

B.Tech – Electrical and Electronics Engineering (Full Time)

Curriculum and Syllabus

2018 Regulation

I SEMESTER

| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С |
|-------|-----------------|--|-------------------|---|-----------|-----|---|
| 1 | BEN18001 | Technical English - I | Ту | 1 | 0/0 | 2/0 | 2 |
| 2 | BMA18001 | Mathematics - I | Ту | 3 | 1/0 | 0/0 | 4 |
| 3 | BPH18001 | Engineering Physics - I | Ту | 2 | 0/1 | 0/0 | 3 |
| 4 | BCH18001 | Engineering Chemistry - I | Ту | 2 | 0/1 | 0/0 | 3 |
| 5 | BES18001 | Basic Electrical and Electronics Engineering | Ту | 2 | 0/1 | 0/0 | 3 |
| 6 | BES18002 | Basic Mechanical and Civil Engineering | Ту | 2 | 0/1 | 0/0 | 3 |
| PRACT | ICALS* | | | | | | |
| 1 | BES18L01 | Basic Engineering Workshop | Lb | 0 | 0/0 | 2/0 | 1 |
| 2 | BES18ET1 | Orientation to Entrepreneurship and 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 | С | | | |
| 1 | BMA18003 | Mathematics – II | Ту | 3 | 1/0 | 0/0 | 4 | | | |
| 2 | BPH18002 | Engineering Physics –II | Ту | 2 | 0/1 | 0/0 | 3 | | | |
| 3 | BCH18002 | Engineering Chemistry – II | Ту | 2 | 0/1 | 0/0 | 3 | | | |
| 4 | BES18003 | Environmental Science* | Ту | NO | N CREI | DIT COU | JRSE | | | |
| PRACT | ICALS* | | | | | | | | | |
| 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



| | III SEMESTER | | | | | | | | | |
|-------|-----------------|---|-------------------|---|-----------|-----|---|--|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | | |
| 1 | BEE18001 | Circuit Theory and Network Analysis | Ту | 3 | 1/0 | 0/0 | 4 | | | |
| 2 | BEE18002 | DC Machines and Transformers | Ту | 3 | 1/0 | 0/0 | 4 | | | |
| 3 | BEE18003 | Electromagnetic Field Theory | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| 4 | BEE18004 | Electrical and Electronics Measurements | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| 5 | BME18I03 | Thermodynamics and Fluid Mechanics | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| PRACT | ICALS* | | | | | | | | | |
| 1 | BEE18L01 | Electrical Machines- I Lab | Lb | 0 | 0/0 | 3/0 | 1 | | | |
| 2 | BEE18L02 | Electrical Circuits Lab | Lb | 0 | 0/0 | 3/0 | 1 | | | |
| 3 | BME18IL2 | Fluid Mechanics and IC Engine Lab | Lb | 0 | 0/0 | 3/0 | 1 | | | |

Credits Sub Total: 20

| IV SEMESTER | | | | | | | | | |
|-------------|-----------------------|--|-------------------|---|-----------|-----|----|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BMA18011 | Numerical Methods for Electrical Engineers | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 2 | BEE18005 | AC and Special Machines | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 3 | BEE18006 | Power System - I | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BEC18I07 | Communication Systems and IOT | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 5 | BHS18NC1/ BHS18NC2 | The Indian Constitution*/ The Indian Traditional Knowledge* | Ту | 2 | 0/0 | 0/0 | NC | | |
| PRACT | [CALS* | | | | | | | | |
| 1 | BEE18ET1 | Linear and Digital Integrated Circuits | ETL | 1 | 0/1 | 3/0 | 3 | | |
| 2 | BEE18L03 | Electrical Machines –II Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 3 | BEE18L04 | Measurement and Instrumentation Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 4 | BEC18IL5 | Signal Processing and Communication Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 5 | BEE18TS1 | Technical Skill 1 (Computer Software Packages) | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 6 | BEN18SK1 | Soft Skill I (Career and Confidence Building) | ETL | 0 | 0/0 | 3/0 | 1 | | |

Credits Sub Total: 22

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



| V SEMESTER | | | | | | | | | |
|------------|-----------------|--|-------------------|---|-----------|-----|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18007 | Power System - II | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 2 | BEE18008 | Control System | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 3 | BXX18EXX | Elective 1 | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BXX18OEX | Open Elective 1 | Ту | 3 | 0/0 | 0/0 | 3 | | |
| | | PRACTICALS* | | | | | | | |
| 1 | BEE18ET2 | Design of Electrical Machines | ETL | 1 | 0/1 | 3/0 | 3 | | |
| 2 | BEE18L05 | Electronics Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 3 | BEE18L06 | Control System Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 4 | BEI18IL1 | Microprocessor, Microcontroller and ARM Processor Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 5 | BEE18TS2 | Technical Skill 2 (Electrical Software Packages) | Lb | 0 | 0/0 | 3/0 | 1 | | |

Credits Sub Total: 20

| VI SEMESTER | | | | | | | | | |
|-------------|-----------------|---|-------------------|---|-----------|-----|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18009 | Power System - III | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 2 | BEE18010 | Power Electronics- I | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 3 | BXX18EXX | Elective II | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BXX18OEX | Open Elective 2 | Ту | 3 | 0/0 | 0/0 | 3 | | |
| PRACTICALS* | | | | | | | | | |
| 1 | BEE18ET3 | Energy Utilization and Conservation | ETL | 1 | 0/1 | 3/0 | 3 | | |
| 2 | BEE18L07 | Electrical Practice Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 3 | BEE18L08 | Power System 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 | BEE18L09 | Mini Project/Inplant Training/Industrial training | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 6 | BEE18TS3 | Technical Skill 3 (Evaluation of Design and Implementation Practice) | Lb | 0 | 0/0 | 3/0 | 1 | | |

Credits Sub Total: 22

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



| VII SEMESTER | | | | | | | | | |
|--------------|-----------------|---|-------------------|---|-----------|-----|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18011 | Microgrid Technology | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 2 | BXX18EXX | Elective III | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 3 | BXX18EXX | Elective IV | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BMG18002 | Management Concepts and Organizational Behavior | Ту | 3 | 0/0 | 0/0 | 3 | | |
| | | PRACTICALS* | | | | | | | |
| 1 | BEE18ET4 | Industrial Drives and Automation | ETL | 1 | 0/1 | 3/0 | 3 | | |
| 2 | BEE18L10 | Microgrid Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 3 | BEE18L11 | Power Electronics and Drives Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |
| 4 | BEE18L12 | Project Phase – I | Lb | 0 | 0/0 | 3/3 | 2 | | |
| 5 | BHS18FLX | Foreign Language | TY | 0 | 0/0 | 3/0 | 1 | | |
| 6 | BXX18OLX | Open Lab | Lb | 0 | 0/0 | 3/0 | 1 | | |

Credits Sub Total: 22

| VIII SEMESTER | | | | | | | | | |
|---------------|-----------------|-----------------------|-------------------|---|-----------|-------|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18012 | Power Electronics- II | Ту | 3 | 1/0 | 0/0 | 4 | | |
| 2 | BEE18013 | Smart Grid Technology | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 3 | BXX18EXX | Elective V | Ту | 3 | 0/0 | 0/0 | 3 | | |
| PRACTICALS* | | | | | | | | | |
| 1 | BEE18L13 | Project Phase – II | L | 0 | 0/0 | 12/12 | 8 | | |

Credits Sub Total: 18

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

| : | 20 Credits |
|-------|-------------------|
| : | 16 Credits |
| : | 20 Credits |
| : | 22 Credits |
| : | 20 Credits |
| : | 22 Credits |
| : | 22 Credits |
| : | 18 Credits |
| ITS - | 160 |
| | ITS - |



| ELECTIVE -I | | | | | | | | | |
|-------------|-----------------|---------------------------------------|-------------------|---|-----------|-----|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18E01 | Wind Energy Conversion Techniques | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 2 | BEE18E02 | IOT Applied to Electrical Engineering | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 3 | BEE18E03 | Mechatronics | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BEE18E04 | Artificial Intelligence | Ту | 3 | 0/0 | 0/0 | 3 | | |

| ELECTIVE -II | | | | | | | | | |
|--------------|-----------------|-------------------------------------|-------------------|---|-----------|-----|---|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | |
| 1 | BEE18E05 | Solar Energy Conversion Techniques | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 2 | BEE18E06 | Green Building Technology | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 3 | BEE18E07 | Neural Networks and its Application | Ту | 3 | 0/0 | 0/0 | 3 | | |
| 4 | BEE18E08 | Digital Signal Processing | Ту | 3 | 0/0 | 0/0 | 3 | | |

| | ELECTIVE –III | | | | | | | | | |
|-------|-----------------|--------------------------------------|-------------------|---|-----------|-----|---|--|--|--|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С | | | |
| 1 | BEE18E09 | Restructuring of Distribution System | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| 2 | BEE18E10 | DG and Energy Storage Technology | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| 3 | BEE18E11 | Material Science in Aviation | Ту | 3 | 0/0 | 0/0 | 3 | | | |
| 4 | BEI18013 | Power Plant Instrumentation | Ту | 3 | 0/0 | 0/0 | 3 | | | |

| | | ELECTIVE –IV | | | | | |
|-------|-----------------|---|-------------------|---|-----------|-----|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С |
| 1 | BEE18E13 | Safety for Electrical Engineers | Ту | 3 | 0/0 | 0/0 | 3 |
| 2 | BEE18E14 | Wide Area Monitoring Protection and Control | Ту | 3 | 0/0 | 0/0 | 3 |
| 3 | BEE18E15 | Robotics and Automation | Ту | 3 | 0/0 | 0/0 | 3 |
| 4 | BEE18E16 | Image Processing | Ту | 3 | 0/0 | 0/0 | 3 |

| | | ELECTIVE -V | | | | | |
|-------|-----------------|---|-------------------|---|-----------|-----|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С |
| 1 | BEE18E17 | Substation Designing | Ту | 3 | 0/0 | 0/0 | 3 |
| 2 | BEE18E18 | Industrial Control and Instrumentation | Ту | 3 | 0/0 | 0/0 | 3 |
| 3 | BEE18E19 | Electric Traction | Ту | 3 | 0/0 | 0/0 | 3 |
| 4 | BEE18E20 | Electric Transients and High Voltage Engineering | Ту | 3 | 0/0 | 0/0 | 3 |



| | | OPEN ELECTIVE | | | | | |
|-------|-----------------|-----------------------------------|-------------------|---|-----------|-----|---|
| S.NO. | SUBJECT CODE | SUBJECT NAME | Ty/ Lb/ ETL | L | T/ SLr | P/R | С |
| 1 | BEE18OE1 | Electrical Safety for Engineers | Ту | 3 | 0/0 | 0/0 | 3 |
| 2 | BEE18OE2 | Energy Conservation Techniques | Ту | 3 | 0/0 | 0/0 | 3 |
| 3 | BEE18OE3 | Electric Vehicle Technology | Ту | 3 | 0/0 | 0/0 | 3 |
| 4 | BEE180E4 | Biomedical Instrumentation | Ту | 3 | 0/0 | 0/0 | 3 |
| 5 | BEE18OE5 | Introduction to Power Electronics | Ту | 3 | 0/0 | 0/0 | 3 |
| 6 | BEE18OE6 | Industrial Instrumentation | Ту | 3 | 0/0 | 0/0 | 3 |
| 7 | BEE18OE7 | Solar Energy Conversion System | Ту | 3 | 0/0 | 0/0 | 3 |
| 8 | BEE18OE8 | Wind Energy Conversion System | Ту | 3 | 0/0 | 0/0 | 3 |
| 9 | BEE18OE9 | Energy Storage Technology | Ту | 3 | 0/0 | 0/0 | 3 |
| | | OPEN LAB | | | | | |
| 1 | BEE18OL1 | Transducer Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 2 | BEE18OL2 | PLC and SCADA Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 3 | BEE18OL3 | Electrical Maintenance Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 4 | BEE18OL4 | Power Electronics Lab | Lb | 0 | 0/0 | 3/0 | 1 |
| 5 | BEE18OL5 | Bio Medical Instrumentation Lab | Lb | 0 | 0/0 | 3/0 | 1 |



DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING DEPARTMENT OF ENGLISH

| Subje | ect | | | Subject | Name :' | ГЕСНИ | ICAL EN | GLISH | [- I | Ty/Lb/ | ETL | L T/ | SLr | P/R | C C |
|-------|--|---|---|------------------------|---------------------|----------------------------|------------------------|--------------------------|---------|-------------|--------------|------|-----|------|--------------|
| Code | biject de: BEN18001 Subject Name :TECHNICAL ENGLISH - I Prerequisite : None Ty/Lb/ETL L T/SLr P/R C Prerequisite : None Ty 1 0/0 2/0 2 L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory / Lab / Embedded Theory and Lab Ty 1 0/0 2/0 2 OBJECTIVES : • Use appropriate vocabulary and structure in academic communication • Use structural and functional grammar in academic writings. • Give instructions, suggestions and recommendations. • Interpret Charts, diagrams, advertisements, etc • Take notes, summarize and make power point presentations. O1 Use appropriate vocabulary and structure in academic communication • • • O2 Use structural and functional grammar in academic communication • • • O2 Use structural and functional grammar in academic communication • • • • O3 Give instructions, suggestions and recommendations. • • • • • O4 Interpret Charts, diagrams, advertisements, etc • • • • • • • • • • • | | | | | | | | | | 2 | | | | |
| | L : I T/L/ | Lectu ETL | re T : : The | Tutorial eory / Lab | SLr : Su / Embed | pervised ded Theo | Learning ory and La | P : Proje ab | ect R : | Research | C: Credi | its | | | |
| | OB. | EC | TIVE | <u>s :</u> | | | | | | | | | | | |
| | • | Use | appr | opriate vo | cabularv | and strue | cture in ac | ademic | comm | unication | | | | | |
| | • | Use | struc | tural and | functiona | l gramm | ar in acad | emic wr | itings. | | | | | | |
| | • | Give | e inst | ructions, s | uggestio | ns and re | commend | lations. | 0 | | | | | | |
| | • | Inte | rpret | Charts, di | agrams, a | advertise | ments, etc | ; | | | | | | | |
| | • | Tak | e not | es, summa | rize and | make po | wer point | presenta | ations. | | | | | | |
| | | | | | | - | - | - | | | | | | | |
| | CO | JRS | E OL | TCOME | S (Cos) : | (3-5) | | | | | | | | | |
| | Stud | ents | comp | oleting the | course w | ould be | able to | | | | | | | | |
| C01 | | | Use | appropria | te vocab | ulary and | a structure | in acade | emic c | ommunicati | on | | | | |
| CO2 | | | Use | structural | and fund | ctional g | rammar in | academ | ic writ | tings. | | | | | |
| CO3 | | | Give instructions, suggestions and recommendations. | | | | | | | | | | | | |
| CO4 | | | Interpret Charts, diagrams, advertisements, etc | | | | | | | | | | | | |
| CO5 | | | Tak | e notes, st | ımmarize | and ma | ke power | point pre | esentat | ions. | | | | | |
| | Map | ping | g of C | Course Ou | tcomes | with Pro | gram Ou | tcomes | (POs) | | | | | | |
| COs | /POs | PO |)1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO | 11 | PO12 |
| CO1 | | | | | | | | | | | | Н | | | |
| CO2 | | | | | | | | | | | | H | | | |
| CO3 | | | | | | | | | | | | H | | | |
| CO4 | | | | | | | | | | | | H | | | |
| CO5 | D5 H | | | | | | | | | | | | | | |
| | H/M | H/M/L indicates strength of correlation H – High, M – Medium, L – Low | | | | | | | | | | | | | |
| y | | | | | | | | | | | | | | | |
| gor | | ic | ance | g ince | nani c | lal <u>snce</u> gran | | gran | | n Xive | stica ect | | | rnsh | ls |
| Caté | | Basi | 2016 | Eng Scie | Hun Secs | Scie Prog | core | Pro _{ Elec | | Ope Elec | Prac Proj | | | Inte | Soft Skil |
| | | _ • | - | | | | - | | | | | | | | -1 -1 |
| | | | | | ' | | | | | | | | | | |



Dr.M.G.R.

BEN18001 TECHNICAL ENGLISH - I 1 0/0 2/0 2

UNIT I VOCABULARYBUILDING

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

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

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

UNIT IV WRITING PRACTICE- NATURE AND STYLE OF TECHNICAL WRITING 6

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

UNIT V ORAL COMMUNICATION AND INTERACTIVE LEARNING

(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 No of Hours: 30

TEXT BOOK :

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

SUGGESTED READINGS:

- 1. Practical English Usage. Michael Swan. OUP. 1995.
- 2. Remedial English Grammar. F.T. Wood. Macmillan.2007
- 3. On Writing Well. William Zinsser. Harper Resource Book. 2001
- 4. Study Writing. Liz Hamp-Lyons and Ben Heasly. Cambridge University Press. 2006.
- 5. Communication Skills. Sanjay Kumar and Pushp Lata. Oxford University Press. 2011.
- 6. Exercises in Spoken English. Parts. I-III. CIEFL, Hyderabad. Oxford University Press
- 7. Pronunciation in Use ,Mark Hancock. Cambridge University Press. 2012



6

6



| Subie | ct | Subject | t Name | MATH | EMATI | $\frac{1}{1}$ | | VIA I | Tv/I | I | T/SI | P/R | C | | |
|-------------|----------------------|--|-------------|----------------------------|-----------------|----------------------|-------|-------|-----------|------------------------|-------------------|---------------------|----------------|--|--|
| Code:BMA | 18001 | Bubjec | | | | | | | b/ET | Ľ | r | 1/10 | C | | |
| | - | | | | | | | | L | | | | | | |
| | | Prereq | uisite: N | lone | | | | | Ту | 3 | 1/0 | 0/0 | 4 | | |
| L : Lecture | T : Tutor | ial SLr : | Supervi | sed Lear | ning P : | Project | R : 1 | Rese | arch C: | Credits | | | | | |
| T/L/ETL : 7 | Theory / I | Lab / Em | bedded [| Theory a | nd Lab | | | | | | | | | | |
| OBJECTI | VES: | | anta in / | lashno | | | | | | | | | | | |
| • App | the Basi | | te in Ma | trices | | | | | | | | | | | |
| • Use | ntify and | solve pr | blems i | n Trigon | ometry | | | | | | | | | | |
| • Uno | derstand t | he Basic | concent | s in Diff | erentiatio | n | | | | | | | | | |
| • An | olv the Ba | asic conc | ents in F | Functions | of Seve | ral varial | bles | | | | | | | | |
| - Apr | jiy the Dt | | opts in I | unctions | of Beve | iai vaita | 0105 | | | | | | | | |
| COURSE | DUTCON | MES (Co | os) : (3 – | - 5) | | | | | | | | | | | |
| Students co | mpleting | the cours | se were a | able to | | | | | | | | | | | |
| CO1 | Find the | e summat | tion of th | ne given s | series of | binomia | l, ex | kpon | ential & | logarith | mic | | | | |
| CO2 | Transfor transfor | rm a no mation. | on – dia | agonal n | natrix ir | nto an e | equi | vale | nt diag | onal ma | ıtrix usi | ng orth | logonal | | |
| CO3 | Find ex | Find expansion of trigonometric function into an infinite series and to separate a complex function into real and imaginary parts. | | | | | | | | | | | | | |
| <u> </u> | Annalas | | | | | | 1 | | | C | | . 1 | . 1 (1 | | |
| CO4 | Apply I maxima | knowledg / minim | a of the | concepts given fur | in find | ing the | deri | vativ | ve of g | iven fur | iction a | nd to f | ind the | | |
| CO5 | Evaluate | e the par | tial / tota | l differei | ntiation a | ind maxi | ima | / mi | nima of | a functi | on of sev | veral va | riables. | | |
| Mapping o | f Course | Outcom | es with | Progran | n Outco | mes (PC |)s) | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PC |)7 | PO8 | PO9 | PO10 | PO11 | PO12 | | |
| CO1 | Н | Н | | | Μ | М | | | | Н | Н | | Н | | |
| CO2 | Н | Н | | | Н | L | | | | | | | Н | | |
| CO3 | Н | Н | | | Μ | | | | | М | Н | | L | | |
| CO4 | Н | Н | | | L | | | | | М | Н | | М | | |
| CO5 | Н | Н | | | | М | | | | М | Μ | | Н | | |
| H/M/L ind | icates str | ength of | correla | tion H | – High, I | M – Me | diuı | m, I | L – Low | 7 | | | | | |
| Category | Basic Sciences | Engg Sciences | Humaniti | es & Social Sciences | Program core | Program Electives | | Open | Electives | Practical / Project | Internship s / | Technical Skills | Soft Skills | | |
| | | | | | | | | | | | | | | | |



BMA18001

MATHEMATICS – I

UNIT I ALGEBRA

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

UNIT II MATRICES

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 III TRIGONOMETRY

Expansions of Sin n θ , Cos n θ in powers of Sin θ and Cos θ – Expansion of Tan n θ – Expansions of Sinⁿ θ and Cosⁿ θ in terms of Sines and Cosines of multiples of θ – Hyperbolic functions – Separation into real and imaginary parts.

UNIT IV DIFFERENTIATION

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

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

Total No of Hours: 60

12

TEXT BOOKS:

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

REFERENCE BOOKS:

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

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DEPARTMENT OF PHYSICS

| Subject Code:BPH18001 Subject Name :ENGINEERING PHYSICS - I TYL b/ET L L L T/S L/ET L P/R C 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 5 7 2 0/1 0/0 3 OBJECTIVES : 0 Outline the relation between Science, Engineering & Technology. • Demonstrate competency in understanding basic concepts. • Apply fundamental laws of Physics in Engineering & Technology. • | | | | | | | | | | | | | | | | | | |
|---|--------------------------|--|--------------|-------------|--------------|----------------------|------------|---------------|------------|------------|------------|--------|--------|----------|--------------|---------------|------|------|
| | | Pr | erea | nici | te • Non | P | | | | | | | , | 2 | 0/1 | | | 3 |
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| L : Lecture T/I /FTI · T | I : Tutori 'heory / I | al SLr ab/Fr | ::Su nhed | per ded | vised Le | arning P and I ab | : Proje | ect | R : Re | sea | rch C | : Crec | lits | | | | | |
| | neory / L | | nocu | ucu | Theory | | | | | | | | | | | | | |
| OBJECTIV | ES: | | | ~ . | _ | | | | | | | | | | | | | |
| • Outline | the relation | on betv | veen | Sci | ence, En | gineerin | g & Te | echn | ology | • | | | | | | | | |
| Demons Apply fr | undament | ipetenc al laws | s of P | una Phys | sics in F | ng Dasic | conce | pis. 'echi | nology | 7 | | | | | | | | |
| To ident | tifv & sol | ve prol | blem | s us | sing phys | sics conc | epts. | cem | nonogy | y . | | | | | | | | |
| Produce | and pres | ent acti | ivitie | s as | ssociated | with the | e cours | e th | rough | eff | ective | techn | ical c | comn | nuni | catior | ı | |
| COURSE (| DUTCON | AES (C | Cos) : | : (3 | - 5) | | | | | | | | | | | | | |
| Students con | mpleting | this cou | urse v | wer | e able to | | | | | | | | | | | | | |
| CO1 | Demons | strate c | ompe | eten | icy in un | derstand | ing ba | sic c | concep | ots. | | | | | | | | |
| CO2 | Utilize | Jtilize scientific methods for formal investigations & demonstrate competency with experimental nethods and verify the concept to content knowledge. dentify and provide solutions for engineering problems. | | | | | | | | | | | | | | | | |
| | method | hethods and verify the concept to content knowledge. dentify and provide solutions for engineering problems. | | | | | | | | | | | | | | | | |
| CO3 | Identify | dentify and provide solutions for engineering problems. | | | | | | | | | | | | | | | | |
| CO4 | Relate t | dentify and provide solutions for engineering problems. celate the technical concepts to day to day life and to practical situations. | | | | | | | | | | | | | | | | |
| CO5 | Think a | nalytic | ally t | o ir | nterpret o | concepts | | | | | | | | | | | | |
| Mapping of | f Course | Outco | mes | witl | h Progra | am Outo | comes | (PO |)s) | | | | | | | | | |
| COs/POs | PO1 | PO2 | PO | 3 | PO4 | PO5 | PO6 | | PO7 | | PO8 | PO | 9 | PO1 | 10 | PO1 | 1 | PO12 |
| | | | | | | | | | | | | | | | | | | |
| CO1 | Н | Η | | | Μ | Μ | Μ | | | | | | | | | | | |
| CO2 | Н | Η | Μ | ſ | Μ | Μ | Μ | | | | | N | 1 | Μ | [| | | |
| CO3 | Н | Η | H | [| Μ | Μ | Μ | | | | | | | Μ | [| | | Μ |
| CO4 | Н | Н | Μ | ſ | Μ | | Μ | | | | | Ν | 1 | Μ | [| | | Μ |
| CO5 | Н | Н | Μ | [| | | Μ | | | | Μ | | | | | | | L |
| H/M/L indi | cates str | ength o | of co | rrel | lation I | H – Higł | n, M – | Me | dium, | L | - Lov | V | I | | | | | |
| y | s | c | x | ÷ | 1 | с с | | S | | | S | 1/ | | ip | | al | | |
| 10g01 | ic ince | 00 | ance | iani | c lial | gran | ran | tive | | ц ; | ti ve | tica | 1 | msh | | nnic ls | | ls |
| Cate | Basi Scie | Eng | ocie | Hun | es & Soci | Pro _f | Pro 6 | Elec | (| Ope 1 | Elec | Prac | 2 | Inte | | I ecl Skil | Soft | Skil |
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BPH18001

ENGINEERING PHYSICS - I 2 0/1 0/0.3

UNIT I **MECHANICS & PROPERTIES OF MATTER**

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

SHM: Simple harmonic motion - differential equation of SHM - graphical representation of SHM - average kinetic energy of vibration - total energy of vibration - free and forced vibrations - damped and undamped vibrations - resonance - transverse wave on a string - law of transverse vibration of string - verification of the laws of transverse vibration of string - standing waves.

Acoustics : Fundamentals of acoustics - reverberation- reverberation time - factors affecting acoustics Ultrasonics -Production of ultrasonic waves - detection of ultrasonic waves - acoustic grating - application of ultrasonic waves.

UNIT III WAVE OPTICS

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**

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 - magnetismdefinition - 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

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-CO₂ laser - semiconductor laser - applications of lasers in science, engineering and medicine.

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

Total No of Hours: 45

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B.Tech – Electrical & Electronics Engineering - 2018 Regulation



DEPARTMENT OF CHEMISTRY

| Subject | 10001 | Subject Name :ENGINEERING CHEMISTRY - I Ty/ Lb/ Lb/ ETL L T/S P/R C 8001 Prerequisite : None Ty 2 0/1 0/0 3 | | | | | | | | | | | | | | |
|-----------------|----------------|--|--------------|-------------|------------|--------------|------------|------------|-----------|----------|-------------|------------|----------|--|--|--|
| Code:BCH | 18001 | | | | | | | | ETL | | Lr | | | | | |
| | | Prer | equisite | e : None | e | | | | Ту | 2 | 0/1 | 0/0 | 3 | | | |
| L : Lecture | T : Tuto | orial SLr | : Super | vised L | earning l | P : Projec | t R : Re | search (| C: Credit | s | | | <u> </u> | | | |
| T/L/ETL : | Theory / | Lab / Er | nbedded | l Theory | y and La | b | | | | | | | | | | |
| OBJECTI | VES : | | | | | | | | | | | | | | | |
| • Pro | oviding a | n insight | into ba | sic conc | cepts of c | chemical | thermod | ynamics | | | | | | | | |
| • To | create | awarenes | s about | the wa | ter qual | ity paran | neters, v | vater ana | alysis an | d softer | ning o | f water | from | | | |
| ind | lustrial p | erspectiv | ve. | | | | | | | | | | | | | |
| • Im | parting | fundame | ntals of | emf, sto | orage and | l fuel cell | ls. | | | | | | | | | |
| • C1 | reating a | wareness | about c | orrosio | n and its | control n | nethods. | | | | | | | | | |
| • Int | roducing | g moderi | n materi | als sucl | h as com | posites a | ılong wi | th basic | concepts | of poly | ymer c | hemist | ry and | | | |
| | istics. | | N) - (1 | 5) | | | | | | | | | | | | |
| COURSE | OUIC | DMES (C | $(1-1)^{-1}$ | - 5) | | | | | | | | | | | | |
| CO1 | Gain a | clear un | derstand | ling of t | the basic | es of chei | mical th | ermodyn | amics w | hich ind | clude c | oncept | s such | | | |
| <u> </u> | as Enth | Enthalpy, Entropy and Free energy. tain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening | | | | | | | | | | | | | | |
| CO2 | Obtain | tain an overall idea of Water quality parameters, Boiler requirements, problems, Water softening I Domestic Water treatment. | | | | | | | | | | | | | | |
| CO3 | Improv | Domestic Water treatment. | | | | | | | | | | | | | | |
| 005 | nrincin | les of sto | rage dev | vices | | | luuctane | | | so unue | istanu | | micai | | | |
| CO4 | Observ | $\frac{100}{100}$ e the in | formatic | on abou | it corros | ion and | underst | and the | mechani | sms of | corro | sion ar | nd the | | | |
| 001 | method | ls of corr | osion co | ontrol. | ••••••• | | | | | 0110 01 | • • • • • • | | | | | |
| CO5 | Articul | ate the sc | cience of | f polym | ers and c | composite | es. | | | | | | | | | |
| Mapping of | of Cours | e Outcor | mes wit | h Progi | ram Out | tcomes (I | POs) | | | | | | | | | |
| COs/PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 |) PC | 011 F | PO12 | | | |
| CO1 | Н | Η | | | | | | | | | | | Μ | | | |
| CO2 | H | H | M | H | | H | H | | | | | | M | | | |
| CO3 | H | Μ | H | | | | L | | | | | | L | | | |
| CO4 | H | | L | Н | | | | | | | | | | | | |
| UU5 H/M/Lind | H licetes s | H | | | | | | | | | | | | | | |
| | incates s | | | | n – nig | <u> </u> | | | w | | | | | | | |
| IJ | SS | Sč | itie | cial 3S | Е | es n | | es / | , a | hip | cal | ills | | | | |
| oge | ic | g Suce | nan | So Sho | graı | grau | ų i | tiv it | ect | Ins | hni Is | Š | | | | |
| Cato | Bas Scie | Eng | Jur | s & Scie | Pro | Prog | Dpe | Llex 2 | Proj | Inte | Skil | Sofi | | | | |
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ENGINEERING CHEMISTRY – I 2 0/1 0/0 3

UNIT I CHEMICAL THERMODYNAMICS

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**

BCH18001

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

Conductance – Types of conductance and its Measurement. Electrochemical cells – Electrodes and electrode potential, Nernst equation – EMF measurement and its applications. Types of electrodes- Reference Books electrodes-Standard hydrogen electrode- Saturated calomel electrode-Quinhydrone electrode Determination of PH using these electrodes. Reversible and irreversible cells- Fuel cells- H2-O2 fuel cell, Batteries-Lead storage battery, Nickel- Cadmium and Lithium-Battery.

