APJ Abdul Kalam Center for Research							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
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

OPEN ELECTIVES - ELECTRONICS AND COMMUNICATION ENGINEERING							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
1	BEC18OE1/BES20OE1	Internet of Things and its Applications	Ty	3	0/0	0/0	3
2	BEC18OE2/BES20OE2	Cellular Mobile Communication	Ty	3	0/0	0/0	3
3	BEC18OE3/BES20OE3	Satellite and its Applications	Ty	3	0/0	0/0	3
4	BEC18OE4/BES20OE4	Fundamentals of Sensors	Ty	3	0/0	0/0	3
5	BEC18OE5/BES20OE5	Basics of Microprocessors and Microcontrollers	Ty	3	0/0	0/0	3
6	BEC18OE6/BES20OE6	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

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SEMESTER I

I Year B.Tech Full Time 2018 Regulation Curriculum & Syllabus

DEPARTMENT OF COMPUTER SCIENCE

Subject Code	Subject Name : TECHNICAL ENGLISH	Ty/ Lb/ ETL	L	T/SLr	P/R	C
BEN18001	Prerequisite : None	Ty	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

- 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.
- Train learners in organized academic and professional writing

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Recall basic grammar, spelling and phonetics concept.(L1,L2)
CO2	Discuss ideas and concepts in groups.(L2,L3,L4)
CO3	Interpret charts, diagrams, reports and advertisements.(L3,L4)
CO4	Analyse and evaluate scientific and technical concepts for organized oral and written presentation (L3,L4)
CO5	Apprise, argue and support using critical judgments on any given topic(L3,L4)

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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Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/SLr	P/R	C
BEN18001	**TECHNICAL ENGLISH - I**	Ty	1	0/0	2/0	**2**

UNIT I VOCABULARY BUILDING 6HRS

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 6HRS

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 6HRS

(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 :

Quest : A Textbook of Communication Skills, Vijay Nicole, 2017.
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

Department of Computer Science and Engineering
Regulation 2018

Subject Code	Subject Name : **MATHEMATICS-I**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BMA18001	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

- 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	Demonstrate knowledge of Basic concepts of Mathematics science & Engineering mathematics (L1,L2,L3)
CO2	Calculate the required parameters using basic mathematical theorems, laws and formulae (L2,L3,L4)
CO3	Apply mathematical techniques to solve problems (L2,L3,L4)
CO4	Examine the relevant methods, tools and techniques to provide solutions(L1,L2,L3,L4)
CO5	Combine scientific & math principles, apply to real time problems for accurate results(L3,L4)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BMA18001	**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 nθ, Cos nθ in powers of Sinθ and Cosθ – Expansion of Tan nθ – Expansions of $\text{Sin}^n\theta$ and $\text{Cos}^n\theta$ in terms of Sines and Cosines of multiples of θ – 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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Subject Code	Subject Name : **ENGINEERING PHYSICS - I**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BPH18001	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. (L1,L2)
CO2	Utilize scientific methods for formal investigations & demonstrate competency with experimental methods and verify the concept to content knowledge. (L1,L2,L3)
CO3	Identify and provide solutions for engineering problems. (L3,L4)
CO4	Relate the technical concepts to day to day life and to practical situations.(L3,L4)
CO5	Think analytically to interpret concepts. (L2,L3,L4)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BPH18001	**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 IIIWAVE 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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Subject Code	Subject Name : **ENGINEERING CHEMISTRY - I**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BCH18001	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 basic science as applied to engineering problems
CO2	Describe the ideas applied to demonstrate the competence through effective communication
CO3	Recall the information and analyze the health, ethical and engineering problems
CO4	Identify the environmental and societal issues and design solutions
CO5	Apply appropriate techniques by recognizing the need.

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ETL	L	T/SLr	P/R	C
BCH18001	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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Subject Code	Subject Name : **BASIC ELECTRICAL & ELECTRONICS ENGINEERING**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BES18001	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.
- Gain information on measurement of electrical parameters.
- Acquire knowledge on conventional &non-conventional energy production.
- Identify basic theoretical principles behind the working of modern electronic gadgets.
- Demonstrate digital electronic circuits and assemble simple devices.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Interpret Fundamental principles, laws, and their practical applications (L1,L2)
CO2	Verify the concept of electric & magnetic circuits and interpret results. (L1,L2,L3)
CO3	Analyze various sources of power & energy, generation methods & conservation (L3,L4)
CO4	Identify & Apply schematic symbols and understand the working principles of electronic devices & instruments (L2,L3,L4)
CO5	Design analog & digital circuits using basic concepts to solve problems (L1,L2,L3)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ETL	L	T/SLr	P/R	C
BES18001	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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Subject Code	Subject Name : **BASIC MECHANICAL & CIVIL ENGINEERING**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BES18002	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

- To understand the fundamentals and applications of IC Engines, power plants, manufacturing processes and mechanics.
- To expose the students to the various construction materials and their applications.

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Understand the construction and working principles of steam generators, IC engines and power plants.
CO2	Apply the knowledge of various concepts of Manufacturing processes.
CO3	Solve simple problems on Engineering mechanics
CO4	Identify the appropriate materials and their properties, used for construction purpose
CO5	Apply the knowledge of construction for various structural 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	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, L- Low

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

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BES18002	**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*

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Subject Code	Subject Name : **BASIC ENGINEERING WORKSHOP**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BES18L01	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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BES18L01	**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

Department of Computer Science and Engineering
Regulation 2018

Subject Code	Subject Name : **ORIENTATION TO ENTREPRENEURSHIP & PROJECT LAB**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BES18ET1	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)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BES18ET1	ENTREPRENEURSHIP & PROJECT LAB	ETL	0	0/0	2/0	1

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR 3Hrs

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 3Hrs

Entrepreneurial styles – Introduction, concept & Different types - Barrier to Communication – Body language speaks louder than words

UNIT III DESIGN THINKING 3Hrs

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 3Hrs

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 3Hrs

How to choose a topic – basic skill sets necessary to take up a project – creating a prototype – Pitch your project – Project presentation.

Total : 15 periods

Department of Computer Science and Engineering
Regulation 2018

SEMESTER II

Subject Code	Subject Name : **MATHEMATICS-II**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BMA18003	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

- 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)

Students completing this course were able to

CO1	Demonstrate knowledge of Basic concepts of Mathematics science & Engineering mathematics(L1,L2,L3)
CO2	Calculate the required parameters using basic mathematical theorems, laws and formulae (L1,L2,L3)
CO3	Analyze the problem, find solution & interpret the data (L3,L4)
CO4	Examine the relevant methods, tools and techniques to provide solutions (L1,L3,L4)
CO5	Combine scientific & math principles, apply to real time problems for accurate results (L2,L3,L4)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BMA18003	**MATHEMATICS – II**	Ty	3	1/0	2/0	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).*

Department of Computer Science and Engineering
Regulation 2018
DEPARTMENT OF PHYSICS

Subject Code	Subject Name : **ENGINEERING PHYSICS - II**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BPH18002	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)

Students completing this course were able to

CO1	Demonstrate skills necessary for conducting research related to content knowledge and laboratory skills.(L1,L2,L3)
CO2	Apply knowledge and concepts in advanced materials and devices.(L1,L2,L3,L4)
CO3	Acquired Analytical, Mathematical skills for solving engineering problems.(L1,L2,L3)
CO4	Ability to design and conduct experiments as well as function in a multi-disciplinary teams.(L1,L2,L3,L4)
CO5	Generate analytical thought to interpret results & place them within a broader context (L2,L3,L4)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BPH18002	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

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*

Department of Computer Science and Engineering
Regulation 2018

DEPARTMENT OF CHEMISTRY

Subject Code	Subject Name : **ENGINEERING CHEMISTRY - II**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BCH18002	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)

Students completing this course were able to

CO1	Recall, predict the consequences and apply appropriate techniques.(L1,L2,L4)
CO2	Categorize the engineering materials and analytical tools through appropriate communication.(L1,L2,L3,L4)
CO3	Analyze the environmental dimension and identify ethical principles to design solutions .(L1,L2,L3,L4)
CO4	Recognize the essential information for continuing professional development.(L1,L2,L4)
CO5	Apply relevant instrumentation techniques through basic sciences to solve complex problems .(L1,L2,L3,L4)

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BCH18002	**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).*

Department of Computer Science and Engineering
Regulation 2018

Subject Code	Subject Name : **COMMUNICATION LAB**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BEN18ET1	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

- Strengthen the academic and interpersonal advanced vocabulary
- Strengthen learners' writing skill such as summarizing, describing and report writing
- Learn to keep the simple conversations in day to day life
- Get to know certain life skills such as marketing, advertising and do presentation
- Improve the reading skill with comprehension

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Use appropriate vocabulary and structure for effective interpersonal and academic communication (L1)
CO2	Interpret charts, diagrams, advertisements, etc. (L2)
CO3	Participate in group discussions and present projects effectively (L3)
CO4	Present project and ideas effectively (L4)
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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BEN18ET1	**COMMUNICATION LAB**	Lb	0	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 HRS: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

Department of Computer Science and Engineering
Regulation 2018

Subject Code	Subject Name : **BASIC ENGINEERING GRAPHICS**	**Ty/ Lb/ ETL**	**L**	**T/SLr**	**P/R**	**C**
BES18ET2	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

- To acquire knowledge in geometrical drawing.
- To expose the students in computer aided drafting**.**

COURSE OUTCOMES (Cos)

Students completing this course were able to

CO1	Gain knowledge on Drawing Standards and angle of projection.
CO2	Draw projections of planes, solid, on planes of projection.
CO3	Apply the knowledge of development to find lateral surface area of solids.
CO4	Visualize and draw Isometric and orthographic projections.
CO5	Apply the knowledge of projection in Building drawing
CO6	Learn and draw simple components using CAD software.

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ETL	L	T/SLr	P/R	C
BES18ET2	**BASIC ENGINEERING GRAPHICS**	ETL	1	0/0	2/0	2

CONCEPTS AND CONVENTIONS (Not for examination) **3 Hrs**

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 I 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 II 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 III 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 IV 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 V 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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Subject Code	Subject Name : **INTEGRATED PHYSICAL SCIENCE LAB**	Ty/ Lb/ ETL	L	T/SLr	P/R	C
BES18L02	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)

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
	√								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ETL	L	T/SLr	P/R	C
BES18L02	**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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Subject Code	Subject Name : **C PROGRAMMING & LAB**	Ty/Lb/ ETL	L	T/SLr	P/R	C
BES18ET3	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)

Students completing this course were able to

CO1	Understand the concepts of C programming
CO2	Develop C Programs using basic programming constructs
CO3	Create Programs with arrays, structures, functions, pointers and file handling
CO4	Write diversified solutions for application using C language

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, L- Low

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/	L	T/SLr	P/R	C
BES18ET3	**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 : $x + X^3/3! + X^5/5! + \ldots\ldots\ldots\ldots\ldots X^n/n!$
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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SEMESTER – III

Subject Code : **BMA18008**	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 Skills	Soft Skills
	√								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMA18008	**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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Subject Code: **BCS18013**	Subject Name : **DATA STRUCTURES**	**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 :

- 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	To understand space and time complexity of various algorithms and implement various operations on arrays and linked list.
CO2	Demonstrate a familiarity with major algorithms and data structures
CO3	To design tree data structure and apply it in data compression algorithms
CO4	Select appropriate searching and/or sorting techniques in the application development
CO5	Implement and analyze graph data structure and apply it to real world problems in finding shortest path.

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**									
CO2	**3**	**3**	**3**									
CO3	**3**	**2**	**3**									
CO4	**3**	**3**										
CO5	**3**	**3**										

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			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18013	**DATA STRUCTURES**	Ty	3	0/0	0/0	3

UNIT I **9 Hrs**

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

UNIT II **9 Hrs**

Stack Operations and Applications, Queue Operations and Applications, Single Linked List, Double Linked List, Circular Linked List.

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

Graphs: Definitions and Representation of Graphs, DFS, BFS, Prim's Algorithm, Kruskal's Algorithm

Total Hours: 45

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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Subject Code: **BCS18002**	Subject Name : **OBJECT ORIENTED PROGRAMMING WITH C++**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/ R**	**C**
	Prerequisite: -	Ty	3	0/1	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 :

- The students will be able to distinguish OOP features with procedural Oriented and analyze these features to a real world object,
- To analyze generic data type for the data type independent programming which relate it to reusability.
- To understand the concepts of Java programs and develop basic networking programs using Java

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding the principles of object oriented programming.
CO2	Apply mathematical foundations, algorithmic principles and computer science theory in the modeling.
CO3	Solve the object oriented problem.
CO4	Design generic classes with C++ templates.
CO5	Develop an application using 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**				**1**			**1**			**3**
CO2	**3**	**2**				**1**			**1**			**3**
CO3	**3**	**3**				**1**			**1**			**2**
CO4	**3**	**2**	**3**		**3**	**1**			**3**			**2**
CO5	**3**	**3**	**3**		**3**	**1**			**3**			**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**3**	**1**	**1**
CO2	**1**	**3**	**1**	**1**
CO3	**2**	**3**	**2**	**1**
CO4	**2**	**3**	**1**	**2**
CO5	**1**	**3**	**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 Skills	Soft Skills			
				✔								

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18002	OBJECT ORIENTED PROGRAMMING WITH C++	Ty	3	0/1	0/0	4

UNITI BASICS, TOKENS, EXPRESSIONS 12 Hrs

Software Evolution, Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages, Features of OOP. How OOP Differ from POP. Applications of OOP, A Simple C++ Program, Structure of C++ Program. Tokens, Keywords, Identifiers and Constants, Basic Data Types, User Defined Data Types, Derived Data Types, Dynamic Initialization of Variables, Reference Variables, Operators in C++, Scope Resolution Operator, Member Dereferencing Operators, Memory Management Operators.

UNITII FUNCTIONS, Classes and Objects 12 Hrs

Introduction of Classes, Specifying a Class, Defining a Member Functions, A C++ Program with Class Access Specifiers, Inline functions, Nesting of Member Functions, Memory Allocation for Objects, Static Data Members, Static Member Functions, Arrays of Objects, Objects as Function Arguments, Default Arguments, Const Arguments, Function Overloading, Friend Functions.

UNITIII CONSTRUCTORS AND DESTRUCTOR 12 Hrs

Introduction, Constructors, Default constructors, Copy Constructors, Dynamic Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic initialization of Objects, Destructors.

UNITIV INHERITANCE 12 Hrs

Introduction to inheritance, Defining Derived Classes, Single Inheritance, Multiple Inheritance, Multi Level Inheritance, Hierarchical Inheritance, Hybrid Inheritance, Abstract Classes, Constructors in Derived Classes, Containership, Operator overloading, Rules for Operator overloading, overloading of binary and unary operators .

UNITVPOINTERS, VIRTUAL FUNCTIONS AND POLYMORPHISM 12 Hrs

Introduction to Memory Management, new Operator and delete Operator, Pointer to Objects, this Pointer, Pointers to Derived Classes, Polymorphism, Compile time polymorphism, Run time polymorphism, Virtual Functions, Pure Virtual Functions, Virtual Base Classes, Virtual Destructors.

Total Hours: 60

TEXT BOOK:

1. E.Balagurusamy, "Object Oriented Programming in C++", 6th ed.,Tata McGraw-Hill, 2013

REFERENCE BOOKS:

1. *K.R.Venugopal, "Mastering C++", published by Tata McGraw- Hill. -2013,Second Edition.*
2. *Rohit Khurana,"Object Oriented Programming With C++",Vikas Publishing House- 2014, Second Edition.*
3. *Robert Lafore, "Object-Oriented Programming in C++", Sams Publishing-2002, Fourth Edition*

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Subject Code: **BCS18014**	Subject Name : **COMPUTER ORGANIZATION AND ARCHITECTURE**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BEC18I02	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 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	Conceptualize the theoretical basics of central processing unit.(Level 2)
CO2	Illustrate the basic operations of CPU.(Level 3)
CO3	Design a central processing unit. (Level 6)
CO4	Define the concepts of memory organization and I/O processing unit. (Level 1)
CO5	Analyze the execution of simple instruction.(Level 4)

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO 9**	**PO10**	**PO11**	**PO12**
CO1	**2**	**1**	**1**									
CO2	**2**	**1**	**1**									
CO3	**3**	**2**	**2**									
CO4	**2**	**1**	**1**									
CO5	**2**	**1**	**1**									

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**1**		**1**
CO2	**3**	**2**	**1**	
CO3		**3**	**1**	
CO4	**2**	**2**		**1**
CO5	**2**	**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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18014	COMPUTER ORGANIZATION AND ARCHITECTURE	Ty	3	0/0	0/0	3

UNIT I BASIC STRUCTURE OF COMPUTERS **9 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 **9 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 **9 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 **9 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: 45

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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Subject Code: BEC18I01	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			
		✔										

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18I01	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.

UNIT IV 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.

UNITV 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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Subject Code: **BCS18L01**	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	Demonstrate the usage of various data structures using simple applications
CO2	Discuss non linear data structure and its application
CO3	Describe the basic operations on arrays, lists, stacks and queue data structures
CO4	Analyze algorithms for operations on Binary Search Trees, AVL data structures.
CO5	Determine and analyze the complexity of given algorithms

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**									
CO2	**3**	**3**	**1**									
CO3	**3**	**3**	**1**									
CO4	**3**	**3**	**1**									
CO5	**3**	**3**	**1**									

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**		**1**
CO2	**2**	**1**		**1**
CO3	**2**	**1**		**1**
CO4	**2**	**1**	**2**	**1**
CO5	**2**	**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 / Technical Skill	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L01	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.

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Subject Code: **BCS18L02**	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 :

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

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the programming skill for solving engineering problems through object oriented analysis, design, implementation and evaluation.
CO2	Design C++ classes for code reuse.
CO3	Explain and implement generic classes with C++ templates.
CO4	Implement real-world entities like inheritance, hiding, polymorphism etc 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**	**2**									**2**	**3**
CO2	**3**	**2**	**2**		**1**		**1**		**2**	**2**	**2**	**1**
CO3	**3**	**1**										
CO4	**3**		**2**		**2**				**2**	**2**		**1**
CO5	**3**	**2**	**3**		**3**		**3**		**2**	**2**	**2**	**2**

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			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L02	OBJECT ORIENTED PROGRAMMING WITH C++ LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMRNTS:

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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Subject Code: BEC18IL1	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			
							✔					

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18IL1	**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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BHS20ET5**	SubjectName: **UNIVERSAL HUMAN VALUES 2: UNDERSTANDING HARMONY**	L	T/S.Lr	P/R	C
	Prerequisite:None, UHV1 (Desirable)	2	1/0	0/0	3

L:LectureT :Tutorial SLr: SupervisedLearning P:Project R:ResearchC:CreditsT/L/ETL:Theory/Lab/Embedded Theoryand Lab

OBJECTIVES:

Human Values Courses: During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

1. Development of a holistic perspective based on self- exploration about themselves (human being), family, society and nature/existence.
2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence
3. Strengthening of self-reflection.
4. Development of commitment and courage to act.