UNIT IV **CORROSION AND PROTECTIVE COATING**

Introduction-Causes of Corrosion-Consequences- Factors affecting corrosion. Theories of corrosion-Chemical corrosion and Electrochemical corrosion. Methods of corrosion 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

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, fiber glass, carbon fibers, ceramics and metals.

TEXTBOOKS:

- 1. P.Udhayakala., S.Dinakar&L.Sankar., "Chemistry for Engineers", Charulatha Publications(2018).
- 2. C.SreekuttanUnnithan, "Applied Chemistry", Sreelakshmi Publications, (2007).
- 3. Dr.R.Sivakumar, Dr.R.Jayaprakasam and Dr.N.Sivakumar, "Engineering Chemistry I & II", 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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Total No of Hours: 45

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B.Tech – Electrical & Electronics Engineering - 2018 Regulation



DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

| Subject Code: BES | 18001 | Subj ELF | ject Nan CCTRO | ne :BAS NICS E | SIC ELI NGINE | ECTRI(ERING | CAL AN | D | Ty/ Lb/ ETL | L | T/S Lr | P/R | C | | |
|-----------------------------|--|-----------------------|---------------------|----------------------------|---------------------|----------------------|---------------|-----------|----------------|-------------------|---------------------|----------|--------|--|--|
| | | Prer | requisite | e : None | | | | | Ту | 2 | 0/1 | 0/0 | 3 | | |
| L : Lecture T/L/ETL : | e T : Tuto Theory / | rial SLr Lab / En | : Superv nbedded | vised Lea Theory | arning P and Lab | : Projec | tR:Re | esearch | C: Credi | ts | | <u> </u> | | | |
| OBJECTI | VES : | | | | | | | | | | | | | | |
| • | Un | derstand | the conc | epts of c | circuit el | ements, | circuit l | aws and | coupled | circuit | s. | | | | |
| • | Act Gai | juire kno n inform | wiedge of ation on | on conve measure | ement of | ænon c f electric | al paran | nai ener | gy produ | letion. | | | | | |
| • | Ide | ntify basi | c theore | tical prin | nciples t | behind th | ne worki | ng of m | odern ele | ectronio | c gadg | ets. | | | |
| • | Der | nonstrate | digital | electron | ic circui | ts and as | semble | simple of | levices. | | | | | | |
| COURSE | OUTCO | MES (C | os) : (3 - | - 5) | | | | | | | | | | | |
| CO1 | Student | ts underst | and Fun | damenta | al laws a | ind theor | ems and | l their p | ractical a | pplicat | ions | | | | |
| CO2 | Predict | the beha | vior of d | lifferent | electric | and mag | gnetic Ci | ircuits. | | | | | | | |
| CO3 | Identify conventional and Non-conventional Electrical power Generation, Transmission and Distribution. Identify & Apply schematic symbols and understand the working principles of electronic devices | | | | | | | | | | | | | | |
| CO4 | Distribution. Identify & Apply schematic symbols and understand the working principles of electronic devices | | | | | | | | | | | | | | |
| CO5 | O5 Analyze basics of digital electronics and solving problems and design combinational circuits | | | | | | | | | | | | | | |
| Mapping of | Analyze basics of digital electronics and solving problems and design combinational circuits Mapping of Course Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POs | Mapping of Course Outcomes with Program Outcomes (POs)COs/POsPO1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12 | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |
| CO1 | Н | Н | Н | Н | | | | | | | | Μ | L | | |
| CO2 | Н | Н | Н | Μ | Μ | | Μ | | | | | Μ | | | |
| CO3 | Н | Μ | Н | Μ | Н | | Μ | | Μ | | | | L | | |
| CO4 | Н | Μ | | Μ | | | Μ | | | | | Μ | L | | |
| CO5 | Н | Μ | Н | Μ | Н | | | | Μ | | | Μ | L | | |
| H/M/L ind | licates st | rength o | f correla | ation H | I – Higł | n, M – N | ledium | , L – L | OW | | · | | | | |
| Category | Basic Sciences | Engg | Humaniti | es & Social Sciences | Program core | Program Electives | Onen | Electives | Project | Internship s / | Technical Skills | Soft | Skills | | |
| | | N | | | | | | | | | | | | | |



BES18001 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING 2 0/1 0/0 3

UNIT I ELECTRIC CIRCUITS

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

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

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

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

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 No of 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 BOOKS:

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

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DEPARMENT OF MECHANICAL ENGINEERING

| Subject Code: BE | S18002 | Su | bject Na | me :BA CIVIL | SIC ME ENGINI | ECHANI EERING | CAI | L Aľ | ND | Ty/ E7 | Lb/ FL | L | T/SL | r | P/R | C |
|--|--|--|---|--|---|--|-------------------------------|-----------------------------|--------------------------------|---------------|------------------------|--------------|--------------------|---------------|------------------|----------------------|
| | | Prer | equisite | e : None | | | | | | Т | 'y | 2 | 0/1 | | 0/0 | 3 |
| L : Lectu T/L/ETL | re T : T : Theor | utorial S y / Lab /] | Lr : Supe Embedd | ervised l ed Theo | Learning ry and La | P : Proje ab | ct R | R : R0 | esearch | n C: | Credi | ts | 1 | | | 1 |
| OBJEC • • • • • • • • • • • • • • • • • • • | FIVES : Learn H Demons machine To iden Learn b Know th Dams E OUT complet | Basics of strate Ho es tify & sol asics of E he basic p COMES ing the co | Internal w metal we probleming building process of (Cos) : (burse we | Combustion for the combustion of the concrete formula ($3-5$) or the combustion of the concrete formula ($3-5$) or the combustion of the | stion En rmed, jo Engineeri s and con ete, type | gines, po ined, usin ing Mech nstructior s of ma | ower ng n anic asoni | plan nach cs ry Co | its and ining of onstruc | boil opera | ers ations of Ro | Lath bads | ne, Mil , Railv | lling vay: | g and s, Bric | Drilling lges and |
| CO1 | Demor | strate the | workin | g princij | oles of po | ower plan | ts, I | C Er | ngines | and | boilers | s | | | | |
| CO2 | Utilize | tilize the concept of metals forming, joining process and apply in suitable machining process tentify and provide solutions for problems in engineering mechanics | | | | | | | | | | | | | | |
| CO3 | Identif | entify and provide solutions for problems in engineering mechanics | | | | | | | | | | | | | | |
| CO4 | Identify and provide solutions for problems in engineering mechanics Utilize the concept of Building materials and construction able to perform concrete mix and masonry types | | | | | | | | | | | | | | | |
| CO5 | Demon | strate ho | w Roads | , Railwa | ays, dam | s, Bridge | s ha | ve b | een co | nstru | icted | | | | | |
| Mapping | g of Cou | rse Outo | omes w | ith Prog | gram Ou | tcomes (| POs | s) | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PC |)7 | PO8 |] | PO9 | P | 010 | PC |)11 | PO12 |
| CO1 | Н | | | | | М | | | Н | | Н | | Н | | | н |
| CO2 | H | | | | L | M | | | M | | M | | Μ | | | M |
| CO3 | H | Н | | | L | L | | | Μ | | М | | Μ | | | М |
| CO4 | H | | | | L | L | | | | | Μ | | Μ | | | Μ |
| CO5 | Н | | | | L | L | | | Μ | | М | | Μ | | | М |
| H/M/L i | ndicates | strengtl | of corr | elation | H – Hi | gh, M – I | Med | lium | , L –] | Low | | | | | | |
| Category | Basic Sciences | ✓ Engg ✓ Sciences | Humaniti | es & Social Sciences | Program core | Program Electives | | Open | Electives | Practical / | Project | Internship | s / Technical | Skills | Soft Skills | |



BES18002 BASIC MECHANICAL AND CIVIL ENGINEERING 2 0/1 0/0 3

UNIT I THERMAL ENGINEERING

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

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

Stresses and Strains – Definition – Relationship – Elastic modulus – Centre of gravity – Moment of Inertia – Problems. (Simple Problems Only).

UNIT IV BUILDING MATERIALS AND CONSTRUCTION

<u>Materials</u>:Brick - Types of Bricks - Test on bricks - Cement – Types, Properties and uses of cement – Steel - Properties and its uses – Ply wood and Plastics.

<u>Construction</u>: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

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 No of 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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DEPARTMENT OF ENGINEERING SCIENCES

| Subject Code: BE | S18L01 | Subje | ect Nam | e :BASI | C ENGI | NEERIN | NG WC | RKSH | OP | Ty Lb ET | / I / L | _ | T/ SL r | P/ R | C |
|--|--|---|--|--|--|--|---|--------------------------------|------------------------|-------------------|---------------------|------|---------------|----------------|----------|
| | | Prere | quisite : | None | | | | | | Lt | . (|) | 0/0 | 2/0 | 1 |
| L : Lectu T/L/ETL | re T : Tutor : Theory /] | ial SL Lab / E | r : Supe Embedde | rvised L d Theor | earning H y and Lal | P : Projec b | t R:R | esearch | C: C | redits | | | | | |
| OBJECT • • • • • • • • • • | TVES : Familiarize Identify ba Identify El Display sin Execute a p | the plusic ele ectroni nple fa oroject MES (| umbing t ctrical w ic compo- brication independ Cos) : (| tools, fit viring an onents ,l n techni dently a 3-5) | tings, car d measur ogic gate ques nd make | rpentry to rement of s and sol a workin | ools, et f electri dering g mode | c. cal quar process l | tities. | | | | | | |
| Students | Domonstre | the co | urse wer | e able to |) | ala 9- D | anforma | hannoa | and of | Elina | Ching | : | Cutt | | |
| CO1 CO2 | Perform th Joints | e proc | ess of fa | brication | n of tray, | $\frac{1}{10000000000000000000000000000000000$ | d funne | els, Tee | Halvii | ng Cro | ss, Lap | Joir | nt Ma | ing. irtise | <u>k</u> |
| CO3 | Demonstra | ate vari | ous type | es of wir | ings and | other equ | uipmen | s. | | | | | | | |
| CO4 | Measure fu | undame | ental par | ameters | using the | e electroi | nic instr | uments | | | | | | | |
| Mapping | g of Course | Outco | omes wi | th Prog | ram Out | comes (l | POs) | _ | | | | | | | |
| COs/POs | 5 PO1 | PO 2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO |)9 | PO10 | P | 011 | PC |)12 |
| CO1 | Н | Н | Н | М | М | | | L | | Μ | | | | | L |
| CO2 | Н | | Н | L | М | | | L | | L | | | | | |
| CO3 | Н | | М | L | | | | L | | L | | | | | |
| CO4 | Н | Н | М | L | | | | L | | L | | | | - | М |
| CO5 | | | | | | | | | | | | | | | |
| H/M/L in | ndicates str | ength | of corre | elation | H – Hig | h, M – N | Aedium | n, L – I | /OW | | | | | | |
| Category | Basic Sciences | Engg Sciences | Humaniti | es & Social Sciences | Program core | Program Electives | Open | Electives | Practical / Proiect | Internship s / | Technical Skills | | Soft | Skills | |
| | | | | | | | | | \checkmark | | | | | | |



BES18L01

BASIC ENGINEERING WORKSHOP 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 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 P



Abdul Kalam CoE for Innovation & Entrepreneurship

| Subject Co BES18ET1 | de : | Subject ENTRF | Name EPREN | : ORIE EURSH | CNTATIO IIP AND | ON TO PROJE | CT LA | B | Ty / Lb/ ETL | L | T/SL r | P/R | C | | |
|------------------------|--------------------------|--|---------------|-----------------|----------------------|----------------|-------------|----------|--------------------|--------|-----------|--------|------|--|--|
| | | Prerequ | uisite : I | None | | | | | ETL | 0 | 0/0 | 2/0 | 1 | | |
| L : Lecture ' | Г : Tutoria heory / L | al SLr : ab / Emb | Supervi | sed Lea | rning P : and Lab | Project 1 | R : Rese | arch | C: Credi | ts | 1 | 1 | | | |
| | | | | | | | | | | | | | | | |
| • Und | ES: lerstand h | ow entre | nreneur | shin Ed | ucation t | ransforms | s individ | luals i | nto succ | essful | leaders | | | | |
| • Ider | tify indiv | idual po | tential & | kS have | career di | reams | , 1101 / 10 | iuuis ii | no succ | c551u1 | leaders. | | | | |
| • Und | lerstand d | ifference | betwee | en ideas | & opport | tunities | | | | | | | | | |
| • Ider | tify comp | onents d | & create | action | plan. | | | | | | | | | | |
| • Use | brainstor | ming in | a group | to gene | rate ideas | S. | | | | | | | | | |
| COURSE (| DUTCON | IES (Co | s) : (3 – | - 5) | | | | | | | | | | | |
| CO1 | Develop | a Busin | ess plan | n & imp | rove abili | ity to reco | ognize b | usines | s opport | unity | | | | | |
| CO2 | Do a sel | a self analysis to build a entrepreneurial career. culate an effective elevator pitch. | | | | | | | | | | | | | |
| СОЗ | Articula | culate an effective elevator pitch. | | | | | | | | | | | | | |
| CO4 | Analyze | the loca | l marke | t enviro | nment & | demonst | rate the | ability | to find | an att | ractive n | narket | | | |
| C05 | Identify | the requ | ired ski | lls for e | ntreprene | urship & | develop |) | | | | | | | |
| Mapping of | f Course | Outcom | es with | Progra | m Outco | mes (PO | s) | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO | 9 | PO10 | PO11 | PO12 | | |
| CO1 | | Μ | Μ | Н | Μ | Μ | Μ | | N | 1 | Μ | Μ | L | | |
| CO2 | Н | Μ | | Н | Μ | Н | Μ | H | H | I | Н | Μ | Μ | | |
| CO3 | | Μ | Μ | Μ | | Н | | Η | I | I | Н | | | | |
| CO4 | | Н | Μ | Μ | Μ | Μ | | H | N | 1 | Μ | Η | | | |
| CO5 | | Μ | Μ | N | 1 | Μ | Η | L | | | | | | | |
| H/M/L indi | cates stre | ength of | correla | tion H | – High, | M – Mee | dium, I | L – Lo | W | | | 1 | | | |
| Category | Basic Sciences | Sciences Engg Sciences Sciences es & Social Sciences Program Program Electives Project Project Project Project Soft Soft Soft Soft Soft Soft Soft Sof | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |



BES18ET1 ORIENTATION TO ENTREPRENEURSHIP AND PROJECT LAB 0 0/0 2/0 1

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR

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.

UNITII ENTREPRENEURIAL STYLE

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

UNIT III DESIGN THINKING

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

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

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

Total No of Hours : 15

3

3

3

3

3

REFERENCE BOOKS & WEBSITE:

- 1. Encyclopedia of small Business (2011) (e book)
- 2. Oxford Handbook of Entrepreneurship (2014) (ebook)
- 3. lms.learnwise.org



DEPARTMENT OF MATHEMATICS

| Subject | t Code : | Subject | Name : | MA | THEMA | TICS – | Ty /] | Lb/ | L | T/SLr | P/R | C |
|-----------|-------------|---------------|-------------------|------------|-------------|-------------|---------------|----------|--------------|-----------|-----------|--------------|
| BMA | 18003 | 11 Prereat | uisite : N | lone | | | | L | 3 | 1/0 | 0/0 | 4 |
| | | Trereq | | vone | | | Ту | 7 | C | 1/0 | 0/0 | • |
| L : Lectu | re T : Tuto | rial SLr : | Supervi | sed I | Learning l | P : Projec | t R:R | esearc | h C: C | redits | | 1 |
| T/L/ETL | : Theory / | Lab / Em | bedded 7 | Theor | ry and La | b | | | | | | |
| OBJECT | TIVES : | | | | | | | | | | | |
| • L | Inderstand | the Basic | concept | s in I | ntegratio | n | | | | | | |
| • I | dentify the | Basic cor | ncepts in | Mul | tiple integ | grals | | | | | | |
| • l | Jse the Bas | sic concep | ts in Ord | linary | y Differer | ntial equa | tions | | | | | |
| • A | Apply the H | Basic conc | epts of A | Analy | tical Geo | metry | | | | | | |
| • A | analyze the | e Basic co | ncepts of | f Vec | tor Calcu | ılus | | | | | | |
| COURS | E OUTCC | OMES (Co | (3 - 3) = (3 - 3) | - 5) | | | | | | | | |
| CO1 | Integrate | given fun | ction by | using | g method | s of integ | gration a | and to | find th | e area un | der curv | e and the |
| | volume of | f a solid b | y revalua | ation. | | | | | | | | |
| CO2 | Evaluate | the multip | le integr | als / a | area /volu | me and t | o chang | e the o | order of | integrati | on. | |
| <u> </u> | 0 1 /1 | 1' | 1.00 (| • 1 | | 1, 1 | - - | 1.00 | . 1 | | | |
| 003 | Solve the | ordinary | different | ial eq | luation an | id to solv | e Eulers | s diffei | cential e | equation. | | |
| CO4 | Find the | equation of | of planes | s, lin | es and sp | here and | to find | the s | hortest | distance | between | to skew |
| | lines. | | | | | | | | | | | |
| CO5 | Find the g | gradient, n | naximum | n dire | ctional de | erivative | and wor | rk don | e by a f | orce and | to verify | Green/ |
| | Stokes/ G | auss diver | gence th | leorei | m | | | | • | | 2 | |
| Mapping | of Cours | e Outcom | es with | Prog | ram Out | tcomes (I | POs) | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO | 4 PO5 | PO6 | PO7 | PO8 | PO | • PO10 | PO11 | PO12 |
| CO1 | Н | Н | | | М | Μ | | | M | Μ | | Н |
| CO2 | Н | Н | | | М | Н | | | Н | Н | | М |
| CO3 | Н | Н | | | Μ | Н | | | H | Н | | Μ |
| CO4 | Н | Н | | | L | Μ | | | Μ | Н | | Μ |
| CO5 | Н | Н | | | Μ | Μ | | | Μ | Н | | М |
| H/M/L in | ndicates st | rength of | ' correla | tion | H – Hig | h, M - N | ledium | , L – | Low | • | • | |
| y | | ~ | ti | | - | s | s | | 1/ | | ip - | |
| gor. | c | lces | ani | al nces | ram | ram ive | ive | | ica | | hsh | s |
| ate | asic | ngg cier | um & & | oci. | rog | rog lect | per lect | | ract roje | | nter | oft kill: |
| C | ΝŇ | ыŇ | н ег | ŇŇ | Ч Х | ЧЩ | ОШ | | ቯ | | Ir s | N N |
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BMA18003

UNIT I INTEGRATION

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

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).

UNIT III ORDINARY DIFFERENTIAL EQUATIONS

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

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

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.

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).



MATHEMATICS – II

12

3 1/0 0/0 4

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12

Total No of Hours: 60



DEPARTMENT OF PHYSICS

| Subject | Subje | ect Name | : ENGI | NEERI | NG PI | HYSIC | S –I | I | Т | y / | L | Τ/ | P/R | C |
|---|--|---|-------------|---------|----------|------------|--------------------|----------|---------|---------|--------|-----|-------------|------------|
| Code : BPH18002 | | | | | | | | | | .b/ | | SL | | |
| 21110002 | Prere | quisite : | None | | | | | |] | Гу | 2 | 0/1 | 0/0 | 3 |
| L : Lecture | T: Tuto | rial SLr : | Supervi | sed Lea | arning l | P : Proj | ect] | R : I | Researc | h C: | Credi | its | | |
| T/L/ETL : 7 | Theory / | Lab / Em | bedded 7 | Theory | and La | b | | | | | | | | |
| OBJECTI | VES : | | | | | | | | | | | | | |
| • Des | sign, con | duct expe | eriment a | nd anal | yze dat | ta. | | | | | | | | |
| • Dev | velop a S | Scientific | attitude a | t micro | and na | ano sca | le of | ma | terials | | | | | |
| Understand the concepts of Modern Physics | | | | | | | | | | | | | | |
| • Apply the science of materials to Engineering & Technology | | | | | | | | | | | | | | |
| COURSE OUTCOMES (Cos) : (3 – 5) | | | | | | | | | | | | | | |
| Students completing the course were able to | | | | | | | | | | | | | | |
| CO1 | Demonstrate skills necessary for conducting research related to content knowledge and | | | | | | | | | | | | | |
| | labora | laboratory skills. | | | | | | | | | | | | |
| CO2 | Apply | Apply knowledge and concepts in advanced materials and devices. | | | | | | | | | | | | |
| CO3 | Acquired Analytical, Mathematical skills for solving engineering problems. | | | | | | | | | | | | | |
| CO4 | Ability to design and conduct experiments as well as function in a multi-disciplinary teams. | | | | | | | | | | | | | |
| CO5 | CO5 Generate analytical thought to interpret results & place them within a broader context | | | | | | | | | | | | | |
| Mapping o | f Course | e Outcom | es with | Progra | m Out | tcomes | (PO | s) | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO 4 | PO 5 | PO 6 | PO | 7 | PO8 | PO 9 | P 0 | 01 | PO1 1 | PO1 2 |
| CO1 | Н | Н | Μ | M | M | L | | | | - | | Μ | - | L |
| CO2 | Н | H | | Μ | Μ | | | | | | | | | L |
| CO3 | Н | H | Н | Н | Μ | | | | | | | Μ | | |
| CO4 | Н | Η | Н | Н | Μ | | | | | H | | Μ | | L |
| CO5 | Н | М | Μ | Μ | Μ | L | | | | Μ | | Μ | | L |
| H/M/L indicates strength of correlation H – High, M – Medium, L – Low | | | | | | | | | | | | | | |
| Ŋ | S | Sč | iti | S L | 1 | n es | | | es | al / | | | hip | |
| ego | iic | 3g ence | ctiv | ctic | 2 | | srns | t Ils | | | | | | |
| Cat | Bas Scie | Eng Scie | Hur es é | Scii | core | Pro Ele | Pro Elec Ope | | | Pra | | | Inte s / | Sof Ski |
| | | | | | | | | | | | | | | |



BPH18002

ENGINEERING PHYSICS - II 2 0/1 0/0 3

UNIT I **QUANTUM PHYSICS**

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**

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

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**

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**

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.

TEXT BOOKS :

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

REFERENCE BOOKS:

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

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Total No of Hours: 45



DEPARTMENT OF CHEMISTRY

| Subje | ct | Sub | ject Name | ENGIN: | IEER | ING CH | EMIST | TRY – | Ty / Lb | 0/ L | T/SL | P/R | C | | |
|---|--|----------------------|---|----------------------|----------------|---------------------|----------------------|------------------------------|-------------|------------------------|--|-----------|----------------|--|--|
| Code BCH1 | : 18002 | II | | | | | | | ETL | | r | | | | |
| Prerequisite : None | | | | | | | | | Ту | 2 | 0/1 | 0/0 | 3 | | |
| L : Leo T/L/E | cture TL : 7 | T : Tuto Гheory / | rial SLr : Lab / Emt | Supervis bedded T | ed Le heory | arning P and Lab | : Projec | t R : Res | search C: | Credits | | | | | |
| OBJE | CTI | VES : | | | | | | | | | | | | | |
| • | Imp | parting th | ne basic co | oncepts of | f phas | e rule an | d apply | the same | to one ar | nd two c | omponer | nt system | ns. | | |
| • | Intr | oducing | the chem | istry of | engine | eering m | aterials | such as | cement, I | lubricant | ts,abrasiv | ves, retr | actories, | | |
| • | То | impart a | a sound ki | nowledge | e on tl | ne princi | ples of | chemistr | v involvi | ng diffe | rent app | lication- | oriented | | |
| | topics | | | | | | | | | | | | | | |
| • | Introducing salient features of fuels and combustion. | | | | | | | | | | | | | | |
| | To give an overview on modern analytical techniques COURSE OUTCOMES (Cos): (1 5) | | | | | | | | | | | | | | |
| | COUKSE OUTCOMES (Cos) : (1 – 5) | | | | | | | | | | | | | | |
| CO1 | | U | Understand the science of phase equilibria and apply the phase rule to different systems. | | | | | | | | | | | | |
| CO2 | | G | Gain an overview of Engineering Materials such as Lime, Cement, Lubricants, Abrasives, | | | | | | | | | | | | |
| CO3 | | R | Recognize the essential information about consumer products such as Soaps and | | | | | | | | | | | | |
| | Detergents, also gaining the basic knowledge about Explosives and Propellants. | | | | | | | | | | | | | | |
| CO4 | | D | iscover the | e fuel Ch | emistr | y and Co | ombusti | on proces | ss. | | | | | | |
| CO5 | | In | ferring fev | v importa | ant Ar | alytical | Technic | ues and t | their appli | ications. | | | | | |
| Mapp | ing o | f Cours | e Outcom | es with H | Progra | am Outc | omes (l | POs) | | | | | | | |
| COs/F | POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 0 | PO1 1 | PO12 | | |
| CO1 | | Н | | | | | | | | | | | L | | |
| CO2 | | Н | | Н | | | L | Н | | | | | L | | |
| CO3 | | Н | | | | | H | | | | | | L | | |
| CO4 | | Н | Μ | Н | Н | | | Η | | | | | Μ | | |
| CO5 | | Η | | | | Μ | | | | | | | H | | |
| H/M/L indicates strength of correlation H – High, M – Medium, L – Low | | | | | | | | | | | | | | | |
| Category Basic Sciences | | Sciences | Engg Sciences | Humaniti es & | Sciences | Program core | Program Electives | Program Electives Open | | Practical / Project | Internship s / Technical Skills | | Soft Skills | | |
| | | | | | | | | | | | | | | | |



BCH18002

ENGINEERING CHEMISTRY – II 2 0/1 0/0 3

UNIT I PHASE EQUILIBRIA

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

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

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

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

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 No of Hours : 45

TEXTBOOKS:

- 1. P.Udhayakala., S.Dinakar&L.Sankar., "Chemistry for Engineers". Charulatha Publications (2018).
- 2. Dr.R.Sivakumar and Dr.N.Sivakumar" Engineering Chemistry" Tata McGraw Hill Publishing Company Ltd, Reprint 2013.
- 3. C. S.Unnithan, T. Jayachandran & P. Udhayakala, "Industrial Chemistry", Sreelakshmi Publications (2009).

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).

9

8





DEPARTMENT OF ENGINEERING SCIENCES

| Subject | Subje | ect Name | : ENVI | RONM | IENTA | L | | Ty / | L | T/S | P/R | C | | |
|---|--|--|--------------|----------|-------------|-----------|---------------|------------|----------|---------|------------------------|------|--|--|
| Code : BES18003 | SCIE | NCE(No | n- Cred | ited) | | | | Lb/ ETL | | Lr | | | | |
| | Prere | quisite : | None | | | | | Ту | - | - | - | - | | |
| L : Lecture | T : Tuto | rial SLr : | Supervi | sed Le | arning I | P : Proj | ect R | : Researc | h C: C | redits | | | | |
| T/L/ETL : ' | Theory / | Lab / Em | bedded 7 | Theory | and La | b | | | | | | | | |
| | VES: | nowlada | of the | Enviro | nment o | nd Fee | ovotor | n & Riad | Vorcity | | | | | |
| • To | acquire k | nowledge | e of the | differer | nt types | of Env | vironm | ental nol | ution | | | | | |
| • To | know me | ore about | Natural | Resour | ces | 51 1211 4 | ii Oliili | entur pon | | | | | | |
| • To | To gain understanding of social issues and the Environment | | | | | | | | | | | | | |
| To attain familiarity of human population and Environment | | | | | | | | | | | | | | |
| COURSE OUTCOMES (Cos) : (3 – 5) | | | | | | | | | | | | | | |
| Students completing the course were able to | | | | | | | | | | | | | | |
| CO1 To known about Environment and Ecosystem & Biodiversity | | | | | | | | | | | | | | |
| | | To clearly comprehend air water Soil Marine Noise Thermal and Nuclear Pollutions and | | | | | | | | | | | | |
| 02 | | To clearly comprehend air, water, Soil, Marine, Noise, Thermal and Nuclear Pollutions and Solid Waste management and identify the importance of natural resources like forest | | | | | | | | | | | | |
| | water | Solid Waste management and identify the importance of natural resources like forest, | | | | | | | | | | | | |
| CO3 | To discover water conservation and watershed management | | | | | | | | | | | | | |
| CO4 To identify its problems and songering alignets shares placel merring with the problems | | | | | | | | | | | | | | |
| 004 | To identify its problems and concerns climate change, global warming, acid rain, ozone | | | | | | | | | | | | | |
| C05 | To ar | nloin form | titu malf | no pro | aromm | n and | rola a | finforma | ion too | hnology | in humar | | | |
| | 10 ex | piani iam | ny wella | are prog | gramme | es and | tote o | 1 morma | lion tec | motogy | in numar | L | | |
| Manning | | | os with | Drogre | m Out | comor | |) | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO | PO | PO | PO7 | , PO8 | PO | PO1 | PO1 | PO1 | | |
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| CO1 | | | | | | Μ | Η | Μ | | | | Μ | | |
| CO2 | | | | | | Μ | H | | | Μ | | Μ | | |
| CO3 | | | | | | M | H | M | | 2.4 | | M | | |
| CO4 | | | | | | M | H TT | M | | М | | | | |
| H/M/L ind | icates st | rength of | corrolo | tion I | I _ Hia | h M | _ п Modi | ium T | Low | IVI | | IVI | | |
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| ates | asic cien | ngg cien | [um: So | cier | rogi ore | rogi | rogr lecti | | ract | | ltern echi kills | oft | | |
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BES18003

ENVIRONMENTAL SCIENCE

0 0 0 0

UNIT I ENVIRONMENT AND ECOSYSTEM

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

UNIT II ENVIRONMENT POLLUTION

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

UNIT III NATURAL RESOURCES

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

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

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

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

Population growth, variation among nations – population explosion, environment and human health – human rights – value education – HIV/AIDS – women and child welfare – role of information technology in environment and human health

TEXT BOOKS:

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

REFERENCE BOOKS:

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



DEPARTMENT OF ENGLISH

| Subject Code: | | Su | bject Na | me :CO | OMMU | NICATI | ON LAB | | Ty / Lł ETL | 0/ L | T/S Lr | P/R | С |
|---------------------------------|--|----------|------------------------------|-----------|----------|-----------|-----------|------------|----------------|------------|-------------|------------|------|
| BEN18H | ET1 | Pr | ereauisi | te : Nor | e | | | | ETL | 1 | 0/0 | 2/0 | 1 |
| L : Lectu | ıre T : 7 | Futo | rial SLr | : Superv | vised Le | arning P | : Project | R : Re | search | C: Credits | | _, . | _ |
| T/L/ETI | : Theo | ry / | Lab / En | nbedded | Theory | and Lab | | | | | | | |
| OBJEC | TIVES | : | | | | | | | | | | | |
| The stud | lent sho | uld | be able to | С | | | | | | | | | |
| • 1 | Use app | orop | riate voca | abulary | and stru | cture for | effective | interpe | ersonal a | nd acaden | nic comm | nunication | l. |
| •] | • Interpret charts, diagrams, advertisements, etc | | | | | | | | | | | | |
| •] | Participate in group discussions and present projects effectively. | | | | | | | | | | | | |
| •] | Present projects and ideas effectively | | | | | | | | | | | | |
| • . | Attend interviews | | | | | | | | | | | | |
| COURSE OUTCOMES (Cos) : (3 – 5) | | | | | | | | | | | | | |
| Student | Students completing the course were able to | | | | | | | | | | | | |
| CO1 | Use appropriate vocabulary and structure for effective interpersonal and academic communication | | | | | | | | | | | | |
| CO2 | Interpret charts, diagrams, advertisements, etc. | | | | | | | | | | | | |
| CO3 | B Participate in group discussions and present projects effectively | | | | | | | | | | | | |
| CO4 | Present projects and ideas effectively | | | | | | | | | | | | |
| CO5 | Atten | d int | terviews | | | | | | | | | | |
| Mappin | g of Co | urs | e Outcor | nes witl | ı Progra | am Outo | comes (PO | Os) | | | | | |
| COs/PO | s PO | 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
| | | | | | | | | | | | | | |
| CO1 | | | | | | | | | | | Н | | |
| CO2 | | | | | | | | | | | Н | | |
| CO3 | | | | | | | | | | | Н | | |
| CO4 | | | | | | | | | | | Н | | |
| CO5 | | | | | | | | | | | Н | | |
| H/M/L i | indicate | es st | rength o | of correl | ation I | H – Higł | n, M – M | edium, | L – L0 | W | - | | |
| Category | Basic Sciences Engg Sciences Sciences Program Program Electives Project Project Project Technical | | l ecunical Skills Soft | Skills | | | | | | | | | |
| | | | | | | | | | | | | | |



| BET18ET1 | COMMUNICATION LAB | 1 | 0/0 | 2/0 | 1 |
|--|---------------------------------------|---|-----|-----|---|
| | | | | | |
| UNIT I Listening and Speaking- Infor | mal and Formal Contexts | | | | 6 |
| UNIT II Interpretation of charts / Diag | rams – Group Discussion | | | | 6 |
| UNIT III Compeering -Anchoring -Gro | up Discussion | | | | 6 |
| UNIT IV Formal Presentation -Power p | oint presentation of charts/ Diagrams | | | | 8 |
| UNIT V Interview | | | | | 4 |

SUGGESTED READINGS:

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



DEPARTMENT OF MECHANICAL ENGINEERING

| SubjectC BES18E | Code: Г2 | Subjec | et Name | : BASI GRA | C ENGI PHICS | NEERIN | ١G | T I E | Ty / Lb/ CTL | L | T/SL r | P/R | - | С |
|---|--|-------------------------|---------------------|--------------------|---------------------|------------------------|------------|--|--------------------|---------|------------|------|----|------|
| | | Prereq | uisite : | None | | | | E | TL | 1 | 0/0 | 2/0 | | 1 |
| L : Lectu T/L/ETL | re T : Tuto : Theory / | orial SLr / Lab / En | : Super- nbedded | vised Le Theory | arning P and Lab | : Project | R : | Res | earch | C: Cred | its | | 1 | |
| OBJECT • L • d • E • T p • k • L COURSI Students CO1 CO2 | Learn to know what kind of pencils to be used to sketch lines, numbers, Letters and Dimensioning in drawing sheet. Draw Projection of points, line, planes and solids using Drafters To identify the angle of projection and development of surfaces, isometric projection and Orthographic projection Know the basics of elevation and plan of building. Learn the basics of Drafting using AutoCAD Software COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to CO1 Utilize the concept of Engineering Graphics Techniques to draft letters, Numbers, Dimensioning in Indian Standards CO2 Demonstrate the drafting practice visualization and projection skills useful for conveying ideas in engineering applications. | | | | | | | | | | | | | |
| CO3 Identify basic sketching techniques of engineering equipments | | | | | | | | | | | | | | |
| CO4 | CO4 Demonstrate the projections of Points, Lines, Planes and Solids. | | | | | | | | | | | | | |
| CO5 Manning | of Cours | | nes wit | h Progre | am Oute | s and util | | Auto | CAD | Soltwal | е. | | | |
| COs/POs | $rac{1}{1}$ PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | P (|)7 | PO8 | PO9 | PO1 |) PO | 11 | PO12 |
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| CO1 | Н | Н | Н | М | Μ | М | | | | Н | Н | | | Н |
| CO2 | Н | Н | Н | Μ | Μ | Μ | | | | Н | Н | | | Н |
| CO3 | Н | Н | Н | L | | Μ | | | | Μ | Μ | | | Μ |
| CO4 | Н | Н | Μ | Μ | | Н | | | Μ | Н | H | | | H |
| CO5 | Н | Η | Η | Μ | Н | L | | | Μ | Н | H | | | H |
| H/M/L indicates strength of correlation H – High, M – Medium, L – Low | | | | | | | | | | | | | | |
| Category | Basic Sciences Engg Sciences Sciences Social Social Social Social Social Social Social Social Social Social Social Social Sciences Engg | | | Open Electives | | Practical / Project | Internship | Internship s / Technical Skills | | Skills | | | | |
| | | | | | | | | | | | | | | |



BES18ET2 BASIC ENGINEERING GRAPHICS 1 0/0 2/0 2

CONCEPTS AND CONVENTIONS (Not for examination)

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

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

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 Books plane and perpendicular to the other.

UNIT III DEVELOPMMENT OF SURFACES AND ISOMETRIC PROJECTION 6

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

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

Introduction to CAD – Advantages of CAD – Practice of basic commands – Creation of simple components drawing using CAD software.

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.



Total No of Hours :30

6

6



| Subject(BES18L | Code: 02 | Subject | Name : | INTE PHYS SCIE | CGRATH SICAL NCE LA | ED AB | Ty / Ll ETL | b/] | | r/SL r | P/R | | С |
|--|--|---------------------------|----------------------|----------------------------------|---------------------------|-----------|-------------------|--|--------|-----------|----------|--------|------|
| | | Prerequ | isite : N | lone | | | Lb | (| 0 | 0/0 | 2/0 | | 1 |
| L : Lectu T/L/ETL | re T : Tutor : Theory / I | ial SLr : S Lab / Embe | upervise edded Tl | ed Lean neory a | ning P : nd Lab | Project R | R : Resea | rch C: | Credi | ts | | • | |
| OBJECT | Demonstrate the ability to make physical measurements & understand the limits of precision in measurements. Display the ability to measure properties of variety of electrical, mechanical, optical systems. To help learners measure conductivity and EMF using electrical equipment. To understand the analytical skills through chromatography &viscometry | | | | | | | | | | | | |
| •] | To understand the analytical skills through chromatography &viscometry To familiarize the concepts of cheminformatics | | | | | | | | | | | | |
| COURSE OUTCOMES (Cos) : (3 – 5) Students completing the course were able to | | | | | | | | | | | | | |
| CO1 | O1 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 | CO3 Familiarizing the titration methods using conductometry & potentiometry | | | | | | | | | | | | |
| CO4 | Developing | g the Rese | arch spii | rit throu | igh the k | nowledge | e of Chei | minfori | natics | & Analy | tical sl | kills. | |
| Mapping | g of Course | Outcome | s with P | rogran | n Outco | mes (POs | 5) | | | | | | |
| COs/PO | s PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO | 011 | PO12 |
| CO1 | Н | Н | L | Н | Н | | | | | | | | |
| CO2 | Н | Н | М | Н | Н | | | | | Μ | | | |
| CO3 | Н | Н | М | Н | Н | | | | Н | | | | |
| CO4 | Н | Н | Н | Н | Н | | | | H | | H | I | Μ |
| H/M/L indicates strength of correlation H – High, M – Medium, L – Low | | | | | | | | | | | | | |
| Category | Basic Sciences Engg Sciences Sciences Program core Program | | Program Electives | Open Electives Practical / | | Project | Internship s / | Internship s / Technical Skille | | SILLAC | | | |
| | | | | | | | | | | | | | |



BES18L02

INTEGRATED PHYSICAL SCIENCE LAB 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_fvalues 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.


DEPARTMENT OF COMPUTER SCIENCE

| Subject BES18E | Code : T3 | Subjec | et Name | C PR | ROGRA | MMING | AND L | | Гу / Lb/ ETL | L | T/S Lr | P/R | С |
|----------------------|------------------------------|------------------------|----------------------|----------------------------|----------------------|----------------------|-----------|-----------|------------------------|-------|--------------------------------|----------------|--------|
| | | Prereq | uisite : | None | | | | J | ETL | 1 | 0/0 | 2/0 | 2 |
| L : Lectu T/L/ETL | re T : Tu : Theory | torial SI / Lab / 1 | Lr : Supe Embedde | ervised I ed Theo | Learning ry and L | g P : Proje ab | ct R : R | esearch | C: Cre | edits | | - | |
| OBJECT | FIVES : Dutline th | e hasics | ofCla | nguage | | | | | | | | | |
| • | Apply fur | damenta | ol e La | orogram | ming. | | | | | | | | |
| • F | Produce a | nd prese | nt activi | ties asso | bciated w | with the co | ourse. | | | | | | |
| COURS | E OUTC | OMES | (Cos) : (| (3-5) | | | | | | | | | |
| Students | completi | ng the co | ourse we | ere able t | to | | | | | | | | |
| CO1 | Acquire | knowled | dge how | to write | e and exe | ecute c pr | ograms | | | | | | |
| CO2 | Underst | and the f | fundame | ntal exp | ression a | and staten | nents of | C Langi | lage. | | | | |
| CO3 | Work w | ith array | s, functi | ons, poi | nters, str | ructures, S | Strings a | nd Files | in C. | | | | |
| CO4 | Identify | and pro- | vide solu | utions fo | or engine | ering pro | blems in | C prog | ammir | ng | | | |
| Mapping | g of Cour | se Outc | omes w | ith Prog | gram Ou | itcomes (| (POs) | | | | | | |
| COs/PO | s PO 1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 |) | PO10 | PO11 | PO12 |
| CO1 | Н | Н | | | Μ | М | | Н | Μ | | | | Н |
| CO2 | Н | Μ | | | Н | М | | Μ | Н | | | | М |
| CO3 | Н | | | Н | | М | | Μ | H | | | | М |
| CO4 | Н | | | Μ | | М | | Н | Μ | | | | М |
| H/M/L i | ndicates | strength | of corr | elation | H – Hi | i gh, M − 1 | Medium | n, L–L | ow | · | | | |
| Category | Basic Sciences | Engg Sciences | Humaniti | es & Social Sciences | Program core | Program Electives | Open | Electives | Practical / Project | ; | Internship s / Technical | Skills Soft | Skills |
| | | | | | | | | | | | | | |



C PROGRAMMING AND LAB

UNIT I **INTRODUCTION**

BES18ET3

Fundamentals, C Character set, Identifiers and Keywords, Data Types, Variables and Constants, Structure of a C Program, Executing a C Program.

EXPRESSION AND STATEMENT UNIT II

Operators, Types-Complex and Imaginary, Looping Statement-For, While, Do, Break, continue, Decision Statement-If, If else, Nested if, Switching Statement, Conditional Operator.

ARRAYS AND FUNCTIONS UNIT III

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 Books, Write a Program in Recursive Function.

UNIT IV STRUCTURES AND POINTERS

Working with Structures -Introduction -Syntax of structures -Declaration and initialization -Declaration of structure variable - Accessing structure variables, Understanding Pointers - Introduction - Syntax of Pointer.

STRINGS AND FILE HANDLING UNIT V

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

- **1.** www.spoken-tutorials.org
- 2. <u>http://www.learn-c.org/</u>

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 : $x + X^3/3! + X^5/5! + \dots X^n/n!$
- 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.

Total No of Hours: 30



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| $\begin{tabular}{ c c c c c c c c c c c c c c c c c c c$ | | Pr | ereq | uisite: | Basic | Elect | rical | & Ele | ctronic | s Engg | | Т | 3 | 1/0 | 0/0 | 4 | | |
| T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE: • To understand the basics of Electric Circuits • To impart knowledge on network theorems • To impart knowledge on the concepts of transient response of circuits • To understand Network graphs, cut sets and Duality of the network • To Understand and solving the two port networks, various types of filters and Attenuators COURSE OUTCOMES (Cos): (3-5) CO1 Analyze the Electric circuits CO2 Apply Circuit theorems in analysing problems in power system CO3 Knowledge about Coupled circuits and Transient Response of Circuits CO4 Familiarization of Network graphs CO5 Understand and solving the two port networks Mapping of Course Outcomes with Program Outcomes (POs) CO4 H CO3 M CO4 H CO3 M CO4 H CO5 Understand and solving the two port networks Mapping of Course Outcomes with Program Outcomes (POs) CO4 H H M CO3 M L L M H CO4 L M | L : Lecture T : | Tutori | al | SLr : S | upervi | sed L | earni | ng P: | Project | R : Re | search | C: Cred | its | | | | | |
| OBJECTIVE: • To understand the basics of Electric Circuits • To impart knowledge on network theorems • To impart knowledge on the concepts of transient response of circuits • To understand Network graphs, cut sets and Duality of the network • To Understand and solving the two port networks, various types of filters and Attenuators COURSE OUTCOMES (Cos): (3-5) CO1 Analyze the Electric circuits CO2 Apply Circuit theorems in analysing problems in power system CO3 Knowledge about Coupled circuits and Transient Response of Circuits CO4 Familiarization of Network graphs CO5 Understand and solving the two port networks Mapping of Course Outcomes with Program Outcomes (POs) CO3 M CO4 H H M CO3 M L M M H CO3 M L M M H M CO4 FO3 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO4 H H M <td>T/L/ETL : The</td> <td>ory/La</td> <td>ıb/Eı</td> <td>nbedde</td> <td>d Theo</td> <td>ory an</td> <td>d La</td> <td>b</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> | T/L/ETL : The | ory/La | ıb/Eı | nbedde | d Theo | ory an | d La | b | | | | | | | | | | |
| To understand the basics of Electric Circuits To impart knowledge on network theorems To understand Network graphs, cut sets and Duality of the network To Understand and solving the two port networks, various types of filters and Attenuators COURSE OUTCOMES (Cos): 63-5 CO1 Analyze the Electric circuits CO2 Apply Circuit theorems in analysing problems in power system CO3 Knowledge about Coupled circuits and Transient Response of Circuits CO4 Familiarization of Network graphs CO5 Understand and solving the two port networks Mapping of Course Outcomes with Program Outcomes (POs) CO5/POS PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 CO1 H H H H M M L L M H M H M CO2 M L L M M M L L M H H H L CO4 L M L M M L L M M H L M H H L CO4 L M L M L M M M L H M H H CO3 M L M L M M M H L M H H L CO4 H H H H H H H M M H L M H H L CO4 H H H H H H M M H L M H H L CO4 H H H H H H M M H M L M H H L CO4 H H H H H H M M M M L M H H L CO4 H H H H H H M M M M H L M H H L CO5 H H H H H H M M M M M CO3 M M L M L H M H M L M H H L CO4 H H H H H H M M M M M CO3 H H H H H H M M M M M CO3 H M M M M M M M CO3 H H H H H H M M M M M CO3 H M M M M M M M M CO3 H M M M M M M M M CO4 H H L M M M M M M CO4 H H H H H M M M M M CO5 J J J J J J J J J J J J J J J J J J J | OBJECTIVE: | 1 | | 1.1.1 | | 6 121 | | ····, | | | | | | | | | | |
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| COLONAL Cols, Cols, Colspan="2">Colspan="2"Cols | | | AFS | (\mathbf{Cos}) | (3-5) | g une t | wop | | voiks, v | anous | types 0 | 1 mers | anu A | uenuai | 015 | | | |
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| CO4 L M L M M M H L M H H L M H H L M M H L M M H L M M H L M M H H L M M H L M M H L Cos PSO2 PSO3 PSO4 PSO5 So Cos PSO3 PSO4 PSO5 So Cos M M H L M | CO3 | N | M | L | Μ | I | L | L | Μ | Μ | L | Н | Μ | I | I | L | | |
| CO5 H H H H H M H M L M M H L COs / PSOs PSO1 PSO2 PSO3 PSO4 PSO5 Image: Cos / PSOs PSO5 Image: Cos / PSOs PSO5 Image: Cos / PSOs PSO2 PSO3 PSO4 PSO5 Image: Cos / PSOs | CO4 | I | Ĺ | Μ | L | N | Л | Μ | Μ | Н | L | Μ | Н | I | I | L | | |
| COs / PSOs PSO1 PSO2 PSO3 PSO4 PSO5 C01 H H M M M M C02 M M M M M M C03 H M L H L Co C04 H L M M H Co C05 M M H L M H H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low Social Sciences Social Sciences Social Sciences Vill Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences V/M/L Indicates Sciences Social Sciences Social Sciences Social Sciences Social Sciences Vill Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Vill Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sciences Social Sci | CO5 | I | H | Н | Н | I | I | Μ | Н | Μ | L | Μ | Μ | I | I | L | | |
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| H/W/T indicates Strendth of Cortelation H- High' W- Wedimi' T-Tom Engineering Sciences and Core Basic Sciences and Core Brocial Sciences and Core Brocial Sciences and Core Social Sciences and Core Soft Skills Soft Skills Arectical / Project Arectives and Core Bractical / Project Arectives and Core Bractical / Project Arectical / Project Arecti | CO5 | | N | 1 | | Μ | | ł | I |] | L | Ι | Ν | | | | | |
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| | | Basi | Eng | Hun Soci | √ Pro£ | Ρroξ | Ope | Prac | Inter Skil | Soft | | | | | | | | |



BEE18001 CIRCUIT THEORY AND NETWORK ANALYSIS 3 1/0 0/0 4

UNIT I BASIC CIRCUIT CONCEPTS

Basic circuit elements-Ideal sources-Ohm's law-Kirchoff's laws-Network reduction: Voltage and Current division, Source transformation-Series and Parallel combination of R,L and C – Mesh and Nodal analysis for D.C and A.C. circuits

UNIT II NETWORK THEOREMS AND COUPLED CIRCUITS

Network theorems (Analysis of DC and AC Circuits): Thevenin, Norton, Superposition, Maximum power transfer and Reciprocity.

UNIT III NETWORK TOPOLOGY AND TRANSIENT ANALYSIS

Graph theory-Branch Nodal Analysis-Link loop Analysis-Tie set and Cut set matrices- Duality. Transients: Behavior of circuit elements under switching conditions and their representation- Forced and free Response of RL, RC, RLC circuits with DC and AC excitations.

UNIT IV TWO PORT NETWORKS, FILTERS AND ATTENUATORS

Characterization of two port networks in terms of Z, Y, H and T parameters-network equivalents-Relation between Network parameters- Analysis of T, Ladder , Bridged T and Lattice Networks - Filters

UNIT V S-DOMAIN ANALYSIS AND NETWORK SYNTHESIS

S-domain network-driving point and transfer impedances and their properties- transform network analysis -Concept of complex frequency- poles and zeros of network functions- time domain response from pole- zero plot- Reliability of one port network- Hurwitz polynomials

Total No. of Hours: 60

TEXT BOOKS:

- 1. Sudhakar, A. Shyammohan, S. and Palli (2015) Circuits and Networks: Analysis and Synthesis, 5th Edn, Tata McGraw-Hill
- 2. Smith , K.A. and. Alley, R.E (2014) Electrical Circuits, Cambridge University Press
- 3. Robert L. Boylestad and Louis Nashelsky (2013) Electronic Devices and Circuit Theory,11th Edn, Pearson Education

REFERENCE BOOKS:

- 1. Hyatt, W.H. Jr and Kimmerly, J.E., Engineering Circuits Analysis, McGraw Hill International.
- 2. Edminister, J.A., Theory and Problems of Electric Circuits, Schaum's Outline series McGraw Hill Book Company
- 3. Paranjothi S.R.(2000)Electric Circuit Analysis, New Age International Ltd., Delhi, 2nd Edition,.
- 4. Van Valkenburg, M.E., Network Analysis, Prentice Hall of India Private Ltd., New Delhi



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| Subject Code BEE18002 | : ! | Subjec | et Nam | e: DC | MACI | HIN | IES AN | D TRA | ANSFO | RMEF | RS / | T /L/ | L | T / S.Lr | P/ R | C |
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| | | | | | | | | | | |] | ETL | | | | |
| |] | Prerec | uisite: | Basic | Electr | rical | & Ele | ctronic | s Engg | | | Т | 3 | 1/0 | 0/0 | 4 |
| L : Lecture T : | Tute | orial | SLr : S | upervis | sed Lea | arni | ng P: | Project | R : Re | search | C: Cred | lits | | | | |
| T/L/ETL : The | eory/ | Lab/Ei | mbedde | d Theo | ry and | l Lal | b | 5 | | | | | | | | |
| OBJECTIVE | : | | | | | | | | | | | | | | | |
| To pro | ovide | the kr | nowledg | ge on th | ne basi | c co | oncepts | of the 1 | otating | circuits | S. | | | | | |
| To far | nilia | rize an | d under | stand t | he wor | rkin | g princ | iple of | the DC | machin | les, tran | sform | ers a | and their | : | |
| perfor | manc | ce char | acterist | ics | | | | | | | | | | | | |
| To pro | ovide | know | ledge o | n trans | former | r cor | nnectio | ns | | | | | | | | |
| To pro | ovide | know | ledge o | n starti | ng and | l me | thods of | of speed | l contro | l of mo | tors. | | | | | |
| To stu | dy tł | ne vari | ous loss | ses and | differ | rent | testing | metho | ds for D | C macl | nines ar | nd Tra | nsfo | ormers | | |
| COURSE OU | TCO | OMES | (Cos): | (3-5) | | | | | | | | | | | | |
| CO1 |] | Famili | iliar knowledge on the basic concepts of rotating circuits. erstand the performance, starting and methods of speed control of the Electrical machines | | | | | | | | | | | | | |
| CO2 | I | Unders | derstand the performance, starting and methods of speed control of the Electrical machines bable of designing different transformer connections | | | | | | | | | | | | | |
| CO3 | (| Capabl | bable of designing different transformer connections proprote knowledge on different testing methods for DC machines and Transformers | | | | | | | | | | | | | |
| CO4 |] | Incorp | bable of designing different transformer connections prporate knowledge on different testing methods for DC machines and Transformers former model and analyze electrical analyze and their application in governments | | | | | | | | | | | | | |
| CO5 |] | Perfor | brporate knowledge on different testing methods for DC machines and Transformers form model and analyze electrical apparatus and their application in power system | | | | | | | | | | | | | |
| Mapping of C | ours | se Out | comes | with P | rograr | m O | outcom | es (PO | s) | | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PO4 | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | .0 | PO11 | PO1 | 2 |
| CO1 | | H | Μ | Η | Μ | [| L | H | Μ | L | H | M | | Η | N | 1 |
| CO2 | | H | Μ | Μ | L | | L | Μ | L | L | H | M | | Μ | N | 1 |
| CO3 | | Μ | L | Μ | Μ | [| Μ | Μ | Μ | Μ | Μ | L | | Μ | L | 4 |
| CO4 | | Μ | Μ | Μ | L | | L | Μ | L | L | Μ | M | | Μ | I | 4 |
| CO5 | | L | Η | H | Μ | [| Μ | H | Μ | Μ | L | H | | Η | N | 1 |
| COs / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | SO5 | | | | |
| CO1 | | H | I | | H | | N | 1 | Ν | Л | | Μ | | | | |
| CO2 | | N | 1 | | Μ | | N | 1 | I | А | | Μ | | | | |
| CO3 | | H | I | | Μ | | Ι | _ |] | H | | L | | | | |
| <u>CO4</u> | | <u> </u> | I - | | L | | <u> </u> | <u>/</u> | N | <u>A</u> | | H | | | | |
| CO5 | | N | 1 | 1. | M | | <u> </u> | <u>I</u> | | L | | Μ | | | | |
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BEE18002 DC MACHINES AND TRANSFORMERS 3 1/0 0/0 4

UNIT I ELECTROMECHANICAL ENERGY CONVERSION 12

12Principles of electromechanical energy conversion – Energy, Co-energy – Elementary concepts of rotating machines — Rotating magnetic field – generated voltage – Torque – Magnetic Leakage

UNIT II DC GENERATORS

Constructional features of DC machine – Principle of operation of DC generator – EMF equation – Methods of excitation and types of DC generators – Characteristics of Series, Shunt and Compound DC generators – Armature reaction – Commutation – Methods of improving commutation – Parallel operation of DC shunt and compound generators

UNIT III DC MOTORS

Principle of operation of DC motors – Back EMF and its significance – Torque equation – Types of DC motors – Voltage Equation – Characteristics of DC series, shunt and compound motors – Starting of DC motors – Types of starter – Speed control of DC series and shunt motors – Power flow, losses and efficiency

UNIT IV TRANSFORMERS

Principle of operation – Constructional features of single phase and three phase shell type and core type transformers –EMF equation – Transformer on No load and Load – Phasor diagram – Parameters referred to HV / LV windings – Equivalent circuit – three phase transformers-connections – Scott Connection-Regulation — Auto transformers

UNIT V TESTING OF DC MACHINES & TRANSFORMERS

Losses and efficiency in DC Machines and transformers – Condition for maximum efficiency – Testing of DC machines – Brake test, Swinburne's test, Retardation test and Hopkinson's test – Testing of transformers – Polarity test, load test, open circuit and short circuit tests, Sumpner's test – All day efficiency.

Total No. ofHours: 60

TEXT BOOKS:

- 1. Kothari, D.P, Nagrath, I.J.(2005) Electrical Machines,7th Edn, Tata McGraw Hill Publishing Co. Ltd, New Delhi
- 2. Murugesh Kumar, K. (2003) DC Machines & Transformers. Vikas Publishing House Pvt Ltd.
- 3. Theraja, B.L. Chand, S. (2008) Electrical Technology Volume.II AC /DC Machines.

REFERENCE BOOKS:

- 1. Fitzgerald, A.E, Charles Kingsley Jr, Stephen, D. Umans (2003) Electric Machinery. 6th Edn, McGraw Hill Companies.
- 2. Hill Stephen, J. Chapman, (2012) Electric Machinery Fundamentals, 5th Edn, McGraw Hill Companies, New Delhi
- 3. Bimbhra, P.S. (2003) Electrical Machinery. Khanna Publishers.
- 4. Gupta, J B. (2015) Theory & Performance of Electrical Machine, S.K. Kataria & Sons



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| Subject Code: | Su | bject] | Name: | ELEC | CTRO | MAG | GNET | IC FIF | LD TH | EORY | TY LB/ | /] / | L | T / S.Lr | P/ R | C |
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| BEE18003 | | | | | | | | | | | ET | L | | | | |
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| OBJECTIV | 'Е: | | | | | | | | | | | | | | | |
| • | Τc | o acqu | ire knov | wledge | e in El | lectro | magne | tic fiel | d theory | | | | | | | |
| • | To | o prov | ide a so | lid fou | indati | on in | Electro | ostatics | such as | Dipole | e, Capa | citanc | e | | | |
| • | To | o attaii | n famili | arity ii | n Bou | ndary | condi | tions a | nd Mag | netic fie | eld | | | | | |
| • | To | o unde | rstand t | he rela | ation l | betwe | en fiel | d theor | y and ci | rcuit th | eory | | | | | |
| | To | o ident | ify the | electro | omagn | netic v | vave p | ropaga | tion in n | nedium | | | | | | |
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| | Un | dersta | nd the I | undan | nental | s in F | Liectro | magne | tic field | theory | | | | | | |
| CO2 | Fou | indation in Electrostatics such as Dipole, Capacitance niliarity in Boundary conditions and Magnetic field | | | | | | | | | | | | | | |
| CO3 | Far | miliarity in Boundary conditions and Magnetic field derstand the relation between field theory and circuit theory | | | | | | | | | | | | | | |
| CO4 | Un | amiliarity in Boundary conditions and Magnetic field Inderstand the relation between field theory and circuit theory | | | | | | | | | | | | | | |
| CO5 | Det | nderstand the relation between field theory and circuit theory etermine the electromagnetic wave propagation in medium | | | | | | | | | | | | | | |
| Mapping of | Cou | rse O | utcome | s with | Prog | gram | Outco | mes (P | POs) | | | | | | | |
| COs/POs | PO | 1 | PO2 | PO3 | PO |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 | PO11 | P | 012 |
| CO1 | | H | Μ | Μ | Ν | M | Η | Μ | Η | Μ | H | Μ | | Н | | Μ |
| CO2 | | H | Μ | Η | Ν | Ν | Μ | Μ | Μ | Μ | H | Μ | | Н | | Μ |
| CO3 | | H | Η | Η |] | H | Η | Η | Η | Μ | H | Μ | | Н | | Μ |
| CO4 | | L | L | Μ | Ν | M | L | L | L | L | Μ | Μ | | Μ | | L |
| CO5 | | H | Н | Η |] | H | Η | H | Η | Μ | H | Μ | | Н | | Μ |
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| CO1 | | H | | | Η | | I | H | l | H | | H | | | | |
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| CO3 | | Μ | | | Μ | | Ν | N | Ν | М |] | М | | | | |
| CO4 | | Μ | | | Η | | I | H |] | H | | H | | | | |
| CO5 | | <u>M</u> | | | H | | N | <u>/</u> | | H | | H | | | | |
| H/M/L indic | ates S | Streng | th of Co | orrelat | ion | H- Hi | gh, M | - Medi | um, L-L | ow | | | | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic: Skill | Soft Skills | | | | | | | |
| | | | | \mathbf{F} | | | | | | | | | | | | |



BEE18003 ELECTROMAGNETIC FIELD THEORY 3 0/0 0/0 3

UNIT I ELECTROSTATIC FIELD

Introduction - Concepts of different co-ordinate systems – Electric field intensity – Electric flux density -electric fields due to charge distributions – Electric potential – potential gradient - Gauss law & Coulomb's law with Application

UNIT II ELECTROSTATICS

Field due to dipoles – Dipole moment – Current and Current density Boundary conditions at dielectric and conductor surfaces – Capacitor - Capacitance– Energy stored and energy density – Capacitance due to Spherical shell, Coaxial cable

UNIT III MAGNETOSTATICS

Introduction to Magnetic materials- Magnetic field intensity- Magnetic flux density (B) – B in free space, conductor, magnetic materials. Magnetization and Permeability – Boundary conditions- Lorentz Law of force, – Biot-Savart Law – Ampere's Law –Magnetic field– Scalar and vector potential – Magnetic force – Torque – Inductance

UNIT IV ELECTRODYNAMIC FIELDS

Faraday's law, induced EMF – transformer and motional EMF, Maxwell's equations (differential and integral forms)- Displacement current - Relation between field theory and circuit theory.