COURSEOUTCOMES(Cos) :(3–5) The students will be ableto

CO1	Relate self and surroundings and identify responsibility in life
CO2	Associate human relationship and nature to handle problems and provide sustainable solutions
CO3	Develop critical ability and engage in reflective and independent Thinking
CO4	Show commitment towards understanding of values
CO5	Apply Human values in day to day setting in real life

Mappingof CourseOutcomeswithProgramOutcomes(POs)

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

Cos/PSOs	PSO1	**PSO2**	**PSO3**	**PSO4**
CO1	**1**	**1**	**1**	**1**
CO2	**2**	**2**	**2**	**2**
CO3	**1**	**1**	**1**	**1**
CO4	**1**	**1**	**1**	**2**
CO5	**1**	**2**	**2**	**1**

3/2/1indicatesstrengthofcorrelation3 –High,2–Medium,1– Low

Category	BasicSciences	EnggSciences	Humanities &SocialSciences	Program	ProgramElectives	OpenElectives	Practical /Project	Internships /	SoftSkills
			√						

Department of Computer Science and Engineering
Regulation 2018

BHS20ET5 Universal Human Values 2: Understanding Harmony 2 1/0 0 /03

UNIT I

Introduction - Need, Basic Guidelines, Content and Process for ValueEducation

Purposeandmotivationforthecourse,recapitulationfromUniversal HumanValues-I - Self-Exploration– what is it? -Its content and process; 'Natural Acceptance'andExperientialValidation-astheprocessforself-exploration. – ContinuousHappinessandProsperity-AlookatbasicHuman Aspirations - Right understanding, Relationship and Physical Facility- the basic requirementsforfulfilmentofaspirationsofeveryhumanbeingwiththeir correct priority-UnderstandingHappinessandProsperitycorrectly-Acriticalappraisalof the currentscenario– Methodtofulfiltheabovehumanaspirations:understandingandliving in harmony atvariouslevels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance forliving with responsibility (living in relationship, harmony and co-existence) rather than asarbitrariness in choice based on liking-disliking.

UNIT II

Understanding Harmony in the Human Being - Harmony in Myself!

Understanding human being as a co-existence of the sentient 'I' and the material 'Body'.- Understanding the needs of Self ('I') and 'Body' - happiness and physical facility. - Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer). - Understanding the characteristics and activities of 'I' and harmony in 'I' - Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physicalneeds, meaning of Prosperity in detail - Programs to ensureSanyam and Health.

Include practice sessions to discuss the role others have played in making material goods available tome. Identifying from one's own life.

Differentiate between prosperity and accumulation. Discussprogram for ensuring health vs dealing with disease

UNIT III

Understanding Harmony in the Family and Society- Harmony in Human-HumanRelationship

Understanding values in human-human relationship; meaning of Justice (nine universal values inrelationships) and program for its fulfilment to ensure mutual happiness; Trust and Respect asthe foundational values of relationship - Understanding the meaning of Trust; Difference between intention and competence - Understanding the meaning of Respect, Difference between respect and differentiation; the othersalient values in relationship - Understanding the harmony in the society (society being an extension of family): Resolution,Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals - Visualizing a universal harmonious order in society- Undivided Society, Universal Order-fromfamily to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family,real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal valuein relationship. Discuss with scenarios. Elicit examples from students' lives.

UNIT IV

Understanding Harmony in the Nature and Existence - Whole existence asCoexistence

Understanding the harmony in the Nature - Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulationin nature - Understanding Existence as Co-existence of mutually interacting units in all-pervasive space - Holistic perception of harmony at all levels of existence - Include practice sessions to discuss human being as cause of imbalance in

nature (film "Home" canbe used), pollution, depletion of resources and role of technology etc.

UNIT V

Implications of the above Holistic Understanding of Harmony on ProfessionalEthics

Natural acceptance of human values - Definitiveness of Ethical Human Conduct - Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order - Competence in professional ethics: a. Ability to utilize the professional competence foraugmenting universal human order b. Ability to identify the scope and characteristics of peoplefriendlyand eco-friendly production systems, c. Ability to identify and develop appropriatetechnologies and management patterns for above production systems. - Case studies of typical holistic technologies, management models and production systems - Strategy for transition from the present state to Universal Human Order: ((a) At the level ofindividual: as socially and ecologically responsible engineers, technologists and managers, (b)Atthe level of society: as mutually enriching institutions and organizations - Sum up

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g.To discuss the conduct as an engineer or scientist etc.

Text Book

1. *Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books,New Delhi, 2010*

Reference Books

1. *Jeevan Vidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.*
2. *Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.*
3. *The Story of Stuff (Book).*
4. *The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi.*
5. *Small is Beautiful - E. F Schumacher.*
6. *Slow is Beautiful - Cecile Andrews*
7. *Economy of Permanence - J C Kumarappa*
8. *Bharat Mein Angreji Raj - PanditSunderlal*
9. *Rediscovering India - by Dharampal*
10. *Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi*
11. *India Wins Freedom - Maulana Abdul Kalam Azad*
12. *Vivekananda - Romain Rolland (English)*
13. *Gandhi - Romain Rolland (English)*

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SEMESTER – IV

Subject Code : **BMA18016**	Subject Name : **STATISTICS FOR COMPUTER ENGINEERS**	**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 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
	√								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMA18016	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 no. of hrs: 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 (9thed)*, Prentice Hall of India, (2016).

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Subject Code: BCS18015	Subject Name : DATABASE MANAGEMENT SYSTEMS	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18001	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 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 fundamental concepts and techniques of DBMS
CO2	Analyze routine requisite for edifice, maintain, and querying databases.
CO3	Represent diverse indexing approach in different database systems
CO4	Evaluate a directory on base of adequate scheme.
CO5	Design an application by means of PL/SQL.

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		3
CO2	3	2	3			2			1	1		3
CO3	2	3	3			2			2	2		2
CO4	2	3	3			2			2	1		2
CO5	3	3	3			3			2	2		3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	1
CO2	3	2		1
CO3	3	1		1
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 / Technical Skill	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18015	DATABASE MANAGEMENT SYSTEMS	Ty	3	0/0	0/0	3

UNIT I FUNDAMENTALS OF DATABASE **9 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 **9 Hrs**

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 **9 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 IVQUERY PROCESSING AND TRANSACTIONS **9 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 **9 Hrs**

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

Total Hours: 45

TEXT BOOKS:

1. Abraham, Silberschatz. Henry, F. K.. Sudharshan, S. (2013) Database System Concepts (6thed.) 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*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18005	Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS	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 :

- 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	Understand the fundamentals of algorithms.
CO2	Develop various applications by analyzing their time complexity using various algorithms
CO3	Describe and implement algorithms for basic mathematical problems.
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
CO2	3	3	3	1						1		1
CO3	3	3	2	2						1		1
CO4	2	3	3	1						1		1
CO5	2	3	3	3								

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	1
CO2	3	3	1	1
CO3	3	2	2	2
CO4	3	3	1	2
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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18005	DESIGN AND ANALYSIS OF ALGORITHMS	Ty	3	0/0	0/0	3

UNIT IINTRODUCTION **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 LargeIntegers – 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 VCOPING 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/

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEC18I02	Subject Name : MICROPROCESSORS AND MICROCONTROLLERS	Ty/ Lb/ ETL	L	T/ 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	Describe the working of 8086 Microprocessor
CO2	Demonstrate the programming in microprocessor
CO3	Analyze the interfacing of different peripheral devices with the microprocessors
CO4	Explain the operation of 8051 microcontroller in real time process
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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
		✔										

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEC18I02	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 (2nd ed.), Tata McGraw Hill Publishing company Limited

REFERENCE BOOKS:

1. *Badri Ram. (2006) Advanced Microprocessors and Interfacing, Tata McGraw Hill Publishing company limited*
2. *Kenneth J. Ayala (2008) "The 8051 Micro Controller", 3rd Edition, Thomas Delmar Learning.*

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Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BHS18NC1**	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**	**PSO 4**
CO1	**1**	**1**	**2**	**3**
CO2	**1**	**1**	**2**	**2**
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			
			✓									

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BHS18NC1	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 andR. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies,Permanent Black, NewDelhi, 2002.*
4. *SubhashC.Kashyap,OurConstitution,NationalBookTrust, NewDelhi, 2011.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BHS18NC2**	Subject Name : **THEINDIAN 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**	**2**
CO2	**1**	**1**	**2**	**1**
CO3	**1**	**1**	**2**	**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	Soft Skills			
			✓									

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BHS18NC2	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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18ET1**	Subject Name : **JAVA PROGRAMMING**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18002	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

OBJECTIVE : To teach the basic concepts and techniques which form the object oriented programming paradigm.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the fundamentals of object-oriented programming in Java, including defining classes, objects, invoking methods etc and exception handling mechanisms.
CO2	Demonstrate the concepts of polymorphism and inheritance.
CO3	Explain the principles of packages and interfaces.
CO4	Create client Side Programming Using Java Applet.
CO5	Develop own application project/ Mini Project using java 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**	**2**	**2**			**1**				**1**		**3**
CO2	**3**	**2**	**1**			**2**				**1**		**2**
CO3	**3**	**2**	**1**			**2**						
CO4	**3**	**2**	**3**		**2**	**2**			**2**	**3**		**2**
CO5	**3**	**3**	**3**		**3**	**2**			**3**	**3**		**3**

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET1	JAVA PROGRAMMING	ETL	1	0/1	3/0	3

UNITI OVERVIEW OF JAVA LANGUAGE **9 Hrs**

Introduction to Java,Features of Java,Comparison with C and C++, Java and World Wide Web, Java Environment, Java Development kit (JDK),Java Runtime Environment(JRE), Application Programming Interface (API), Java Virtual Machine (JVM),Primitive Datatypes, Declarations, Ranges,Variable Names Conventions,Numeric Literals, Character Literals,String Literals,Arrays(One dimensional, two- dimensional), Enumerated Data Types

UNITII CLASSES, OBJECTS AND METHODS: **9 Hrs**

Classes and Objects,Defining a class;Defining instance variables and methods,Creating objects out of a class,Method calls via object references,Abstraction,Packages,Interfaces and Abstract classes,Abstract and non-abstract methods,Inheritance,extends and implements keywords in Java,Super class and Sub class,this keyword, super keyword in Java for inheritance,Concrete classes in Java,Polymorphism,Compile time polymorphism - Overloading of methods,Run time polymorphism - Overriding of methods,Method Overriding rules and method overloading rules,Encapsulation.

UNITIII EXCEPTION AND MULTITHREADED PROGRAMMING **9 Hrs**

Exception handling, Need for exceptions, API heirarchy for Exceptions, Types of Exceptions, Keywords in Exception API: try, catch, finally, throw, throws, -Introduction to Threads – Creating Threads, Extending the Thread Class, Implementing the runnable interface, life cycle of a thread, priority of a thread, Multithreading ,Synchronization, Dead Lock.

UNITIV STREAMS AND OBJECT SERIALIZATION **9 Hrs**

Overview of Streams,Bytes vs. Characters,Overview of the entire Java IO API,Reading a file; writing to a file usinf various APIs,Reading User input from console, PrintWriter Class, Object Serialization, Serializable Interface, Serialization API, ObjectInputStream and ObjectOutput, Transient Fields, readObject and writeObject.

UNITV GRAPHICS PROGRAMMING: **9 Hrs**

Introduction, Abstract Window Toolkit (AWT),Applets-Life Cycle- Basics of event handling – event handlers – adapter classes – actions – mouse events –AWT event hierarchy – introduction to Swing – buttons–Layout Management–Swing Components.

Total Hours: 45

TEXT BOOKS:

1. Herbert Schildt, “The Complete Reference JAVA 2”, Tata McGraw Hill publications, 7th Ed., 2007.
2. Balagurusamy, “Programming with JAVA A primer 3rd Edition”, Tata McGraw-Hill, 2007

REFERENCE BOOKS:

1. Y.Daniel Liang, “An Introduction to JAVA Programming”, Pearson, 2015
2. Kathy Sierra, Bert Bates,“ Head First Java”, Oreilly Publication, 2nd Edition, 2005

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Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name : DATABASE MANAGEMENT SYSTEMS LAB	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L03	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 the programming and theoretical concept of commands.
CO2	Analyze the problem and apply the syntactical structure of query.
CO3	Remember the structure and syntax of PL/SQL.
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	3	2	2	1					1	2		2
CO2	3	2	3	1					1	1		2
CO3	2	3	2	1					1	2		2
CO4	2	3	3	1					1	3		3
CO5	3	3	3	1					1	2		3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1		1
CO2	2	1		1
CO3	2	1		1
CO4	2	1	2	1
CO5	2	2	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 Skills	Soft Skills			
							✔					

Department of Computer Science and Engineering
Regulation 2018

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

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)

Department of Computer Science and Engineering
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Subject Code: BCS18L04	Subject Name : DESIGN AND ANALYSIS OF ALGORITHMS 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
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	Design and analyze the performance of algorithms that employ various strategy.
CO2	Solve problems using fundamental algorithms and sorting.
CO3	Experiment and analyze the average-case running times of randomized algorithms, and shortest path algorithms
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
CO2	3	3	2	1						1		1
CO3	2	3	2	1						1		1
CO4	3	3	3	1						1		1
CO5	3	3	2	1						1		1

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

Department of Computer Science and Engineering
Regulation 2018

							✔					

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

LIST OF EXPERMENTS:

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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BEC18IL2**	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			
							✔					

Department of Computer Science and Engineering
Regulation 2018

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

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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18TS1	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	PO 1	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
								✔	

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18TS1	**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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEN18SK1	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)

Students will be able to

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					
CO2	1	1	3					
CO3	1	1	3					
CO4	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 / Technical Skill	Soft Skills			
			✓						✓			

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BEN18SK1	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

Department of Computer Science and Engineering
Regulation 2018

SEMESTER - V

Subject Code: **BCS18006**	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 :

- The students will 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	Remember and Understand functions, structures and history of operating systems
CO2	Analyze various functions of CPU processing algorithms
C03	Understand the concept of hazard and analyze with prevention process.
C04	Analyze various memory management schemes
C05	Apply the functionality of file 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**	**3**			**1**							
CO2	**3**	**3**	**2**		**1**							
C03	**3**	**3**	**2**		**1**							
C04	**3**	**3**	**2**		**1**							
C05	**3**	**3**	**2**		**1**							

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**		
CO1	**3**	**3**	**1**	**1**		
CO2	**3**	**3**	**1**	**1**		
C03	**3**	**3**	**1**	**1**		
C04	**3**	**3**	**1**	**1**		
C05	**3**	**3**	**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			
				✔								

Department of Computer Science and Engineering
Regulation 2018

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

UNIT ICONCEPTS & 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 IIPROCESS 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 IVSTORAGE 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*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18007**	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	Students will understand and remember how network works.
CO2	Students will have knowledge on IP address and analyze the protocols.
CO3	Apply knowledge about protocols to avoid congestion.
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**	**1**							**2**
CO2	**3**	**2**	**1**	**2**	**1**							**2**
CO3	**3**	**2**	**1**	**3**	**1**							**2**
CO4	**3**	**3**	**2**	**3**	**1**							**2**
CO5	**3**	**2**	**2**	**2**	**1**							**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**2**
CO4	**3**	**1**	**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			
				✔								

Department of Computer Science and Engineering
Regulation 2018

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

UNIT IINTRODUCTION **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 IIDATA 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 IIINETWORK 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 IVTRANSPORT LAYER **9 Hrs**

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

UNIT VAPPLICATION 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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18008	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 :

- Kindly don't make any changes in pre exiting objectives…

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recall the basic concepts of computation
CO2	Understand the basics of Assemblers, Loaders, Linkers and Macro processors to compare the architectures.
CO3	Ability to differentiate and construct an automata.
CO4	Apply the principles of compiler to generate the target code
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	3	2									
CO2	3	3	3									
CO3	2	3	1									
CO4	2	3	1									
CO5	1	2	3									

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

Department of Computer Science and Engineering
Regulation 2018

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

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,
2. 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

Department of Computer Science and Engineering
Regulation 2018

Subject Code	Subject Name :	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET2	**COMPUTER GRAPHICS**					
	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	Explain the various output primitives ,transform geometrical structures and graphics systems
CO2	Understand 2D transformations, viewing and clipping techniques
CO3	Explain the 3D objects and projections and solving numerical problems on 3D transformation and polygon rendering methods
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	3	2	1	1								
CO2	3	3	2	3								
CO3	3	3	2	3								
CO4	2	2	3	2								
CO5	2	2	3	2								

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	2	1	1	1
CO2	2	2	1	1
CO3	2	1	1	1
CO4	3	1	1	1
CO5	3	2	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	ProgramElectives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET2	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, (4th 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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18L05**	Subject Name : **NETWORK PROGRAMMING LAB**	**Ty /Lb /ETL**	**L**	**T/S.Lr**	**P/R**	**C**
	Prerequisite: **: BCS18ET2**	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**					**2**
CO2	**3**	**2**	**1**	**2**	**2**	**3**	**3**					**2**
CO3	**3**	**2**	**1**	**3**	**3**	**3**	**2**					**2**
CO4	**3**	**3**	**2**	**3**	**1**	**3**	**1**					**2**
CO5	**3**	**2**	**2**	**2**	**1**	**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			
				✔								

Department of Computer Science and Engineering
Regulation 2018

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

LIST OF EXPERMENTS:

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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18L06	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	Create processes and implement IPC
CO2	Implement Deadlock avoidance and Detection Algorithms
CO3	Compare the performance of various CPU Scheduling Algorithms
CO4	Analyze the performance of the various Page Replacement Algorithms
CO5	Implement File Organization and File Allocation Strategies

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	3									
CO3	2	3	3									
CO4	2	3	3									
CO5	3	3	3									

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	2	3	2
CO2	3	3	2	3
CO3	3	2	2	2
CO4	3	3	3	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 / Technical Skill	Soft Skills			
							✔					

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L06	**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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18L07	Subject Name : SYSTEM SOFTWARE AND COMPILER DESIGN 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 design assembler, loader and linker
- The students will be able to construct the NFA and DFA for a regular expression and implement various phases of compiler.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Implement Symbol table using C/C++ Language
CO2	Design an assembler, loader and linker.
CO3	Construct the NFA and DFA for a regular expression.
CO4	Implement the front end and back end of a compiler.
CO5	Implement different parsing algorithms.

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									
CO2	3	3	3									
CO3	3	3	3									
CO4	3	3	3									
CO5	3	3	3									

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L07	**SYSTEM SOFTWARE AND COMPILER DESIGN LAB**	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

1. To implement the Symbol Table using C / C++
2. To implement the Assembler using C / C++
3. To implement the Loader using C / C++
4. To implement the Linking Loader using C / C++
5. Lexical Analyzer using “C”.
6. Constructing NFA from a regular expression
7. Constructing DFA from a regular expression
8. To eliminate Left Factoring
9. Constructing top down parsing table
10. To implement the Shift-reduce parsing algorithm.
11. To implement the Operator-Precedence parsing algorithm
12. Constructing LR-Parsing table.
13. Generate a code for a given intermediate code
14. Generate Machine code

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18TS2	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
								✔	

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18TS2	**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.

Department of Computer Science and Engineering
Regulation 2018

SEMESTER - VI

Subject Code: **BCS18009**	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	Summarize different process models.
CO3	Analyze on various architectural designs using UML diagrams.
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**	**2**	**3**		**2**	**3**		**2**	**2**			
CO2	**2**	**3**	**2**		**3**	**3**		**2**	**2**	**1**		
CO3	**3**	**2**	**2**		**3**	**2**		**2**	**2**	**1**		
CO4	**3**	**3**	**2**		**3**	**2**		**2**	**2**	**1**		
CO5	**3**	**2**	**2**		**2**	**2**		**3**	**3**	**1**		

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**1**	**2**
CO2	**3**	**3**	**1**	**3**
CO3	**2**	**3**	**1**	**2**
CO4	**2**	**2**	**1**	**3**
CO5	**2**	**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 / Technical Skill	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18009	**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 (9th 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 (8th ed.) McGraw hill Publications*
4. *Grady Booch (2009) Object oriented Analysis & design ,Pearson Education India*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BIT18003	Subject Name **WEB TECHNOLOGY AND WEB SERVICES**	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
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	Remember the concept of Hyper Text markup language and CSS
CO2	Understand the skills that will enable to design and build high level web enabled applications.
CO3	Analyze the applicability of Scripting language as per current software industry standards..
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	1							
CO2	3	3	3	3	1							
CO3	3	3	3	3	1							
CO4	3	3	3	3	1							
CO5	3	2	2	2	1							

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18003	**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 **9 Hrs**

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 V WEB 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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18ET3**	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	**List the fundamentals of scripting language.**
CO2	**Demonstrate a variety of database concept.**
CO3	**Classify the various web technique designs.**
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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
				✔								

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18ET3	**PHP / MYSQL**	ETL	1	0/1	3/0	3

UNIT IIntroduction **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 IIArrays **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 VFiles 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 3rd Edition – 2013
3. Luke Welling, Laura Thomson " PHP and MySQL Web Development" Person Education 5th Edition – 2016.

Reference Books:

1. *Robin Nixon "Learning PHP, MySQL & JavaScript" O REILLY – 5th Edition - 2015.*
2. *Elizabeth Naramore, Jason Gerner, etal "Beginning PHP5, Apache, MySQL web development" Wrox Publishing – 2005.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18L08	Subject Name : OBJECT ORIENTED SOFTWARE ENGINEERING LAB	Ty/ Lb/ ETL	L	T/ 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	2	3	1	2	1						
CO2	2	3	1	2	3	1				2		
CO3	3	2	2	1	2	1						
CO4	3	3	1	2	3	1				2		
CO5	1	2	2	2	2	1				2		

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L08	OBJECT ORIENTED SOFTWARE ENGINEERING LAB	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS:

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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BIT18L03**	Subject Name **WEB TECHNOLOGY AND WEB SERVICES 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	Remember and build high level web enabled applications.
CO2	Understanding the concept of CSS to develop interactive web pages.
CO3	Ability to design a dynamic web site using XML and XSLT
CO4	Able to learn and develop to design mail communication
CO5	Create applications using different types of web services and frameworks

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**							
CO2	**3**	**3**	**3**	**2**	**2**							
CO3	**3**	**3**	**3**	**2**	**2**							
CO4	**2**	**3**	**3**	**2**	**2**							
CO5	**3**	**3**	**3**	**2**	**2**							

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**1**	**2**
CO2	**3**	**3**	**1**	**2**
CO3	**2**	**3**	**1**	**3**
CO4	**2**	**1**	**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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							✔					

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BIT18L03	**WEB TECHNOLOGY AND WEB SERVICES LAB**	**Lb**	**0**	**0/0**	**3/0**	**1**

LISTOF EXPERMENTS:

1. Create a web page with the following using HTML
   i) To embed an image map in a web page
   ii) To fix the hot spots
   iii) Show all the related information when the hot spots are clicked.
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML
4. Write a program in Java to create applets incorporating the following features:
   i. Create a color palette with matrix of buttons Set background and foreground of the control text area by selecting a color from color palette.
   ii. In order to select Foreground or background use check box control as radio buttons
   iii. To set background images
5. Programs using XML – Schema – XSLT/XSL
6. Create a Web form for an online library. This form must be able to accept the Membership Id of the person borrowing a book, the name and ID of the book, and the name of the book's author. On submitting the form, the user (the person borrowing the book) must be thanked and informed of the date when the book is to be returned. You can enhance the look of the page by using various ASP.NET controls.
7. Create a JSP application. Send a simple E-Mail to your friends
8. Consider a case where we have a web Service- an airline service and a travel agent and the travel agent is searching for an airline. Implement this scenario using Web Services and Data base.

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Subject Code: BEN18SK2	Subject Name : SOFT SKILL – II	Ty/ Lb/ ETL	L	T/ 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 :

- To bring behavioural patterns of students.
- To train them for corporate culture.
- To create self awareness.
- To build confidence.
- To train the students for facing the interviews and develop interpersonal relationship.

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	1	1	2	1
CO2	1	2	1	1
CO3	1	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 / Technical Skill	Soft Skills			
									✓			

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BEN18SK2	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).*

Department of Computer Science and Engineering
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Subject Code: **BCS18L09**	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	Aspire an insight of an industry / organization/company pertaining to the domain of study.
CO2	Construct skills and knowledge for a smooth transition into the career.
CO3	Support 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			
								✔				

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L09	**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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18TS3	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	PO 1	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
								✔	

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18TS3	**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.

Department of Computer Science and Engineering
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SEMESTER – VII

Subject Code: **BCS18010**	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	Identify the functionality of the various data mining and data warehousing component
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models
CO3	Explain the analyzing techniques of various data
CO4	Describe different methodologies used in data mining and data ware housing.
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**	**2**	**3**	**2**						
CO2	**3**	**2**	**2**	**2**	**3**	**2**						
CO3	**3**	**3**	**2**	**2**	**3**	**2**						
CO4	**3**	**2**	**3**	**2**	**3**	**2**						
CO5	**3**	**3**	**3**	**2**	**3**	**2**						

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**1**	
CO2	**2**		**1**	**1**
CO3	**2**	**2**	**1**	
CO4	**3**	**1**	**1**	**1**
CO5	**1**	**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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18010	**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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Subject Code: BCS18011	Subject Name : DOT NET FRAMEWORK	Ty/ Lb/ ETL	L	T/ 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	Understand the concepts of Dotnet framework
CO2	Choose appropriate algorithm for each module considering economic and social aspects
CO3	Construct the simple program with the connectivity of front end and back end.
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							1			
CO2	2				3				3	1		
CO3	2	3			3				2	2		
CO4	2	3		1	1				3	3		
CO5	2	3		3	3				3	2		

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			
					✔							

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18011	**DOT NET FRAMEWORK**	**Ty**	**3**	**1/0**	**0/0**	**4**

UNIT IDOT 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 IIC#.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, (3rded.) 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 (4thed.) 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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Subject Code:	Subject Name : MANAGEMENT CONCEPTS AND ORGANIZATIONAL BEHAVIOR	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BMG18002	Prerequisite: BES18ET3 Basic Knowledge such as Statistical Techniques and 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 :

- 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	Remember the functions of manager and management
CO2	Able to understand the co workers at work environment
CO3	Apply the 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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BMG18002	**MANAGEMENT CONCEPTS AND ORGANIZATIONAL**	**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 10th 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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Subject Code: BCS18L11	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 the weka tool
CO2	Classify big data analytics domains and collect relevant data for analysis
CO3	Understanding various performance metrics for evaluation of data mining techniques
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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L11	**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. 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
11. Classification using

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Subject Code: BCS18L12	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

OURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the various built in packages and its application in Dot Net
CO2	Demonstrate the interface, multithread concepts and File handling
CO3	Knowledge on designing windows based, web based applications.
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	3	3		1	2				3	1	1	3
CO2	2	3		2					3		2	2
CO3	2	3		3	3				3	2	2	3
CO4	2	3		2	3				3			2
CO5	2	3		3	3				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			
							✔					

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L12	**DOT NET LAB**	Lb	0	0/0	3/0	1

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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(An ISO Certified Institution)
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Maduravoyal , Chennai - 600 095

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Subject Code: **BCS18L13**	Subject Name : **PROJECT PHASE - I**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	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	Design the software system effectively
CO3	Encourage students to think critically and creatively about societal issues and develop user friendly solution.
CO4	Support the field experience and get linked with the professional network.
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			
							✔					

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L13	**PROJECT PHASE – I**	**Lb**	**0**	**0/0**	**3/3**	**2**

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

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Subject Code: **BHS18FLX**	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	**1**	**1**	**1**	**1**
CO2	**1**	**1**	**1**	**1**
CO3	**1**	**2**	**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			
			✓									

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BHS18FLX	**FOREIGN LANGUAGE (EVALUATION)**	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

Department of Computer Science and Engineering
Regulation 2018

SEMESTER - VIII

Subject Code: BCS18012	Subject Name : OPEN SOURCE SCRIPTING LANGUAGES	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18ET3	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	Remember the concepts of basic structure of the program
CO2	Understand the basic programming concepts of OOSL based on their knowledge
CO3	Interpret and efficient solutions for problem based on OOSL
CO4	Differentiate the problem based on OOSL and provide efficient solutions.
CO5	Build to develop an application using scripting languages.

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							
CO2	3	3	3	2	3							
CO3	2	3	3	3	3							
CO4	2	3	2	3	3							
CO5	3	3	2	2	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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18012	OPEN SOURCE SCRIPTING LANGUAGES	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION TO SCRIPTING LANGUAGES 8 Hrs

Introduction to Scripting: Scripts and Programs, Origin of Scripting , Scripting Today, Characteristics of Scripting Languages, Uses for Scripting Languages, Web Scripting, and the universe of Scripting Languages.

UNIT II JAVASCRIPT 9 Hrs

JavaScript introduction – control structures – functions – arrays – document objects model – Event handling – object oriented in JavaScript - simple web applications

UNIT III PERL 9 Hrs

PERL- Names and Values, Variables, Scalar Expressions, Control Structures, arrays, list, hashes, strings, pattern and regular expressions, subroutines.Finer points of looping, pack and unpack, file system, eval, data structures, packages, modules, objects, interfacing to the operating system, Creating Internet ware applications, Dirty Hands Internet Programming, security Issues.

UNIT IV PYTHON 10 Hrs

Python: Installing Python,Introduction to Python language, Basic syntax, interactive shell, editing, saving, and running a script. The concept of data types; variables, assignments; immutable variables-operators and expressions - Conditions and Control statements – String handling, files and directories - functions and its types.Simple Graphics and Image Processing, Python with OOP - Exception handling

UNIT V RUBY 9 Hrs

Introduction to RUBY : Basics, Comments, Variables Strings, Operators, Conditional Statements,Arrays and Hashes, Methods Files,classes, Exception Handling Introduction to Ruby on Rail .

Total Hours: 45

TEXT BOOKS:

1. David Barron, “The World of Scripting Languages” , Wiley Publications,2002
2. Kenneth A. Lambert, Martin Osborne, “Fundamentals ofPython: First Programs”, Contributing Author published by Course Technology, Cengage Learning Publications.2010.
3. Michael Fitzgerald, “Learning Ruby”, O’Reilly Publications, 2007.

REFERENCE BOOKS:

1. *Richard Clark, Oli Studholme, Christopher Murphy and Divya Manian,”Beginning HTML5 and CSS 3” @ Apress.*
2. *Jennifer Campbell , Paul Gries, Jason Montojo , Greg Wilson , “Practical Programming An Introduction to Computer Science Using Python” , The Pragmatic Bookshelf Raleigh, North Carolina Dallas, Texas , 2009*
3. *Tom Christiansen, brian d foy & Larry Wall, with Jon Orwant, “Programming Perl, Fourth Edition “, O’Reilly, 2012.*

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Subject Code: BCS18L14	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	To explain the functionality of the system
CO2	To express proficiency in handling the technologies
CO3	To support the societal problems
CO4	To summarize the innovative ideas with good documentation
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	2	1	2	1		
CO2	3	3	3	3	3	3	3	2	2	1		
CO3	3	3	3	2	2	3	3	1	1	3		
CO4	2	2	3	2	3	2	2	1	1	2		
CO5	3	2	2	2	2	2	2					

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	2	2
CO2	3	3	3	3
CO3	2	2	1	3
CO4	2	1	2	1
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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18L14	**PROJECT (PHASE – II)**	**Lb**	**0**	**0/0**	**12/12**	**8**

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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5th SEMESTER ELECTIVES E- I (Common to CSE&IT)

Subject Code: **BCS18E01**	Subject Name : **IMAGE PROCESSING**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18ET1	**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 Lean the image fundamentals and mathematical transforms necessary for image processing.
- To Learn the image enhancement techniques
- To Learn image restoration procedures.
- To Learn the image compression procedures.
- To Learn the image segmentation and representation techniques.

COURSE OUTCOMES (COs) : (3- 5)

CO1	To Identify digital image
CO2	Discuss digital image fundamentals
CO3	Apply image enhancement and restoration techniques
CO4	Analyze images in the frequency domain using various transforms.
CO5	To improve the quality of image

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**	**2**	**2**	**1**	**2**	**1**	**2**	**2**	**2**	**1**
CO2	**3**	**3**	**3**	**3**	**3**	**1**	**2**	**1**	**2**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**2**	**3**	**2**
CO4	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**1**	**2**	**2**	**2**
CO5	**3**	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**3**	**2**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**2**	**2**
CO2	**3**	**3**	**1**	**3**
CO3	**2**	**3**	**2**	**3**
CO4	**2**	**3**	**1**	**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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E01	IMAGE PROCESSING	Ty	3	0/0	0/0	3

UNIT I INTRODUCTION **9 Hrs**

Digital image representation-Fundamental steps in image processing -Elements of digital image processing systems, Digital Image Fundamentals - :Elements of visual perception-A simple image model -Sampling and quantalization -Some basic relationship between pixels-Imaging geometry -Photographic film.

UNIT II IMAGE TRANSFORMS **9 Hrs**

Introduction to the Fourier transform -The Discrete Fourier transform -Some properties of the two dimenstional Fourier transform -The fast Fourier transform-Other seperable image transforms-The hotelling transform.

UNIT III IMAGE ENHANCEMENT **9 Hrs**

Background -Enhancement by point Processing -Spatial filtering-Enhancement in the frequency domains - Generations of the spatial masks from frequency Domain specifications- Color image processing -Image Restoration: Degradation Model -diagonalization of Circulant and Block circulant Matrices -Algebraic approach to restoration-Inverse filtering -Least mean square filter -constrained least square restoration-Restoration in spatial domain-Geometric transformation.

UNIT IV IMAGE COMPRESSION **9 Hrs**

Fundamentals -image Compression models -Elements of information Theory - Error-free Compression - Lossy Compression - Image Compression standards, Images Segmentation : Edge linking and boundary detection - Thresholding - Region - Oriented segmentation – The use of motion in segmentation.

UNIT V REPRESENTATION AND DESCRIPTION **9 Hrs**

Representation Schemes - Boundary descriptors - Morphology - Relational descriptors, Recognition and Interpretation: Elements of image Analylsis - Pattern and pattern classes - Decision theoretic methods - Structural Methods - Interpretation.

Total Hours: 45

TEXT BOOKS:

1. RAFAEL C.GONZALEZ and RICHARD E.WOODS. Digital Image Processing - 2009,Prentice Hall.
2. Jayaraman, S. Esakkirajan and T. Veerakumar, Digital Image Processing – Tata McGraw Hill, 2009

REFERENCE BOOKS :

1. *M.A.SID AHMAED, Image Processing Theory, Algorithm and Architecture – McGraw Hill, 1995*
2. *DON PEARSON, Image Processing, McGraw Hill, 1991.*

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Subject Code: BCS18E02	Subject Name : Geographical Information Systems	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 able to design, explore, interpolate and analyze GIS models
- To create a new geo coding technique and apply the learnt GIS modeling for a real time case study.

COURSE OUTCOMES (COs) : (3- 5)	
CO1	Able to apprehend GIS concepts
CO2	Understand the various GIS models
CO3	Apply the learnt GIS models in real time application
CO4	To analyze the various GIS techniques
CO5	To apply the new geo coding technique for real time case study

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	2	1	2	2	3	2	2	3	2	1
CO2	1	1	2	2	2	2	2	2	2	2	2	2
CO3	2	2	1	1	2	3	3	2	2	2	2	1
CO4	2	1	1	1	3	3	2	2	2	2	1	2
CO5	1	2	2	2	2	2	3	2	2	2	1	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	2	1	2
CO2	2	2	1	1
CO3	2	1	1	2
CO4	2	1	2	1
CO5	2	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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E02	GEOGRAPHICAL INFORMATION SYTEMS	Ty	3	0/0	0/0	3

UNIT I BASIC CONCEPTS **9 Hrs**

Introduction - Coordinate Systems - Vector Data Model - Raster Data Model.

UNIT II DATA ACQUISTION & MANIPULATION **9 Hrs**

GIS Data Acquisition - Geometric Transformation - Spatial Data Editing - Attribute Data Input and Management - Data Display and Cartography.

UNIT III DATA ANALYSIS **9 Hrs**

Data Exploration - Vector Data Analysis - Raster Data Analysis - Terrain Mapping and Analysis - Viewsheds and Watersheds.

UNIT IV INTERPOLATION & APPLICATIONS **9 Hrs**

Spatial Interpolation - Geocoding and Dynamic Segmentation - Path Analysis and Network Applications.

UNIT V MODELLING **9 Hrs**

GIS Model and Modelling.

Total Hours: 45

TEXT BOOK:

1. Kang-tsung Chang (2015), *Introduction to Geographic Information Systems*, (8^{th} ed.), Mcgrawhill ISBN 0078095131, 9780078095139

REFERENCE BOOKS:

1. *Prithvish Nag And Smita Sengupta, Introduction To Geographical Information Systems, Concept Publishing Company, 2007, ISBN 8180694399, 9788180694394*
2. *Paul Longley, Geographical information systems, 2/e, Wiley, 1999,Digitised 2007, ISBN - 0471321826, 9780471321828*

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Subject Code:	Subject Name : **DATABASE TUNING**	**Ty/Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
BCS18E03	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 :

- The students will be able to tune the databases for different data base applications
- To develop case studies in data bases, and able to troubleshoot the data bases
- Identify the critical performance tuning steps

COURSE OUTCOMES (COs) : (3- 5)

CO1	Remember the concepts of DBMS
CO2	Understand the fundamentals of Tuning.
CO3	Able to Tune the databases for different Data base Applications
CO4	Able Develop Case Studies in data bases.
CO5	Able to Troubleshoot the data bases

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**	**1**	**2**	**2**	**2**	**1**
CO2	**3**	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**	**2**
CO4	**3**	**3**	**3**	**3**	**1**	**3**	**2**	**3**	**2**	**3**	**3**	**2**
CO5	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**3**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**3**	**3**	**2**
CO2	**1**	**3**	**3**	**2**
CO3	**2**	**3**	**3**	**3**
CO4	**3**	**2**	**3**	**2**
CO5	**2**	**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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E03	DATABASE TUNING	Ty	3	0/0	0/0	3

UNIT I Fundamentals of Tuning 9 Hrs

Review of Relational Databases – Relational Algebra - Locking and Concurrency Control – Correctness Consideration – Lock Tuning – Logging and the Recovery Subsystem – Principles of Recovery – Tuning the Recovery Subsystem – Operating Systems Considerations – Hardware Tuning

UNIT II Indexing and Hashing 9 Hrs

Types of Queries – Data Structures – B tree – B+ Tree - Hash Structures – Bit Map Indexes – Clustering Indexes – Non Clustering Indexes – Composite Indexes – Hot Tables – Comparison of Indexing and Hashing Techniques

UNIT III Query Optimization 9 Hrs

Techniques - Tuning Relational Systems – Normalization – Tuning De-normalization – Clustering Two Tables – Aggregate Maintenance – Record Layout – Query Tuning – Triggers – Client Server Mechanisms – Objects, Application Tools and Performance – Tuning the Application Interface – Bulk Loading Data – Accessing Multiple Databases

UNIT IV Troubleshooting 9 Hrs

Query Plan Explainers – Performance Monitors – Event Monitors – Finding ―Suspicious‖ Queries – Analyzing a Query‘s Access Plan – Profiling a Query Execution – DBMS Subsystems

UNIT V Case Studies 9 Hrs

Transaction Chopping – Time Series Databases – Understanding Access Plans – Configuration Parameters: ORACLE; SQL SERVER; DB2UDB – DISTRIBUTED DATABASE – IMPLEMENTATION.