UNIT V ELECTROMAGNETIC FIELDS AND WAVE PROPAGATION

Generation – electromagnetic wave equations – Wave parameters- velocity, intrinsic impedance, propagation constant – Wave propagation in free space, loss and lossless dielectrics, conductors – skin depth, Poynting vector

Total No of Hours: 45

TEXT BOOKS:

- 1. William Hayt, (2005) Engineering Electromagnetics.7th Edn,McGraw Hill.
- 2. Matthew. N.O. Sadiku,(2007) Elements of Electromagnetics.4th Edn, First Indian Edition,Oxford University Press.
- 3. Ashutosh Pramanik,(2006)Electromagnetism theory and application,Prentice Hall of India Private Ltd.

REFERENCE BOOKS:

- 1. David K. Cheng, (2004) Field and Wave Electromagnetics, 2nd Edn, Pearson Education.
- 2. William H. Hayt Jr, John A. Buck, (2006) Engineering Electromagnetics,7th Edn,Tata McGraw Hill Publishing Company Ltd.
- 3. Edminister, J.A. Schaum's, (2006) Theory and problems of Electromagnetics,2nd Edn,Special Indian Edition, Tata McGraw hill.

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| BEE 18004 EIL Prerequisite: Basic Electrical and Electronics Engg T 3 0/0 0/0 L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE: |) 3 | | | | | | | | | | | | | |
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| L : Lecture T : Tutorial SLr : Supervised Learning P : Project R : Research C: Credits T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE: | | | | | | | | | | | | | | |
| T/L/ETL : Theory/Lab/Embedded Theory and Lab OBJECTIVE: | | | | | | | | | | | | | | |
| OBJECTIVE: | | | | | | | | | | | | | | |
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| • To understand about Instruments and its Calibration. | | | | | | | | | | | | | | |
| • To impart knowledge about various types of Analog and Digital meters | | | | | | | | | | | | | | |
| • To understand the various methods of Measurements | | | | | | | | | | | | | | |
| • To understand the about different types of Transducers and Converters | | | | | | | | | | | | | | |
| • To understand the various types of Storage and display devices. | | | | | | | | | | | | | | |
| CO1 Gain knowledge about Instruments and its Calibration | | | | | | | | | | | | | | |
| CO2 Ability to understand the usage of meters | | | | | | | | | | | | | | |
| CO3 Ability to understand the various methods of Measurements | ity to understand the usage of meters ity to understand the various methods of Measurements ity to understand the application of transducers and Converters | | | | | | | | | | | | | |
| CO4 Ability to understand the application of transducers and Converters | ity to understand the various methods of Measurements ity to understand the application of transducers and Converters knowledge about the Storage and display devices | | | | | | | | | | | | | |
| CO5 Gain knowledge about the Storage and display devices | ty to understand the application of transducers and Converters knowledge about the Storage and display devices | | | | | | | | | | | | | |
| Mapping of Course Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POsPO1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11 | PO12 | | | | | | | | | | | | | |
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| H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low | | | | | | | | | | | | | | |
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BEE18004 ELECTRICAL AND ELECTRONICS 3 0/0 0/0 3 MEASUREMENTS

UNIT I INTRODUCTION

Functional elements of Instrument -Static and Dynamic characteristics -Errors in measurement Statistical evaluation of measurement data -Standard and Calibration

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS

Principle and types of analog and digital ammeters and voltmeters –D'Arsonval Galvanometer-Construction, Torque Equation-Single and three phase Wattmeter and Energy meter - magnetic measurements -Instrument Transformers -Instruments for measurement of frequency and phase- Applications

UNIT III METHODS OF MEASUREMENTS

D.C & A.C potentiometers-D.C & A.C bridges- transformer ratio bridges- self-balancing bridges-PMMC, moving iron- Electrostatic and Electromagnetic interference –Grounding techniques - Calibration

UNIT IV TRANSDUCERS AND CONVERTERS

Classification of transducers – Selection of transducers – Resistive-capacitive & inductive transducers – Piezoelectric, Hall effect- optical and digital transducers –A/D and D/A conversion Techniques and its Types

UNIT V STORAGE AND DISPLAY DEVICES

Magnetic disc and Tape Recorders –Digital plotters and printers -CRT displays -Digital CRO – LED, LCD and Dot matrix displays- Data Loggers.

Total No. of Hours: 45

TEXT BOOKS:

- 1. Doebelin, E.O.(1990) Measurement Systems Application and Design,McGraw Hill Publishing Company
- 2. Sawhney, A.K.(2016) A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai& Sons
- 3. Kalsi, H.S. (2010) Electronic Instrumentation, 3rd Edn, Tata McGraw-Hill Education Pvt. Ltd

REFERENCE BOOKS:

- 1. Robert B Northrop (2005) Introduction to Instrumentation and Measurements, Taylor & Francis
- 2. Stout, M.B. (1986) Basic Electrical Measurement, Prentice Hall of India
- 3. Dalley, J.W. Riley, W.F. Meconnel, K.G(1993) Instrumentation for Engineering Measurement, John Wiley & Sons.
- 4. Moorthy, D.V.S. (1995) Transducers and Instrumentation., Prentice Hall of India Pvt. Ltd



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| | |) unde | rstand t | he pro | nortio | ull I lull | Juide a | and im | eis. Moment | ation of | Hydrau | lic m | achinar | v & D | umpe | | |
| • | To | b know | v the im | portan | ce, ap | plica | tion an | id inter | relatior | ship of | various | prop | erties of | f fluid | umps. | | |
| • | To | o study | / about | variou | s type | es of p | oumps | and tu | rbines | • | | | | | | | |
| COURSE O | DUTC | COME | ES (Cos | <u>): (3-5</u> |) | | 2 | | | | | | | | | | |
| CO1 |] | Knowl | edge or | the b | asic L | aws o | of Ther | modyr | namics a | nd the v | working | princ | ciple of | IC En | gines | | |
| CO2 | 0 | Capabl | le of sel | ecting | the s | uitabl | e turbi | nes and | 1 boilers | depend | ling upo | n the | applica | tions | | | |
| CO3 |] | Incorp | orporating the knowledge gained in operating the Hydraulic machinery & Pumps owledge on properties of different fluids and its applications | | | | | | | | | | | | | | |
| CO4 |] | Knowl | owledge on properties of different fluids and its applications velop knowledge on the working of different types of pumps and turbines | | | | | | | | | | | | | | |
| CO5 |] | Develo | velop knowledge on the working of different types of pumps and turbines | | | | | | | | | | | | | | |
| Mapping of | Cou | rse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | | |
| CO1 | | Μ | Μ | Μ | J | H | Μ | L | L | Μ | Н | Μ | H | I | Н | | |
| CO2 | | Μ | L | L | Ι | N | Н | Μ | Η | Н | Η | Μ | I | I | Μ | | |
| CO3 | | Η | Η | Η | Ι | M | L | Μ | L | Η | Η | Μ | I | I | L | | |
| CO4 | | Μ | Μ | Μ |] | H | Μ | L | L | L | Η | Μ | I | I | L | | |
| CO5 | | L | Н | Η | Ι | N | L | Μ | Η | L | Η | Η | I | I | Μ | | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | | |
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| ategory | sic Sciences | gineering Science | geineering Sciences manities cial Sciences Bgram Electives and H- High, M- Medium, T-Tom Bgram Electives and Core en Electives and Project trives ff Skills ff Skills | | | | | | | | | | | | | | |
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BME18I03 THERMODYNAMICS ANDFLUID MECHANICS 3 0/0 0/0 3

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS

Thermodynamics systems, Concepts of continuum, Thermodynamics properties, Equilibrium, Process, Cycle, Work, Heat, Temperature, Zeroth law of thermodynamics. First law of thermodynamics – Applications to closed and open systems – Steady flow Energy Equations – Simple Problems

UNIT II SECOND LAW OF THERMODYNAMICS

Statements, Reversibility, Causes of irreversibility, Carnot Cycle, Reversed Carnot Cycle, Heat Engines, Refrigerators, Heat Pumps - Clausius Inequality – Entropy - Principles of increase of entropy - Carnot theorem.

UNIT III POWER CYCLES

Air cycles – Assumptions - Otto, Diesel, Dual and Brayton cycle – Air standard efficiency – Mean effective pressure – Working of two stroke and Four Stroke Petrol and Diesel Engines.

UNIT IV FLUID MECHANICS

Fluid properties; fluid statics, manometer, control-volume analysis of mass, momentum and energy; differential equations of continuity and momentum; Bernoulli's equation; viscous flow of incompressible fluids; boundary layer; elementary turbulent flow; flow through pipes, head losses in pipes, bends etc.

UNIT V FLUID MACHINERY

Introduction, types of pumps – reciprocating pump – centrifugal pump - construction details – working principles, Pelton-wheel, Francis and Kaplan turbines – construction and working principles.

Total No. of Hours: 45

TEXT BOOKS:

- 1. Nag, P.K. Engineering Thermodynamics, 2nd Edn, Tata McGraw Hill Publishing Company Ltd.
- 2. Rajput R.K., Fluid Mechanics and Hydraulic Machines, S.Chand and Co., India

REFERENCE BOOKS:

1. Holman, J.P. (1995) Thermodynamics, McGraw Hill.

2. Yunus A. Cengel, Thermodynamics-An Engineering Approach. , Tata Mc. Graw Hill.

3. Bansal R.K., A Text Book of Fluid Mechanics and Hydraulic Machines , S.Chand and Co., India

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| Code: | Subject Name: ELECTRICAL MACHINES- I LAB TY / L T / P / C LB/ S.Lr R ETL Image: Comparison of the second seco | | | | | | | | | | | | | | | |
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| DELIGEOT | Prerec | quisite: | Basic | Elect | rical | & Ele | ctroni | cs Engg | 5 | LIL | 0 | 0/0 | 3/0 | 1 | | |
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| OBJECTIVE: | | | | | | | | | | | | | | | | |
| • To | analyze | the Inte | ernal ar | nd Ex | ternal | Load | Charao | cteristic | s for D | C Genera | ators | and Mot | ors | | | |
| • To | determi | ne the s | peed co | ontrol | usin | g diffe | rent me | ethods f | for DC | Motor a | nd Ge | enerator | | | | |
| • To | find the | constar | nt loss a | and co | opper | loss o | f DC N | Aachine | S | | | | | | | |
| • To | find the | equival | lent cir | cuit o | of tran | sform | er | | | | | | | | | |
| • To | determi | ne the e | fficien | cy and | d regu | ulation | of DC | Machi | nes and | l transfor | mer | | | | | |
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| COI | Analyz | ze the L | oad Ch | aract | eristic | cs of L | C Gen | erators | and M | otors | | | | | | |
| CO2 | Detern | etermine different methods of speed control for DC Machines nderstand the losses incorporated in DC Machines apable of understand the performance of a Transformer | | | | | | | | | | | | | | |
| CO3 | Under | inderstand the losses incorporated in DC Machines apable of understand the performance of a Transformer | | | | | | | | | | | | | | |
| CO4 | Capab | apable of understand the performance of a Transformer compute the efficiency of a D.C. machine without actually loading it. | | | | | | | | | | | | | | |
| CO5 | Comp | ompute the efficiency of a D.C. machine without actually loading it. | | | | | | | | | | | | | | |
| Mapping of Co | ourse O | ompute the efficiency of a D.C. machine without actually loading it. se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | | |
| CO1 | Μ | Μ | H | N | 1 | L | Μ | Н | Μ | Η | Μ | H | [| Μ | | |
| CO2 | Μ | Μ | H | N | 1 | L | H | Μ | Μ | Η | Μ | H | [| Μ | | |
| CO3 | Η | H | Μ | N | 1 | L | Μ | Н | L | Н | Μ | H | [| H | | |
| CO4 | Η | H | Η | N | 1 | Μ | Μ | Н | Μ | Μ | Μ | H | [| L | | |
| CO5 | H | H | H | I | ł | H | H | H | Μ | H | Μ | H | [| H | | |
| Cos / PSOs | PS | 01 | P | SO2 | | PS | 03 | PS | 504 | PS | 05 | | | | | |
| <u>CO1</u> | H | I | | M | | N | <u>/</u> | l | M | N | /[| | | | | |
| <u>CO2</u> | <u> </u> | 1 | | M | | <u> </u> | 1 | | M | N | <u>/</u> | | | | | |
| <u>CO3</u> | <u> </u> | 1 | | <u>M</u> | | <u> </u> | | 1 | M | | <u>/I</u> | | | | | |
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| Catego Basic S | Engi | Hun Soc: | Pro | Pro | op | Pra | Int Sk | Sof | | Inte | | | | | | |
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BEE18L01 ELECTRICAL MACHINES- I LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

- 1. Open Circuit Characteristics Of DC Shunt Generator
- 2. Load Characteristics of DC Compound Generator
- 3. Load test on DC Shunt Motor
- 4. Load test on DC Series Motor
- 5. Swinburne's Test
- 6. Speed control of DC Shunt Motor
- 7. OC and SC test on Single Phase Transformer
- 8. Hopkinson's test
- 9. Load test on Single Phase Transformer
- 10. Separation Of No Load Losses In Single Phase Transformer
- 11. Sumpner's Test
- 12. Parallel Operation Of Single Phase Transformer

Total No of Hours: 45



| Subject Code: | | Subjec | et Nam | e: ELI | ECTI | RICA | AL CIF | RCUIT | S LAB | 6 | | / L | | [/ Lr | P/ R | C | |
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| BEE18L02 | | | | | | | | | | | ETI | L | | ••••• | n | | |
| | | Prerec | uisite: | Basic | Elect | rical | & Ele | ctronic | es Engg | | L | 0 | 0 | /0 | 3/0 | 1 | |
| L : Lecture | Г : Т | utorial | SLr : | Superv | vised | Lear | ning P | : Proie | ect R:] | Resea | rch C: C | redits | | | | | |
| T/L/ETL : T | heor | ry/Lab/ | Embed | led The | eory a | and L | Lab | J | | | | | | | | | |
| OBJECTIV | Έ: | | | | | | | | | | | | | | | | |
| • To p | provi | ide prac | ctical ex | perien | ce of | elect | rical ci | rcuits | | | | | | | | | |
| • To | impa | art prac | tical ki | nowled | ge on | ı solv | ving cire | cuits us | sing net | work | theorems | 5 | | | | | |
| • To c | leve | lop pra | ctical k | nowled | lge o | n the | concep | ots of r | resonance | ce in o | coupled of | circuit | ts ar | id tra | nsien | t | |
| resp | onse | e of c | rcuits | | 1 | | | C ("1 | | 1 | | | | | | | |
| • 10 | desi | gn the | two poi | t netwo | orks, | varic | ous type | es of fil | ters and | I Atte | nuators | | | | | | |
| | | | wiedge | $\frac{\text{on the}}{3.5}$ | meas | suren | ient of | variou | is paran | leters | in power | rsyste | em | | | | |
| COURSE C | | Analv | ze and | solve f | , he El | ectri | c circui | ts | | | | | | | | | |
| CO2 | | Knowl | nowledge in Circuit theorems and apply in analyzing problems in power system erform analysis of Coupled circuits and Transient Response of Circuits | | | | | | | | | | | | | | |
| | | D 6 | rform analysis of Coupled circuits and Transient Response of Circuits | | | | | | | | | | | | | | |
| CO3 | | Pertori | form analysis of Coupled circuits and Transient Response of Circuits | | | | | | | | | | | | | | |
| CO4 | | Capabl | pable of designing various types of filters and Attenuators | | | | | | | | | | | | | | |
| CO5 | | Unders | derstand and apply the concepts in engineering applications | | | | | | | | | | | | | | |
| Mapping of | Co | urse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO |)4 | PO5 | PO6 | PO7 | PO | 8 PO9 | PO | 10 | POI | 11 | PO12 | |
| CO1 | | Н | Н | Μ | N | Л | Μ | Н | Μ | Μ | Н | N | 1 | H | [| Μ | |
| CO2 | | Μ | Н | Μ | I | I | Η | H | Μ | Μ | H | N | 1 | H | [| Μ | |
| CO3 | | L | Μ | Μ | N | A | Μ | Μ | Μ | M | H | N | 1 | H | [| L | |
| CO4 | | L | Μ | L | I | H | H | H | L | Μ | H | N | 1 | H | [| L | |
| CO5 | | Μ | L | L | I | I | H | H | Μ | H | H | I | I | H | [| Μ | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 604 | P | SO5 | | | | | |
| <u>CO1</u> | | <u> </u> | I | | M | | <u> </u> | <u>/</u> | I | M | | <u>H</u> | | | | | |
| <u>CO2</u> | | <u> </u> | 1 | | <u>M</u> | | <u> </u> | <u>/I</u> | | | _ | | | | | | |
| <u>CO3</u> | | | 1 / | | H T | | 1 T | 1 | 1 | | | | | | | | |
| C04 | | N T | 1 | | <u>г</u> н | | 1 F | J T | 1 | VI VI | | <u>п</u> Т | | | | | |
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BEE18L02 ELECTRICAL CIRCUITS LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

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- 1. Experimental verification of Kirchhoff's voltage and current laws
- 2. Experimental verification of Current and Voltage Division and Source Transformation
- 3. Experimental verification of network theorems (Thevenin, Norton, Superposition and maximum power transfer Theorem).
- 4. Verification of Nodal and Mesh Analysis
- 5. Experimental determination of time constant of series R-C electric circuits
- 6. Experimental determination of frequency response of RLC circuits.
- 7. Design and Simulation of series resonance circuit.
- 8. Design and Simulation of parallel resonant circuits
- 9. Simulation of three phase balanced and unbalanced star, delta networks circuits
- 10. Experimental determination of power in three phase circuits by two-watt meter method
- 11. Determination of two port network parameters
- 12. Design and Simulation of low pass and high pass passive filters
- 13. Determination of self, mutual inductance and coefficient of coupling

Total No of Hours: 45



| Subject Code: BMF18II 2 | | Subjec F | et Nam LUID | e: MECH | [ANI | CS A | ND IC | CENG | INE LA | В | TY / LB/ | L | T / S.Lr | P/ R | C | |
|-------------------------------|----------------|----------------------|--|--------------|-------------------|----------------|---------------------|---------------------------------|-------------|------------------|-------------|------------|-------------|---------|------|--|
| DWIE10112 | í I | Prerec | quisite: | Basic | Mech | anic | al & C | ivil E | ngg | | | 0 | 0/0 | 3/0 | 1 | |
| L : Lecture | Γ : Tι | ıtorial | SLr: | Superv | vised | Learr | ning P | : Proje | ect R : H | Researc | h C: Cro | edits | | | | |
| T/L/ETL : T | heory | y/Lab/ | Embed | ded The | eory a | and L | ab | U | | | | | | | | |
| OBJECTIV | 'Е: | | | | | | | | | | | | | | | |
| • | To | o analy | ze perf | ormand | e of t | flow | using v | various | measur | ing inst | ruments | | | | | |
| • | Pr | ovidir | ng fair k | nowled | lge oi | n the | workin | ng of va | arious P | umps fo | or testin | g thei | r perfoi | manc | e. | |
| • | Tł | ne grad | duate w | ill learr | the the | valve | timing | g and p | ort timi | ng diag | rams for | IC E | ngines. | | | |
| • | To | o analy | ze perf | ormand | e and | l Hea | ıt Balar | nce Tes | st of IC | Engine | s. | | | | | |
| • | To | o analy | ze perf | ormanc | e and | l Hea | ıt Balar | nce Tes | st of Ref | rigerat | or and b | oilers. | | | | |
| COURSE C |)UT(| COME | ES (Cos |): (3-5) |) | | | | | | | | | | | |
| CO1 | 1 | Analyz | ze the p | erforma | ance o | of flo | w usin | g vario | us meas | uring i | nstrume | nts. | | | | |
| CO2 | (| Gain k | in knowledge on the performance and testing of various pumps in knowledge on the concepts of timing diagrams for IC Engines | | | | | | | | | | | | | |
| CO3 | (| Gain k | in knowledge on the concepts of timing diagrams for IC Engines alyze the performance and testing of IC engines | | | | | | | | | | | | | |
| CO4 | 8 | analyz | In knowledge on the concepts of timing diagrams for IC Engines alyze the performance and testing of IC engines alyze the performance and testing of Refrigerator and boilers | | | | | | | | | | | | | |
| CO5 | 1 | Analyz | alyze the performance and testing of IC engines alyze the performance and testing of Refrigerator and boilers. | | | | | | | | | | | | | |
| Mapping of | Cou | rse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | | |
| COs/POs | I | PO1 | PO2 | PO3 | PO | 94 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
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| CO3 | | Μ | L | Μ | N | 1 | Μ | Н | Μ | L | Μ | Μ |] | | L | |
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| CO5 | | Μ | Μ | Μ | N | 1 | Μ | Μ | Μ | Μ | Μ | Μ |] | I | Н | |
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| CO1 | | Ν | 1 | | H | | N | ſ | 1 | H |] | H | | | | |
| CO2 | | H | I | | H | | N | 1 | I | H |] | H | | | | |
| CO3 | | N | 1 | | H | | I | I | Ν | Ν |] | H | | | | |
| CO4 | | H | I | | Μ | | N | 1 | Ν | A | I | N | | | | |
| CO5 | | Ν | 1 | | Μ | | Ι | | | L | | H | | | | |
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| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technica Skill | Soft Skills | Interdicialinary | | | | | | |
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BME18IL2 FLUID MECHANICS AND IC ENGINE LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

FLUID MECHANICS

- 1. Measurement of flow using Orificemeter.
- 2. Measurement of flow using Venturimeter.
- 3. Measurement of flow using flow through pipes.
- 4. Measurement of flow using Flow meter.
- 5. Performance test on Reciprocating pump.
- 6. Performance test on Centrifugal pump.

IC ENGINES

- 7. Valve timing and port timing diagrams for IC Engines.
- 8. Performance test on a Petrol Engine.
- 9. Performance test on a Diesel Engine.
- 10. Heat Balance test on an IC Engine.
- 11. Boiler performance and Heat Balance Test.
- 12. Performance test on a Refrigerator (Determination of COP)

Total No of Hours: 45



| Subject Code: | | Subjec ELEC | et Nam TRICA | e: NU AL EN | MER IGINI | ICA EER | L MET S | THODS | 5 FOR | | TY/LB/ | L | T / S.L | r P. R | / | С |
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| $T/I / FTI \cdot 7$ | I.I Theor | utoriai v/Lab/ | SLI. Embed | Jed Th | viseu | Leal and I | inng r Sab | . Floje | | (esearc | n C. Ci | suns | | | | |
| OBJECTIV | VE• | y/La0/ | Linocu | | leory | | 240 | | | | | | | | | |
| • To | devel | op the | ability | in Nur | nerica | al Ski | ills | | | | | | | | | |
| COURSE (| DUT | COME | ES (Cos | s): (3-5 | 5) | | | | | | | | | | | |
| CO1 | | To und | lerstand | l the B | asic c | once | pts in N | Jumerio | cal Anal | ysis | | | | | | |
| CO2 | | To unc | lerstand | l the B | asic c | once | pts in S | ystem | of Linea | ar Equa | tions | | | | | |
| CO3 | | To und | lerstand | l the B | asic c | once | pts in N | Ion Lin | ear Equ | ations | | | | | | |
| CO4 | | To und | lerstand | l the B | asic c | once | pts in Iı | | | | | | | | | |
| CO5 | | To unc | lerstand | l the B | asic c | once | pts in N | erentiati | ion and | Integr | ation | 1 | | | | |
| Mapping of | f Coı | irse O | utcome | s with | Prog | ram | Outco | mes (P | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 1 | PO11 | P | '012 |
| CO1 | | L | H | L | I | [] | L | L | L | L | M | L | | L | | Μ |
| CO2 | | L | H | L | I | [] | L | L | L | L | Μ | L | | L | <u> </u> | Μ |
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| CO4 | | L | H | L | I | [] | L | L | L | L | Μ | L | | L | | Μ |
| CO5 | | L | Η | L | Ι | Ĺ | L | L | L | L | Μ | L | | L | | Μ |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 505 | | | | |
| CO1 | | N | 1 | | Μ | | Ι | |] | |] | Ĺ | | | \perp | |
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| CO5 | | N | Í | | <u>M</u> | | | | | <u> </u> |] | Ĺ | | | | |
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| Category | Basic Sciences | Engineering Sciences | Humanities and Soci Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technics Skill | Soft Skills | Interdicinlinary | | | | | | |
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BMA18011 NUMERICAL METHODS FOR ELECTRICAL ENGINEERS 3 1/0 0/0 4

UNIT I BASICS OF NUMERICAL METHODS

Curve fitting-Method of group averages-Principle of least square-Method of moments-Finite differences-Operators (Forward, Backward & Shifting) -Relationship between the operators.

UNIT II SYSTEM OF LINEAR EQUATIONS

Gauss Elimination method – Gauss-Jordan method – Iterative methods – Gauss-Jacobi method – Gauss-Seidel method – Matrix Inversion by Gauss-Jordan method- Eigen value problem-Power method.

UNIT III NON LINEAR EQUATIONS

Solution of Algebraic and Transcendental equations – Method of false position -Fixed point iteration method (single and multi variables)- Newton-Raphson method (single and multi variables).

UNIT IV INTERPOLATION

Newton forward and backward differences – Central differences – Stirling's and Bessel's formulae – Interpolation with Newton's divided differences – Lagrange's method.

UNIT V NUMERICAL DIFFERENTIATION AND INTEGRATION

Numerical differentiation with interpolation polynomials – Numerical integration by Trapezoidal and Simpson's (both 1/3 rd & 3/8 th) rules – Two and three point Gaussian Quadrature formulae – Double integrals using Trapezoidal and Simpson's rules.

Total No. of Hours: 60

REFERENCE BOOKS:

- 1. Veerarajan T., Numerical Methods, Tata McGraw Hill Publishing Co., (2007).
- 2. Sastry S.S., Introductory Methods of Numerical Analysis, Prentice Hall of India, (2012).
- 3. Kandasamy P., Thilagavathy, Gunavathy K., Numerical Methods (Vol.IV), S.Chand & Co., (2008).
- 4. Grewal B.S., Higher Engineering Mathematics, Khanna Publishers, (2012).



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| Subject Code: | | Subjec | et Nam | e: AC | C ANI |) SPE | ECIAL | MAC | HINES | | TY / LB/ | L | T / S.Lr | P/ R | C | | |
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| | | Prerec | uisite: | BEEI | /001/ | BEE | 18002 | | | | 1 | 3 | 1/0 | 0/0 | 4 | | |
| L : Lecture | Г:Т | utorial | SLr: | Super | vised | Learn | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | | | |
| 1/L/EIL: I | heor | y/Lab/ | Embed | ded Tr | leory | and L | ab | | | | | | | | | | |
| OBJECHIV | е: П | nderst | ands the | e const | ructio | n and | lonera | tion of | Synchr | onous | renerator | | | | | | |
| | A | cauire | s Know | ledge | about | svncl | hronou | is moto | ors used | in the F | ower sv | stem | | | | | |
| • | A | ble to | learn a | bout th | iree p | hase | inducti | on mo | tor and | to draw | the circ | le di | agram c | of Indu | uction | | |
| | m | achine | ; | | ľ | | | | | | | | 8 | | | | |
| • | G | ains kı | nowledg | ge in s | tarting | g and | speed | control | l of three | e phase | inductio | n mo | tor | | | | |
| • | U | ndersta | and the | conce | pts of | vario | us spe | cial ma | chines i | involve | d in the | powe | r system | netw | ork | | |
| COURSE C |)UT | COME | DMES (Cos): (3-5) Iderstand the concepts of synchronous generator pable knowledge about synchronous motors and its performance characteristics | | | | | | | | | | | | | | |
| CO1 | | Unders | derstand the concepts of synchronous generator pable knowledge about synchronous motors and its performance characteristics n draw the circle diagram of Induction machine | | | | | | | | | | | | | | |
| CO2 | | Capabl | pable knowledge about synchronous motors and its performance characteristics n draw the circle diagram of Induction machine | | | | | | | | | | | | | | |
| CO3 | | Can dr | a draw the circle diagram of Induction machine owledgeable in starting and speed control of three phase induction motor | | | | | | | | | | | | | | |
| CO4 | | Knowl | wedgeable in starting and speed control of three phase induction motor puire knowledge in special electrical machines | | | | | | | | | | | | | | |
| CO5 | | Acquir | pwledgeable in starting and speed control of three phase induction motor quire knowledge in special electrical machines | | | | | | | | | | | | | | |
| Mapping of | [°] Cot | irse O | utcome | s with | Prog | gram | Outco | mes (P | Os) | 1 | 1 1 | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | | |
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| <u>CO2</u> | | M | M | M | 1 | M | <u>M</u> | M | M | M | M | | | | | | |
| CO3 | | H | H | H | | | H | H | H | M | M | M | H | | | | |
| CO4 | | M | M | | 1 | | | M | | M | | M | | | H | | |
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| CO5 | | N | 1 | | Μ | | I | H |] | Ĺ | Ι | | | | | | |
| H/M/L indic | ates | Streng | th of C | orrelat | ion | H- Hi | igh, M | - Medi | um, L-L | OW | | | | | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technica Skill | Soft Skills | Intardicialinany | | | | | | | |
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Dr.M.G.R. Educational and Research Institute (DEEMED TO BE UNIVERSITY) (An ISO Certified Institution) rsity with Graded Autonomy St Maduravoyal , Chennai - 600 095

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

3 1/0 0/0**BEE18005 AC AND SPECIAL MACHINES**

UNIT I SYNCHRONOUS GENERATOR

Types & Constructional Features of Synchronous Generators- EMF Equation - Synchronous reactance -Armature reaction – Voltage regulation – EMF, MMF and ZPF methods – Change of excitation and mechanical input - Application

SYNCHRONOUS MOTOR UNIT II

Principle of operation - Construction - Equivalent Circuit and phasor diagram - Power and Torque - Power flow - Power developed by synchronous motors - Speed-Torque characteristics - Effect of change in excitation – V curves and inverted V curves – Hunting & suppression - Application

UNIT III THREE PHASE INDUCTION MOTOR

Construction - Types of rotors - Cage and wound rotor machines - Principle of operation - Production of rotating magnetic field - Equivalent circuit - Torque and Power output - Torque-slip characteristics -Condition for maximum efficiency – Testing – Load Test – No load and Blocked rotor test – Circle diagram.

STARTING & SPEED CONTROL OF INDUCTION MOTORS UNIT IV 12

Necessity for Starters – Starting methods of three phase induction motor – Types of Starters – Stator resistance and reactance - Rotor resistance starter- star-delta starter - Cogging & Crawling - Speed control -Voltage control –Rotor resistance control.

UNIT V **SPECIAL MACHINE**

Single phase induction motor - Constructional details - Double revolving field theory - Equivalent circuit -Speed-torque characteristics - Starting methods - Split-phase motor - shaded-pole induction motor -Universal motor - Variable Reluctance motor, Switched Reluctance Motor, Stepper Motor, Permanent Magnet Motors - Application

Total No. of Hours: 60

TEXT BOOKS:

- 1. Nagrath, I.J. Kothari, D.P. (2005) Electric Machines.7th Ed. New Delhi: T.M.H publishing Co Ltd.
- 2. Bhimbhra, P.S. (2003) Electrical Machinery. Khanna Publishers.

REFERENCE BOOKS:

- 1. Fitzgerald, Kingsley, Umans, (1990) Electric Machinery. 5th Ed. New Delhi: McGraw Hill Books co.
- 2. Stephen J. Chapman, (1985) Electric Machinery Fundamentals. New Delhi : McGraw Hill Book Co.
- 3. Say, M.G. (1980) Alternating current Machines.4th Ed. ELBS & Pitman. London:
- 4. Sen, S.K. (1984) Electrical Machinery. New Delhi: Khanna Publishers.

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| Subject Code: | | Subjec | et Nam | e: POV | VER | SYS' | TEM - | I | | | TY/ LB/ | L | T/ S.Lr | P/ R | C | |
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| BEE18006 | | | | | | | | | | | ETL | | | | | |
| | | Prerec | luisite: | Basic | Elect | rical | & Ele | ctronic | es Engg | | Т | 3 | 0/0 | 0/0 | 3 | |
| L : Lecture | T : T | 'utorial | SLr: | Super | vised | Learı | ning P | : Proje | ect R : I | Researc | h C: Cr | edits | | | | |
| T/L/ETL : 7 | Theor | ry/Lab/ | Embed | led Th | eory a | and L | ab | | | | | | | | | |
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| COURSE (| DUT | COME | ES (Cos |): (3-5 |) | | | | | | | | | | | |
| CO1 | | Attain | knowle | dge on | the b | oasic (| of Pow | er syste | em | | | | | | | |
| CO2 | | Knowl | edge or | transi | nissio | on lin | e parar | neter | | | | | | | | |
| CO3 | | Ability | to mod | lel the | transr | nissio | on line | s | | | | | | | | |
| CO4 | | Knowl | wledge on Distribution system | | | | | | | | | | | | | |
| CO5 | | Ability | ity to recover the faulted line Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| Mapping of | f Co | urse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO | 94 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
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| CO2 | | Μ | Μ | Η | Ν | 1 | L | Μ | Μ | L | H | Μ | Ν | Л | Η | |
| CO3 | | Μ | Μ | Μ | Ν | 1 | Μ | Μ | Μ | Μ | L | Μ | Ν | Л | Μ | |
| CO4 | | H | L | Μ | H | ł | Μ | H | Н | Μ | Μ | H |] | | Μ | |
| CO5 | | Μ | Μ | L | N | 1 | M | M | Μ | Μ | H | M | N | Л | L | |
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| <u>CO1</u> | | <u> </u> | I | | L | | I | I | N | <u>M</u> | 1 | M | | | | |
| <u>CO2</u> | | | 1 1 | | | | <u> </u> | / <u> </u> | | L. | | | | | | |
| C03 | | | I T | | M | | N | л Т | | <u>л</u> | 1 | r r | | | | |
| C04 | | N | 1 1 | | M | | 1 | <u>т</u> Л | | л Л | 1 | L M | | | | |
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BEE18006

POWER SYSTEM - I

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UNIT I INTRODUCTION TO POWER SYSTEM

Conventional sources of energy – Thermal, Nuclear, Diesel, Gas etc – Non-conventional Sources of Energy - Solar, Wind, Biomass, Geothermal, Tidal - Structure of Electrical Power System - Different operating Voltages

UNIT II TRANSMISSION LINE PARAMETERS

Mechanical design of transmission line between towers – sags and tension calculations with the effect of ice and wind - Parameters of Resistance, Inductance and Capacitance calculations - Single and three phase transmission lines - Single and Double circuits - Solid, Stranded and Bundled Conductors - Symmetrical and Unsymmetrical Spacing - Transposition of Lines - Concepts of GMR and GMD - Skin and Proximity Effects

MODELLING AND PERFORMANCE OF TRANSMISSION LINES UNIT III

Classification of lines - short line, medium line and long line - equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance; transmission efficiency and voltage regulation, real and reactive power flow in lines, Power - circle diagrams, surge impedance loading, methods of voltage control; Ferranti effect

UNIT IV **DISTRIBUTION SYSTEM AND SUBSTATIONS**

Feeders, distributors and service mains – DC distributor – 2-wire and 3-wire, radial and ring main distribution - AC distribution - single phase and three phase 4-wire distribution - Substation - Classification, functions and major components - sample substation layout

UNIT V **FAULTS & PROTECTION**

Need and principles of protection - Nature, Causes and Consequences of faults - symmetrical components and fault calculation - Methods of Neutral grounding - Zones of protection and essential qualities of protection - Protection schemes - Protection against overvoltages

Total No. ofHours: 45

TEXT BOOKS:

- 1. V. K. Mehta, "Principles of Power Systems", S. Chand, New Delhi, 2005
- S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. 2. Ltd, New Delhi, 2002
- 3. Ravindranath, B. and Chander, N. (1997) Power System Protection and Switchgear, Wiley
- 4. Chakrabarti, A. Soni, M.L.Gupta, P.V. Bhatnagar, U.S. (2002) A Text Book on Power System Engineering. Dhanpat Rai & Co. Pvt. Ltd

REFERENCE BOOKS:

- 1. Patra, S.P. Basu, S.K. and Chowduri, S. (1983) Power systems Protection. Oxford and IBH
- 2. Sunil S. Rao, (1986) Switchgear and Protection. New Delhi: Khanna Publishers
- 3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi

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| Subject Code: BEC18107 | | Subjec IOT | et Nam | e: COI | MMU | JNIC | ATIO | N SYS | TEMS | AND | TY / LB/ | L | T / S.Lr | P/ R | C | |
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| DEC10107 | | Prerec | quisite: | Basic | Elect | rical | & Ele | ctronio | s Engg | | | 3 | 0/0 | 0/0 | 3 | |
| L : Lecture ' | T : T | utorial | SLr: | Super | vised | Lear | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | | |
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| • | • Т | To study | y about | the me | thods | to co | onvert . | Analog | to Digi | tal com | municat | ion u | sing coo | le the | ory. | |
| • | r e | To study | y about | differe | ent m | odula | tion te | chniqu | es | | | | | | | |
| • |) T | o intro | duce va | rious r | nedia | for d | igital c | commu | nicatior | 1 | | | | | | |
| COUDSE | | comply | y the co FS (Cos) | $\frac{1}{2}$ | $\frac{\text{of Interview}}{2}$ | ernet | of Thi | ngs in t | he real | world s | cenario | | | | | |
| COURSE C | | Canabl | Capable of understanding the concepts of Analog and Digital communication circuits | | | | | | | | | | | | | |
| | | Cain l | Gain knowledge about the Communication conversion methods | | | | | | | | | | | | | |
| 02 | | Gain k | an knowledge about the Communication conversion methods | | | | | | | | | | | | | |
| CO3 | | Gain k | Bain knowledge about the different concepts of modulation techniques | | | | | | | | | | | | | |
| CO4 | | Develo | Develop knowledge about the various digital communication media | | | | | | | | | | | | | |
| CO5 | | Understand and incorporate the concepts of IOT in different fields. | | | | | | | | | | | | | | |
| Mapping of | f Co | urse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | • | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| C01 | | H | M | M | N | A A | L | L | M | M | L | | | ſ | H | |
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| C04 | | <u></u> М | H | H | | Л | M | IVI I. | M | н | M | H | | 1 | <u>и</u> М | |
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| CO3 | | H | I | | Η | | I | H | Ι | Μ |] | L | | | | |
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| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic Skill | Soft Skills | | | | | | | |
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BEC18107COMMUNICATION SYSTEMS AND IOT30/00/03

UNIT I SIGNALS & NOISE

Periodic & Aperiodic Signals – Noise - External Noise – Thermal Agitation – Shot Noise – Noise Figure – Signal to Noise ratio – Equivalent Noise resistance.

UNIT II INTRODUCTION TO COMMUNICATION

Basic Communication systems – Need for Modulation in communication systems – Amplitude Modulation – Double Side Band amplitude Modulation – Single sideband and VSB modulation – modulators. AM Transmitter and Receiver, FM transmitter and Receiver.

UNIT III MODULATION TECHNIQUES AND PULSE MODULATION

Phase modulation – Noise triangle – Pre-emphasis and de-emphasis – Stereophonic FM multiplex system – comparison of wideband and narrow band FM – AFC – Sampling theorem –Quantization, Quantization Error, PAM, PWM, PPM, PCM.

UNIT IV DIGITAL MODULATION & INFORMATION THEORY

ASK, FSK, PSK, Transmitter and Receiver. Introduction-Information & Entropy, Source Coding Theory, Discrete Memory less Channel, Mutual Information Channel Capacity, Channel Coding Theory.

UNIT V INTERNET OF THINGS

Introduction – Block diagram of IoT- IoT Architecture – Communication Technologies in IoT – Cloud Storage in IoT-Data Storage in IoT – Applications of IoT – Smart Home, Smart City, Smart Agriculture, Health Monitoring System.

Total No.of Hours: 45

TEXT BOOKS:

- 1. Roy Blake, (2002) Electronic Communication systems. 2nd Edn, Thomson Learning.
- 2. George Kennedy, (1992) Electronic communication systems, Tata McGraw Hill publications.
- 3. Michael Miller, (2015) The Internet of Things, Que Publishing

REFERENCE BOOKS:

- 1. Bruce Carlson, A. Taub& Schilling, (1986) Principles of Communication Systems, Tata McGraw Hill.
- 2. Simon Haykins, (2001) Principles of Communications, Prentice Hall of India.
- 3. Arshdeep Bahga, Vijay Madisetti (2015) Internet of Things A hands-on approach, Universities Press



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| Subject Code | : | | Subject I | Name | | | | Ty/ | L | T / | P/R | С | | |
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| OBJECTIVE | ES: | | | <u>j</u> | | | | | | | | | | |
| • To pr | ovide ar | n overvi | ew of the | e history | of the | making o | f Indiar | n Con | stitutio | on | | | | |
| • To un | derstan | d the pr | eamble a | nd the b | oasic str | uctures of | f the Co | nstitu | tion. | | | | | |
| • To Ki | now the | fundan | nental rig | hts, dut | ies and | the direct | ive prin | ciples | s of sta | ate policy | / | | | |
| • 10 un | derstan | d the fu | nctionali | ty of th | e legisla | ature, the | e execut | ive a | nd the | judiciar | У | | | |
| COURSE OU | UTCON | IES (C | Os) : Aft | er stud | ying thi | the stu | the student would be able to | | | | | | | |
| CO1 | To prov | ide an o | overview | of the h | nistory o | of the mal | king of I | India | n Cons | stitution | | | | |
| CO2 | To unde | erstand | the prean | nble and | the bas | sic structu | ures of t | he Co | onstitu | tion. | | | | |
| CO3 | To Kno | w the f | undament | tal right | s, duties | s and the | directiv | e prir | ciples | of state | policy | | | |
| Mapping of (| Course | Outcon | tcomes with Program Outcomes (POs) | | | | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | | |
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| CO2 | | | | | | H | L | L | L | L | | | | |
| CO2 | | | | | | Н | L | L | Μ | L | | | | |
| COs / PSOs | PSO | 1 | PSO2 | 2 | PSO | 3 | | | | | | | | |
| CO1 | L | | L | | Μ | | | | | | | | | |
| CO2 | L | | L | | М | | | | | | | | | |
| CO3 | L | | L | | Μ | | | | | | | | | |
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| BHS18NC1 | THE INDIAN CONSTITUTION | Ту | 2 | 0/0 | 0/0 | NC |
|--------------|---|------------|--------|----------|------|----|
| UNIT I | | | | 31 | Hrs | |
| The History | of the Making of Indian Constitution, Preamble | and the Ba | asic S | tructure | S | |
| UNIT II | | | | 31 | Irs | |
| Fundamenta | l Rights and Duties, Directive Principles of Stat | e Policy | | | | |
| UNIT III | | | | 31 | Irs | |
| Legislature | Executive and Judiciary | | | | | |
| UNIT IV | | | | 31 | Hrs | |
| Emergency | Powers | | | | | |
| UNIT V | | | | 31 | Irs | |
| Special Prov | visions for Jammu and Kashmir, Nagaland and O | ther Regio | ons, A | mendm | ents | |

Total Hours: 15

TEXT BOOKS:

1. D D Basu, Introduction to the Constitution of India, 20th Edn., LexisnexisButterworths, 2012.

REFERENCE BOOKS:

- 1. Rajeev Bhargava (ed), Ethics and Politics of the Indian Constitution, Oxford University Press, New Delhi, 2008.
- 2. Granville Austin, The Indian Constitution: Cornerstone of a Nation, Oxford University Press, Oxford, 1966.
- 3. Zoya Hassan, E. Sridharan and R. Sudarshan (eds), India's Living Constitution: Ideas, Practices, Controversies, Permanent Black, New Delhi, 2002.
- 4. Subhash C. Kashyap, Our Constitution, National Book Trust, New Delhi, 2011.



| Subject Code: BHS18NC2 | | S T F | ubjec THE I KNOV | t Name : NDIAN VLEDGI | TRA E | ADIT] | 10 | NAL | | Ty/ Lb/ ETL | L | T/ S.Lr | P/R | С |
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| OBJECTIVES • To und • To und • To Kno Shasht • To und in Anc | understand the Pre- colonial and Colonial Period, Indian Traditional Knowledge System understand the Traditional Medicine, Traditional Production and Construction Technolo Know the History of Physics and Chemistry, Traditional Art and Architecture and Vastu Ishtra, Astronomy and Astrology understand the Origin of Mathematics, Aviation Technology in Ancient India, Crafts and Ancient India | | | | | | | | | | | | | m logy tu nd Trade |
| COURSE OU | TCOME | S (CC | \mathbf{Ds}): A | After stud | lyin | g this | co | urse t | he stu | dent v | vould | be able | to | ~ |
| CO1 | To under | stand | the P | re- coloni | al ar | nd Col | lon | ial Per | riod, Ir | ndian 7 | Fraditi | onal Kr | lowledg | e System |
| CO2 | To under Technolo | rstand Ogy | the T | raditional | l Me | dicine | , Т | raditio | onal Pr | oducti | ion an | d Const | ruction | |
| CO3 | To under Trade in | stand Ancie | the O ent Inc | rigin of N lia | Aath | ematio | cs, | Aviati | ion Te | chnolo | ogy in | Ancient | India, (| Crafts and |
| Mapping of C | ourse Ou | itcom | es wit | h Progra | am (| Outcor | me | es (POs | s) | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | | PO5 | ; | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
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| CO1 CO2 | | п Н | п Н | L L | | | _ | M | | | | M | | L L |
| CO2 | | Н | Н | L | | | | M | | | | Μ | | L |
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| CO1 | L | | | L | | Μ | | | | | | | | |
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| CO3 | L | | | L | | Μ | | | | | | | | |
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| Category | Basic Sciences | Engg Sciences | | ≺ & Social Sciences | Program core | Program | Electives | Open Electives | Practical / Project | Internships / Technical | Soft Skills | | | |
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BHS18NC2 THE INDIAN 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, Astronom Astrology | iy and |
| 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



| Subject Code: BEE18ET1 | | Subjec INTE(| ct Name GRATI | e: LIN ED CII | EAR RCUI | ANI TS | D DIGI | TAL | | | TY / LB/ ETL | L | T / S.Lr | P/ R | C | |
|---|---------------------|--|---|------------------|-------------------|----------------|---------------------|----------------------------------|-------------|-----------------|--------------------|----------------|-----------------|----------------|---------|--|
| | | Prereg | uisite: | BEE18 | 8001 | | | | | | ETL | 1 | 0/1 | 3/0 | 3 | |
| L : Lecture 7 | $\Gamma:\mathbf{T}$ | utorial | SLr: | Superv | vised 1 | Lear | ning P | : Proje | ect R : l | Researc | h C: Cre | edits | | | | |
| T/L/ETL : T | heor | y/Lab/ | Embed | ded The | eory a | ind L | Lab | | | | | | | | | |
| OBJECTIV | E: To a | 4.1. dr. th | a IC fai | miantin | | aadu | | | | | | | | | | |
| • | TO SI | tudy tii tudy ch | e IC Iai | istics 1 | n pro ealize | | re. wite an | d desig | m for si | anal an | alveiem | ing (| n_amn | ICs | | |
| • | To si | tudy en tudy in | ternal f | inction | val blo | ocks | and the | a uesig | cations | of speci | al ICs li | ke Ti | p-amp mers F | ICs. ILL ci | rcuits | |
| | regul | lator C | ircuits. | ADC | iui oit | JURD | und th | uppin | cutions | or speed | | KC II | iners, 1 | | realts, | |
| • | Fam | niliarity | of diff | erent ty | pes o | of gat | tes usin | g truth | table w | vith logi | c circuit | s. | | | | |
| •] | Fami | iliarity | iarity to use logic gates in sequential and combinational circuits. | | | | | | | | | | | | | |
| COURSE O | UT | COME | COMES (Cos): (3-5) | | | | | | | | | | | | | |
| CO1 | | Capable of understanding the concepts of IC fabrication | | | | | | | | | | | | | | |
| CO2 | | Realization of Circuits using Op-amps | | | | | | | | | | | | | | |
| CO3 | | Knowledge about Special IC's and apply in designing logic circuits | | | | | | | | | | | | | | |
| CO4 | | Knowl | Knowledge about the basic gates | | | | | | | | | | | | | |
| CO5 | | Capable to design logic Circuits using gates | | | | | | | | | | | | | | |
| Mapping of | Cot | irse Oi | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| CO1 | | Μ | Μ | Μ | H | I | Μ | L | Μ | Μ | L | L | N | 1 | Μ | |
| CO2 | | H | H | Μ | N | ſ | H | L | Μ | L | Μ | Μ |] | | М | |
| CO3 | | M | M | H | H | I | M | L | L | L | M | <u>H</u> | N | 1 | L | |
| <u>CO4</u> | | L | | <u>M</u> | N | 1 | | M | | L | M | <u>M</u> | | 1 | M | |
| | | | | <u>H</u> | | 1 | M | | | | | | N | /1 | L | |
| | | 150 | | P | 502 M | | <u> </u> | 03 | PS | 04 M | PS | 105 | | | | |
| $\frac{CO1}{CO2}$ | | | L T | | <u>и</u> н | | 1 T | | I T | VI M | I I | r r | | | | |
| CO2 | | H | 1 [| | M | | I | <u>.</u> | | <u>vi</u> [] | | <u>с</u> Г. | | | | |
| CO4 | | N | 1 | | L | | N | /[| | L | | L | | | | |
| CO5 | | N | 1 | | H | | Ι | | I | М |] | L | | | | |
| H/M/L indic | ates | Streng | th of Co | orrelati | on I | H- H | igh, M | Mediu | um, L-L | OW | | T | | | | |
| Category Basic Sciences Engineering Sciences Humanities and Social Sciences | | | | | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | | | | | |
| | | | | 7 | | | | | | | | | | | | |



BEE18ET1 LINEAR AND DIGITAL INTEGRATED CIRCUITS 1 0/1 3/0 3

UNIT I IC FABRICATION

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs

UNIT II CHARACTERISTICS AND APPLICATIONS OF OP AMP

Ideal OP-Amp characteristics, offset voltage and current, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator - Instrumentation amplifier, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit

UNIT III SPECIAL IC'S

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs

UNIT IV BOOLEAN ALGEBRA

Deriving a Boolean equation from truth table-simplification of Boolean functions using K-map & Quine Mc Cluskey method, Implementation of a Boolean function using Logic gates and universal gates

UNIT V COMBINATIONAL CIRCUITS AND SEQUENTIAL CIRCUITS

Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers- Function realization multiplexers - Latches-Flip flops - Mealy and Moore Models- Design of Shift Registers and counters(Synchronous and Asynchronous Sequential Circuits) - Hazards

TEXT BOOKS:

- 1. Ramakant, A. Gayakward, (2003)Op-amps and Linear Integrated Circuits,6th Edn,Pearson Education PHI.
- 2. Roy Choudhary, D. Sheil B. Jani, (2003) Linear Integrated Circuits, 2nd Edn, New Age.
- 3. Morris Mano, M. (2002) Digital Logic and Computer Design, Prentice Hall of India

REFERENCE BOOKS:

- 1. Jacob Milman, Christos C. Halkias, (2003)Integrated Electronics Analog and Digital circuits system, Tata McGraw Hill.
- 2. Robert F. Coughlin, Fredrick F. Driscoll, (2002)Op-amp and Linear ICs. 4th Edn,Pearson Education/ PHI. Charles H. Roth, (2002) Fundamentals Logic Design, 4th Edn, Jaico Publishing.
- 3. Floyd,(2003) Digital Fundamentals, 8th Edn, Pearson Education.
- 4. John F. Wakerly, (2002) Digital Design Principles and Practice, 3rd Edn, Pearson Education



Total No. of Hours: 45

9

9

9



| Subject Code: | ŝ | Subjec | et Nam | e: EL | ECTI | RICA | LAB | TY / LB/ | L | T / S.Lr | P/ R | C | | | | |
|------------------|---|--|--|----------|--------|--------|--------------|-------------|------------|-------------|------------|------------|----------|-------|------|--|
| BEE18L03 | | | | | | | | | | | ETL | | | | | |
| |] | Prerec | uisite: | BEE1 | 8001 | | | | | | L | 0 | 0/0 | 3/0 | 1 | |
| L : Lecture 7 | ר : Tו | ıtorial | SLr : | Super | vised | Lear | ning P | : Proie | ct R : F | Researc | h C: Cre | edits | | 1 | 1 | |
| T/L/ETL : T | heory | y/Lab/ | Embed | ded Th | eory a | and L | ab | · • j · | | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | | |
| • | Го аг | nalyze | the Loa | ad Cha | racter | istics | of Syr | nchrono | ous mac | hines | | | | | | |
| • | Го fi | nd Vo | ltage R | egulati | on of | Sync | hronou | is mach | nines. | | | | | | | |
| • | Го st | udy th | e effect | of fre | quenc | y and | l voltag | ge cont | rol actio | n of Th | ree pha | se ind | uction 1 | nachi | nes. | |
| • | Гo be | e fami | liar witl | n the e | quival | lent c | ircuit c | of singl | e phase | inductio | on mach | nines. | | | | |
| • 7 | Гo st | udy th | e Perfo | rmance | e Cha | racter | istics o | of Spec | ial Mac | hines | | | | | | |
| COURSE O | UTC | COMES (Cos): (3-5) | | | | | | | | | | | | | | |
| CO1 | 1 | Determine the characteristics of transformers and induction motors. | | | | | | | | | | | | | | |
| CO2 | I | Understand the basic knowledge of alternators | | | | | | | | | | | | | | |
| CO3 | 1 | Analyze the effect of frequency and voltage control action of Three phase induction | | | | | | | | | | | | | | |
| | 1 | nachir | achines. | | | | | | | | | | | | | |
| CO4 | I | Famili | amiliar with the equivalent circuit of single phase induction machines | | | | | | | | | | | | | |
| CO5 | 1 | Analyze the Performance Characteristics of Special Machines | | | | | | | | | | | | | | |
| Mapping of | f Course Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| CO1 | | Η | Η | Η | I | I | Η | H | Η | Μ | Η | Μ | E | I | Η | |
| CO2 | | Μ | Μ | Μ | N | A | Μ | Μ | Μ | Μ | Μ | L | E | I | L | |
| CO3 | | Η | Η | Η | I | H | Η | H | Н | Μ | Μ | Μ | E | I | Η | |
| CO4 | | Μ | Μ | Μ | N | A | Μ | Μ | Μ | Μ | Μ | Μ | N | 1 | Η | |
| CO5 | | Η | Н | Н | I | Η | Н | H | Н | Μ | Η | Μ | E | I | L | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | H | I | | Η | | I | H | I | I | I | N | | | | |
| CO2 | | N | 1 | | Μ | | N | A | Ν | Л | Ι | N | | | | |
| CO3 | | H | I | | Η | | I | I | I | I | Ι | N | | | | |
| CO4 | | Ν | 1 | | Μ | | N | Л | Ν | Л | Ι | N | | | | |
| CO5 | | H | I | | Η | | I | I | I | I | Ι | N | | | | |
| H/M/L indic | ates ! | Streng | th of C | orrelati | ion | H- H | igh, M | - Medi | ım, L-L | ow | | - | | 1 | | |
| Category | Basic Sciences | Engineering Sciences Engineering Sciences Humanities and Social Sciences Program Electives Open Electives Practical / Project Internships / Technical Skill Soft Skills | | | | | | | | | | | | | | |
| | | | | | | | \mathbf{r} | | | | | | | | | |



BEE18L03 ELECTRICAL MACHINES - II LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

- 1. Regulation of Three Phase Alternator By EMF and MMF Methods
- 2. Regulation of Three Phase Alternator By ZPF and ASA Methods
- 3. Load Test on Three Phase Alternator
- 4. Synchronizing and Parallel operation of Alternators
- 5. Performance Characteristics Of Synchronous Motor (V And Inverted V Curve)
- 6. Load Test on Three Phase Induction Motor
- 7. No load and blocked rotor test on three-phase induction motor
- 8. Load Test on Single Phase Induction Motor
- 9. Speed Control of Three Phase Induction Motor
- 10. Determination of Basic Step Angle Measurement Of Stepper Motor
- 11. Determination of the Characteristics of Repulsion Motor
- 12. Determination of the Characteristics of Universal Motor

Total No. of Hours: 45



| Subje Code: BEE1 | ct 8L04 | | Subject MEA | Name: SUREME | AB | TY / LB/ ETL | L | T / S.Lr | P/ R | С | | | | | | |
|------------------------|---|---|--|-----------------|--------------|--------------------|-----------------------|---------------------|----------------------------------|-------------|------------|----------|--------|---------|--------|---------|
| | | | Prerequ | isite: BEE | 18004 | | | | | | | L | 0 | 0/0 | 3/0 | 1 |
| L:Le | cture ' | T : 1 | Futorial | SLr : Supe | ervised | Lear | ning | P: Pr | oject R | R : Rese | earch C | : Credit | s | | | |
| T/L/E | TL : 7 | Theo | ory/Lab/E | Embedded 7 | Theory a | and L | ab | | | | | | | | | |
| OBJE | CTIV | /E: | | | | | | | | | | | | | | |
| | • | To | understa | nd the Meas | sureme | nt and | d co | ntrol c | oncepts | 5 | | | | | | |
| | • | Stu | dents wil | l obtain kn | owledg | e abo | ut di | ifferen | t types o | of Tran | sducers | , bridge | es and | its cha | racter | istics. |
| | • | То | calibrate | energy m | eters in | i sing | gle p | hase, | three p | hase ar | nd mea | sure the | e pow | ver, ir | on los | s and |
| | | power factor. To familiarize the students with the measurement of low resistance, inductance and capacitance | | | | | | | | | | | | | | |
| | • | To familiarize the students with the measurement of low resistance, inductance and capacitance factor using simulation package such as LARVIEW (MATLAR etc. | | | | | | | | | | | | | tance- | |
| COLU | | tact | factor using simulation package such as LABVIEW /MATLAB etc. | | | | | | | | | | | | | |
| COUR CO1 | KSE (| | TCOMES (Cos): (3-5) | | | | | | | | | | | | | |
| | Stud | ents | ts get familiarized about different types of Transducers, bridges and its characteristics. | | | | | | | | | | | | | |
| CO2 | Und | ersta | ands the concept of calibration of energy meters in single/three phase and measure the power | | | | | | | | | | | | | er |
| CO3 | The | e students gets familiarized with the measurement of low resistance, inductance and capacitance- | | | | | | | | | | | | | | |
| ~~ . | facto | actor using simulation packages etc. | | | | | | | | | | | | | | |
| CO4 | O4 Attained knowledge on P/I and I/P Converters | | | | | | | | | | | | | | | |
| CO5 | Atta | ined | l knowled | lge on Sma | rt Tran | sduce | ers | | | | | | | | | |
| Марр | ing of | f Co | urse Ou | tcomes wit | h Prog | ram | Out | comes | (POs) | | | | | | | |
| COs/I | POs | | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PC | 011 | PO12 |
| CO1 | | | Μ | L | H | N | 1 | H | Μ | Н | Μ | H | Μ |] | Η | H |
| CO2 | | | Μ | L | Μ | H | [| H | H | H | Μ | Μ | L |] | Η | Μ |
| CO3 | | | L | Μ | H | H | [| Η | H | H | H | H | H |] | Η | L |
| CO4 | | | Μ | H | Η | H | [| Η | Н | Η | Η | H | H |] | I | Μ |
| CO5 | | | Η | Μ | Η | H | [| H | L | H | L | Н | Μ |] | I | Μ |
| Cos /] | PSOs | | PS | 501 | PS | SO2 | | PS | 03 | PS | 04 | PS | SO5 | | | |
| CO1 | | | 1 | М | | H | | I | I | I | I |] | H | | | |
| CO2 | | |] | H | | H | | I | I | ŀ | I |] | H | | | |
| CO3 | | |] | H | | H | | ł | I | ŀ | I |] | H | | | |
| CO4 | | |] | H | | H | | H | I | I | I |] | H | | | |
| CO5 | | | | L | | M | | H | M | | 1 |] | H | | | |
| H/M/L | /L indicates Strength of Correlation H- High, M- Medium, L-Low | | | | | | | | | | | | | | | |
| Category | Basic Sciences Engineering Sciences Humanities and Social Sciences | | | | Program Core | Program | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | | | | |
| | | | | | ~ | | | | | | | | | | | |