TOTAL HOURS: 45

TEXT BOOKS:

1. Dennis Shasha and Philippe Bonnet (2005) Database Tuning, Principles, Experiments, and Troubleshooting Techniques, Elsevier
2. Thomas Connoly and Carlolyn Begg (2009) Database Systems, A Practical Approach to Design, Implementation and Management, (4th ed.) Pearson Education

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Subject Code: **BCS18E04**	Subject Name : **COMPONENT BASED TECHNOLOGY**	**Ty/Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18ET2 & BCS18012	**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 :

- Show clear understanding of theoretical concepts of component based development and be able to apply the appropriate techniques of implementation using EJB 3 technology.
- To show the ability to critically discuss the key concepts in component based development and influence of this topic to modern trends in business computing and software engineering.
- Show detailed knowledge of aspects of EJB 3 technology that allow development of applications based on components and service oriented architecture.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Apply the principles for building software systems from components.
CO2	Familiarity with the technologies and understand the standards for component models and service-oriented computing.
CO3	Analyze the Java realization of components including Java Beans, JSP, Servlets, EJB, and Java RMI and how Web services are realized in Java.
CO4	Understand the components of the CORBA .
CO5	Remember the Microsoft Component Technologies and apply in various 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**	**3**	**3**	**2**	**2**	**1**	**2**	**3**	**3**	**3**	**3**
CO2	**3**	**2**	**3**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**3**	**2**	**2**	**1**	**3**	**3**	**3**	**3**	**3**
CO4	**3**	**2**	**2**	**1**	**2**	**2**	**1**	**3**	**2**	**2**	**2**	**1**
CO5	**3**	**2**	**3**	**2**	**1**	**2**	**2**	**3**	**3**	**2**	**3**	**1**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**H3**	**3**
CO2	**3**	**1**	**2**	**3**
CO3	**3**	**2**	**3**	**3**
CO4	**3**	**1**	**1**	**2**
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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E04	**COMPONENT BASED TECHNOLOGY**	Ty	3	0/0	0/0	3

UNIT I Distributed Object Technology 9 Hrs

Introduction-Evolution of distributed systems-Evolution of distributed objects- Methods of distribution-Multi-Tier Architecture.**Component Technology:** Component Concepts-Modules- Interfaces-Callbacks – Directory services-Component Architecture-Component Based Software development.

UNIT II Enterprise Foundations 9 Hrs

Enterprise Architecture Overview-Object Oriented Software Development for the Enterprise- Component based Software development for the Enterprise- Java Enterprise System Architecture with J2EE.**JAVA Based Component Model:** JAVA Beans-Remote Method Invocation(RMI)-RMI-IIOP. **Enterprise Java Beans:** Introduction-EJP Architecture-Types of Enterprise Beans-Life Cycle of Beans-Steps in developing an EJP.

UNIT III Architecture of Corba 9 Hrs

The History of CORBA- CORBA Architecture-ORB-Portable Object Adapter-Internet inter-ORB Protocol(IIOP)-Dynamic CORBA-OMG IDL-CORBA Services-CORBA Object Location Service-CORBA Activation Framework-CORBA Messaging Services-CORBA Event Service-CORBA Security Service-CORBA Object Transaction Service. CORBA Component Model-Model Driven Architecture.

UNIT IV Microsoft Component Technologies 9 Hrs

Evolution of Microsoft Component Technologies-OLE-Active X Controls-DLL Surrogates and Executables-Components with ATL-DCOM Architecture-Interface-COM IDL.**Service Oriented Architecture:** Introduction to Web Services-Introduction to Service oriented architecture-Business Value of SOA-Architectural Elements of SOA- Web Services and Service Oriented Architecture.

UNIT V Application 9 Hrs

Client Server using –RMI-RMI/IIOP- CORBA-Enterprise Beans.Componentized Application Development using EJP.

Total Hours: 45

TEXT BOOKS:

1. G. Sudha Sadasivam(2008)- Component Based Technology,Wiley India Pvt.Ltd.

REFERENCE BOOKS:

1. *Robert Orfali, Dan Harkey and Jeri Edwards (2002)-The Essential Client / Server Survival Guide, Galgotia*
2. *Publications Pvt. Ltd.*
3. *Tom Valesky (2002) - Enterprise Java Beans, Pearson Education.*
4. *Jason Pritchard (2000) —COM and CORBA Side by Side, Addison Wesley.*
5. *Joel Murach,Anne Boehm (2012)- C#, Murach.*

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Subject Code: **BCS18E05**	Subject Name : **E-COMMERCE**	**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
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Understand the nature of e-Commerce
- Recognize the business impact and potential of e-Commerce
- Explain the technologies required to make e-Commerce viable
- Discuss the current drivers and inhibitors facing the business world in adopting and using eCommerce;
- Explain the economic consequences of e-Commerce;
- Discuss the trends in e-Commerce and the use of the Internet.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the concepts of E-commerce business models and strategy
CO2	Discuss the infrastructure for E-commerce and various services
CO3	Illustrate the various protocols and wireless devices for M-commerce
CO4	Classify the technologies of Mobile commerce
CO5	Design the model and evaluate the plan

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**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**2**	**1**	**2**
CO2	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**2**	**2**	**2**
CO3	**1**	**1**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**	**2**	**2**
CO4	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**2**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**1**	**1**	**1**
CO2	**2**	**2**	**2**	**2**
CO3	**2**	**1**	**1**	**1**
CO4	**3**	**2**	**2**	**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 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
BCS18E05	E-COMMERCE	Ty	3	0/0	0/0	3

UNIT I Introduction 9 Hrs

History of E-Commerce -E-Commerce Vs E-Business-Emergence of the Internet- Advantages-Disadvantages-Business model- E –Business Models based on the relationship of Transaction Parties- E –Business Models based on the relationship of Transaction Types- Technologies of World Wide Web- Internet Client Server Applications-Networks and Internets-Software Agents-Internet Standards and Specification-Internet Service Provider-Markup Language and the web-JavaScript-XML-Intranets and Extranets.

UNIT II E-Marketing 9 Hrs

Identifying Web Presence Goals- The Browsing Behaviour Model-Online Marketing-E-Advertising-Internet Marketing Trends-Targets Markets-E-Branding-Marketing Strategies E-Security: Security on the Internet-E-Business Risk Management Issues-E-Payment Systems: Digital Token based e-payment System-Classification of New Payment System- Electronic Cash-Risk and E-Payment System-Designing E-paymentSystem- Digital Signature.

UNIT III E-Customer Relationship Management 9 Hrs

CRM-ECRM Solutions- ECRM Toolkit-Typical Business Touch point. E-Supply Chain Management-Supply Chain Management- Supply chain Management for Various Industries- E- Strategy and Knowledge management.

UNIT IV Mobile Commerce 9 Hrs

Information System for Mobile Commerce-Mobile Payments-Cellular Networks-Different Generations in wireless Communication- Technologies for mobile Commerce-WAP Programming Model. Portals for E-Business: Portals-Requirements of Intelligent Websites.

UNIT V Applications 9 Hrs

Plan your Business and create a web Site with wordpress.

Total Hours: 45

TEXT BOOK:

1. P.T. Joseph, S.J. (2015),E-Commerce Indian Perspective Fifth Edition, PHI Learning

REFERENCE BOOKS:

1. *Zheng Qin(2009), Introduction to E-Commerce,Springer.*
2. *Mamta Bhusry,E-Commerce, Laxmi Publications PVT Ltd.*

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Subject Code: **BCS18E06**	Subject Name : **ARTIFICIAL INTELLIGENCE**	**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

OBJECTIVES :

•The students will be able to solve problems using AI techniques
•To develop new games using AI techniques
To guide the process of deducing information in a computational manner

COURSE OUTCOMES (COs) : (3- 5)

CO1	Illustrate different types of AI agents and searching strategies
CO2	Ability to inference the knowledge and plan effectively
CO3	Discuss the techniques used for game playing using various searching algorithms.
CO4	Analyze various types of planning to create effective AI applications
CO5	Learns how artificial intelligence support robotics.

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**	**3**	**1**	**1**	**3**	**3**	**1**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**3**	**2**	**3**
CO5	**1**	**1**	**1**	**1**		**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**	**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
BCS18E06	ARTIFICIAL INTELLIGENCE	Ty	3	0/0	0/0	3

UNIT I Introduction and Problem Solving 9 Hrs

Introduction– Intelligent agent – Types of agents – Agent Structure – Problem solving agents – Problem Formulation - Uninformed search strategies – Breadth first search – Uniform cost search – Depth first search – Depth limited search – Bidirectional search – Searching with partial Information

UNIT II Informed Search Methods and Game Playing 9 Hrs

Informed search Strategies – A* Heuristic function – Hill Climbing search – Constraint Satisfaction problem - Optimal decisions in games – Pruning –Alpha-Beta pruning - State-of-the-Art Game Programs

UNIT III Knowledge and Reasoning 9 Hrs

Knowledge based agent – The Wumpus world environment – First-order logic –Building a Knowledge base – Properties of Good and Bad Knowledge bases – The Grocery Shopping World - Inferences in FOL – Forward and backward chaining algorithm

UNIT IV Acting Logically 9 Hrs

Planning-Simple planning agent-Planning with state space search-Partial order planning-Practical planning – Practical planners – Planning and Acting – Conditional Planning – Fully Integrated planning and execution

UNIT V Uncertain Knowledge Reasoning and Robotics 9 Hrs

Acting under Uncertainty - Knowledge Engineering for Uncertain Reasoning - Case study: The Pathfinder system – Robotics Introduction – Goods of Robots – Parts of Robots – Navigation and Motion planning.

Total Hours: 45

TEXT BOOKS:

1. Stuart R. Peter N. (2010) Artificial Intelligence A modern Approach, Prentice Hall
2. Elaine R. Kevin K. (2008) Artificial Intelligence Tata McGraw Hill

REFERENCE BOOKS:

1. Tim Jones M. (2008) Artificial Intelligence, A System Approach(Computer Science)
2. Ben Coppin (2004) Artificial intelligence illuminated, Jones and Bartlett Learning

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Subject Code: **BCS18E07**	Subject Name : **HUMAN COMPUTER INTERACTION**	**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 :

- Learn the foundations of Human Computer Interaction
- Be familiar with the design technologies for individuals and persons with disabilities
- Collect fundamental design and evaluation methodologies of computer
- Manage HCI
- Enumerate the cognitive computerized models and HCI implication for designing e-learning web sites.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Explain basics of human computer interacting criterion
CO2	Understand the design technologies for individuals and persons with disabilities
CO3	Describe what interaction design is and how it relates to human computer interaction and other fields
CO4	Analyze and discuss HCI in designing emotions for games
CO5	Understand how to manage the emerging issues in HCI

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**	**2**	**3**	**3**	**3**	**3**
CO2	**2**	**2**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**2**
CO3	**2**	**2**	**3**	**3**	**2**	**2**	**3**	**3**	**2**	**3**	**1**	**2**
CO4	**2**	**2**	**2**	**3**	**2**	**1**	**3**	**2**	**2**	**2**	**3**	**1**
CO5	**2**	**2**	**3**	**2**	**2**	**1**	**1**	**2**	**1**	**2**	**3**	**1**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**2**	**1**
CO2	**3**	**3**	**3**	**2**
CO3	**3**	**3**	**3**	**1**
CO4	**3**	**3**	**2**	**1**
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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E07	HUMAN COMPUTER INTERACTION	Ty	3	0/0	0/0	3

UNIT I Humans In HCI **9 Hrs**

Introduction-implications for HCI-overview of HCI-Mentor models in HCI-emotions in HCI-cognitive architecture –task loading and stress in HCI-theoretical framework and mitigation strategies-motivating ,influencing and persuading users – human error identification in HCI

UNIT II Computers In HCI **9 Hrs**

Input technologies and techniques – sensor and recognition based input for interaction-visual displays-haptic interfaces-nonspeech auditory output-network based interaction-wearable computers-design of computer workstation

UNIT III Application/Domain Specific Design **9 Hrs**

HCI in health care-designing emotions for games, entertainment interfaces and interactive products-motor vehicle driver interfaces-HCI in aerospace-user centred design in games

UNIT IV Designing For Diversity **9 Hrs**

The digital divide-the role of gender in HCI-IT and older adults-HCI for kids-IT for cognitive support-physical disabilities and computing technologies – an analysis of impairments-computing technologies for deaf and hard of hearing users

UNIT V Managing HCI and Emerging Issues **9 Hrs**

Technology transfer-augmenting cognition in HCI-human values, ethics and design, cost justification-future trends in HCI

Total Hours: 45

TEXT BOOK:

1. The Human Computer Interaction Handbook –Fundamentals evolving Technologies and emerging Applications – Andrew Sears,Julie A Jacko, CRC Press ,3rd edition,2012.

REFERENCE BOOK:

1. *Alan Dix , Janet Finlay, Gregory D.Abowd, Russell Beale, " Human Computer Interaction", Third Edition, Pearson Education.*

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Subject Code: **BCS18E08**	Subject Name **:** **WIRELESS AND MOBILE NETWORKING**	**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
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVE :

- To show the ability to critically discuss the key concepts in wireless and mobile communication standards and mobile networking concepts.

COURSE OUTCOMES (COs) : (3- 5) Student will be able to

CO1	Understand the various forms of communication.
CO2	Analyze the functional behavior of various layers
CO3	Apply the concept of network for designing the topologies.
CO4	Knowledge about functions of protocol.
CO5	Determine how communication is done.

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**	**2**	**2**	**3**	**2**	**1**	**2**
CO2	**3**	**3**	**2**	**2**	**1**	**2**	**2**	**2**	**3**	**3**	**2**	**2**
CO3	**3**	**2**	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**1**	**2**
CO4	**3**	**2**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**2**	**1**
CO5	**3**	**2**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**1**	**2**
CO2	**3**	**2**	**2**	**1**
CO3	**3**	**2**	**3**	**3**
CO4	**3**	**1**	**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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E08	WIRELESS AND MOBILE NETWORKING	Ty	3	0/0	0/0	3

UNIT I Wireless Communication 9 Hrs

Cellular systems- Frequency Management and Channel Assignment- dropped call rates & their evaluation - MAC–SDMA–FDMA–TDMA – CDMA – Cellular Wireless Networks.

UNIT II Wireless LAN 9 Hrs

IEEE 802.11 Standards – Architecture – Services – Mobile Ad hoc Networks- WiFi and WiMAX - Wireless Local Loop.

UNIT III Mobile Communications 9 Hrs

GSM-architecture-Location tracking and call setup- Mobility management- GSM SMS –-Mobile Number portability -VoIP service for Mobile Networks – GPRS –Architecture and procedures.

UNIT IV Mobile Networking 9 Hrs

Mobile IP – Dynamic Host Configuration Protocol-Mobile Ad Hoc Routing Protocols– Multicast routing-TCP over Wireless Networks – Indirect TCP – Snooping TCP – Mobile TCP – Fast Retransmit / Fast Recovery - Wireless Networks.

UNIT V Application Layer 9 Hrs

WAP Model- Mobile Location based services -WAP Gateway –WAP protocols – WAP user agent profile- caching model-wireless bearers for WAP - WML – WMLScripts – WTA - iMode- SyncML.

Total Hours: 45

TEXT BOOK:

1. Goldsmith, Andrea (2005). *Wireless Communications*. Cambridge University Press. ISBN 0-521-83716-2.

REFERENCES BOOKS:

1. *Lenzini, L.; Luise, M.; Reggiannini, R. (June 2001). "CRDA: A Collision Resolution and Dynamic Allocation MAC Protocol to Integrate Date and Voice in Wireless Networks".IEEE Journal on Selected Areas in Communications (IEEE Communications Society) **19** (6): 1153-1163. ISSN 0733-8716*
2. *Pahlavan, Kaveh; Krishnamurthy, Prashant (2002). Principles of Wireless Networks – a Unified Approach. Prentice Hall. ISBN 0-13-093003-2.*
3. *Rappaport, Theodore (2002). Wireless Communications: Principles and Practice. Prentice Hall. ISBN 0-13-042232-0.*

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6th SEMESTER ELECTIVES – E-II (Common to CSE&IT)

Subject Code: **BCS18E09**	Subject Name : **WEB MINING**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS18011	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 :

- To understand the characteristics of the Internet and data mining
- To know about the web crawling algorithm implementation
- To study the web data collection and analysis of web data for new patterns

COURSE OUTCOMES (COs) : (3- 5)

CO1	Can Model semantic web related applications.
CO2	Demonstrate knowledge using Mining Algorithms
CO3	Predict human behaviour in social web and related communities
CO4	Categorize the social networks and web search
CO5	Discus about Basic Crawler Algorithm and Sentiment Analysis

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**	**3**	**2**	**2**	**3**	**1**	**3**	**3**	**2**	**2**
CO2	**3**	**1**	**1**	**2**	**3**	**3**	**2**	**3**	**3**	**1**	**3**	**1**
CO3	**2**	**3**	**3**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**1**	**2**
CO4	**2**	**3**	**3**	**2**	**3**	**3**	**2**	**3**	**2**	**3**	**3**	**2**
CO5	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**2**	**2**	**3**	**3**
CO2	**3**	**2**	**2**	**3**
CO3	**2**	**3**	**3**	**1**
CO4	**2**	**1**	**2**	**2**
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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E09	**WEB MINING**	Ty	3	0/0	0/0	3

UNIT I Data Mining Foundations 9 Hrs

Association Rules and Sequential Patterns - Basic Concepts of Association Rules - Apriori Algorithm- Data Formats for Association Rule Mining - Mining with Multiple Minimum Supports - Mining Class Association Rules - Basic Concepts of Sequential Patterns - Generating Rules from Sequential Patterns.

UNIT II Information Retrieval and Web Search 9 Hrs

Basic Concepts of Information Retrieval - Information Retrieval Models - Relevance Feedback - Evaluation Measures - Text and Web Page Pre-Processing - Inverted Index and Its Compression - Latent Semantic Indexing - Web Search - Meta-Search - Web Spamming.

UNIT II ISocial Network Analysis 9 Hrs

Social Network Analysis - Co-Citation and Bibliographic Coupling – Page Rank – HITS- Community Discovery

UNIT IV Web Crawling 9 Hrs

A Basic Crawler Algorithm - Implementation Issues - Universal Crawlers – Focused Crawlers - Crawler Ethics and Conflicts.

UNIT V Opinion Mining and Sentiment Analysis 9 Hrs

The Problem of Opinion Mining - Document Sentiment Classification - Sentence Subjectivity and Sentiment Classification- Opinion Lexicon Expansion - Aspect-Based Opinion Mining - Mining Comparative Opinions - Opinion Search and Retrieval.

Total Hours: 45

TEXT BOOK:

1. Bing Liu**,** 2011,Web Data Mining Exploring Hyperlinks, Contents and Usage Data, , Second Edition, Springer.

REFERENCE BOOK:

1. *Soumen Chakrabarti,2002, "Mining the Web", Morgan-Kaufmann Publishers, Elseiver.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18E10**	Subject Name : **WEB DATA DESIGN & MANAGEMENT**	**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 :

- The students will be able to analysis and evaluate to propose a new web site based upon recent trend
- To learn to develop a client-server based application using server and client side scripting languages like Java script, JSP, ASP and PHP.
- To learn to develop a dynamic web site using scripting languages and the technologies like XML, AJAX.
- The student will learn how to plan, design, testing and production and post- production process in a web site designing.
- The student will have the ability to design a static and dynamic web site based upon the end user need.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to remember evaluate a web site
CO2	Understanding the concepts of the technology on website design
CO3	Applying knowledge to analysis and design a quality web site.
CO4	Analysis and manage the production based up on user requirements
CO5	Ability to create a well interactive web-based 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**	**2**	**3**	**1**	**3**	**2**	**1**	**1**	**2**	**2**	**3**	**3**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**3**	**3**	**2**	**1**	**3**	**2**	**3**	**3**
CO4	**3**	**2**	**3**	**1**	**3**	**2**	**1**	**1**	**2**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**2**	**3**	**3**

COs /PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**1**	**3**
CO2	**3**	**3**	**1**	**2**
CO3	**3**	**3**	**1**	**3**
CO4	**3**	**2**	**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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E10	WEB DATA DESIGN & MANAGEMENT	Ty	3	0/0	0/0	3

UNIT I Site Organization and Navigation 9 Hrs

User centered design – Web medium – Web design process – Evaluating process – Site types and architectures – Navigation theory – Basic navigation practices – Search – Site maps

UNIT II Elements of Page Design 9 Hrs

Browser compatible design issues - Pages and Layout – Templates – Text – Color – Images – Graphics and Multimedia - GUI Widgets and Forms – Web Design patterns.

UNIT III Scripting Languages 9 Hrs

Client side scripting: XHTML – DHTML– JavaScript– XML Server side scripting: Perl – PHP – ASP/JSP Designing a Simple web application.

UNIT IV Pre-Production Management 9 Hrs

Principles of Project Management – Web Project Method – Project Road Map – Project Clarification – Solution Definition – Project Specification – Content – Writing and Managing content.

UNIT V Production, Maintenance and Evaluation 9 Hrs

Design and Construction – Testing, Launch and Handover – Maintenance – Review and Evaluation – Case Study

Total Hours: 45

TEXT BOOKS:

1. Themas A. Powell (2003)*The Complete Reference – Web Design* (3rd ed.), Tata McGraw Hill
2. Ashley Friedlein (2001)*Web Project Management*, Morgan Kaufmann Publishers
3. H. M. Deitel, P. J. Deitel, A. B. Goldberg (2004)*Internet and World Wide Web – How to Program*(3rd ed.) Pearson Education

REFERENCE BOOKS:

1. *Joel Sklar (2001)Principles of Web Design, Thomson Learning*
2. *Van Duyne, Landay, and Hong (2006)The Design of Sites: Patterns for creating winning websites (2nd edition.) Prentice Hall*
3. *Lynch, Horton and Rosenfeld (2002) Web Style Guide: Basic Design Principles for Creating Web Sites (2nd edition.) Yale University Press.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18E11**	Subject Name : **RISK 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 :

- 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	Understand the various risks face by an organization
CO2	Able to applying various risk control measure to the suitable risk organization
CO3	Demonstrating the knowledge of financial and financial related risks facing organizations
CO4	Able to analyzing a risk management program for an organization
CO5	Design a risk management program for a business organization.

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**	**3**	**2**	**2**
CO2	**2**	**2**	**2**	**1**	**3**	**3**	**2**	**1**	**3**	**1**	**1**	**1**
CO3	**3**	**2**	**2**	**1**	**1**	**1**	**1**	**1**	**2**	**2**	**1**	**1**
CO4	**2**	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**2**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**3**	**1**	**1**	**1**	**1**	**1**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**3**	**2**
CO2	**3**	**2**	**3**	**3**
CO3	**3**	**1**	**3**	**3**
CO4	**3**	**3**	**1**	**1**
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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E11	RISK MANAGEMENT	Ty	3	0/0	0/0	3

UNIT I The Risk Management Process **9 Hrs**

Introduction to software risk management, why do we need to manage risk in software development, Use, Objectives, Risk Management Paradigm, Risk management and litigation.Models for Risk Management.

UNIT II Discovering Risk In Software Development **9 Hrs**

Risk attributes and Identification, Identifying software risk, Common software project risks, Risk Taxonomy, Risk Mapping, statements, reviews., Risk ownership and stakeholder management.

UNIT III Risk Assessment **9 Hrs**

Objectives and goals.Approach to assessment, Risk assessment tools and techniques, presenting the risk findings.

UNIT IV Planning Risk Mitigation Strategies **9 Hrs**

Risk Planning, Best practices in the risk planning, Risk management tools, Risk mitigation strategies, Formulating and Implementing risk management plans.

UNIT V Monitoring Risk In Software Projects **9 Hrs**

Developing a process for monitoring risk, formulating a project risk database, Managing and tracking risk, Risk support tools. Software Risk Metrics, organization, estimation, development methodology.

Total Hours: 45

TEXT BOOKS:

1. Yacov Y. Haimes, (2011) Risk Modeling, Assessment, and Management, Wiley
2. John Mcmanus,(2004) Risk Management in software development projects, Elsevier Butterworth-Heinemann

REFERENCE BOOKS:

1. *Martin Loosemore, John Raftery, (2006) Risk management in projects,Taylor& Francis Ltd*
2. *Ravindranath P. C, (2007) Applied Software Risk Management, Auerbach,*
3. *Dale Walter Karolak,,(1995) Software engineering risk management, Wiley-Ieee Computer Society*

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name :	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	CRYPTOGRAPHY AND NETWORK SECURITY					
BCS18E12	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 student will be able :

- Understand OSI security architecture and classical encryption techniques.
- gain basic knowledge on the number theory.
- Understand various block cipher modes.
- understands the principles of public key cryptosystems, and different message authentication and integrity techniques

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the fundamentals of networks security, security architecture, threats and vulnerabilities
CO2	Apply the different cryptographic operations of symmetric and Asymmetric cryptographic algorithms
CO3	To design, analyze and implement different network security protocols
CO4	Apply the various Authentication schemes to simulate different applications
CO5	Understand various Security practices and System security 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	3	2	2	2	1	2	2	1	1	1
CO2	3	2	3	2	3	1	2	1	2	1	1	1
CO3	3	3	3	2	2	1	2	1	2	1	1	1
CO4	3	2	3	2	3	2	2	2	2	1	1	2
CO5	3	3	3	2	3	2	2	2	2	1	1	2

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E12	CRYPTOGRAPHY AND NETWORK SECURITY	Ty	3	0/0	0/0	3

UNIT I Introduction & Number Theory 9 Hrs

OSI security architecture - Security attacks ,Services and Mechanisms - -Network security model-Classical Encryption techniques (Symmetric cipher model, substitution techniques, transposition techniques, stenography)- **NUMBER THEORY**: Modular arithmetic-Euclid's algorithm- Fermat's and Euler's theorem- The Chinese remainder theorem- Discrete logarithms.

UNIT II Block Ciphers & Public Key Cryptography 9 Hrs

Data Encryption Standard-Block cipher principles-block cipher modes of operation-Advanced Encryption Standard (AES)-Triple DES -RC5 algorithm. **Public key cryptography:** Principles of public key cryptosystems-The RSA algorithm-Key management - Diffie Hellman Key exchange--Elliptic curve cryptography.

UNIT III Cryptographic Data Integrity Algorithms 9 Hrs

Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC –MD5 - SHA - HMAC – CMAC - Digital signature and authentication protocols-DSS.

UNIT IV Network Security Practice 9 Hrs

Authentication Applications – Kerberos – X.509 Authentication Service – Electronic mail Security – Pretty Good Privacy – S/MIME – IP Security – Web Security.

UNIT V System Security 9 Hrs

Intruders – Intrusion Detection – Password Management – Malicious Software – Viruses and Related Threats - Viruses Countermeasures – Distributed Denial of Service Attacks - Firewalls – Firewall Design Principles – Trusted Systems.

Total Hours: 45

TEXT BOOK:

1. William Stallings (2011) *Cryptography And Network Security – Principles and Practices*, (5th ed.) Pearson Education.

REFERENCE BOOKS:

1. *Atul Kahate (2008) Cryptography and Network Security Tata McGraw Hill*
2. *Bruce Schneier (2007) Applied Cryptography, John Wiley & Sons Inc.*
3. *Charles B. Pfleeger, Shari Lawrence Pfleeger (2007) Security in Computing (4th ed.), Pearson Education*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18E13**	Subject Name : **MOBILE ADHOC NETWORKS**	**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 :

- Knowledge of mobile ad hoc networks, design and implementation issues, and available solutions.
- knowledge of routing mechanisms
- Knowledge of the 802.11 Wireless Lan (WiFi) and Bluetooth standards.

This includes their designs, operations, plus approaches to interoperability.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recollect the networking concepts of mobile ad hoc networks
CO2	Understand MAC and IEEE standards
CO3	Apply wifi and Bluetooth technologies
CO4	Understand the transport layer along with its designs and issues.
CO5	Analyse cross layer design and apply for 4g

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**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**3**	**2**	**3**
CO3	**3**	**2**	**2**	**2**	**2**	**2**	**2**	**2**	**3**	**3**	**2**	**2**
CO4	**3**	**2**	**3**	**2**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**3**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**2**	**3**	**2**
CO2	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**2**	**3**
CO4	**2**	**2**	**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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E13	MOBILE ADHOC NETWORKS	Ty	3	0/0	0/0	3

UNIT I Introduction 9 Hrs

Introduction to adhoc networks – definition, characteristics features, applications -Characteristics of Wireless channel, Adhoc Mobility Models:- Indoor and outdoor models.

UNIT II Medium Access Protocols 9 Hrs

MAC Protocols: design issues, goals and classification. Contention based protocols- with reservation, scheduling algorithms, protocols using directional antennas. IEEE standards: 802.11a, 802.11b, 802.11g, 802.15. HIPERLAN .

UNIT III Network Protocols 9 Hrs

Routing Protocols: Design issues, goals and classification.Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm, Energy aware routing algorithm, Hierarchical Routing, QoS aware routing.

UNIT IV End-End Delivery and Security 9 Hrs

Transport layer : Issues in desiging- Transport layer classification, adhoc transport protocols. Security issues in adhoc networks: issues and challenges, network security attacks, secure routing protocols.

UNIT V Cross Layer Design And Integration of Adhoc For 4g 9 Hrs

Cross layer Design: Need for cross layer design, cross layer optimization, parameter optimization techniques, Cross layer cautionary prespective. Intergration of adhoc with Mobile IP networks.

Total Hours: 45

TEXT BOOKS:

1. C.Siva Ram Murthy and B.S.Manoj (2007) Ad hoc Wireless Networks Architectures and Protocols, (2nd ed.), Pearson Education
2. Charles E. Perkins (2000) Ad hoc Networking , Addison Wesley

REFERENCE BOOKS:

1. Mohammad Ilyas (2002) The handbook of adhoc wireless networks, CRC press,
2. T. Camp, J. Boleng, and V. Davies ,A Survey of Mobility Models for Ad Hoc Network Research, WirelessCommun. and Mobile Comp., Special Issue on Mobile
3. V.T.Raisinhani and S.Iyer (2004) ÉCLAIR; "An Efficient Cross-Layer Architecture for wireless protocol stacks, World Wireless cong., San francisco,CA,

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E14	Subject Name : TCP/IP DESIGN AND IMPLEMENTATION	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
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- To learn the principles of TCP / IP and its Architecture
- Understand the transport layer protocols
- IP addressing and routing

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand IP Addressing schemes and TCP/IP Architecture
CO2	To discuss the fundamentals of network design and implementation
CO3	Analyze the network management issues
CO4	Can solve and implement network applications
CO5	Categorize the IP addresses and Routing Protocols

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	2	2	1	3	2	3	2
CO2	3	2	2	1	2	2	2	1	3	2	3	2
CO3	3	3	3	2	2	2	2	1	3	2	3	2
CO4	3	3	3	2	2	2	2	2	3	2	3	2
CO5	3	3	3	3	2	2	2	1	3	3	3	2

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	3	3	1	2
CO2	3	3	2	3
CO3	3	3	2	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 and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E14	TCP/IP DESIGN AND IMPLEMENTATION	Ty	3	0/0	0/0	3

UNIT I Introduction **9 Hrs**

Protocols and standards-standards organizations-internet standards-internet administration – Protocol layers-OSI model-TCP/IP Protocol suite-addressing.

UNIT II Underlying Technologies **9 Hrs**

Wired LANs: IEEE Standards, frame format, addressing, Ethernet evolution, standard Ethernet, fast Ethernet Gigabyte Ethernet, Ten-Gigabyte Ethernet-Wireless LAN- Point-to-Point WANS-Switched WANs-Connecting Devices- Case study – developing simple LAN setup using ns-2 simulator

UNIT III IP Addresses and Routing **9 Hrs**

Switching-network layer services- issues- IPv4 Addresses: Classful addressing, classless addressing, special addresses-delivery-forwarding- IPv4: datagrams, fragmentation, options, checksums, IP package-ARP- RARP-ICMP-IGMP- Case study – Analyzing the trace file using awk and plot graph using xgraph.

UNIT IV Unicast and Multicast Routing Protocols **9 Hrs** Unicast routing – intra and inter domain routing – distance vector routing :Routing Information Protocol(RIP) – link state routing: Open Shortest Path First (OSPF) – path vector routing: Border Gateway Protocol (BGP) – Multicasting and Multicast routing protocols - - Case study – Developing a topology using more than two router and analyze the routing.

UNIT V TCP & UDP **9 Hrs**

Introduction to Transport Layer – Services – Protocols. UDP – user datagram – UDP services – UDP package – UDP applications. TCP – segment - flow control – error control – congestion control – state transition diagram – TCP package. SCTP – services – features – Case study – Develop a network, attach various type TCP variant and analyze the trace file.

Total Hours: 45

TEXT BOOK:

1. Behrouz A. Forouzam (2010), “TCP/IP Protocol Suite”, 4th Edition, Tata McGraw Hill..

REFERENCE BOOKS:

1. *Douglas E. Comer, David L. Stevens (2009), “Internetworking with TCP/IP Volume – II, III” 3rd Edition, PHI Learning Private Limited.*
2. *Richard Stevens W., (2011) “TCP/IP Illustrated, The Protocol-Volume I, II, II”, 2nd Edition Addison-Wesley Pub Co.*
3. *Dougles E. Comer,(2000) “Internetworking with TCP/IP–Principles, Protocols & Architecture”, 4th Edition,Pearson education.*

Department of Computer Science and Engineering
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Subject Code: BCS18E15	Subject Name : CYBER FORENSICS AND INTERNET SECURITY	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite:BCS18OE5	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 :

- To learn the computer forensic fundamentals
- To understand various types of cyber crime activities involved in the digital world
- To study various network security technologies to prevent the data from hacker or intruder

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understanding how to protect the data/secure their personal and official data in computer.
CO2	Can analyze the frauds in digital forensics
CO3	Will have knowledge to keep data in secure manner in the network using network security technologies.
CO4	Apply the knowledge to find the frauds with help of case study
CO5	Analyze in which system they are working and how to safe gaurd

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	2	2	2	2	2	3
CO2	3	3	3	3	2	2	2	3	3	1	2	3
CO3	3	3	2	2	3	2	2	2	2	2	3	3
CO4	3	3	3	3	3	3	3	3	3	2	2	3
CO5	3	3	3	3	3	3	3	3	3	2	2	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	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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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E15	CYBER FORENSICS AND INTERNET SECURITY	Ty	3	0/0	0/0	3

UNIT I Cyber Forensics Fundamentals 9 Hrs

Introduction to Cyber forensics: Information Security Investigations, Corporate Cyber Forensics, Scientific method in forensic analysis, investigating large scale Data breach cases. Analyzing Malicious software.

UNIT II Computer Forensics Technology 9 Hrs

Types of Computer Forensics Technology, Types of Military Computer Forensic Technology, Types of Law Enforcement: Computer Forensic Technology, Types of Business Computer Forensic Technology, Specialized Forensics Techniques, Hidden Data and How to Find It, Spyware and Adware, Encryption Methods and Vulnerabilities, Protecting Data from Being Compromised Internet Tracing Methods, Security and Wireless Technologies, Avoiding Pitfalls with Firewalls Biometric Security Systems

UNIT III Computer Forensics Systems 9 Hrs

Internet Security Systems, Intrusion Detection Systems, Firewall Security Systems, Storage Area Network Security Systems, Network Disaster Recovery Systems, Public Key Infrastructure Systems, Wireless Network Security Systems, Satellite Encryption Security Systems, Instant Messaging (IM) Security Systems, Net Privacy Systems, Identity Management Security Systems, Identity Theft, Biometric Security Systems

UNIT IV Network Security Techniques 9 Hrs

Network Security Applications, Authentication Mechanisms: Passwords, Cryptographic authentication protocol, Smart Card, Biometrics, Digital Signatures and seals, Kerberos, X.509 LDAP, Directory. Web Security: SSL Encryption, TLS, SET

UNIT V Case Study 9 Hrs

E-mail Security, Pretty Good Privacy (PGPs) / MIME, IP Security, Access and System Security, Intruders, Intrusion Detection and Prevention, Firewall, Hardware Firewall, Software Firewall, Application Firewall, Packet Filtering. , Packet Analysis, Proxy Servers, Firewall setting in Proxy, ACL in Proxy.

Total Hours: 45

TEXT BOOKS:

1. John R. Vacca, (2005) Computer Forensics: Computer Crime Scene Investigation, 2nd Edition, Charles River Media.
2.Man Young Rhee, (2003) “Internet SecurityCryptographic Principles, Algorithms and Protocols”, WILEY.

REFERENCE BOOKS:

1. *William Stallings, “Cryptography and Network Security: Principles and Standards”, Prentice Hall India, 3rd Edition, 2003*
2. *Computer Forensics: Investigating Network Intrusions and Cyber Crime (Ec-Council Press Series: Computer Forensics), 2010*
3. *Christof Paar, Jan Pelzl, Understanding Cryptography: A Textbook for Students and Practitioners, 2nd Edition, Springers, 2010.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E16	Subject Name : DATABASE 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 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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SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E16	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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Subject Code: **BCS18E17**	Subject Name : **MANAGEMENT INFORMATION 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 :

- Evaluate the role of the major types of information systems in a business environment and their relationship to each other;
- Assess the impact of the Internet and Internet technology on business electronic commerce and electronic business;
- Identify the major management challenges to building and using information systems and learn how to find appropriate solutions to those challenges

COURSE OUTCOMES (COs) : (3- 5)

CO1	Observe the role of information technology and information systems in business
CO2	Record the current issues of information technology and relate those issues to the firm
CO3	Reproduce a working knowledge of concepts and terminology related to information technology
CO4	Illustrate how information systems support the activities of managers and end-users in organizations.
CO5	Identify the principal management challenges posed by the ethical and social impact of information systems and management solutions.