BEE18L04 MEASUREMENT AND INSTRUMENTATION 0 0/0 3/0 1 LABORATORY

LIST OF EXPERIMENTS:

- 1. Study of temperature measuring transducers (Thermocouples).
- 2. Study of displacement and pressure transducers (LVDT)
- 3. Measure the stress and strain using strain gauge.
- 4. AC Bridges.
- 5. DC Bridges.
- 6. Calibration of Single phase Energy meter.
- 7. Calibration of Three-phase Energy meter.
- 8. Measurement of Three-phase power and power factor.
- 9. Hall effect transducer.
- 10. Characteristic of LDR, Thermistor and thermocouple.
- 11. Ramp response characteristic of filled in system thermometer.
- 12. P/I and I/P converters.
- 13. Study of smart transducers

Total No of Hours: 45


| Subject Code: BEC18IL | .5 | Subject COMM | Name: SIG UNICATI(isite: Basic | NAL DN LA | PRC AB rical | OCES | SING | AND | σ | | TY LB/ ET | /] / L | | T / S.Lr | P / R 3/0 | C |
|-----------------------------|----------|------------------------|--|--------------|--------------------|--------------|--------------|--------------|------------|------------|-----------------|----------------|------|-------------|-----------------|------|
| T T | - | Trerequ | | . Encu | 1 ICai | <u>.</u> | | | 5 | 1.0 | | | 0 | 0/0 | 5/0 | 1 |
| L: Lectur | e T : | Tutorial | SLr : Sup Emboddod 7 | ervised | d Lea | rning Lob | P : F | Project R | : Resea | rch C: | Credits | | | | | |
| OBIECT | IVE. | 01 y/ La0/1 | | neory | anu | Lau | | | | | | | | | | |
| ODJECT | • | Analyze a | nd impleme | ent dio | rital s | ional | nroce | essing svs | tems in | time d | omain | | | | | |
| | • I | Understan | nd the implement | ementa | tion of | of the | DFT | in terms | of the F | FT as | well as | som | ne o | f its ar | nlicat | tion |
| | • 1 | Use MAT | LAB for D | SP svs | tem : | analy | sis and | d design | or the r | 1 1, us | wen us | 5011 | | 1 115 up | prica | lion |
| | • 1 | Fo impler | nent the var | ious a | nalos | y and | digita | il modula | tion and | demo | dulation | ı Tea | chni | iques | | |
| | • 5 | Students y | will be able | to det | ermi | ne the | e suita | bility of | a partici | ilar coi | nmunia | ratio | n sy | vstem | to a g | iven |
| | r | problem. | | | ••••• | | | .011109 01 | a puiro | | | | | , | | |
| COURSE | | TCOME | S (Cos): (3 | -5) | | | | | | | | | | | | |
| CO1 | | Acquired | l knowledge | e DFT | and | FFT | | | | | | | | | | |
| CO2 | | Ability to | o design lin | ear dig | gital f | filters | both | FIR and 1 | IIR usin | g diffe | rent tec | hniq | lues | • | | |
| CO3 | | Ability to | o understan | d the c | conce | pt of | Multi | -rate sign | al proce | essing a | and sam | ple | rate | conve | ersion | |
| CO4 | | Acquired | cquired knowledge of analog and digital communication. | | | | | | | | | | | | | |
| CO5 | | Acquired | cquired knowledge different Modulation Techniques. | | | | | | | | | | | | | |
| Mapping | of C | ourse Ou | tcomes wit | th Pro | gran | ı Out | come | s (POs) | - | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | P | 04 | PO5 | PO6 | PO7 | PO8 | PO9 | PO | 10 | POI | 1 P | 012 |
| CO1 | | Μ | H | H | Ι | M | Η | H | Η | Μ | H | N | M | H | | L |
| CO2 | | Μ | H | H | I | M | Μ | Μ | Μ | Μ | H | ł | H | H | | L |
| CO3 | | L | M | M |] | Ĺ | H | H | H | H | H | ŀ | H | H | | L |
| CO4 | | Μ | L | L | I | M | H | H | H | H | H | H | I | H | | H |
| CO5 | <u>,</u> | L | M | M | | M | <u>H</u> | | H | M | H | | | H | | L |
| Cos / PSC |)s | PS | <u>501</u> | P | <u>802</u> | | P | <u>803</u> | PS | 04 | P | <u>505</u> | | | | |
| | | | L T | | | | | H H | l T | 1 T | | <u>H</u> 11 | | | | |
| C02 | | ז | | | | | | H M | | 1 Л | | <u>н</u> u | | | | |
| CO4 | | <u>ו</u> ז | M | | M | | | L | | / 1 | | <u>н</u> Н | | | | |
| CO5 | | <u>ו</u> ן | M | | L | | | M | | <u></u> | | M | | | | |
| H/M/L inc | licate | es Strengt | h of Correla | ation | H- H | High. | M- M | ledium. L | Low | - | | | | | | |
| | SS | | | Φ | | sə | | E | 2011 | | | | | | | |
| ~ | ence | gu | es al | Cor | | ctiv | | os/ Sk | s | | | | | | | |
| gor | Sci | eri es | niti oci: ces | Ш | В | Ele | al | shif ical | kill | | | | | | | |
| ate§ | sic | gine | mai I S. ien(| gra | gra | en] | ctic | stras | ît Sl | | | | | | | |
| Ü | Bas | En _{ Sci | Hu and Sc | Pro | Pro | Op | Pra | Inte Tec | Sof | | | | | | | |
| | | | | | | | \mathbf{r} | | | | | | | | | |



BEC18IL5 SIGNAL PROCESSING AND COMMUNICATION LAB 0 0/0 3/0 1

LIST OF EXPERIMENTS

SIGNAL PROCESSING :

- 1. Implementation of Sampling & Waveform Generation
- 2. Implementation of FIR & IIR Filters
- 3. Implementation of Fast Fourier Transforms
- 4. Implementation of Adaptive Filters
- 5. Implementation of Multirate Signal Processing Measurement on Signal Parameters in Time Domain & Frequency Domain.
- 6. Representation of Time Series; Computation Of Convolution Using Matlab
- 7. DFT Computation Using Matlab
- 8. Computational Experiments With Digital Filtering DSP Using Matlab

COMMUNICATION :

- 1. Design and Testing of Amplitude Modulation
- 2. Design and Testing of Amplitude Demodulation
- 3. Design and Testing of Frequency Modulation
- 4. Design and Testing of Frequency Demodulation (Any One Method)
- 5. Design and Testing of Pulse Amplitude Modulation & Demodulation
- 6. Design and Testing of ASK, FSK and PSK
- 7. Study of Line Coding and Decoding Techniques
- 8. Study of Sampling
- 9. Study of Pulse Code Modulation

Total No.of Hours: 45



| Subject Code: BEE18TS1 | Subj Softv | ect Nam vare Pac | e: TE(kages) | CHNI) | CAL | SKIL | L 1(Co | omputer | | TY / LB/ ETL | L | T / S.Lr | P/ R | C | |
|------------------------------|----------------------|--|------------------|-----------|---------|---------|----------|----------|---------|--------------------|-------|-------------|---------|-----|--|
| | Prer | equisite: | - | | | | | | | ETL | 0 | 0/0 | 3/0 | 1 | |
| L : Lecture T : | Tutoria | l SLr: | Super | vised | Learr | ning P | : Proje | ct R : R | esearch | n C: Cre | dits | | | | |
| T/L/ETL : The | ory/Lat | /Embed | ded Th | eory a | and L | ab | | | | | | | | | |
| • T | • 1e obie | ctive is t | o dev | elop t | he te | chnica | ıl skill | of the s | tudent | s | | | | | |
| COURSE OU | TCOM | ES (Cos | s): (3-5 | 5) | | | | | | | | | | | |
| CO1 | Deve | lop the | techni | cal sl | cills 1 | require | ed in th | e field | of stud | y | | | | | |
| CO2 | Brid | ge the g | ap bet | ween | the s | kill re | quirem | ents of | the en | nployer | or in | dustry | and | the | |
| | com | betency | of the | stude | ents. | | | | | | | | | | |
| CO3 | Enha | nce the | emplo | oyabil | ity o | f the s | tudents | 5. | | | | | | | |
| Mapping of C | Course (| rse Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 | | | | | | | | | | | | | |
| COs/POs | PO1 | D1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 H H H H H M M H M H | | | | | | | | | | | | | |
| CO1 | Η | H H H H H H M I | | | | | | | | | Μ | | H | Μ | |
| CO2 | H | Н | Μ |] | H | Η | Н | Μ | Μ | Н | Η | | H | Η | |
| CO3 | H | Н | H |] | H | Η | Н | Μ | Μ | Н | Η | | H | Н | |
| Cos / PSOs | Р | 501 | I | PSO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | H | | Η | | I | I | H | I |] | H | | | | |
| CO2 | | H | | Η | | I | I | H | I |] | H | | | | |
| CO3 | | H | | Η | | ŀ | I | H | I |] | H | | | | |
| CO4 | | H | | H | | I | I | H | ł |] | H | | | | |
| H/M/L indicat | es Stren | gth of C | orrelat | ion | H- Hi | gh, M- | · Mediu | ım, L-Lo | ow | | | | | | |
| Category | Engineering Sciences | Engineering Sciences Engineering Sciences Humanities Humanities Humanities Hogram Core Sciences Sciences Sciences Sciences Sciences Soft Skills Internships / Technical Skill Internships / Technical Skills | | | | | | | | | | | | | |



| Subject Code: BEN18SK1 | | Subjec Confid | et Name lence B | e: SOF Juilding | T SK g) | KILL | -I ((| Career | · & | | TY / LB/ ETL | L | T / S.Lr | P / R | C |
|------------------------------|-------------------|----------------------|--|--------------------|-------------------|------------------|---------------------|---------------------------------|-------------|------------|--------------------|------------|-------------|----------|--------|
| T. J. L. a. star and T | · | Prereg | uisite: | - C | | T | | . D | | 1 | | 1.40 | 0/0 | 3/0 | |
| L: Lecture I | | utoriai | SLT: Embody | Superv | vised | Lear | ning P | : Proje | ect K : F | Research | n C: Cre | alts | | | |
| | F. | y/La0/. | Lindeu | | cory a | | au | | | | | | | | |
| • T | г. Го с | reate av | wareneo | ss in st | udent | s var | ious to | n com | nanies h | elning t | hem im | nrove | their sl | cill set | t |
| r | natr | ix. lead | ling to | develo | o a po | s, vai sitive | e frame | e of mi | nd. | ciping (| | prove | then si | | - |
| • 7 | Го h | elp stu | dents b | e aware | e of v | ariou | s techn | iaues o | of candid | late rec | ruitmen | t and | help the | em pre | epare |
| | CV's | s and re | esume. | | | | | 1 | | | | | 1 | I | 1 |
| •] | Гo h | elp stu | dent ho | w to fa | .ce va | rious | types | of inter | view, pi | reparing | g for HR | , tech | nical in | tervie | ws. |
| •] | Гo h | elp stu | dents ir | nprove | their | verb | al read | ing, na | rration a | and pres | entatior | ı skill | s by per | forms | \$ |
| V | varic | ous mo | ck sessi | ons. | | | | | | | | | | | |
| COURSE O | UT | COME | ES (Cos |): (3-5 |) | | | | | | | | | | |
| CO1 | | Be awa | are of v | arious | top co | ompa | nies lea | ading to | o improv | vement | in skills | amo | ngst the | m. | |
| CO2 | | Be awa | are of v | arious | candi | idate | recruit | ment to | echnique | es like g | group di | scuss | ion, inte | erview | /s and |
| GOA | | be able | to prep | bare CV | √'s ar | nd res | sumes. | 1 | | 1.0 | UD | | | | |
| CO3 | | Prepare | epare for different types of interviews and be prepared for HR and technical interviews. | | | | | | | | | | | | |
| | - | Improv | prove their verbal, written and other skills by performing mock sessions. | | | | | | | | | | | | |
| Mapping of | Cou | irse Oi | utcome | s with | Prog | ram | Outco | mes (P | Os) | - | · · · · · · | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | L | L | L | I | | L | M | Μ | H | Μ | H | N | 1 | Н |
| CO2 | | L | L | L | I | | L | M | Μ | H | Μ | Η | N | 1 | H |
| CO3 | | L | L | L | I | | L | M | Μ | H | Μ | H | N | 1 | H |
| CO4 | | L | L | L | I | | L | Μ | Μ | H | Μ | H | N | 1 | H |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
| CO1 | | L | 4 | | L | | ł | I | l | | | | | | |
| <u>CO2</u> | | L | 4 | | L | | H | <u>I</u> | I | |] | | | | |
| <u>CO3</u> | | | / | | | | <u> </u> | <u> </u> | | | | | | | |
| | | L C(marked | $\frac{1}{1}$ | 1 | L | | 1 1. N | 1 M. 15 | | | | 4 | | | |
| H/M/L indica | ates | Streng | th of Co | orrelati | on . | H- H | ign, M· | | um, L-L | ow | | | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic: Skill | Soft Skills | | | | | | |
| | | | \mathbf{r} | | | | | | | | | | | | |



BEN18SK1 SOFT SKILL - I (Career and Confidence Building) 0 0/0 3/0 1

UNIT I

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

UNIT II

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

UNIT III

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

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

UNIT V

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 No. of Hours: 30

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| Subject Code: | 5 | Subjec | et Nam | e: PO | WER | SYS | ГЕМ - | · II | | | TY/ | L | T/ S.Lr | P/ R | C | |
|------------------|----------------|----------------------|--|------------------|-------------------|----------------|---------------------|--------------------------------|----------------------|------------|----------|------------|------------|---------|------|--|
| BEE18007 | | | | | | | | | | | ETL | | 5.11 | | | |
| |] | Prerec | uisite: | Basic | Elect | trical | & Ele | ctroni | cs Engg | 5, | Т | 3 | 1/0 | 0/0 | 4 | |
| |] | BEE18 | 3006 | | | | | | | | | | | | | |
| L : Lecture 7 | [: Tı | utorial | SLr: | Super | vised | Learr | ning P | : Proje | ect \mathbf{R} :] | Researc | h C: Cre | edits | | | | |
| T/L/ETL : T | heory | y/Lab/ | Embed | led Th | leory | and L | ab | | | | | | | | | |
| OBJECTIV | E: | • 1 | 1 1 | 1 | 1 | ı · | | 1 0 | D 1 | | | | | | | |
| • | Toatt | ain kn | owledg | e abou | it the | basic | princip | ples of | Relay | | | | | | | |
| • | IOKI Toot | now at | sout the | appar | atus p | brotect | lion | Cinoni | t huaalra | *** | | | | | | |
| • | 10 at To m | lani Ki vodal ti | ho pow | ge on i | | mpon | elays, | Circui | l Dieake | 18 | | | | | | |
| COURSEO | | | ES (Cos) |)• (3 -5 | 6111 CC 5) | mpon | lents | | | | | | | | | |
| CO1 | | Ability | to wor | k on R | elav | | | | | | | | | | | |
| CO2 | | Attaine | ed knov | ledge | on th | e prot | ection | of Ap | oaratus | | | | | | | |
| CO3 | | Ability | to wor | k on N | Jumer | rical R | elays | | | | | | | | | |
| CO4 | 1 | Ability | to desi | gn Cir | cuit b | oreake | rs | | | | | | | | | |
| CO5 | 1 | Ability | to mod | lel Pov | wer S | ystem | Comp | onents | | | | | | | | |
| Mapping of | Cou | rse O | e Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| CO1 | | Н | Н | Н | I | H | L | Н | Н | L | Н | Н | E | [| Н | |
| CO2 | | Μ | Μ | Н | I | N | L | Μ | Μ | L | Η | Μ | N | 1 | Н | |
| CO3 | | Μ | Μ | Μ | Ι | N | Μ | Μ | Μ | Μ | L | Μ | N | 1 | Μ | |
| CO4 | | Η | L | Μ |] | H | Μ | H | Η | Μ | Μ | Η | I | 4 | Μ | |
| CO5 | | Μ | Μ | L | Ν | N | Μ | Μ | Μ | Μ | H | Μ | N | 1 | L | |
| Cos / PSOs | | PS | 01 | P | PSO2 | | PS | 03 | PS | 504 | PS | 05 | | | | |
| CO1 | | H | I | | L | | ŀ | H | I | М | Ι | N | | | | |
| CO2 | | N | 1 | | L | | N | Λ | | L |] | H | | | | |
| CO3 | | N | 1 | | Μ | | N | Λ | 1 | M | Ι | M | | | | |
| CO4 | | <u> </u> | l r | | M | | I | <u>I</u> | 1 | M | | | | | | |
| CO5 | 2422 | N. | 1 th of C | | M | | N ah M | Madi | | M | 1 | VI | | | | |
| H/M/L indic | ates | Streng | | orrelat | ion | H- H1 | gn, M | | um, L-L | LOW | | 1 | | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic Skill | Soft Skills | | | | | | | |
| | | | | \mathbf{i} | | | | | | | | | | | | |



BEE18007

POWER SYSTEM - II

UNIT I RELAYS

Operating Principles of relays - Common relay terms - Universal Torque Equation.– Electromagnetic relays, Induction relays – Over current relays - Directional, Distance, Differential and negative sequence relays

UNIT II APPARATUS PROTECTION

Generator Protection - Motor protection - Bus bar protection and Transmission line and Feeder protection - CT and PT protection

UNIT III STATIC AND NUMERICAL RELAYS

Static relays - components of static relays – over current relays, differential protection and distance protection – Microprocessor based relays - Block diagram of Numerical relays

UNIT IV CIRCUIT BREAKERS

Arc phenomena – arc interruption – Current zero interruption theories – recovery voltage and restriking voltage - RRRV – current chopping – Resistance switching- Various types of circuit breakers – selection and Testing of circuit breakers – Fuses – HRC fuses

UNIT V MODELLING OF POWER SYSTEM COMPONENTS

Modern Electric Power System and its component -Modelling of Generator, Transformer, Transmission System and Load Representation in Single line diagram – per phase and per unit representation – change of base - Analysis for system planning and operational studies

Total No. of Hours: 60

TEXT BOOKS:

- 1. V. K. Mehta, "Principles of Power Systems", S. Chand, New Delhi, 2005
- 2. S.N. Singh, 'Electric Power Generation, Transmission and Distribution', Prentice Hall of India Pvt. Ltd, New Delhi, 2002
- 3. Ravindranath, B. and Chander, N. (1997) Power System Protection and Switchgear, Wiley
- 4. Chakrabarti, A. Soni, M.L.Gupta, P.V. Bhatnagar, U.S. (2002) A Text Book on Power System Engineering. Dhanpat Rai & Co. Pvt. Ltd

REFERENCE BOOKS:

- 1. Patra, S.P. Basu, S.K. and Chowduri, S. (1983) Power systems Protection. Oxford and IBH
- 2. Sunil S. Rao, (1986) Switchgear and Protection. New Delhi: Khanna Publishers
- 3. Central Electricity Authority (CEA), 'Guidelines for Transmission System Planning', New Delhi

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| Subject Code: | | Subje | et Namo | e: CO | NTR | OL S | YSTE | Μ | | | TY/ | L | T/ SLr | P/ R | C | |
|------------------|--------------|---------------------|---|-------------|--------------|--------------|----------------|-----------------------|-----------------------|------------|------------|------------|-----------|---------|------|--|
| BEE18008 | | | | | | | | | | | ETL | | 5.11 | | | |
| | | Prerec | uisite: | BMA1 | 18001 | , BM | A1800 | 3, BEI | E18002 | | Т | 3 | 0/0 | 0/0 | 3 | |
| L : Lecture | T:T | utorial | SLr: | Super | vised | Learr | ning P | : Proje | ect R: | Researc | h C: Cre | dits | | | | |
| T/L/ETL : 7 | Theor | y/Lab/ | Embedo | ied Th | neory | and L | ab | | | | | | | | | |
| OBJECTIV | VE: | | | | | | | | | | | | | | | |
| • | Und | erstand | the bas | sic con | npone | ents of | f contro | ol syste | ems | | | | | | | |
| • | Capa | able to | solve p | roblen | ns in t | ime d | omain | & free | luency of | lomain | | | | | | |
| • | Unde | erstand | the fre | quency | y resp | onse | tor the | stabili | ty of the | e systen | 1 | | | | | |
| • | Und | erstand | the cor | icept c | of Coi | npens | sators | | | | | | | | | |
| | | erstand | the Sta | te spa | ce An | alysis | s of dif | ferent | variable | S | | | | | | |
| COURSE C | | COMI The st | <u>15 (Cos</u> |): (3-3 |) tond t | haha | i | | to of co | nteal ar | stoma | | | | | |
| | | $\frac{1}{1}$ ne su | | indersi | | ne bas | | nponen | $\frac{115}{1}$ of co | ntroi sy | stems. | | 1 · | | | |
| CO2 | | The stu | udents a | re cap | able t | o solv | e prot | olems 1 | n time d | lomain | & freque | ency of | lomain | | | |
| CO3 | | The stu | udents u | inderst | tand t | he fre | quency | y respo | nse for | the stab | ility of t | he sy | stem. | | | |
| CO4 | | The stu | udents u | inderst | tand t | he cor | ncept c | of Com | pensato | rs | | | | | | |
| CO5 | | The stu | the students understand the State space Analysis of different variables | | | | | | | | | | | | | |
| Mapping of | f Cou | ırse O | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | .0 PO | 11 | PO12 | |
| CO1 | | Η | Н | Μ |] | H | Η | Μ | Μ | L | Μ | Μ | I | I | L | |
| CO2 | | Η | Μ | Η |] | H | Η | Μ | Н | Μ | Μ | Μ | I | I | L | |
| CO3 | | Η | Н | Η |] | H | Η | Η | Н | L | Μ | Η | I | I | Μ | |
| CO4 | | Μ | Н | L | Ι | Ν | L | L | L | L | Μ | L | I | | L | |
| CO5 | | Η | Н | Η |] | H | Η | L | L | L | Μ | L | I | I | Μ | |
| Cos / PSOs | ; | PS | 01 | P | PSO2 | | PS | 03 | PS | 504 | PS | 05 | | | | |
| CO1 | | H | I | | Η | | I | H | I | М | I | I | | | | |
| CO2 | | H | I | | Η | | I | H |] | H | I | I | | | | |
| CO3 | | H | I | | Η | | I | H | I | М | H | I | | | | |
| CO4 | | Ι | | | L | | Ν | N | | L | N | 1 | | | | |
| CO5 | | M H H M | | | | | | | | | H | I | | | | |
| H/M/L indi | cates | Streng | th of Co | orrelat | ion | H- Hi | gh, M | - Medi | um, L-L | JOW | | <u> </u> | | r — | | |
| | s | ciences | trength of Correlation H- High, M- Medium, L-Low | | | | | | | | | | | | | |
| Category | asic Science | ngineering S | umanities ocial Scienc | rogram Core | rogram Elect | pen Elective | ractical / Pro | ternships / 7 kill | oft Skills | | | | | | | |
| | <u> </u> | Щ | Ϋ́ς Ν | √ ₽ | 4 | C | | Ir | S | | | | | | | |



BEE18008 CONTROL SYSTEM 3 0/0 0/0 3

UNIT I INTRODUCTION TO CONTROL SYSTEMS COMPONENTS

Open and closed loop Systems -mathematical models of physical systems-differential equations-transfer function-armature control-field control-block diagram reduction-signal flow graphs

UNIT II TIME RESPONSE ANALYSIS

Standard test signals-time response of first order - second order systems-steady state errors and error constants

UNIT III FREQUENCY RESPONSE AND CONCEPT OF STABILITY

Bode plot, polar plot, Nyquist stability - Concept of stability-necessary conditions- Hurwitz stability criterion-Routh stability criterion-relative stability analysis.

UNIT IV INTRODUCTION TO DESIGN OF COMPENSATORS

Realization of basic compensators-lag, lead, lag-lead. Introduction to P, PI, PD, PID controllers, tuning of PID controllers

UNIT V STATE SPACE REPRESENTATION

Concept of state- State Variable-State Equations- Sampling theorem- Controllability and observability

Total No. of Hours: 45

TEXT BOOKS:

- 1. Nagrath, L.J. Gopal, M. Control System Engineering.4th Ed. New age International (P) Ltd Publishers.
- 2. Ogata, K. Modern Control Engineering-analysis of system dynamics, system design using Root Locus. 4th Ed. Prentice Hall for practice and solutions.

REFERENCE BOOKS:

1. www.GaliLMc.com - GALIL we move the world-featured tutorials – motion controllers, tuning servo systems, adjustment of PID filter.

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| Subject Code: BEE18ET2 | | Subjec | t Nam DESI | e: GN OH | FELI | ECTF | RICAL | MAC | HINES | 5 | TY / LB/ ETL | L | T / S.Lr | P/ R | C | |
|------------------------------|----------------|----------------------|---|--------------|-------------------|----------------|---------------------|---------------------------------|-------------|---------|--------------------|---------|-------------|---------|--------|--|
| | | Prerec | uisite: | BEE1 | 8002, | BEE | 18005 | | | | ETL | 1 | 0/1 | 3/0 | 3 | |
| L : Lecture T | : T | utorial | SLr : | Super | vised | Lear | ning P | : Proje | ect R:] | Resear | ch C: Cr | edits | 1 | | | |
| T/L/ETL : Th | eor | y/Lab/ | Embed | ded Th | eory | and L | lab | | | | | | | | | |
| • | ш. Т | he grad | luate w | ill be c | anabl | le of d | lesigni | ng the | transfor | mers | | | | | | |
| • | Т | o unde | rstand t | he des | ignin | g the | rotor b | ars & s | slots. | | | | | | | |
| • | Т | he grac | luate w | ill be c | apabl | le of o | designi | ng mao | chine pa | ramete | ers relate | d to th | ne Indus | trial n | eeds. | |
| • | Т | he grac | luate w | ill be c | apabl | le of o | lesigni | ng the | Electric | al mac | chines | | | | | |
| • | Т | o unde | rstand t | he cha | racter | ristics | like sp | beed, to | orque et | c. of d | ifferent e | lectric | cal macl | nines. | | |
| COURSE O | UTO | Come | <u>LS (Cos</u> | 5): (3-5 |) a tha i | tuonof | | | | | | | | | | |
| | | | | signing | g the | r hore | ormers | ota | | | | | | | | |
| 02 | | Abinty | to des | agn the | 2 1010 | | and si | ots | | | | | | | | |
| CO3 | | Capabl | e of de | signing | g mac | hine | parame | ters re | lated to | the In | dustrial n | eeds. | | | | |
| CO4 | | Famili | ar with | design | ofE | lectric | cal mac | chines | | | | | | | | |
| CO5 | | Unders | nderstand the characteristics like speed, torque etc. of different electrical machines se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| Mapping of | Cor | irse O | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| CO1 | | M | <u>M</u> | M | | H | M | M | H | H | H | M | <u> </u> | I | H | |
| CO2 | | H | <u>H</u> | H | 1 | | | M | H | M | | | | 1 | M | |
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| Cos / PSOs | | - II PS | <u></u> 01 | P | SO2 | | PS | 03 | PS | 504 | PS | 505 | I . | | 11 | |
| CO1 | | N | 1 | | M | | N | 1 | 1 | M | | H | | | | |
| CO2 | | H | [| | Η | | ł | ł | I | М | | L | | | | |
| CO3 | | N | 1 | | Μ | | Ν | 1 |] | H | | L | | | | |
| CO4 | | H | [| | Μ | | N | <u>/</u> | 1 | M |] | H | | | | |
| CO5 | | <u> </u> | | 1 / | H | | <u>I</u> | H I | | M | | L | | | | |
| H/M/L indica | ites | Streng | rg C | orrelat | lon | <u>н- н</u> | ign, M | - Medi 'ਚ | um, L-L | LOW | | | | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities ar Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic. Skill | Soft Skills | | | | | | | |
| | | | | \mathbf{k} | | | | | | | | | | | | |



BEE18ET2 DESIGN OF ELECTRICAL MACHINES 1 0/1 3/0 3

UNIT I INTRODUCTION

Major considerations – Limitations – Space factor temperature gradient – Heat flow in two dimensions – Thermal resistivity of winding – Temperature gradient in conductors placed in slots

UNIT II DC MACHINES

Magnetic circuit calculations –Net length of Iron –Real & Apparent flux densities– D.C machines output equations –Design of shunt and series field windings– Design of Commutator and brushes.

UNIT III TRANSFORMERS

KVA output for single and three phase transformers – Window space factor – Temperature rise of Transformers – Design of Tank with & without cooling tubes – Conservator- Breather

UNIT IV INDUCTION MOTORS

Magnetic leakage calculations – Leakage reactance of poly-phase machines- Output equation of Induction motor — circle diagram – Dispersion co-efficient – relation between D & L for best power factor.

UNIT V SYNCHRONOUS MACHINES

Runaway speed – construction – output equations – choice of loadings – Design of salient pole machines – Short circuit ratio – Introduction to computer aided design – Program to design main dimensions of Alternators.

Total No. of Hours: 45

TEXT BOOKS:

1. Sawhney, A.K. Dhanpat Rai & Sons, (1984) A Course in Electrical Machine Design. New Delhi:

REFERENCE BOOKS:

1. Sen, S.K. (1987) Principles of Electrical Machine Designs with Computer Programmes. New Delhi: Oxford and IBH Publishing Co. Pvt. Ltd.