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**	**3**	**2**	**3**	**3**	**3**	**3**
CO2	**3**	**3**	**1**	**3**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**2**
CO3	**3**	**2**	**2**	**2**	**2**	**3**	**2**	**2**	**3**	**2**	**2**	**2**
CO4	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**
CO5	**3**	**3**	**2**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**3**	**2**	**3**
CO2	**3**	**3**	**2**	**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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E17	MANAGEMENT INFORMATION SYSTEMS	Ty	3	0/0	0/0	3

UNIT I Organizations, Management and The Networked Enterprise 9 Hrs

Information Systems in Global Business- Global E-Business-Information Systems-Strategy Systems- Ethical and Social issues in Information System - Analyzing Business Resource for an Enterprise System.

UNIT II IT Infrastructure 9 Hrs

IT infrastructure- Emerging Technology - Business Intelligence: Databases and Information Management – Telecommunication - Internet and Wireless Technology - Information Security Systems

UNIT III Key System Application For The Digital Age 9 Hrs

Enterprise application- Ecommerce-Digital Markets- Digital Goods- Managing knowledge- Decision Making – Enterprise portal design

UNIT IV Building and Managing Systems 9 Hrs

Building Systems - Project Management- Establishing Business values - Managing Change - Managing Global System - Redesigning Business Processes- Case studies

UNIT V Advanced Concepts In Information System 9 Hrs

Enterprise Resource Planning - modules : Human Resources, Finance – Accounting - Production & Logistics - Supply Chain Management – CRM - Procurement - Management System Object Oriented modeling- case studies

Total Hours: 45

TEXT BOOKS :

1. James A, O' Brian,(2007) Management information systems ,(7th ed.), TMH Publisher
2. Kenneth C. Laudon, Jane P.(2008) Management Information Systems: Managing the Digital Firms Pearson Education, TMH, 2008.

REFERENCE BOOKS:

1. *James A. O'Brien, Northern Arizona University,George M. Marakas, University of Kansas, (2007) Introduction to Information Systems*
2. *Ross and Clagget (2004) Information System for Modern Management, Prentice-Hall of India Pvt. Ltd.*
3. *Alexis Leon,(2007) Enterprise Resource Planning, TMH*

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Regulation 2018
7th SEMESTER ELECTIVES E-III (Common to CSE&IT)

Subject Code: BCS18E41	SubjectName : MOBILE APPLICATION DEVELOPMENT	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18ET2	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 :

- Describe the limitations and challenges of working in a mobile and wireless environment
- Describe and apply the different types of application models/architectures used to develop mobile software applications.
- Describe the components and structure of a mobile development frameworks

COURSE OUTCOMES (COs) : (3- 5)	
CO1	Able to remember the various Mobile Platforms and analyze its architectures
CO2	Understand and develop various Mobile Applications for Android and Apple
CO3	Apprehend the design and develop own mobile application
CO4	Apply the different types of application models and architectures
CO5	Analyze the concepts of various mobile services

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	2	1	1	2	3	2	2	3	1	3
CO2	2	2	3	1	1	2	3	2	3	3	1	2
CO3	3	3	3	2	3	3	3	3	3	2	3	3
CO4	3	2	3	3	2	2	3	2	2	3	2	2
CO5	2	2	2	1	3	3	2	2	3	2	1	2

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

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E41	MOBILE APPLICATION DEVELOPMENT	Ty	3	0/0	0/0	3

UNIT I Introduction **9 Hrs**

Introduction to Mobile Platforms – Exploring Android Platform – Android Studio, Java, XML – Exploring Apple IPhone Platform – XCode, Objective C, Swift – Options for development

UNIT II User Interface (UI) Development For Mobile Apps **9 Hrs**

UI Elements – User Interface Frameworks – Layouts – Gesture based interfaces – Applying Styles & Themes – Adding Settings

UNIT III Google Andriod Platform **9 Hrs**

Google Application Architecture – Basic Building Blocks - The Android Emulator – Event based programming – SQLite Database Access – ADB – Location based Services

UNIT IV Apple Iphone Platform **9 Hrs**

UI Kit for Interfaces - Event Handling and Graphics Services – SQLite Database Access – Application Debugging – Location Handling

UNIT V Implementing Software as a Service **9 Hrs**

Service Oriented Computing Examples – Google Maps – Enabling Map based services in Application – Amazon Web Services – Exploring AWS S3 & AWS IoT APIs

Total hours: 45

TEXT BOOKS:

1. Ed Burnette (2015) Hello, Android: Introducing Google's Mobile Development Platform, 4th edition, Pragmatic Bookshelf.
2. Marko Gargenta (2011) Learning Android, O'Reilly Media.

REFERENCE BOOKS:

1. *Richard Rodger (2012) Beginning Mobile application development in the cloud, Wrox Publication.*
2. *Jonathan A. Zdziarski (2008), iPhone Open Application Development, 2nd edition, O'Reilly Media Publication.*

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Subject Code: **BCS18E18**	Subject Name : **DATA SCIENCE AND BIG DATA ANALYTICS**	**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
T/L/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES :

- Deploying the Data Analytics Lifecycle to address big data analytics projects
- Reframing a business challenge as an analytics challenge
- Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable result
- Using tools such as: R and RStudio, MapReduce/Hadoop, in-database analytics,Window and MAD lib functions.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Remember the Data Analytics Lifecycle to address big data analytics projects
CO2	Understanding the business challenge to reframe the analytics challenge
CO3	Applying appropriate analytic techniques and tools to analyze big data, create statistical models, and identify insights that can lead to actionable results
CO4	Able to apply data science concepts and methods to solve problems in Predictive Analytics
CO5	Analyze and explore the next generation of big data tools and 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**	**3**	**3**	**3**	**3**	**3**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**3**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**3**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**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	**2**	**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
BCS18E18	DATA SCIENCE AND BIG DATA ANALYTICS	Ty	3	0/0	0/0	3

UNIT I Introduction **9 Hrs**

Big data overview - State of the practice in analytics, BI vs data science, current analytical architecture, drivers of big data - Big data ecosystem - **Data analytics lifecycle -** overview – Discovery Phase - Data preparation Phase - Model Planning Phase - Model building Phase - Communicate results Phase - Operationalisation Phase.

UNIT II Basic Data Analytic Methods Using R **9 Hrs**

Introduction to R , R Graphical User interfaces, Data import and export, Attribute and data types, descriptive statistics - Exploratory data analysis, visualization data analysis, dirty data, visualizing a single variable, examining multiple variables, data exploration vs presentation, - Statistical methods for evaluation, Hypothesis testing, Difference of Means, Wilcoxon Rank-sum test, Type I and II errors, power and sample size, ANOVA

UNIT III Advanced Analytical Theory & Methods (Clustering, Association Rules And Regression) **9 Hrs**

Clustering- k-means, use cases, determining the number of clusters, diagnostics, Reasons to choose and cautions, additional algorithms - Association rules- Apriori algorithm, Evaluation of candidate rules, Application of association rules, an example- transactions in a grocery store, the groceries dataset, frequent itemset generation, rule generation and visualization, validation and testing, diagnostics - Regression- linear and logistic regression, usecases, model description, diagnostics – Additional Regression Models

UNIT IV Advanced Analytical Theory & Methods (Classification, Time Series Analysis And Text Analysis) **9 Hrs**

Classification - Decision Trees, general algorithm, evaluating a decision tree, Decision trees in R - Naive Bayes - Bayes theorem, Naive Bayes classifier, Smoothing, diagnostics, Additional Classification Methods - Time Series Analysis- Box-Jenkins Methodology, ARIMA Model, Auto correlation Function(ACF), Auto regressive models, moving average models, ARMA and ARIMA Models, building and evaluating a ARIMA Model - Text Analysis- collecting raw text, representing text, term frequency-Inverse document frequency(TFIDF), Categorizing documents by topics, determining sentiments, gaining insights

UNIT V Advanced Analytics-Technology and Tools: Mapreduce and Hadoop **9Hrs**

Analytics for unstructured data, usecases, Mapreduce, Apache Hadoop - **The Hadoop Ecosystem -** Pig, Hive, HBase, Mahout, NoSQL **- In-database analytics** - SQL Essentials, Joins, Set operations, Grouping extensions, In-Database text analytics, Advanced SQL, Window functions, User-defined functions and aggregates, Ordered Aggregates, MADlib.

Total Hours: 45

TEXT BOOK:

1. EMC Education Services (Editor), 2015 Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data,Wiley Publications, ISBN: 978-1-118-87613-8

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BIT18006**	Subject Name : **CLOUD TECHNOLOGY**	**Ty/ Lb/ ETL**	**L**	**T/ S.Lr**	**P/R**	**C**
	Prerequisite: BCS17I01	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 Cloud computing infrastructure and services, to acquire knowledge about cloud storage. to understand cloud computing security and to test web application in cloud platform.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Define the Basic concepts of cloud computing.(Level 1)
CO2	Differenciate the cloud Computing services.(Level 2)
CO3	Develop Cloud Implementation using Phython.(Level 6)
CO4	Demonstrate the Key components of Web Services in cloud. (Level 3)
CO5	Design an efficient and flexible cloud applications. (Level 6)

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**	**3**	**1**	**2**	**2**	**2**	**1**	**3**
CO2	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**3**	**2**
CO3	**2**	**2**	**3**	**3**	**3**	**3**	**1**	**2**	**2**	**2**	**1**	**3**
CO4	**3**	**3**	**3**	**2**	**2**	**1**	**3**	**2**	**2**	**1**	**3**	**2**
CO5	**3**	**3**	**3**	**2**	**2**	**1**	**1**	**2**	**2**	**1**	**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	**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			
					✔							

SUBJECT CODE	SUBJECT NAME	T/Lab/ ETL	L	T/ S.Lr	P/R	C
BIT18006	**CLOUD TECHNOLOGY**	**Ty**	**3**	**0/0**	**0/0**	**3**

UNIT I CLOUD COMPUTING INTRODUCTION 9Hrs

Characteristics – cloud models – cloud services – cloud based services and applications – virtualization – Load balancing – deployment – replication – monitoring – MapReduce – Identity and Access management.

UNIT II CLOUD SERVICES AND PLATFORMS 9Hrs

Compute services – storage services – database services – application services – content delivery services – analysis services – Deployment & management services – identity and Access management services – open source private cloud software – Hadoop MapReduce job execution – Hadoop schedulers – Hadoop cluster setup

UNIT III CLOUD APPLICATION DESIGN & PYTHON 9Hrs

Design consideration for cloud applications – reference architecture for cloud applications – cloud application design methodologies - data storage approaches – Python data types & data structures – control flow – functions – modules – packages – file handling – classes.

UNIT IV CLOUD APPLICATION DEVELOPMENT 9Hrs

Python for Amazon web services – Google cloud platform – windows Azure – packages of Internet – JSON – XML – HTTPLib and URLLib – Web application framework – Django – design approaches – image processing App – document storage app – MapReduce app.

UNIT V ADVANCED APPICATIONS 9Hrs

Clustering Big Data – Classification of Big Data – multimedia cloud – Streaming protocols – cloud application benchmarking and tuning – workload characteristics – application performance matrix – design consideration – benchmarking tools- deployment prototyping – CSA cloud security architecture – authentication – authorization – data security – auditing.

Total Hours: 45

TEXT BOOKS:

1. Arshdeep Bahga et al, “Cloud computing a hands-on approach” Universities press - 2014
2. Anthony T.Velte et al, “Cloud Computing A Practical Approach” Tata McGraw-Hill – 2013
3. Zaigham Mahmood et al, “Cloud Computing Concept Technology Architecture” Pearson, 2014.

REFERENCE BOOKS:

1. *Barrie Sosinsky, “Cloud Computing Bible” Wiley India Publication – 2011*
2. *Rishabh Sharma “Cloud Computing Fundamentals, Industry Approach and Trends” Wiley – 2015.*
3. *David Crookes “Cloud Computing in easy steps” McGraw Hill – 2012*

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Subject Code: **BCS18E19**	Subject Name : **NETWORK FORENSICS**	**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
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- Provide a comprehensive understanding of network forensic analysis principles
- Understand the relationship between network forensic analysis and network security technologies.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Learn to identify network security incidents and potential sources of digital evidence.
CO2	Demonstrate the ability to perform basic network data acquisition and analysis using computer based applications and utilities
CO3	Identify potential applications for the integration of network forensic technologies
CO4	Apply tools for network forensic investigation
CO5	Recognize the network details and routing path

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**	**2**	**3**	**2**	**3**	**2**
CO2	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**2**
CO3	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**3**	**2**	**3**	**1**
CO4	**3**	**3**	**3**	**3**	**3**	**2**	**2**	**3**	**2**	**2**	**3**	**3**
CO5	**3**	**3**	**3**	**2**	**2**	**3**	**1**	**3**	**3**	**2**	**3**	**1**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**1**	**3**	**3**
CO2	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**3**
CO4	**3**	**2**	**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
BCS18E19	NETWORK FORENSICS	Ty	3	0/0	0/0	3

UNIT I Technical Fundamentals 9 Hrs

Concepts in digital evidence- challenges- investigative methodology- sources of network based evidence- principles of internetworking-Internet Protocol suite- Evidence acquisition

UNIT II Packet and Statistical Flow Analysis 9 Hrs

Packet analysis - protocol analysis - flow analysis- higher layer traffic analysis – Statistical Flow analysis:- sensors- flow record export protocols- collection and aggregation- analysis tools and techniques – Case study and Tools Analysis: Wire Shark

UNIT III Network Intrusion Detection and Analysis 9 Hrs

NIDS/NIPS functionality- modes of detection-types-NIDS/NIPS evidence acquisition -NIPS/NIDS interfaces – packet logging – Case study and Tools Analysis : Snort

UNIT IV Network Devices and Servers 9 Hrs

Sources of Logs-Network log architecture- collecting and analyzing evidence- Switches- routers – firewalls- interfaces-logging - Case study and Tools Analysis: Angry IP Scanner

UNIT V Network Tunnelling and Case Studies 9 Hrs

Tunneling for functionality, confidentiality- covert tunneling- trends in malware evolution-network behavior of malware – future of malware and network forensics - Case study and Tools Analysis : Cuckoo Sandbox

Total Hours: 45

TEXT BOOK:

1. Network Forensics : Tracking Hackers Through CyberSpace Sherri Davidoff,Jonathan Ham Pearson Education 2012

REFERENCE BOOKS:

1. *Introduction to Security and Network ForensicsWilliam J. Buchanan Auerbach Publications 2012*
2. *Handbook of Digital Forensics and Investigations, 1st Edition Eoghan Casey ed., Elsevier Academic Press, ISBN 13: 978-0-12-374267-4,.*

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Subject Code: BCS18E20	Subject Name : INTERNET OF THINGS	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 :

- Vision and introduction to IoT
- Data knowledge management and use of devices in IoT Technology
- Understand the state of Art – Iot Architecture
- Real world Iot Design constraints, industrial automation and commercial building automation in IoT

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the vision of IoT from a global context.
CO2	Determine the Market perspective of IoT.
CO3	Use of Devices, Gateways and Data Management in IoT
CO4	Understand the Application of IoT in Industrial and Commercial Building Automation and Real World Design Constraints
CO5	Identify and design Simple and creative IOT Projects

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	1	3	2	3	3
CO2	2	2	3	3	3	1	3	1	3	2	3	3
CO3	3	3	3	3	3	3	3	2	3	2	3	2
CO4	3	3	3	3	3	3	3	2	3	3	3	3
CO5	2	3	1	1	1	2	2	1	1	1	1	2

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E20	INTERNET OF THINGS	Ty	3	0/0	0/0	3

UNIT I Introduction To IoT **9 Hrs**

Definition – characteristics of IoT-Physical Design of IoT – Logical Design of IoT- IoT enabling technologies – IoT Levels and Deployment Templates

UNIT II IoT and M2M **9 Hrs**

M2M to IoT – A Basic Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies.

M2M to IoT-An Architectural Overview– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.

UNIT III IoT Platforms Design Methodology **9 Hrs**

Introduction – IoT Design Methodoloy – Case study on IoT system for Weather Monitoring – Motivation of using Python

UNIT IV IoT Physical Devices and Endpoints **9 Hrs**

IoT Device – Basic building blocks of an IoT Device – Exemplary Device: Raspberry Pi – Linux on Raspberry Pi – Raspberry Pi Interfaces – Raspberry Pi with Python – Simple
Programs

UNIT V IoT Applications For Value Creations **9 Hrs**

Introduction, IoT applications for industry: Future Factory Concepts, Brownfield IoT, Smart Objects, Smart Applications, Four Aspects in your Business to Master IoT, Value Creation from Big Data and Serialization, IoT for Retailing Industry, IoT For Oil and Gas Industry, Opinions on IoT Application and Value for Industry, Home Management, eHealth. Case Studies Illustrating to IoT Design.

Total Hours: 45

TEXT BOOK:

1. Vijay Madisetti and Arshdeep Bahga, , 2015“Internet of Things (A Hands-on-Approach)”, Universities Press

REFERENCE BOOKS:

1. *Francis daCosta, 2013 “Rethinking the Internet of Things: A Scalable Approach to Connecting Everything”, 1st Edition, A press Publications*
2. *Cuno Pfister, Getting Started with the Internet of Things, O"Reilly Media, 2011, ISBN: 978-1-4493-9357-1*

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Regulation 2018

Subject Code: **BCS18E21**	Subject Name : **SOCIAL COMPUTING**	**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 :

- Understand important features of social computing.
- Design and prototype new social computing systems.
- Analyze data left behind in social media.
- Understand the research issues in this field.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recall the basic concepts web technologies, computer network, programming languages (Java, AJAX).
CO2	Understand the basic concept of social computing, web services and will have the ability to identify the problem.
CO3	Will have the ability to provide a solution for the issues.
CO4	Student will be able to apply the programming knowledge for the problems by utilizing various technologies.
CO5	Will have the ability to analyze the predicament and provide a effective solution.

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**	**1**	**2**	**2**	**1**	**2**	**3**	**1**	**1**
CO2	**3**	**1**	**2**	**2**	**1**	**2**	**2**	**2**	**2**	**3**	**1**	**1**
CO3	**3**	**2**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**2**	**2**	**3**
CO4	**3**	**3**	**2**	**1**	**2**	**1**	**3**	**3**	**3**	**2**	**2**	**3**
CO5	**3**	**3**	**3**	**1**	**2**	**1**	**3**	**3**	**3**	**2**	**3**	**3**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**
CO1	**3**	**1**	**1**	**2**
CO2	**3**	**1**	**2**	**1**
CO3	**3**	**2**	**1**	**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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E21	SOCIAL COMPUTING	Ty	3	0/0	0/0	3

UNIT I Basic Concepts 9 Hrs

Web 2.0 Introduction – Advantages & Disadvantages of Web2.0 – Business Aspects of Web2.0 – Web2.0 Principles – Characteristics – design aspects – Introduction to Web services.

UNIT II Web2.0 Services 9 Hrs

Web2.0 Services – Applications –Communication - Blogs – Topic, Event, Marketing, Learning , Scholarly - Wiki – Wikia, Wetpaint, Pbwiki, Wikispaces -Podcasting , Vodcasting - 21st century skills - Social Networking- Social Bookmarking – RSS & Syndication –Newer Web2.0 services and Applications

UNIT III Technology 9 Hrs

Ajax – Alternatives to Ajax – Open APIs –SOAP –REST - Microformats – Client side technologies – Web gateway - Security Challenges with Web2.0 – Content Management System(CMS)

UNIT IV Application Creation 9 Hrs

DOJO toolkit - Creation of Application with DOJO, JSON ,Adobe Flex, Cloud computing, Hadoop – Building Offline Applications using Adobe AIR.