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| Subject | | Subjec | t Nam | e: ELF | ECTR | ONI | CS LA | В | | | TY/ | L | T/ SIr | P/ P | C | |
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| BEE18L05 | | | | | | | | | | | ETL | | 5.11 | N | | |
| | | Prerec | uisite: | BEE18 | BET1 | , BEI | E 1800 1 | L | | | L | 0 | 0/0 | 3/0 | 1 | |
| L : Lecture 7 | : T | utorial | SLr: | Super | vised | Lear | ning P | : Proje | ect R : H | Researc | h C: Cre | dits | | | | |
| T/L/ETL : T | heor | ry/Lab/ | Embed | ded Th | eory a | and L | ab | - | | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | | |
| • ' | Fo k | cnow th | e basic | knowl | edge | of log | gic gate | es 1 | . . | | | | | | | |
| • | Desi | ign kno | wledge | on imp | pleme | entati | on of E | soolean | flim flo | on | | | | | | |
| • | Stud | lents ab | ole to de | esign C | ounte | rs, K | egister | s using | IIIp-IIO | ps IDI | | | | | | |
| | διμα Γο ε | tudy al | quit mu | ltinley | ige ill ers an | prog id dei | multinl | ng or v evers | ernog r | IDL | | | | | | |
| COURSE O | | | CS (Cos | (3-5) |) | | nunipi | CACIS | | | | | | | | |
| CO1 | | Unders | stand th | e basic | conc | epts | of logi | c gates | | | | | | | | |
| CO2 | | Familia | arizatio | n to the | e Desi | ign a | nd imp | lement | ation of | Boolea | n Funct | ion | | | | |
| CO3 | | Unders | stand ab | out Co | ounter | s, Re | gisters | using | flip-flop | S | | | | | | |
| CO4 | | Unders | stand th | e conc | epts in | n pro | gramm | ing of | verilog | HDL | | | | | | |
| CO5 | | Capabl | e to un | derstan | d abc | out m | ultiple | xers an | d demul | tiplexer | ſS | | | | | |
| Manning of | Col | urse Oi | Dutcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | | PO1 | Dutcomes with Program Outcomes (POs)PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12 | | | | | | | | | | | | | |
| CO1 | | H | H | Η | H | I | Μ | Μ | Μ | Н | Н | Μ | Ι | | Μ | |
| CO2 | | Μ | Μ | Μ | N | /I | Η | Н | Μ | Μ | Μ | L | Ν | 1 | Η | |
| CO3 | | Н | Н | Η | N | ſ | Μ | Μ | Н | Η | Μ | Η | Ν | 1 | L | |
| CO4 | | Н | Н | Μ | N | 1 | L | L | Μ | Η | Μ | Μ | H | I | Μ | |
| CO5 | | Μ | Μ | Μ | N | / | L | Μ | Μ | Η | Μ | L | N | 1 | Μ | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | H | [| | Η | | Ν | Л |] | L | Ν | / | | | | |
| CO2 | | N | 1 | | M | | <u> </u> | I | I | <u> </u> | I | I | | | | |
| <u>CO3</u> | | <u> </u> | | | M | | N | <u>/</u> | | <u>/ </u> | | | | | | |
| C04 | | <u>ון</u> נו | L | | M | | | <u>.</u> | | <u>1</u> | | / <u>1</u> / | | | | |
| H/M/L indic | ates | Streng | th of Co | orrelati | on] | H- H | igh M | - Mediı | ım L-L | ow. | I | 1 | | | | |
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BEE18L05

ELECTRONICS LAB

0 0/0 3/0 1

LIST OF EXPERIMENTS

- 1. Study of Logic Gates & Digital Logic families
- 2. Implementation of Boolean functions
- 3. Conduct an Experiment on Adders & Subtractors
- 4. Construct Multiplexers and de-multiplexers
- 5. Study of Flip-flops
- 6. Study of Registers
- 7. Study of Counters
- 8. Implementation of any general combinational / sequential logic circuits
- 9. Characteristics of Semiconductor diode and Zener Diode
- 10. Characteristics of JFET
- 11. Characteristics of UJT and Generation of saw tooth waveforms
- 12. Design and Testing of RC Phase shift, LC Oscillators
- 13. Single phase half wave and full wave rectifiers with inductive and capacitive filters
- 14. Differential amplifiers using FET
- 15. Astable and Monostable Multivibrators

Total No. of Hours: 45



| Subject Code: | | Subje | et Nam | e: CON | NTRO | DL SY | YSTE | M LAF | 6 | | TY / LB/ | L | T / S.Lr | P / R | C |
|------------------|-------|------------|--|------------------|----------|--------|----------|--------------|----------|---------|-------------|------|-------------|----------|---|
| BEE18L06 | 6 | | | | | | | | | | ETL | | | | |
| | | Prerec | uisite: | BEE18 | 8002, 1 | BEE | 18005 | | | | L | 0 | 0/0 | 3/0 | 1 |
| L : Lecture | T : 1 | Futorial | SLr : | Superv | vised I | Learr | ning P | : Proje | ct R : F | Researc | h C: Cre | dits | | | |
| T/L/ETL : 7 | Theo | ry/Lab/ | Embed | ded The | eory a | nd L | ab | | | | | | | | |
| OBJECTIV | VE: | | | | | | | | | | | | | | |
| • | Tol | know th | e basic | knowle | edge o | of coi | ntrol sy | ystem | | | | | | | |
| • | Des | ign kno | wledge | on P,P | I, PID | O Cor | ntroller | S | | | | | | | |
| • | Stu | dents ab | ole to de | esign sr | nart C | ontro | oller | | | | | | | | |
| • | Stu | dents ac | quire k | nowled | ge in ' | Time | e varia | nt syste | m | | | | | | |
| COURSE (| OUT | COM | ES (Cos |): (3-5) |) | | | | | | | | | | |
| CO1 | | Attain | ed knov | vledge | on Syı | nchro | OS | | | | | | | | |
| CO2 | | Ability | v to desi | gn P,P | I,PID | Cont | troller | | | | | | | | |
| CO3 | | Ability | v to desi | gn sma | rt Coi | ntroll | ler for | the syst | tem | | | | | | |
| CO4 | | Attains | s knowl | edge or | n trans | sfer f | unctio | n | | | | | | | |
| CO5 | | Attains | s knowl | edge or | n lead | -lag o | compe | nsator | | | | | | | |
| Mapping of | f Co | urse O | Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
| COs/POs | | PO1 | Dutcomes with Program Outcomes (POs)PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12 | | | | | | | | | | | | |
| CO1 | | Η | Μ | Μ | Μ | I | Н | Μ | Μ | Н | Μ | Η | I | I | Μ |
| CO2 | | Μ | Н | Н | Μ | I | Μ | Н | Μ | Μ | Μ | Μ | N | ſ | Μ |
| CO3 | | Μ | Μ | Μ | H | [| Η | Μ | Н | Н | Н | Н | I | I | Н |
| CO4 | | Μ | L | L | Μ | I | Н | L | Μ | Н | Μ | Н | I | I | Μ |
| CO5 | | Μ | L | Μ | Μ | I | Н | Μ | Μ | Н | Μ | Н | I | I | Μ |
| Cos / PSOs | 5 | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
| CO1 | | H | I | | Μ | | Ι | | H | H | Ν | A | | | |
| CO2 | | Ν | 1 | | Μ | | N | Л | N | Л | Ν | A | | | |
| CO3 | | F | I | | H | | N | Л | I | I | l | I | | | |
| CO4 | | H | I | | Μ | | I | I | I | I | I | A | | | |
| CO5 | | H | I | | Μ | | N | Л | I | I | I | Л | | | |
| H/M/L indi | cates | s Streng | th of Co | orrelati | on H | I- Hi | igh, M· | - Mediu | ım, L-L | ow | | | | | |
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BEE18L06

CONTROL SYSTEMS LAB

0 0/0 3/0 1

LIST OF EXPERIMENTS

- 1. Programmable Logic Controller Verification of truth tables of Logic gates, simple Boolean expressions, and application of spped control of motor
- 2. Effect of Feedback on DC servo motor
- 3. Transfer function of DC Motor
- 4. Transfer function of DC Generator
- 5. Temperature controller using PID
- 6. Characteristics of AC Servo motor
- 7. Effect of P, PI, PID Controller on a second order systems
- 8. Lag and Lead Compensation Magnitude and Phase plot
- 9. Simulation of P, PI, PID Controller
- 10. Simulation of Linear system Analysis
- 11. Simulation for Stability Analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system
- 12. Simulation and verification of state space model for classical transfer function
- 13. Design of Lead- Lag Compensator for the given system with specification

Total No. of Hours: 45



| Subject Code: BEI18IL1 | | Subjec MICR LAB Prerec | ct Nam OCON | e: MIC TROI BEE18 | CROI | PROC R ANI | CESSO D ARN | OR, /I PRO | CESSC |)R | TY / LB/ ETL | L 0 | T / S.Lr | P / R 3/0 | C | |
|------------------------------|----------------|---------------------------------|--|-------------------------|-------------------|----------------|---------------------|-------------------------------|-----------------|---------------|--------------------------|---------------|-------------|-----------------|------|--|
| I · Lecture | | utorial | | Super | visad | Loor | ing D | · Proje | ot D · L | Decentro | $\frac{1}{h C \cdot Cr}$ | dite | 0/0 | 0/0 | - | |
| T/L/ETL: T | T . T Theor | y/Lab/ | Embed | ded Th | eory a | and L | ab | . 110jt | α κ . Ι | Cocare | n c. cr | Ans | | | | |
| OBJECTIV | VE: | | | | | | | | | | | | | | | |
| | • [| To und | erstand | progra | m the | e Asse | embly | langua | ge in Mi | icropro | cessor | | | | | |
| | • 7 | To kno | w the p | rogram | n Asse | embly | ' langu | age in | Microco | ontrolle | r | | | | | |
| | • 7 | To und | erstand | simple | e prog | ramn | ning us | ing AF | RM proc | essor | | | | | | |
| | • [| To mak | ke progi | am usi | ng Kl | EIL so | oftware | e. | | | | | | | | |
| COURSE (| DUT | | ES (Cos |): (3-5 |) | .1 / | 1 | 1 1 | · · | <u>N</u> | | | | | | |
| COI | | Capab | le of pro | ogramr | ning | the A | Assemt | oly lang | guage in | Micro | processo | or | | | | |
| CO2 | | Famili | ar with | Interfa | acing | of pe | riphera | al devic | es using | g 8085 | | | | | | |
| CO3 | | Capab | le of un | derstar | nd the | prog | ram As | ssembl | y langua | ige in N | Aicrocon | ntrolle | er | | | |
| CO4 | | Capabl | le of un | derstar | nd sir | nple j | program | nming | using A | RM pr | ocessor | | | | | |
| CO5 | | Unders | stand th | e prog | ram u | sing I | KEIL s | oftwar | е. | | | | | | | |
| Mapping of | f Cou | arse O | e Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
| CO1 | | Η | Μ | Η | N | А | Η | Η | Н | L | Н | Μ | H | I | Μ | |
| CO2 | | Μ | Μ | Μ | N | A | Μ | L | L | L | Μ | L | Ν | 1 | L | |
| CO3 | | H | Н | H | I | I | Η | H | Μ | Μ | H | Μ | H | I | Μ | |
| CO4 | | H | Μ | H | N | Л | Η | Μ | Μ | Μ | H | Μ | H | I | Μ | |
| CO5 | | H | M | <u>H</u> | N | Л | H | M | M | M | H | M | H | I | Μ | |
| Cos / PSOs | | <u>PS</u> | 01 | P | <u>SO2</u> | | <u>PS</u> | 03 | PS | 04 | PS | 05 | | | | |
| | | | | | M | | <u> </u> | / <u> </u> | | π | 1 | | | | | |
| C02 | | N | 1 1 | | M | | N | / <u>1</u> /ſ | | <u>и</u> Л | ر ۱ | <u>п</u> ч | | | | |
| CO4 | | N | <u>1</u> 1 | | M | | N | <u>/</u> | | <u> </u> |] | H | | | | |
| CO5 | | Ι | | | Μ | | N | 1 | N | A | I | M | | | | |
| H/M/L indi | cates | Streng | th of C | orrelati | on | H- Hi | gh, M· | - Medi | ım, L-L | OW | | | | | | |
| | | SS | and | | | | | ical | | | | | | | | |
| Category | Basic Sciences | Engineering Science | Humanities 8 Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Techni Skill | Soft Skills | | | | | | | |
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BEI18IL1 MICROPROCESSOR, MICROCONTROLLER AND ARM 0 0/0 3/0 1 PROCESSOR LAB

LIST OF EXPERIMENTS:

- 1. Write a Program for Multi precision addition / subtraction / multiplication / division.
- 2. Write a Program for Increment / Decrement.
- 3. Write a Program for Ascending / Descending order.
- 4. Write a Program for Maximum / minimum of numbers.
- 5. Write a Program for A/D Interfacing.
- 6. Write a Program for D/A Interfacing.
- 7. Write a Program for Traffic light controller.
- 8. Write a Program for Stepper motor Control
- 9. Program on Simple Arithmetic Operations using ARM processor
- 10. Programming with control instructions using ARM processor
- 11. Seven segment display interfacing using ARM processors. (ARM926 kit)
- 12. LED display Interfacing using ARM processors.(ARM926 kit)

Total No.ofHours: 45



| Subject Code: | | Subje Softwa | ct Name are Pacl | : TEC | HNIC | CAL | SKIL | L 2 (Ele | ctrical | | TY/ LB/ | L | T / S.Lr | P/ R | С |
|------------------|----------------|-----------------|---|-------------------|-------------------|----------------|---------------------|----------------------------------|-------------|------------|------------|------------|-------------|---------|------|
| BEE18TS2 | 2 | Proroc | misito | | | | | | | | ETL I | 0 | 0/0 | 3/0 | 1 |
| | | Innu | luisite. | | | | | | | | L | v | 0/0 | 5/0 | L |
| L : Lecture | T : 7 | Futoria | l SLr : | Superv | vised | Lear | ning I | P: Project | rt R : R | esearch | C: Cre | dits | | | |
| T/L/ETL : 1 | <u>Theo</u> | ory/Lab | /Embed | ded The | eory a | and I | Lab | | | | | | | | |
| OBJECTI | VE: | | | | | | 11 0 | | | | | | | | |
| The object | ive i | is to d | evelop t | he tech | nnica | ul ski | ll of t | he stude | ents. | | | | | | |
| COURSE (| OUT | COM | ES (Cos | b): (3-5) |) | | | | | | | | | | |
| CO1 | | Devel | op the t | echnic | al sk | ills r | equire | ed in the | field o | of study | 7 | | | | |
| CO2 | | Bridge | e the ga | p betw | een t | the s | kill re | quireme | ents of t | he em | ployer | or ind | ustry a | and th | ne |
| | | compe | etency of | of the s | tude | nts. | | | | | | | | | |
| CO3 | | Enhan | ice the e | employ | vabili | ity of | f the s | tudents. | | | | | | | |
| Mapping o | f Co | ourse C | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | Н | Н | Η | H | I | Η | Н | Μ | Μ | Η | Μ | H | ł | М |
| CO2 | | Н | Η | М | H | I | Η | Н | Μ | Μ | Η | Η | H | I | Η |
| CO3 | | Н | Н | Η | H | I | Η | Н | Μ | Μ | Η | Η | H | ł | Η |
| Cos / PSOs | 5 | PS | 01 | PS | SO2 | | P | 503 | PS | 04 | PS | 05 | | | |
| CO1 | | I | Η | | Н | | | Н | H | ł | I | Н | | | |
| CO2 | | I | Η | | Н | | | Н | H | ł | I | Н | | | |
| CO3 | | I | Н | | Н | | | Н | H | ł | I | Н | | | |
| H/M/L indi | cates | s Stren | gth of C | orrelati | on 1 | H- H | ligh, N | I- Mediu | m, L-Lo | ow | | | • | | |
| Category | Basic Sciences | Engineering | Humanities and Social | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technical Skill | Soft Skills | | | | | | |
| | | | | | | | $\overline{}$ | | | | | | | | |



| Subject Code: | 5 | Subje | ct Name | : POW | ER S | SYST | ГЕМ • | · III | | | TY / LB/ | L | T / S.Lr | P/ R | C |
|------------------|-------|------------|------------|--------------|---------|--------------|---------------------------|-------------|------------|------------|-------------|------------|-------------|------------|------|
| BEE18009 | | | | | | | | | | | ETL | | | | |
| |] | Prerec | quisite: | BEE18 | 8004,] | BEE | 218007 | 1 | | | Т | 3 | 1/0 | 0/0 | 4 |
| L : Lecture ' | Т : Т | utoria | 1 SLr: | Super | vised | Lear | ning l | P : Proje | ct R : R | esearcl | n C: Cre | dits | | | 1 |
| T/L/ETL : T | Theor | ry/Lab | /Embed | ded Th | eory a | and L | Lab | _ | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | |
| • | То а | attain ł | oasic kn | owledg | ge on l | Powe | er Qua | lity and | power S | ystem | operatio | n | | | |
| • | To p | plot loa | ad durati | on cur | ve and | d und | lerstan | d the ne | ed for re | gulatio | on | | | | |
| • | To i | mpart | knowled | lge on | Frequ | ency | ^v contr | ol and V | oltage C | Control | | | | | |
| • | To s | study t | he econo | omic op | peratio | on of | powe | r system | and Un | it com | nitment | | | | |
| • | To l | know t | he impo | rtance | of Sys | stem | Moni | toring an | d Power | Quali | ty Meas | ureme | nt Equ | ipmeı | nts |
| COURSE O | DUT | COM | ES (Cos | s): (3-5 |) | | | | | | | | | | |
| CO1 | | Acquii | re knowl | edge o | n Pov | wer (| Quality | y and por | wer Syst | em op | eration | | | | |
| CO2 | 1 | Unders | standing | of loa | nd dur | atior | n curve | e and reg | ulation | needs | | | | | |
| CO3 |] | Famili | ar to Fre | quency | conti | rol a | nd Vo | ltage Co | ntrol | | | | | | |
| CO4 |] | Knowl | edge on | econo | mic o | perat | tion of | f power s | system a | nd Uni | t comm | itmen | t | | |
| CO5 | ۱ | Unders | stand th | e impo | rtance | e of S | System | n Monito | ring and | Powe | r Quality | y Mea | sureme | ent | |
| |] | Equipments | | | | | | | | | | | | | |
| Mapping of | f Co | urse C | Outcome | s with | Prog | ram | Outco | omes (P | Os) | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PO4 | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PC | D11 | PO12 |
| CO1 | | Н | Н | H | H | [| Η | H | Н | Н | H | Η |] | H | Н |
| CO2 | | H | Н | Η | H | [| Η | Н | Η | L | Μ | L |] | H | L |
| CO3 | | H | Η | Η | H | [| Η | H | Н | L | Μ | L |] | H | L |
| CO4 | | Μ | Μ | Μ | Μ | [| Μ | Μ | Н | L | Μ | Μ |] | H | Н |
| CO5 | | Η | Н | Н | H | [| Η | Н | Н | Μ | Η | Η |] | H | Μ |
| Cos / PSOs | | PS | 01 | P | SO2 | | P | SO3 | PS | 04 | PS | 605 | | | |
| CO1 | | I | H | | H | | | H | H | I | l | H | | | |
| CO2 | | I | H | | Μ | | | Μ | H | I |] | H | | | |
| CO3 | | I | H | | H | | | H | N | 1 | I | Μ | | | |
| CO4 | | I | H | | Μ | | | L | I | I |] | H | | | |
| CO5 | | I | H | | L | | | Μ | Ν | ſ |] | H | | | |
| H/M/L indic | cates | Stren | gth of C | orrelati | on I | H- H | igh, N | I- Mediu | m, L-Lo | 0W | | | | | |
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| | es | | So | e | ctiv | es | oje | kill | | | | | | | |
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| lteg | | ine | nar | grai | grai | пE | ctic | rns chr | S | | | | | | |
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BEE18009 POWER SYSTEM - III 3 1/0 0/0 4

UNITI INTRODUCTION TO POWER QUALITY AND SYSTEM OPERATION 12

Power Quality Terms- Overloading- Under Voltage- Over Voltage-Voltage Sag- Voltage Swell – Voltage imbalance- Voltage fluctuation-Power Frequency Variation – Harmonics - System load Characteristics–load curves and load-duration curve - load factor - diversity factor - Need for Voltage regulation and frequency regulation in power system - Basic P-F and Q-V control loops

UNIT II REAL POWER - FREQUENCY CONTROL

Fundamentals of AGC-Fundamentals of Speed Governing mechanisms and modeling - Speed-Load characteristics-regulation of two Synchronous Machines in parallel - Control areas - LFC of single & Multi areas Static & Dynamic Analysis of uncontrolled and controlled cases – Tie line with frequency bias control – Steady state instabilities

UNIT III REACTIVE POWER-VOLTAGE CONTROL

Excitation system Modeling - Static & Dynamic Analysis - stability Compensation-Principles of transmission line compensation - Effect of Generator loading – static VAR System Modeling - System Level Voltage control

UNIT IV ECONOMIC DISPATCH AND UNIT COMMITMENT

Need for Economic Dispatch-Characteristics curve for Steam and hydroelectric Units - Co-ordination Equation with Loss and without losses- Base point and Participation Factor- Constraints and solutions in Unit Commitment -Priority List methods-Forward Dynamic Programming approach

UNIT V MONITORING & COMPUTER CONTROL OF POWER SYSTEMS 12

Need of computer control of power systems. Concept of energy control centre (or) load dispatch centre and the functions - system monitoring - data acquisition and control. System hardware configuration – SCADA and EMS functions-Control Strategies – Power quality Measurement Equipment – Harmonic Analyser – Flicker meter

Total No. ofHours: 60

12

12

12

TEXT BOOKS:

- 1. Allen. J. Wood and Bruce F. Wollenberg,(2003) Power Generation, Operation and Control. John Wiley & Sons. Inc
- 2. Chakrabarti & Halder,(2004) Power System Analysis: Operation and Control. Ed. Prentice Hall of India
- 3. Kundur, P,(1994) Power System Stability and Control. USA: MCGraw Hill Publisher

REFERENCE BOOKS:

- 1. Kothari, D.P. and Nagrath, I.J. (2003) Modern Power System Analysis.3rd .Tata McGraw Hill Publishing Company Limited
- 2. Grigsby, L.L. (2001) The Electric Power Engineering, Hand Book. CRC Press & IEEE Press
- 3. Hadi Saadat, (2007) Power System Analysis.11th Reprint
- 4. N.V.Ramana, (2011)Power System Operation and Control," Pearson
- 5. C.A.Gross, (2011)Power System Analysis," Wiley India



| Subject | | Subje | ct Nam | e: POV | VER | ELE | CTRC | DNICS | - I | | TY/ | L | T/ SIr | P/ P | C | |
|-------------|---------------|-----------|--|---------------------------|---------|--------|---------------|-----------|---------------|----------|----------------------|-------|-----------|---------|--------------|--|
| BEE18010 | | | | | | | | | | | ETL | | 5.11 | N | | |
| | | Prerec | quisite: | Basic | Elect | rical | & Ele | ctronic | s Engg | | T | 3 | 1/0 | 0/0 | 4 | |
| L · Lecture | $T \cdot T$ | utorial | SLr · | Super | vised | Lear | ning P | • Proie | ct R · F | Researc | h C [.] Cre | edits | | | | |
| T/L/ETL:7 | Theor | v/Lab/ | Embed | ded Th | eory a | and L | Lab | . 110je | | teseure | | Juito | | | | |
| OBJECTIV | E: | <u> </u> | | | | | | | | | | | | | | |
| | • T | o attai | n Power | Electi | onic | Devi | ces and | l its cha | racteris | tics. | | | | | | |
| • | • T | o desig | gn the tr | iggerir | ng of : | firing | g circui | ts. | | | | | | | | |
| | • T | o learn | the inv | verters, | chop | pers a | and Inc | lustrial | drives. | | | | | | | |
| | • T | 'o attair | n knowl | ledge o | n DC | & A | C Driv | es | | | | | | | | |
| COURSE (| DUT | COMI | ES (Cos | s): (3-5 |) | | | | | | | | | | | |
| CO1 | | Knowl | ledge or | n Powe | r Elec | ctroni | ic Devi | ces and | l its cha | racteris | tics | | | | | |
| CO2 | | Ability | to desi | ign the | trigge | ering | of firir | ng circu | iits | | | | | | | |
| CO3 | | Knowl | ledge or | 1 chopp | bers, i | nvert | ters | | | | | | | | | |
| CO4 | | Knowl | ledge or | n AC & | c DC | Drive | es | | | | | | | | | |
| CO5 | | Knowl | ledge or | n Contr | ol cir | cuits | and Ve | ector co | ontrol | | | | | | | |
| Mapping of | f Cot | ırse O | Knowledge on Control circuits and Vector control rse Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 | | | | | | | | | | | | | |
| COs/POs | | PO1 | se Outcomes with Program Outcomes (POs) O1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 U M U M M M M M M M M M | | | | | | | | | | | | | |
| CO1 | | Η | Second comes with Program Outcomes (POS)O1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12HMHMMMMMML | | | | | | | | | | | | | |
| CO2 | | Μ | Η | H | N | A | Μ | H | Η | Η | Η | Η | H | I | L | |
| CO3 | | L | Μ | Η | I | H | Η | Μ | Μ | Μ | Μ | Μ | N | 1 | \mathbf{M} | |
| CO4 | | Η | Μ | Μ | N | Л | Μ | Μ | Μ | Μ | Μ | Μ | N | 1 | L | |
| CO5 | | Μ | Μ | L | Ι | L | L | Μ | Μ | Μ | Μ | Μ | N | 1 | Μ | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | H | I | | Μ | | Ν | Л | I | H | I | N | | | | |
| CO2 | | H | I | | Μ | | Ν | Л | I | Ι | 1 | N | | | | |
| CO3 | | H | I | | Н | | I | I | I | I |]] | H | | | | |
| CO4 | | N | 1 | | Μ | | Ν | Λ | Ν | Л | 1 | N | | | | |
| CO5 | | Ι | 4 | | L | | I | | | L |] | Ĺ | | | | |
| H/M/L indi | cates | Streng | th of C | orrelati | on | H- H | igh, M | - Mediu | ım, L-L | ow | | | | 1 | | |
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| | ces | Š | nce | ore | ecti | ves | roj | / T | | | | | | | | |
| Σ. | ien | ing | ies cie | ŭ | Εľ | ecti | / P | sd | \mathbf{ls} | | | | | | | |
| 10g | \mathbf{Sc} | leel | anit 1 S | am | am | Ele | cal | idsi | ŝkil | | | | | | | |
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| | ${ m B}_{6}$ | En | Hı So | $\mathbf{P}_{\mathbf{r}}$ | Pr | Of | \mathbf{Pr} | Int Sk | Sc | | | | | | | |
| | | | | \mathbf{k} | | | | | | | | | | | | |



BEE18010 POWER ELECTRONICS - I 3 1/0 0/0 4

UNITI POWER SEMICONDUCTOR DEVICES

Power semiconductor devices Overview: Characteristics of power Structure, operation, Static characteristics and switching characteristics (Turn on and Turn off) of SCR, TRIAC, BJT, MOSFET and IGBT – Two transistor model of SCR – Series and Parallel operation of SCR – Turn on circuits for SCR – Different techniques of commutation – Protection of Thyristors against over voltage, over current, dv/dt and di/dt

UNIT II PHASE CONTROLLED CONVERTERS

Single phase and three phase half controlled and fully controlled rectifiers with R, RL and RLE loads – Waveforms of load voltage and line current – Inverter operation of fully controlled converter – harmonic factor, power factor, ripple factor, distortion factor – operation with freewheeling diode – effect of source inductance – dual converter.

UNIT III INVERTERS

Voltage and current source inverters – Single phase and three phase inverters (both 120° mode and 180° mode) inverters – PWM techniques: Sinusoidal PWM, modified sinusoidal PWM - multiple PWM – Resonant series inverter – current Source Inverter – UPS

UNIT IV DC DRIVES

Features of armature controlled, field controlled DC drives using conventional rheostat (Shunt and series), conventional Ward-Leonard control, Slow speed operation inching and jogging. Transfer functions of armature controlled, field controlled DC motors.

UNIT V AC DRIVES

Induction motor drives- speed control by stator frequency variation – operation of induction motor on variable frequency sources – operation of IM on non sinusoidal waveforms – constant flux operation current fed operation – dynamic and regenerative braking of CSI and vs. drives – slip controlled drives – Introduction to vector control – cycloconverter drives –features

Total No. of Hours: 60

TEXT BOOKS:

- 1. Rashid, M.H. (2004) Power Electronics Circuits Devices and Applications.3rd Ed. Prentice Hall of India.
- 2. Bimbhra, P.S. (1999) Power Electronics.3rd Ed. Khanna Publishers.

REFERENCE BOOKS:

- 1. Singh, M.D. Kanchandani, (2002) Power Electronics. New Delhi: Tata McGraw Hill & Hill publication Company Ltd.
- 2. Dubey, G.K. Doradia, S.R. Joshi, A. Sinha, R.M. (1986) Thyristorised Power Controllers. Wiley Eastern Limited.
- 3. Lander, W. (1993) Power Electronics.3rd Ed. McGraw Hill and Company.