UNIT V Case Studies 9 Hrs

Teaching & Learning Issues – Research – Academic Publishing – Library – Repositories – Archiving – Future of Web2.0 – Web2.0 & Semantic Web –Emergence of Web Science.

Total Hours: 45

REFERENCE BOOKS:

1. *shelly / Frydenberg, 2011, "Web2.0- concepts & Applications", Cengage Learning.*
2. *Gwen Solomon, Lynne Schrum, 2007, "Web 2.0 – new tools, new schools" , ISTE Publication.*
3. *www.jisc.ac.uk - JISC Technology and Standards Watch, Feb. 2007 Web 2.0(PDF)*
4. *Web2.0 Tutorials(from web)*
5. *Mastering Web2.0 Technologies(from web)*
6. *www.dojotoolkit.org*

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Subject Code:	Subject Name : ENTERPRISE ARCHITECTURE	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E22	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 define and explain gaps
- Help to achieve the business strategy, vision and Target Operating Model
- Provide the flexibility to include new ideas in the future
- Enable faster decision making, avoiding the need for long studies
- Learn UML and BPMN Modeling.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Construct models for enterprise architecture definition which conform to industry standards and frameworks
CO2	Analyze alternative models for enterprise architecture components and processes for different organizations
CO3	Identify critical success factors for common enterprise architect approaches
CO4	Analyze technology architecture with relevance to environment
CO5	Inspect business process diagram using UML and BPMN

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	3	3	2	3	3	3	3	2	3	3
CO2	1	3	3	3	1	3	3	3	3	3	3	3
CO3	1	2	3	3	3	3	2	3	2	2	2	2
CO4	1	1	3	3	3	2	3	3	3	3	2	3
CO5	1	1	3	3	3	3	3	3	2	3	2	3

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E22	ENTERPRISE ARCHITECTURE	Ty	3	0/0	0/0	3

UNIT I Introduction 9 Hrs

TOGAF- General Presentation-Keypoints-ADM Method: ADM Cycle-The Phases of the ADM-Iterations-ADM Techniques and Guidelines. **Components of TOGAF Architecture:** Architecture components-The Metamodel-Artifacts-Building Blocks-Deliverables. Repository and Governance: Architecture Repository-Architecture Governance.

UNIT II Key Modeling Techniques 9 Hrs

Models: Benefits Uses and Characteristics-The concepts of viewpoints-Special role played by diagrams-consistency and traceability-Architecture Repository-Risks and main difficulties-Repository governance-Tools and Languages. **TOGAF Models:** TOGAF Artifacts-UML and BPMN for TOGAF Modeling-**Model Vision**: Stakeholder Matrix-Artifacts linked to Goals, Requirement, and Business Process-Solution Concept Diagram-Value Chain Diagram.

UNIT III Model Business Architecture 9 Hrs

Business Dictionary Artifacts-Artifacts linked to Enterprise Organization, function and Services, Business Processes, Data. Information System Architecture: Application Communication Diagram-Migration Diagram- User Location Diagram-System use Case Diagram-Process System Realization Diagram-Enterprise Manageability diagram-Data Architecture-Service Data Diagram-

UNIT IV Technology Architecture 9 Hrs

Environment and Location Diagram-Processing Diagram-Network Computing Hardware Diagram-Benefits Diagram. SOA Processes and Information:SOA-Business Processes-Information-TOGAF Within AMUE, EDF. Archimate.

UNIT V 9 Hrs

Draw Business Process Diagram Using UML and BPMN.

Total Hours: 45

TEXT BOOK:

1. Philippe Desfray, Gilbert Raymond (2014) –Modelling Enterprise Architecture with TOGAF A Practical Guide Using UML and BPMN. Elsevier Pub.

REFERENCE BOOKS:

1. *Peter Rittgen, (2007)-Enterprise Modeling and Computing with UML , Idea Group Publishing.*
2. Marc Lankhorst et al (2013) , The Enterprise Engineering Series, Springer

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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18EXX	**Subject based on Industry Demand**	Ty	3	0/0	0/0	3

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Department of Computer Science and Engineering
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Subject Code:	Subject Name : OPTIMIZATION TECHNIQUES	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E23	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 understand importance of optimization of industrial process management and apply basic concepts of mathematics to formulate an optimization problem.
- To analyze and appreciate variety of performance measures for various optimization problems

COURSE OUTCOMES (COs) : (3- 5)

CO1	Should remember basic concept of structural orientation of data
CO2	Understand the different methods of optimization and be able to suggest a technique for a specific problem.
CO3	Apply knowledge of optimization to formulate and solve engineering problems
CO4	Analyze the complexity of solution to an optimization problem.
CO5	Formulate Mathematical models for optimization problem

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	2
CO3	3	2	2	3	2	2	3	2	3	3	2	3
CO4	3	3	1	3	2	2	3	2	2	1	3	2
CO5	3	3	2	3	2	3	1	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	2
CO4	2	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E23	OPTIMIZATION TECHNIQUES	Ty	3	0/0	0/0	3

UNIT I Introduction to Operation Research 9 Hrs

Operation Research approach, scientific methods, introduction to models and modeling techniques, general methods for Operation Research models, methodology and advantages of Operation Research, history of Operation Research.

UNIT II Linear Programming (LP) 9 Hrs

Introduction to LP and formulation of Linear Programming problems, Graphical solution method, alternative or multiple optimal solutions, Unbounded solutions, Infeasible solutions, Maximization – Simplex Algorithm, Minimization – Simplex Algorithm using Big-M method, Two phase method, Duality in linear programming, Integer linear programming.

UNIT III Transportation & Assignment Problems 9 Hrs

Introduction to Transportation problems, various methods of Transportation problem, Variations in Transportation problem, introduction to Assignment problems, variations in Assignment problems

UNIT IV Network Analysis 9 Hrs

Network definition and Network diagram, probability in PERT analysis, project time cost trade off, introduction to resource smoothing and allocation.

UNIT V Sequencing 9 Hrs

Introduction, processing N jobs through two machines, processing N jobs through three machines, processing N jobs through m machines.**Inventory Model:** Introduction to inventory control, deterministic inventory model, EOQ model with quantity discount.**Queuing Models:** Concepts relating to queuing systems, basic elements of queuing model, role of Poison & exponential distribution, concepts of birth and death process.

Total Hours: 45

REFERENCE BOOKS :

1. *J K Sharma, Operations Research Theory and Applications, MacMillan India Ltd.*
2. *N D Vohra, Quantitative Techniques in management, Tata McGraw Hill.*
3. *Handy A Taha, Operations Research – An Introduction, Prentice Hall of India, New Delhi.*
4. *Wagner H M, Principles of Operations Research: With Applications to Management Decisions, Prentice-Hall of India, New Delhi.*

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8th SEMESTER ELECTIVES E-IV AND E-V (Common to CSE&IT)

Subject Code: **BCS18E24**	Subject Name : **INFORMATION STORAGE MANAGEMENT**	**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
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	Discuss various storage architectures (Level 2)
CO2	Evaluate the performance of storage subsystems,like DAS, SAN, NAS, CAS (Level 5)
CO3	Define backup, recovery, disaster recovery, business continuity, and replication (Level 1)
CO4	Categorize different Security Measures in Storage management (Level 4)
CO5	Understand logical and physical components of a storage infrastructure (Level 2)

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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E24	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, 2nd 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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Subject Code: BCS18E25	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 VLANs, and to test Network security and wireless security.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recall the concepts of computer networks
CO2	Outline the use of network infrastructure
CO3	RecognizetheimportanceandrelevanceofVLANs and EIGRP
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			
					✔							

Department of Computer Science and Engineering
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SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E25	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.*

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Subject Code: **BCS18E26**	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	Describe concurrent programming concepts, semaphores and monitors
CO2	Discuss about distributed programming
CO3	Explain basic concepts of message passing 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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Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E26	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*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18E27**	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E27	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*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E28	Subject Name : HADOOP DISTRIBUTED FILE SYSTEM	Ty/ Lb/ ETL	L	T/ 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 and to examine MapReduce types and formats.

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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E28	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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E29	Subject Name : MOBILE DATABASES	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
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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E29	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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E30	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E30	**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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: **BCS18E31**	Subject Name : **4G NETWORKS**	**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 understand the latest technology in mobile communication and the high speed data communication through wireless network.

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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E31	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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name : ENTERPRISE RESOURCE PLANNING	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E32	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 :

- Know basic business functional areas and explains how they are related.
- Illustrate how unintegrated information systems fail to support business decision and how integrated information systems can help a company prosper by providing business managers with accurate, consistent, and current data
- Understand how Enterprise Resource Planning software is used to optimize business processes Acquire experience in using ERP software that can be applied in further coursework

COURSE OUTCOMES (COs) : (3- 5)

CO1	Understand the basics of Enterprise Resource process
CO2	Identify and report the key implementation issues of ERP
CO3	Apply the business modules of ERP
CO4	Adapt to some popular products in the area of ERP
CO5	Analyze the current and future trends in ERP

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	3	3	2	1	3	2	3	2	2
CO2	2	2	3	3	2	1	2	3	3	3	3	3
CO3	1	2	2	3	3	1	2	3	3	1	3	3
CO4	3	3	2	2	3	2	2	3	2	2	3	2
CO5	2	3	3	2	3	2	2	3	3	3	3	3

COs / PSOs	PSO1	PSO2	PSO3	PSO4
CO1	1	1	2	3
CO2	2	2	2	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E32	ENTERPRISE RESOURCE PLANNING	Ty	3	0/0	0/0	3

UNIT I Introduction 9 Hrs

Overview of enterprise systems – Evolution - Risks and benefits - Fundamental technology - Issues to be consider in planning design and implementation of cross functional integrated ERP systems - Case studies.

UNIT II ERP Solutions And Functional Modules 9 Hrs

Overview of ERP software solutions- Small medium and large enterprise vendor solutions, BPR, Business Engineering and best Business practices - Business process Management. Overview of ERP modules -sales and Marketing, Accounting and Finance, Materials and Production management etc. -Case studies.

UNIT III ERP Implementation 9 Hrs

Planning Evaluation and selection of ERP systems-Implementation life cycle - ERP implementation, Methodology and Frame work- Training – Data Migration.People Organization in implementation-Consultants, Vendors and Employees-Case studies.

UNIT IV Post Implementation 9 Hrs

Maintenance of ERP- Organizational and Industrial impact; Success and Failure factors of and ERP Implementation -case studies.

UNIT V Emerging Trends on ERP 9 Hrs

Extended ERP systems and ERP bolt –on -CRM, SCM, Business analytics etc- Future trends in ERP systems-web enabled, Wireless technologies so on-Case studies.

Total Hours: 45

TEXT BOOK:

1. Alexis Leon, 2006 ERP demystified, second Edition Tata McGraw-Hill.

REFERENCE BOOKS:

1. *Jagan Nathan Vaman, 2008 ERP in Practice, Tata McGraw-Hill.*
2. *Alexis Leon, 2008 Enterprise Resource Planning, second edition, Tata McGraw-Hill.*
3. *Mahadeo Jaiswal and Ganesh Vanapalli, 2006 ERP Macmillan India.*
4. *Vinod Kumar Grag and N.K. Venkitakrishnan,2006, ERP- Concepts and Practice, Prentice Hall of India.*
5. *Summer, 2008 ERP, Pearson Education.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E33	Subject Name : SUPPLY CHAIN MANAGEMENT	Ty /Lb /ETL/ EVL	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

OBJECTIVES :

- For students to analytically solve problems related to inventory management, facility location, and supply chain optimization
- To utilize computer resources to research and analyze supply chain operations.
- To understand the global environment and strategic alliances in modern business and their impact on supply chain management

COURSE OUTCOMES (COs) : (3- 5)

CO1	Recall the basic of fundamentals of Supply chain management
CO2	Summarize the problems and solution in logistics management
CO3	Identify the relative network design to make decisions
CO4	Understand the sourcing and inventory management
CO5	Associate the supply chain management of current 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	3	3	3	3	3	3	1	3	2	3	3
CO2	3	3	3	3	3	3	3	2	3	2	3	3
CO3	3	3	3	3	3	2	3	1	3	2	3	3
CO4	3	3	3	3	3	2	3	2	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	3
CO2	3	3	2	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 Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E33	SUPPLY CHAIN MANAGEMENT	Ty	3	0/0	0/0	3

UNIT I Introduction 9 Hrs

Defining Supply Chain management and logistics management.Evolution. Supply Chain – Fundamentals, , and Importance. Supply chain strategy, Enablers/ Drivers of Supply Chain Performance. Supply Chain relationships.

UNIT II Logistics Management 9 Hrs

Logistics – functions, objectives, solution. Customer Service.Warehousing and Material Storage, Material Handling, Transportation and Packaging – 3PL and 4PL.

UNIT III Network Design 9 Hrs

Distribution Network Design – Role, Factors Influencing, Options, Value Additions.Models for Facility Location and Capacity allocation.Impact of uncertainty on Network Design. Network Design decisions using Decision trees.

UNIT IV Sourcing And Inventory Management 9 Hrs

Sourcing – Make vs buy decision, Creating World Class Supply base, World Wide Sourcing Inventory Management – managing cycle inventory, safety inventory. Value of information, Bullwhip effect, Coordination in supply chain, Analysing impact of supply chain redesign on the inventory.

UNIT V Current Trends 9 Hrs

E-Business – Framework and Role of Supply Chain in e- business and b2b practices. Supply Chain IT Framework.E-Supply Chains, E – Logistics- eSRM, eLRM, eSCM, Agile Supply Chains. Reverse Logistics, Global Logistics.

Total Hours: 45

TEXT BOOKS:

1. Bowersox Donald J, 2000 Logistical Management – The Integrated Supply Chain Process" Tata McGraw Hill.
2. Sunil Chopra and Peter Meindl, 2007 Supply Chain Management-Strategy Planning and Operation, Prentice Hall.

REFERENCE BOOKS:

1. *Donald J. Bowersox, David J. Closs and M. Bixby Cooper, 2008 "Supply Chain Logistics Management", Tata McGraw Hill.*
2. *Altekar Rahul V, 2005 Supply Chain Management-Concept and Cases, Prentice Hall India.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCS18E34	Subject Name : MAIN FRAME COMPUTING	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
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	Review the different concept of operating system.
CO2	Demonstrate some computer programming language.
CO3	Estimate the various e-business transactions.
CO4	Knowledge about different Database design
CO5	Capable to optimize algorithms 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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E34	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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Subject Code:	Subject Name : NEURO FUZZY COMPUTING	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E35	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E35	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”, (3rd 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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Subject Code: BCS18E36	Subject Name : WEB CONTENT MANAGEMENT	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	Prerequisite: BCS18E09	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 Lean the basics of Content Management System
- To Learn the Tools and techniques
- To Learn the use of web browser,navigate to a web page
- To Learn the CMS tools for backup and customization

COURSE OUTCOMES (COs) : (3- 5)

CO1	To describe the CMS terminology, including open source, , etc.,
CO2	Capable of modeling personalized template for content publishing.
CO3	To apply API code for text editor.
CO4	Identify the Editorial Tools , Workflow and templating
CO5	Analyze with API model and work with external investigator

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	1	3	2	2	3	3	3	3	2
CO2	3	2	2	2	3	3	2	2	3	3	3	2
CO3	3	3	3	2	1	3	2	2	3	2	3	2
CO4	3	2	2	1	3	3	2	3	3	3	3	3
CO5	3	3	3	2	2	3	1	2	3	2	2	2

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

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E36	WEB CONTENT MANAGEMENT	Ty	3	0/0	0/0	3

UNIT I Introduction to Content Management 9 Hrs

CMS – Types of CMS –Create Content –System Versus implementation – Platform versus product – Open source versus commercial – management versus delivery – Content model manageability

UNIT II Editorial Tools and Workflow 9 Hrs

Shape of Content – Aggregation Models: Implicit and Explicit – URL Addressability of Aggregations – Content Lifecycle – workflow and approvals – Content File Management - Permissions

UNIT III Output and Publication Management 9 Hrs

Templating - Publishing Content – Multiple Language handling – Language Rules – Personalization, Analytics and Marketing Automation – Form Building – URL Management – Reporting Tools and Dashboards

UNIT IV Implementation 9 Hrs

APIs and Extensibility: Code API-Event Models-Customizing Rich Text Editors – CMS implementation – Types of implementation – Implementation process

UNIT V Working With External Integrators 9 Hrs

Engagement models – Sales and scoping – costs –Written agreements – Production – Training and support

Total Hours: 45

TEXT BOOK:

1. Deane Barker,2016, Web content Management systems, Features and Best Practices, O'Reilly Publications

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Subject Code:	Subject Name : MACHINE LEARNING	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E37	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 learn machine learning techniques, to acquire knowledge about clustering and nonparametric methods and to design and analyze machine learning experiments.

COURSE OUTCOMES (COs) : (3- 5)

CO1	Remember the concept of techniques in Artificial Intelligence.
CO2	Understand the concept of various Machine Learning Methods
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	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E37	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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Subject Code: BCS18E38	Subject Name : M - COMMERCE	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
Ty/Lb/ETL : Theory/Lab/Embedded Theory and Lab

OBJECTIVES:

- To understand the E – commerce strategies and value chains
- To understand the M-commerce services
- To understand M – commerce infrastructure and applications.
- To know the availability of latest technology and applications of M- commerce in various domains.
- To apply mobile commerce in business-to-business application

COURSE OUTCOMES (COs) : (3- 5)

CO1	Able to apply M – commerce principles to various business domains
CO2	Able to apply E – commerce principles in market place
CO3	Understand the theory and applications of M-commerce in business domain
CO4	Analyze M – commerce business models.
CO5	Identify current technological advancements in M-commerce.

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	3	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	2	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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E38	M- COMMERCE	Ty	3	0/0	0/0	3

UNIT I: Electronic Commerce **9 Hrs**

Traditional commerce and E-commerce – Internet and WWW – Role of WWW – Value Chains – Strategic Business And Industry Value Chains – Role of E-commerce. Packet Switched Networks – TCP/IP Protocol Script – Internet Utility Programmes – SGML, HTML and XML – Web Client And Servers – Web Client/Server Architecture.

UNIT II: Mobile Commerce **9 Hrs**

Introduction – Infrastructure of M–Commerce – Types Of Mobile Commerce Services – Technologies Of Wireless Business – Benefits And Limitations, Support, Mobile Marketing & Advertisement, Non– Internet Applications In M–Commerce – Wireless/Wired Commerce Comparisons.

UNIT III: Mobile Technology **9Hrs**

A Framework For The Study Of Mobile Commerce – NTT Docomo's I-Mode – Wireless Devices For Mobile Commerce – Towards A Classification Framework For Mobile Location Based Services – Wireless Personal And Local Area Networks .

UNIT IV: Theory and Applications **9Hrs**

The Ecology Of Mobile Commerce – The Wireless Application Protocol – Mobile Business Services – Mobile Portal – Factors Influencing The Adoption of Mobile Gaming Services – Mobile Data Technologies And Small Business Adoption And Diffusion – E–commerce in The Automotive Industry – Location– Based Services.

UNIT V: Business– To– Business Mobile E– Commerce **9Hrs**

Enterprise Enablement – Email and Messaging – Field Force Automation (Insurance, Real Estate, Maintenance, Healthcare) – Field Sales Support (Content Access, Inventory) – Asset Tracking and Maintenance/Management – Remote IT Support – Customer Retention (B2C Services, Financial, Special Deals) – Warehouse Automation – Security.

Total Hours: 45

Text Books:

1. E.BrianMennecke, J.TroyStrader, (2005) Mobile Commerce: Technology, Theory and Applications, Idea Group
2. Ravi Kalakota, B.AndrewWhinston,(2007) Frontiers of Electronic Commerce, Pearson Education

Reference Books:

1. P. J. Louis (2009) M-Commerce Crash Course, McGraw- Hill Companies
2. Paul May (2006) Mobile Commerce: Opportunities, Applications, and Technologies Of Wireless Business,,Cambridge University Press.

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Subject Code: BCS18E39	Subject Name : REAL TIME SYSTEMS	Ty/ Lb/ ETL	L	T/ 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

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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E39	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.*

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name :	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
	DISTRIBUTED COMPUTING					
BCS18E40	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	To show the relation among model designs of distributed computing systems
CO2	Interpret the inter-process communication concepts of distributed systems
CO3	Role-play a new memory with effective synchronization
CO4	Prepare appropriate scheduling between resource and process
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			
					✔							

Department of Computer Science and Engineering
Regulation 2018

SUBJECT CODE	SUBJECT NAME	Ty/ Lb/ ETL	L	T/ S.Lr	P/R	C
BCS18E40	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*

Department of Computer Science and Engineering
Regulation 2018

OPEN ELECTIVES -CIVIL

	Subject Code: BCE18OE1/ BCE20OE1	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			
						√						

Department of Computer Science and Engineering
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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.

Department of Computer Science and Engineering
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Subject Code: BCE18OE2/ BCE20OE2	Subject Name ENVIRONMENT,HEALTHANDSAFETY ININDUSTRIES	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

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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name	Ty / Lb/ 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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCE18OE3/ BCE20OE3	Subject Name **GREEN BUILDING AND VASTU CONCEPTS**	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

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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BCE18OE3/ BCE20OE3	**GREEN BUILDING AND VASTU CONCEPTS**	**Ty**	**3**	**0/0**	**0/0**	**3**

UNITIINTRODUCTION OFGREENBUILDING 9Hrs

Concept of green building, History of green building, Need of green building in present scenario, ImportanceofgreenbuildingMeritsanddemerits,Classificationofgreenbuilding,Assessmentmethods Global assessment and certification, Local assessment, LEED India GRIHA (Green Rating for Integrated HabitatAssessment)

UNITIIPRINCIPLESANDELEMENTSOFDESIGNOFGREENBUILDING 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

UNITIIITHERMAL COMFORT INSIDETHEBUILDING 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

UNITIVWATERCONSERVATIONANDBUREAUOFENERGYEFFICIENCY 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 VVASTUCONCEPT 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

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Regulation 2018

Subject Code: BCE18OE4/ BCE20OE4	Subject Name CLIMATE CHANGE AND SUSTAINABLE DEVELOPMENT	Ty /Lb/ 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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Subject Code:	Subject Name	Ty / Lb / ETL	L	T / S.Lr	P/ R	C
BCE18OE4/BCE20OE4	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.

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Subject Code: BCE18OE5/ BCE20OE5	Subject Name **INTELLIGENT TRANSPORTATION SYSTEMS**	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

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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Subject Code: BCE18OE5/ BCE20OE5	Subject Name	Ty / Lb/ 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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Subject Code: BCE18OE6/ BCE20OE6	Subject Name GEOGRAPHICAL INFORMATION SYSTEM AND MAPPING	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

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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCE18OE6/ BCE20OE6	Subject Name	Ty / Lb/ 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

- 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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7.

ubject Code: BCE18OE7/ BCE20OE7	**Subject Name** **INDUSTRIAL POLLUTION PREVENTION AND CLEANER PRODUCTION**	**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

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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Subject Code: BCE18OE7/ BCE20OE7	Subject Name	Ty/ Lb/ 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”,McGr aw-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.

3.

Subject Code: BCE18OE8/ BCE20OE8	**Subject Name** **AIR POLLUTION AND CONTROL**	**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 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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SubjectCode: BCE18OE8/ BCE20OE8	Subject Name	TY/Lb /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, McGrawHill 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

Department of Computer Science and Engineering
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OPEN LAB

Subject Code: BCE18OL1/ BCE20OL1	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

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: 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.

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Subject Code: BCE18OL2/ BCE20OL2	Subject Name : GEOGRAPHICALINFORMATIONSYSTEMA ND 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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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

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Subject Code: BCE18OL3/ BCE20OL3	**Subject Name :** **ENVIRONMENTALENGINEERING 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			
							√					

Department of Computer Science and Engineering
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Subject Code:	Subject Name :	T y/ Lb/ ETL	L	T / S.Lr	P/ R	C
BCE18OL3/ BCE20OL3	**ENVIRONMENTALENGINEERING LABORATORY**	Lb	0	0/0	3/0	1

LIST OF EXPERIMENTS

1. a) Determination ofpH.
   b) Determination of Turbidity.
2. Determination ofHardness.
3. Determination ofAlkalinity.
4. Determination of ResidualChlorine.
5. Estimation ofChlorides.
6. Estimation of AmmoniaNitrogen.
7. Estimation ofSulphate.
8. Determination of optimumcoagulant dose.
9. Determination of specificconductivity.
10. EstimationofavailablechlorineinBleaching Powder.
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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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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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 NANOMATERIAL 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 CHARACTERIZATIONTECHNIQUE 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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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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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:

P. N. Ananthanarayan, "Basic Refrigeration & Air conditioning", Tata McGraw Hill, New Delhi,2007

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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	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

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ubject Code: BCT18OE3/ BCT20OE3	Subject Name:	Ty / Lb/ ETL	L	T / SLr	P/ R	C
	Alternative Fuels And Energy Systems	Ty	3	0/0	0/0	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. CO2 and H2S 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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCT18OE4/ BCT20OE4	Subject Name: Petrochemical Unit Processes	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 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			
						√						

Department of Computer Science and Engineering
Regulation 2018

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

UNITI 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.

UNITII SYNTHESISGASPRODUCTION 9Hrs

Steam reforming of Natural gas – Naphtha and Heavy distillate to produce Hydrogen and Synthesis gas – Production of Methanol – Oxo process.

UNITIII UNITPROCESSES I 9Hrs

Fundamental and Technological principled involved in Alkylation – Oxidation – Nitration and Hydrolysis.

UNITIVUNITPROCESSESII 9Hrs

Fundamental and Technological principled involved in Sulphonation, Sulfation and Isomerisation.

UNITV UNITPROCESSESIII9Hrs

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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BCT18OE5/BCT20OE5	Subject Name: Principles of Desalination Technologies	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: 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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name:	Ty / Lb/ ETL	L	T / SLr	P/ R	C
BCT18OE5/ BCT20OE5	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:THERMALDESALINATIO **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 **Total Hours:45 Hrs**

REFERENCES:

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, Desalination Publications Elsevier(1994)Kirk &Othmer :Encyclopaedia of ChemicalTechnology

Department of Computer Science and Engineering
Regulation 2018

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

Catagory	Basic Sciences	Engineering Sciences	Humanities and Social	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

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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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	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
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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.

Department of Computer Science and Engineering
Regulation 2018
OPEN ELECTIVE- ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18OE1/ BEE20OE1	Subject Name: ELECTRICAL SAFETY FOR ENGINEERS	Ty/Lb/ 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						
Approval												

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Subject Code: BEE18OE1/ BEE20OE1	Subject Name:	Ty/Lb/ 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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Subject Code: BEE18OE2/BEE 20OE2	Subject Name: ENERGY CONSERVATION TECHNIQUES	Ty / Lb/ 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	PO 7	PO 8	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			
						√						

Department of Computer Science and Engineering
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Subject Code: BEE18OE2/ BEE20OE2	Subject Name:	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	ENERGY CONSERVATION TECHNIQUES	Ty	3	0/0	0/0	3

UNITI INTRODUCTION 9Hrs

Historical uses–Components of the energy conseervation system – Power output from an ideal system –

Power output from practical system

UNIT IIENERGYCONSERVATION 9Hrs

Principle of energy conservation - waste heat recovery - Heat pump – Economics of energy conservation, cogeneration, combined cycle plants, electrical energy conservation opportunities

UNIT IIIENERGYEFFICIENCIES 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 IVECONOMICASPECTS 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

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Subject Code: BEE18OE3/ BEE20OE3	Subject Name: ELECTRIC VEHICLE TECHNOLOGY	Ty/Lb/ 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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Subject Code: BEE18OE3/ BEE20OE3	Subject Name:	Ty /Lb/ 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 VEHICLETECHNOLOGY1 9Hrs

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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE4/ BEE20OE4	Subject Name: BIOMEDICAL INSTRUMENTATION	Ty /Lb/ 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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE4/ BEE20OE4	Subject Name:	Ty /Lb/ 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:

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Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE5/ BEE20OE5	Subject Name: INTRODUCTION TO POWER ELECTRONICS	Ty /Lb/ 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:

- 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE5/ BEE20OE5	Subject Name:	Ty /Lb/ 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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE6/ BEE20OE6	Subject Name: INDUSTRIAL INSTRUMENTATION	Ty /Lb/ 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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE6/ BEE20OE6	Subject Name:	Ty /Lb/ 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:MEASUREMENTOFACCELERATION,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
2. Jain, R.K. (1999) Mechanical and Industrial Measurements. New Delhi: KhannaPublishers.

References

1. Patranabis,D.(1996)PrinciplesofIndustrialInstrumentation.TataMcGrawHillPublishingCompany
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
4. Singh, S.K.(2003) Industrial Instrumentation and Control.Tata McGrawHill.
5. Eckman, D.P. Industrial Instrumentation. Wiley EasternLtd.

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Regulation 2018

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE7/ BEE20OE7	Subject Name: SOLAR ENERGY CONVERSION SYSTEM	Ty /Lb/ 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE7/ BEE20OE7	Subject Name:	Ty /Lb/ ETL	L	T / S.Lr	P / R	C
	SOLAR ENERGY CONVERSION SYSTEM	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.

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE8/BEE20OE8	Subject Name: WIND ENERGY CONVERSION SYSTEM	Ty /Lb/ 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE8 /BEE20OE8	Subject Name:	Ty /Lb/ ETL	L	T / S.Lr	P / R	C
	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

Department of Computer Science and Engineering
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Subject Code: BEE18OE9/ BEE20OE9	Subject Name: ENERGY STORAGE TECHNOLOGY	Ty /Lb/ 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 and Humanities and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
			√								

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OE9/ BEE20OE9	Subject Name:	Ty /Lb/ 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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OL1/ BEE20OL1	Subject Name: TRANSDUCER 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 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						
Approval												

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OL1/ BEE20OL1	Subject Name:	Ty/Lb/ 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

Subject Code: BEE18OL2/ BEE20OL2	Subject Name: PLC AND SCADA LAB	T / 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 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			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OL2 /BEE20OL2	Subject Name:	Ty / Lb/ ETL	L	T / 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

Department of Computer Science and Engineering
Regulation 2018

Subject Code: BEE18OL3/ BEE20OL3	Subject Name: ELECTRICAL MAINTENANCE LAB	Ty / Lb/ ETL	L	T / S.L r	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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name:	Ty /Lb/ ETL	L	T / S.Lr	P / R	C
BEE18OL3/BEE20OL3	**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

Department of Computer Science and Engineering
Regulation 2018

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.
- TounderstandthetechniquestocontrolthespeedofBrushlessDCMotorandSRMotor
- 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 and SocialSciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						
Approval												

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name:	Ty /Lb/ ETL	L	T / S.Lr	P / R	C
BEE18OL4/ BEE20OL4	**POWER ELECTRONICS LAB**	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

Department of Computer Science and Engineering
Regulation 2018

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												

Department of Computer Science and Engineering
Regulation 2018

Subject Code:	Subject Name:	Ty /Lb/ ETL	L	T / S.Lr	P / R	C
BEE18OL5/ BEE20OL5	**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

Department of Computer Science and Engineering
Regulation 2018
OPEN ELECTIVES- BIOTECHNOLOGY

UNIT-I: BASIC TERMS USED IN STUDY OF FOOD AND NUTRITION **9Hrs**

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

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			
						✓						

Department of 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

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

Department of Computer Science and Engineering
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Subject Code: BBT18OE2/ BBT20OE2	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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						✓						

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

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												

Subject Code: BBT18OE3/	Subject Name CLINICAL BIOCHEMISTRY	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BBT20OE3	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

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			
						✓						

Approval	

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.

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	PO 7	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			
						✓						

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

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

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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			
						✓						

Subject Code: BBT18OE6/ BBT20OE6	Subject Name : Basic Bioinformatics	Ty / Lb/ ETL	L	T / S.Lr	P/ 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:NUTRIGENOMICS9 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

OPEN LAB

Subject Code: BBT18OL1/ BBT20OL1	Subject Name : Basic Biochemistry Lab	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	Prerequisite: NIL	Lb	0	0/0	3/0	1

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).

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

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 / 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		
										✓		

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.

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

O1	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		
										✓		

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

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

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		
										✓		

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

OPEN ELECTIVES- MECHANICAL ENGINEERING

Subject Code: BME18OE1/BME 20OE1	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			
						✓						

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

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.

Subject Code:	Subject Name : FINITE ELEMENT METHOD	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
BME18OE2/ BME20OE2	**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			
						✓						

Subject Code: BME18OE2 /BME20OE2	Subject Name : FINITE ELEMENT METHOD	Ty / Lb/ ETL	L	T / 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,

Subject Code: BME18OE3/ BME20OE3	SubjectName: 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.

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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			
						✓						

Subject Code: BME18OE3/ BME20OE3	SubjectName: AUTOMOBILE ENGINEERING	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.

Subject Code:	Subject Name : INDUSTRIAL ROBOTICS	Ty / Lb/ ETL	L	T / S.L r	P/ R	C
/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 / Technical Skill	Soft Skills			
						✓						

Subject Code: BME18OE4/ BME20OE4	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:COMPONENTSANDOPERATIONS **9 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:ROBOTPROGRAMMING9Hrs

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.

Subject Code:	SubjectName: RENEWABLE SOURCES OF 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 / Tech	Soft Skills			
						✓						

Subject Code: BME18OE5/ BME20OE5	SubjectName: RENEWABLE SOURCESOF ENERGY	Ty / Lb/ ETL	L	T / S.Lr	P/ R	C
	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”.

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**

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 / Technic	Soft Skills			
						✓						

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.

Subject Code: BME18OE7/ BME20OE6	Subject Name : COMPOSITE MATERIALS	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

- 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 / Technical Skill	Soft Skills			
					✓							

Subject Code:	Subject Name : COMPOSITE MATERIALS	Ty / Lb/ ETL	L	T / S.L r	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:MATERIALS9Hrs

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.

OPEN ELECTIVE

LABS

Subject Code: BME18OL1/BME20OL1	**SubjectName:** **INTERNALCOMBUSTIONENGINES & 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		
						✓						

Subject Code: BME18OL1/ BME20OL1	SubjectName: INTERNALCOMBUSTION ENGINES & STEAMLAB	Ty / Lb/ ETL	L	T / 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

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**

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	3		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	3		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 / Technical Skill	Soft Skills	Open Elective Lab/ Practical		
										✓		

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

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		
										✓		

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

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

Dr APJ Abdul Kalam Center for Research

Dr.A.P.J Abdul Kalam CoE in Innovation & Entrepreneurship

Subject Code :	Subject Name :	Ty/Lb/ ETL	L	T/ SLr	P/ R	C
BMG18OE1/ BMG20OE1/ BMG13E12/ BMG20E12	**TECHNICAL ENTREPRENEURSHIP**					
	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
							√		

Subject Code : BMG18OE1/ BMG20OE1/ BMG13E12/ BMG20E12	Subject Name : **TECHNICAL ENTREPRENEURSHIP**	**Ty/ Lb/ ETL**	**L**	**T/ SL r**	**P/ R**	**C**
	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

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	**PO 1**	**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
							√		

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.

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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

Open Electives-ECE

Subject Code: BEC18OE1/ BES20OE1	Subject Name :Internet of Things and its Applications	Ty / Lb/ 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 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 / Soft Skills	Category	Basic Sciences	Engg Sciences
						√					

Subject Code: BEC18OE1/ BES20OE1	Subject Name : Internet of Things and its Applications	Ty / Lb/ 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.*

Subject Code: BEC18OE2/ BES20OE2	Subject Name : Cellular Mobile Communication	Ty /Lb/ 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 /	Soft Skills	Category		
						√						

Subject Code: BEC18OE2/ BES20OE2	Subject Name : Cellular Mobile Communication	Ty / Lb/ 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*

Subject Code: BEC18OE3/ BES20OE3	Subject Name : Satellite and its Applications	Ty / Lb/ 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 / Technical Skills	Soft Skills			
						√						

Subject Code: BEC18OE3/ BES20OE3	Subject Name :Satellite and its Applications	Ty /Lb/ 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 IIELEMENTS 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 IVEARTH 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 VAPPLICATIONS 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/*

Subject Code: BEC18OE4 /BES20OE4	Subject Name :Fundamentals of Sensors	Ty / Lb/ 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 :

- 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	PO1	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			
						✓						

Subject Code: BEC18OE4 /BES20OE4	Subject Name :Fundamentals of Sensors	Ty / Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite:	Ty	3	0/0	0/0	3

UNITI SENSOR FUNDAMENTALS9 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 SENSING9 Hrs

Electric Charges, Fields, and Potentials - Capacitance – Magnetism – Induction – Resistance - Piezoelectric Effect -

UNITV SENSOR ELEMENTS9 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:

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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

Subject Code: BEC18OE5/ BES20OE5	Subject Name :Basics of Microprocessor and Microcontroller	Ty / Lb/ 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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
						√						

Subject Code: BEC18OE5/BES20OE5	Subject Name :Basics of Microprocessor and Microcontroller	Ty / Lb/ 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*

Subject Code: BEC18OE6/ BES20OE6	Subject Name :Industry 4.0 Concepts	Ty / Lb/ 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 / Soft Skills			
						√					

Subject Code: BEC18OE6/ BES20OE6	Subject Name :Industry 4.0 Concepts	Ty / Lb/ 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)

OPEN LAB

Subject Code: BEC18OL1/BEC20OL1	Subject Name :Sensors and IoT Lab	Ty / Lb/ 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 Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					

Subject Code: BEC18OL1/ BEC20OL1	Subject Name : Sensors and IoT Lab	Ty / Lb/ 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.

Subject Code: BEC18OL2/ BEC20OL2	Subject Name :Robotics Control Lab	Ty / Lb/ 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			
							✓					

Subject Code: BEC18OL2/ BEC20OL2	Subject Name :Robotics Control Lab	Ty / Lb/ 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

Subject Code: BEC18OL3/ BEC20OL3	Subject Name : Basics of MATLAB	Ty / Lb/ 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			
							√					

Subject Code: BEC18OL3/ BEC20OL3	Subject Name : Basics of MATLAB	Ty / Lb/ 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