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| Subject Code: BEE18ET3 | | Subjec CONS | et Nam SERVA | e: ENI TION | ERGY | Y UT | ILIZA | TION | AND | | TY / LB/ ETL | L | T / S.Lr | P/ R | C | |
|------------------------------|----------------|--|--|-----------------|--------|---------|--------|----------|---------|------------|--------------------|-------|-------------|---------|---|--|
| |] | Prerec | quisite: | | | | | | | | ETL | 1 | 0/1 | 3/0 | 3 | |
| L : Lecture | T : Tı | utorial | SLr: | Super | vised | Learr | ning P | : Proje | ect R: | Researc | h C: Cre | edits | | | | |
| T/L/ETL : 1 | Theor | y/Lab/ | Embed | ded Th | eory | and L | ab | | | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | | |
| • | To st | udy th | e energ | y cons | ervati | ion on | build | ings | | | | | | | | |
| • | The a | analyse | e the he | ating a | ind co | oling | of bui | ldings | | | | | | | | |
| • | Unde | erstand | the end | ergy ef | ficier | it equi | ipment | S | | | | | | | | |
| • | Unde | erstand | ls and a | nalyse | energ | gy aud | liting | | | | | | | | | |
| | Desig | gn the | house v | viring | N | | | | | | | | | | | |
| COURSE C | JUTC | | <u>2S (Cos</u> | <u>s): (3-5</u> |) | | | | 1 1 11 | | | | | | | |
| COI | (| $Can at \overline{c}$ | ble to sti | udy the | e ener | gy co | nserva | tion on | buildir | ng | | | | | | |
| <u>CO2</u> | (| Can an | an analyse the heating and cooling of building | | | | | | | | | | | | | |
| <u>CO3</u> | (| Can ab | an able to analyse the energy efficient equipments Ability to perform energy audit | | | | | | | | | | | | | |
| <u>CO4</u> | 1 | Ability to perform energy audit | | | | | | | | | | | | | | |
| CO5 | 4 | Ability to find solution for energy conservation | | | | | | | | | | | | | | |
| Mapping of | f Cou | rse O | rse Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs |] | PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 | | | | | | | | | | | | | | |
| CO1 | | Μ | L | H |] | H | Μ | L | H | H | M | L |] | H | H | |
| CO2 | | Μ | Μ | Μ | Ι | M | Μ | Μ | M | Μ | Μ | Μ | I | M | Μ | |
| CO3 | | Μ | L | H | Ι | M | Μ | L | H | Μ | Μ | L | | H | Μ | |
| CO4 | | Η | H | H |] | H | H | H | H | Η | H | H |] | H | Η | |
| CO5 | | Μ | Μ | H | | H | Μ | Μ | H | H | Μ | Μ |] | H | H | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | SO4 | PS | 05 | | | | |
| CO1 | | E | I | | Μ | |] | |] | H |] | H | | | | |
| CO2 | | E | I | | Μ | | Ν | Л | 1 | M |] | H | | | | |
| CO3 | | N | 1 | | M | |] | |] | H | | H | | | | |
| <u>CO4</u> | | N | 1 | | H | | I | <u>I</u> | | H | | H | | | | |
| CO5 | | <u>L</u> | | 1 / | M | <u></u> | | | | H | | H | | | | |
| H/M/L indic | cates | Streng | th of Co | orrelati | lon | H- H1 | gn, M | | um, L-L | LOW | | | | | | |
| Category | Basic Sciences | Engineering Science Engineering Science Humanities a Social Sciences Program Core Program Electives Open Electives Practical / Project Internships / Technic Skill Soft Skills | | | | | | | | | | | | | | |
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BEE18ET3 ENERGY UTILIZATION AND CONSERVATION 1 0/1 3/0 3

UNITI HEATING AND WELDING

Advantages and methods of electric heating, resistance ovens, induction heating, dielectric heating, the arc furnace - heating of building. Electric welding, resistance and arc welding, control devices

UNIT II ILLUMINATION

Importance of lighting – properties of good lighting scheme – laws of illumination –photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting and sports ground – energy efficiency lamps.

UNIT III ELECTRIC DRIVES

Type of electric drives, choice of motor, starting and running characteristics, speed control, temperature rise, particular applications of electric drives, types of industrial loads, continuous, intermittent and variable loads, load equalization

UNIT IV INTRODUCTION TO ELECTRIC AND HYBRID VEHICLES

Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement and energy consumption

UNITV ENERGY CONSERVATION

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

TEXT BOOKS:

- 1. Epenshaw Taylor, (2009) Utilization Of Electric Energy.12th Impression. Universities Press.
- 2. Mehrdad, Ehsani, Yim in Gao, Sabastien E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles.CRC Press.
- 3. Wadhwa, C.L. (2003) Generation, Distribution and Utilization of Electrical Energy. NewAge International Pvt. Ltd.
- 4. Gupta, B.R. (2003) Generation of Electrical Energy. New Delhi: Eurasia Publishing House (P) Ltd.

REFERENCE BOOKS:

- 1. Soni Gupta, Bhatnager-DhanapatRai& sons A Course in Electrical Power.
- 2. Uppal, S.L. Electrical Power. Khanna Publications



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Total No of Hours: 45



| Subject Code: BEE18L07 | 1 | Subje | et Namo El | e: LECTI | RICA | AL PI | RACT | ICE L | AB | | TY / LB/ ETL | L | T / S.Lr | P/ R | С | | |
|------------------------------|----------------|--|---|-------------|------------|----------|----------|--------------|----------|----------|--------------------|------|-------------|---------|---|--|--|
| |] | Prerec | uisite: | BEE18 | 8004 | | | | | | L | 0 | 0/0 | 3/0 | 1 | | |
| L : Lecture | Γ : Τι | utorial | SLr: | Superv | vised | Learı | ning P | : Proje | ct R : I | Researc | h C: Cre | dits | | | | | |
| T/L/ETL : T | heor | y/Lab/ | Embed | ded The | eory a | and L | ab | _ | | | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | | | |
| • | To k | now al | oout var | ious el | ectric | al ap | paratus | s and it | s symbo | ol | | | | | | | |
| • | To ki | now ho | ow to di | raw a s | ingle | line o | liagran | n of a I | Power N | etwork | | | | | | | |
| | To le | arn ab | out the | wiring | syste | ems ir | n dome | stic and | d comm | ercial n | narkets | | | | | | |
| COURSE C | | | LS (Cos |): (3-5) |) :: | | . for I | | in and I | | 11001 | | | | | | |
| | 4 | Ability | $\frac{1}{1}$ to desi | gn a w | iring | syste | m for I | Jomes | ic and I | naustria | al load | | | | | | |
| CO2 | 4 | Attain | knowle | dge on | vario | ous E | lectrica | al Gadg | gets | | | | | | | | |
| CO3 | | Ability | bility to troubleshoot the domestic appliances bility to design a simple substation | | | | | | | | | | | | | | |
| CO4 | | Ability | bility to design a simple substation | | | | | | | | | | | | | | |
| CO5 | - | Attain | ttain knowledge on Earthing | | | | | | | | | | | | | | |
| Mapping of | f Cou | rse O | Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POs |] | PO1 | rse Outcomes with Program Outcomes (POs)O1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12HHHHHHHHHHH | | | | | | | | | | | | | | |
| CO1 | | PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 H H M H M L M L L L M | | | | | | | | | | | | | | | |
| CO2 | | Η | Η | H | H | I | Μ | Μ | L | Μ | Μ | Η | | H | Μ | | |
| CO3 | | Μ | Μ | Μ | Ι | | L | Μ | Μ | Η | Μ | L | | М | L | | |
| CO4 | | L | Μ | Μ | N | I | L | L | Μ | Η | Μ | Μ | | L | Μ | | |
| CO5 | | Μ | L | H | H | I | Μ | Μ | Н | Η | Μ | L | | М | Μ | | |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | | |
| CO1 | | E | I | | Μ | | Ι | | Ι | Л | Ι | Ν | | | | | |
| CO2 | | H | I | | Μ | | N | Λ |] | Ĺ | Ν | N | | | | | |
| CO3 | | Ι | 4 | | L | | N | 1 | Ν | И |] | H | | | | | |
| <u>CO4</u> | | N | 1 | | L | | <u> </u> | | Ν | <u>A</u> |] | H | | | | | |
| CO5 | | <u>E</u> | l that C | | M | | <u>N</u> | <u>/</u> | | 1 | | 1 | | | | | |
| H/M/L indic | cates | Streng | th of Co | orrelati | on | H- H | ign, M· | - Medit | ım, L-L | .ow | | | | | | | |
| Category | Basic Sciences | Engineering Sciences Engineering Sciences Nocial Sciences an Program Core Program Electives Open Electives Practical / Project Internships / Technics Skill Soft Skills | | | | | | | | | | | | | | | |
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BEE18L07

ELECTRICAL PRACTICE LAB

0/0 3/0 1

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LIST OF EXPERIMENTS

- 1. Introduction to the symbols in Single line diagram and to draw a simple power network and Safety Procedures
- 2. Types of wiring
- 3. Estimation of Lighting and Power Loads
- 4. Introduction to PCB Design and design a simple board
- 5. Design of Single Phase Residential wiring using all the necessity apparatus with calculation
- 6. Design of Three Phase Residential wiring using all the necessity apparatus with calculation
- 7. Study on Trouble shooting of Electrical Equipments
- 8. Study of various Electrical Gadgets
- 9. Connect the Inverter to Power supply through 2/3 pin socket and 1- way switch (Back up)
- 10. Prepare pipe Earthing
- 11. Prepare Plate Earthing
- 12. Indian Electrical Act
- 13. Design a Substation of rating 11kV /400kV
- 14. Sketch the different types of Switch gear and Protection cables
- 15. Sketch the different types of supporting structures and different electrical earthing system

Total No of Hours: 45

Note: All the students need to bring insulated tool kit and follow the safety precautions in the lab sessions



| Subject | Subject Name: POWER SYSTEM LAB TY / L T / P / C LB/ S.Lr R | | | | | | | | | | | | | | | |
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| | TTere | juisite. | DEEI | .0007 | _ | | | | _ | | U | 0/0 | 3/0 | I | | |
| L: Lecture T: T_{I} | Futorial | SLr : Embod | Super | vised | Lear | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | | | |
| OBJECTIVE: | ny/Lau/ | EIIIDeu | | leory | | 200 | | | | | | | | | | |
| • | To k | now abo | out the | trans | missi | on line | s | | | | | | | | | |
| • | To u | ndersta | nd Loa | d Flo | w An | alysis | | | | | | | | | | |
| • | To u | nderstai | nd abou | ut Fai | ılt Ar | alysis | | | | | | | | | | |
| • | To ga | ain kno ⁻ | wledge | e on P | ower | Electro | onic Ci | ircuits | | | | | | | | |
| • | To fa | miliar a | about S | Simul | ation | of Elec | ctrical of | drives u | sing Ele | ectrical S | oftw | are | | | | |
| COURSE OUT | COM | ES (Cos | s): (3-5 | 5) | | | | | | | | | | | | |
| CO1 | Studen | ts will | know | about | t the t | ransmi | ssion l | ines | | | | | | | | |
| CO2 | Studen | Students will understand Load Flow Analysis Students will understand Load Fault Analysis | | | | | | | | | | | | | | |
| CO3 | Studen | Students will understand Load Fault Analysis | | | | | | | | | | | | | | |
| CO4 | Studen | Students will have knowledge on Power Electronic Circuits | | | | | | | | | | | | | | |
| CO5 | Studen | Students will understand Simulation of Electrical drives using MATLAB, PSCAD | | | | | | | | | | | | | | |
| Mapping of Co | ourse O | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POs | PO1 | Irse Outcomes with Program Outcomes (POs)PO1PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12HHMMLLMMLLM | | | | | | | | | | | | | | |
| CO1 | Н | Η | Μ | Ι | Μ | L | L | Μ | Μ | L | L | L | 4 | Μ | | |
| CO2 | Μ | Μ | Μ |] | H | H | H | Μ | Μ | L | Μ | H | [| Μ | | |
| CO3 | Μ | Μ | L |] | L | L | L | H | H | H | Μ | N | I | Μ | | |
| CO4 | H | H | M |] | H | H | Μ | M | L | H | Η | N | I | Μ | | |
| CO5 | M | M | M | | M | M | | H | H | M | $\frac{M}{2}$ | N | ſ | H | | |
| Cos / PSOs | | | P | <u>'802</u> | | <u>PS</u> | 03 | PS | <u>504</u> | | 05 | | | | | |
| | | <u>і</u> Л | | M | | I | L M | 1 | <u>VI</u> M | | <u>и</u> Л | | | | | |
| CO2 | | 1 /[| | L | | I | H H | 1 | H H | I | <u> </u> | | | | | |
| CO4 | I | I | | M | | N | M | I | M | N | 1 | | | | | |
| CO5 | N | 1 | | Η | | J | Ĺ |] | L | N | 1 | | | | | |
| H/M/L indicate | s Streng | th of C | orrelati | ion | H- H | igh, M | - Medi | um, L-L | OW | | | | | | | |
| | es | and | | | | | ical | | | | | | | | | |
| | enc | | | es | | ct | chn | | | | | | | | | |
| S | Sci | ces | e | ctiv | es | oje | Te | | | | | | | | | |
| y enc | ng (S / Prc tiv less / S / Prc tiv less / S / | | | | | | | | | | | | | | | |
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BEE18L08

POWER SYSTEM LAB

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LIST OF EXPERIMENTS

- 1. Experimentation on Performance of Over Voltage Relay.
- 2. Experimentation on Performance of Under Voltage Relay.
- 3. Experimentation on Performance of Earth Fault Relay.
- 4. Experimentation on Performance of Differential Protection of transformer.
- 5. Experimentation on Dielectric Testing of transformer oil.
- 6. Experimentation on Performance of Over Current Relay using Electromagnetic and Digital Type.
- 7. Computation of Parameters and Modeling of Transmission Lines
- 8. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
- 9. Simulation on Load Flow Analysis I : Solution of Load Flow And Related Problems Using Gauss-Seidel Method
- 10. Simulation on Load Flow Analysis II: Solution of Load Flow and Related Problems Using Newton-Raphson and Fast-Decoupled Methods
- 11. Simulation on Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
- 12. Simulation on SLG fault in a power system network
- 13. Simulation on DLG fault in a power system network
- 14. Study the characteristics of MCB & HRC Fuse.

Total No of Hours: 45



| Subject Code: BEN18SK | 2. | Subjec Quant | et Nam itative | e: SOI Skills) | FT SH) | KILI | 2 –II (Q | Qualita | tive and | 1 | TY / LB/ ETL | L | T / S.Lr | P/ R | С | |
|-----------------------------|-----------------------|---|--|-------------------|------------|-------|-----------|----------|-----------|------------|--------------------|-------|-------------|---------|---|--|
| DLIVIODI | _ | Prerec | uisite: | BSK1 | ISET1 | 1 | | | | | ETL | 0 | 0/0 | 3/0 | 1 | |
| L : Lecture | T : 1 | Futorial | SLr : | Super | vised | Lear | ming P | : Proje | ect R: | Researc | h C: Cr | edits | | | | |
| T/L/ETL : 7 | Theo | ry/Lab/ | Embed | ded Th | eory a | and I | Lab | | | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | | |
| | | • <u>To</u> | help stu | udents | to im | prov | e their] | Logical | reason | ing. | | | | | | |
| | | • To | help stu | udents | to im | prov | e their a | arithme | etic reas | oning. | | | | | | |
| COUDCE | | • To | help st | udents | impro | ove t | heir dat | a interp | oretation | n skills | | | | | | |
| COURSE C | JUI | | ONES (Cos): (3-5) repare students for Logical reasoning | | | | | | | | | | | | | |
| | | Prepar | Prepare students for arithmetic reasoning | | | | | | | | | | | | | |
| 002 | | Prepar | Prepare students for data interpretation skills | | | | | | | | | | | | | |
| CO3 | | Prepar | repare students for data interpretation skills | | | | | | | | | | | | | |
| Mapping of | f Co | urse O | e Outcomes with Program Outcomes (POs) 1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 | | | | | | | | | | | | | |
| COs/POs | | PO1 | rse Outcomes with Program Outcomes (POs) PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 | | | | | | | | | | | | | |
| CO1 | | L | PO1 PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO12 L L L L M M H M H M H | | | | | | | | | | | | | |
| CO2 | | L | L | L | L | | L | Μ | Μ | Н | Μ | Η | Μ |] | H | |
| CO3 | | L | L | L | L | | L | Μ | Μ | Η | Μ | Η | Μ |] | H | |
| Cos / PSOs | | PS | 01 | P | PSO2 | | PS | 03 | PS | 504 | PS | 505 | | | | |
| CO1 | | I | 4 | | L | | I | H | | L | | L | | | | |
| CO2 | | I | 4 | | L | |] | I | - | L | - | L | | | | |
| CO3 | | | 1 60 | 1 . | L | | | H | | L | | L | | | | |
| H/M/L indi | cates | s Streng | th of Co | orrelat | 10n | H- H | ligh, M | - Medn | ım, L-L | LOW | | | | | | |
| Category | Basic Sciences | Engineering Sciences Humanities an Social Sciences an Program Core Program Electives Open Electives Practical / Project Internships / Technic Soft Skills | | | | | | | | | | | | | | |
| | | | \mathbf{z} | | | | | | | | | | | | | |



| BEN18SK | 2 SOFT SKILL –II (Qualitative and Quantitative Skills) | 0 | 0/0 | 3/0 | 1 |
|---------------------------------|--|-------|---------|---------|---------|
| UNIT I Logical Stateme | LOGICAL REASONING I ents – Arguments – Assumptions – Courses of Action. | | | | 6 |
| UNIT II Logical conclus | LOGICAL REASONING II sions – Deriving conclusions from passages – Theme detection. | | | | 6 |
| UNIT III | ARITHMETICAL REASONING I | | | | 6 |
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| UNIT IV | ARITHMETICAL REASONING II | | | | 6 |
| Time & Work - man out and Se | – Time & Distance – Clocks – Permutations & Combinations – Heighries. | hts & | è Dista | ances - | - Odd |
| UNIT V Tabulation – Ba | DATA INTERPRETATION ar graphs – Pie graphs – Line graphs. | | | | 6 |
| | Т | otal | No. of | f Hour | :s : 30 |

REFERENCE BOOKS:

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).



| Subject Code: | | Subject Name: MINI PROJECT/ INPLANTTY /LT /P /CTRAINING/ INDUSTRIAL TRAININGLB/S.LrRETLImage: Comparison of the second se | | | | | | | | | | | | | | |
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| CO2 | | To acq | uire ski | lls and | knov | vledg | ge for a | smooth | n transit | ion into | the car | eer. | | | | |
| <u> </u> | | To and | o gain field experience and get linked with the professional network. | | | | | | | | | | | | | |
| 03 | | To gai | O gain held experience and get linked with the professional network. | | | | | | | | | | | | | |
| Mapping of | f Co | urse O | e Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
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| The object | ive i | is to de | velop t | he tech | nnical | skil | ll of t | he stude | nts. | | | | | | | |
| COURSE | OUT | COMES (Cos): (3-5) Develop the technical skills required in the field of study | | | | | | | | | | | | | | |
| CO1 | | Develo | op the to | echnic | al skil | lls re | equire | ed in the | field o | of study | 7 | | | | | |
| CO2 | | Bridge the gap between the skill requirements of the employer or industry and the | | | | | | | | | | | | | | |
| | | compe | competency of the students. | | | | | | | | | | | | | |
| CO3 | | Enhan | Enhance the employability of the students. | | | | | | | | | | | | | |
| Mapping o | f Co | urse O | Irse Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
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| OBJECTIV | /E: | <u>j</u> | | | | | | | | | | | | | | |
| • | To st | tudy at | out var | ious co | onver | tional | l & No | onconve | entional | source | of energ | y res | ources | | | |
| • | To st | tudy th | e conce | pt of 1 | Micro | ogrid a | and the | e contro | ol modes | 5 | - | | | | | |
| • | To ir | mpart k | cnowled | lge on | Distr | ibuted | l Gene | ration | | | | | | | | |
| • | To a | nalyse | the imp | act of | Grid | Integr | ration. | | | | | | | | | |
| • | To u | ndersta | Iderstand various power quality issues and the protection schemes for Microgrid. | | | | | | | | | | | | | |
| COURSE C | DUT | COMES (Cos): (3-5) Understanding of various conventional and Nonconventional source of energy resources | | | | | | | | | | | | | | |
| CO1 | | Understanding of various conventional and Nonconventional source of energy resources Familiar to Microgrid and the control modes | | | | | | | | | | | | | | |
| CO2 | | Familiar to Microgrid and the control modes | | | | | | | | | | | | | | |
| CO3 | | Knowledge on Distributed Generation | | | | | | | | | | | | | | |
| CO4 | | Familiar to Grid Integration | | | | | | | | | | | | | | |
| CO5 | | Acquire knowledge on various power quality issues and the protection schemes for | | | | | | | | | | | | | | |
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BEE18011 MICROGRID TECHNOLOGY 3 1/0 0/0 4

UNIT I INTRODUCTION

Conventional and Non-Conventional Power Generation - Advantages & Disadvantages – Energy Crisis in India – Review of Solar, Wind, Fuel Cells, Biomass, Tidal- Thermal, Hydel, Nuclear- Microturbines

UNIT II OVER VIEW OF MICROGRID

Composition of Microgrid-Structure-Operation Modes-Control Modes-Three state control of independent microgrid-Inverter Control – Grid Connection and separation control

UNIT III DISTRIBUTED GENERATION

Concept- Topologies- Selection of Sources- Standards for interconnecting Distributed resources to Power System- Energy Storage Systems- Market Design Issues – Distributed Generation Optimization and Energy Management

UNIT IV IMPACT OF GRID INTEGRATION

Requirements for Grid Connection- Limits on operational parameters-Voltage-Frequency-THD Response to grid abnormal operating conditions- islanding issues - Integration with NCE sources – Reliability

UNIT V POWER QUALITY ISSUES AND PROTECTION IN MICROGRID 12

Issues in Microgrid – Modelling and Stability Analysis – Economics in Microgrid- Operation and Protection strategies – Protection scheme for Distribution network connected with Microgrid

Total No of Hours: 60

TEXT BOOKS:

- 1. Fusheng Li, Ruisheng Li, Fengquan Zhou (2015), Microgrid Technology and Engineering Application, 1st Ed, Elsevier
- 2. Nikos Hatziagyriou (2013), Microgrids: Architectures and Control, Wiley

REFERENCE BOOKS:

- S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6
- 2. David Gao, (2015) Energy Storage for Sustainable Microgrid, 1st Ed, Elsevier
- **3.** Magdi S, Mahmoud , (2017), Microgrid- Advanced Control Methods and Renewable Energy System Integration, Butterworth –Heinemann- Elsevier
- 4. Chowdhury, S, Chowdhury, SP, Crossley, P, Microgrids and Active Distribution Networks, IET



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| CO4 | 1 | Unders | Inderstanding and implementing good policies for the welfare of management and workers | | | | | | | | | | | | orkers |
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BMG18002 MANAGEMENT CONCEPTS AND ORGANISATION 3 0/0 0/0 3 BEHAVIOR

UNIT I INTRODUCTION TO MANAGEMENT

 $\begin{array}{l} Definition \ of \ Management-Science \ or \ Art \ or \ Profession-Manager \ v_s \ Entrepreneur \ vs \ Leader-Types \ of \ Managers-Managerial \ roles \ and \ skills-Evolution \ of \ Management-Scientific, \ Human \ relations \ and \ system \ approaches \end{array}$

UNIT II PLANNING AND ORGANIZING

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

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

Diversity - Attitudes and Job satisfaction – Emotions and Moods – personality and values – perception – Decision making – Motivation concepts – Motivation Applications

UNIT V GROUP BEHAVIOR

Foundations of Group Behavior – Understanding Teams – power and politics – Conflict and Negotiation – Stress Management

Total No of Hours :45

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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 "Principles of Management" Tata McGraw Hill 2012
- 2. Stephen P. Robbins, David A.De.Cenzo, Mary Coulter "Fundamentals of Management" Pearson Education 2016


| Subject Code: BEE18ET4 | | Subjec II | et Nam NDUST | e: 'RIAL | , DRI | VES | AND A | AUTO | MATIO | DN | TY / LB/ ETL | L | T / S.Lr | P/ R | C | |
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| CO2 | , | To dev | velop kr | owled | ge on | DC I | Drive | | | | | | | | | |
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BEE18ET4INDUSTRIAL DRIVES AND AUTOMATION10/13/03

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

UNIT I INTRODUCTION

Definition, block diagram and types of Electric Drives – dynamics of electric drives – torque equations – speed torque characteristics of DC and AC motors – components of load torque – load equalization – steady state stability – heating and cooling curves – loading conditions and classes of duty – Selection of power rating for drive motors

UNIT II DC DRIVES

Speed control of DC series and shunt motors – concepts of constant torque and constant power control – concepts of Armature and field control, Ward Leonard control system – Speed control Using single phase controlled rectifiers – fully controlled – half controlled – speed control using 3 phase fully controlled rectifier – control using DC choppers – multi quadrant operation – electric braking – closed loop control of DC drives

UNIT III ENERGY CONSERVATION AND SPECIAL CLASS OF DRIVES

Need for energy conservation in electrical drives – improvement of power factor, improvement of quality supply – solar and battery powered drives – Drives used for traction – Control of fractional hp motors

UNIT IV SCADA

SCADA-Direct digital control-AI and except control system-Case studies on computer control for industrial process

UNIT V PLC

Evaluation of PLC's- Sequential and programmable controllers-Architecture-Relay logic-Applications of PLC-Bottle fielding system

TEXT BOOKS:

- 1. Dubey. G.K., "Power Semiconductor Controlled Drives", Prentice Hall International, 1989
- 2. B. K.Bose, "Modern Power Electronics and AC Drives", Prentice Hall Onglewood cliffs, New Jersey, 2002
- 3. D. Patranabis, Principle of industrial instrumentation, Tata MCgrahills publishers company ltd, 1996
- 4. Prof. Rajesh Mehra, DLC-Theory and Practical, Lakshmi Publications 2016

REFERENCE BOOKS:

- 1. E.O Doubelin, "Measurement System"- Application Tata- McGraw hills 2004
- 2. Kevin collis, "PLC programming for In Industrial Automation, Diggory Press Publishers, 2007
- 3. Vedam Subrahmanyam, "Electric drives concepts and applications", TMH Pub. Co.Ltd. 1994



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Total No of Hours: 45



| Subject | Subje | ct Name: N | /ICR(| OGRID LA | AB | | | | | TY/ | L | T/ | P/ | C |
|----------------------------------|--------------------|------------------------|---|---------------|--------------|----------------------------|-------------|----------|-----------|------------|----------|----------|---------|------------|
| Code: RFF18L10 | | | | | | | | | | LB/ ETL | | S.Lr | ĸ | |
| DELIGEIO | Prerec | quisite: BE | E1801 | 0, BEE180 |)09 | | | | | L | 0 | 0/0 | 3/0 | 1 |
| I · Lecture T · | Tutoria | $\frac{1}{1}$ SIr · Si | unervi | ed Learnin | σΡ | · Proje | ct R · R | esearc | h C · C | redite | | | | |
| T/L/ETL : The | eorv/Lat | o/Embedde | d Theo | orv and Lab | | . I loje | | cscare | n c. c | licuits | | | | |
| OBJECTIVE | : | | | , | | | | | | | | | | |
| • St | udents o | can obtain | knowle | edge about | spec | cific w | ind pow | er, cal | culate | the w | ind fre | quency | , turb | oines |
| ch | aracteri | stics, time | period | and freque | ncy o | of the r | otating t | urbine | at dif | ferent | speeds | • | | |
| • To | o unders | stand the Cl | naracte | ristics of S | olar I | Modul | es when | conne | cted in | n series | s and p | arallel | | |
| • To | b help t | he student | s to u | nderstand t | he m | nodelli | ng, sim | ulation | , imp | lement | ation a | and per | rform | ance |
| ch | aracteri | stics of sol | ar phot | ovoltaic an | d wii | nd turt | oine. | | | | | | | |
| | b help th | the students | $\frac{10 \text{ desi}}{(2 \text{ s})}$ | gn and sim | ulate | the pe | erforman | ce cha | racteri | stics o | t a Mi | cro-gri | d | |
| COURSE OU | Student | LES (COS): | (3-5) | adaa ahayt (| ronord | atad wi | nd nowa | . turbin | as aba | rootorio | tion no | rformor | oo of | |
| COI | turbine | at different | speeds | euge about g | genera | ated wi | na power | , turbin | les cha | racteris | ucs, pe | riorinai | | |
| CO2 | Student | ts can under | stand th | e concept of | f semi | icondu | ctors and | p-n jur | ction e | energy l | band, Il | luminat | ion eff | fect |
| | on PV | Modules, ef | fect of 7 | Femperature | n PV M | lodules | , Effect | t of Ang | gle of Ir | nclinati | ion | | | |
| | of Sola | r Modules. | | | | | | | | | | | | |
| CO3 | Capable and par | e of understa allel | anding | the concept | s of Sol | ar Moo | lules w | hen cor | inected | in seri | es | | | |
| CO4 | Student | ts will be ab | le to mo | odel, simulat | te, im | plemen | it and per | form th | e char | acterist | ics of s | olar pho | otovolt | aic |
| | and wir | nd turbine. | | | | - | - | | | | | • | | |
| CO5 | Student | ts will be ab | le to de | sign and sim | nulate | the per | rformanc | e chara | cteristi | cs of a | Micro- | grid | | |
| Mapping of C | Course (| Outcomes | with P | rogram Ou | utcon | nes (P | Os) | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | P | 05 | PO6 | PO 7 | PO 8 | PO 9 | PO1 | 0 PO | 1 F | PO1 |
| CO1 | Н | Н | Н | Н | | Н | Н | , H | M | H | Μ | H | [| L |
| CO2 | Н | Н | Н | Н | | Н | H | Н | Μ | Н | Μ | H | [| L |
| CO3 | Μ | М | Η | Н | | Н | Н | Н | Μ | Н | Μ | H | [| L |
| CO4 | Н | Н | Н | Н | | Н | Н | Н | Н | Н | Н | H | [| Н |
| CO5 | Η | Н | Η | Н | | Η | Н | Н | L | Н | Н | H | [| L |
| Cos / PSOs | Р | SO1 | | PSO2 | | PS | 03 | PS | 04 | P | SO5 | | | |
| CO1 | | H | | Μ | | N | 1 |] | H | | H | | | |
| CO2 | | Μ | | L | | Ν | 1 |] | L | | Η | | | |
| CO3 | | H | | H | | Ν | 1 | J | I | | L | | | |
| CO4 | | H | | M | | N | 1 |] | H | | L | | | |
| CO5 | ~ | M | | H | | <u> </u> | <u> </u> | Ι | Л | | L | | | |
| H/M/L indicat | es Stren | gth of Cori | elatior | 1 H- High | <u>а, М-</u> | Medu | ım, L-Lo | OW | | | | | | |
| <i>b</i> | ing | ies tial | | | | | ps / | ls | | | | | | |
| goi | eer | unit Soc ces | am | ves | ves | cal | shi lica | ikil | | | | | | |
| ic Ite | ain si | m€ d ¦ | gr | en en | scti | icti oje | ern chn | ft S | | | | | | |
| - <u>-</u> - <u>-</u> - <u>-</u> | ≝. <u>∞</u> | = 2 .2 | 0 | | | - CO + | . <u> </u> | · · · · | | | | | | |
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BEE18L10

MICROGRID LAB

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LIST OF EXPERIMENTS

- 1. Characteristics of PV Modules
- 2. Characteristics of Series connection PV Modules
- 3. Characteristics of Parallel Connection PV Modules
- 4. Effect of Shading in the PV Characteristics
- 5. Effect of Tilting in PV Characteristics
- 6. Evaluation of cut-in and start up speed of Wind Turbine
- 7. Evaluation of co-efficient of performance of Wind Turbine
- 8. Evaluation of Turbine Power and Wind Speed
- 9. Evaluation of TSR and Co-efficient of Power
- 10. Simulation of Characteristics Of PV Module.
- 11. Simulation of Characteristics Of Wind Turbine
- 12. Simulation of Characteristics Of PV Modules Connected in Parallel
- 13. Simulation of Characteristics Of PV Modules Connected in Series
- 14. Design of a Micro-grid using Matlab/PSCAD/ETAP

Total No of Hours: 45



| Subject | | Subject | t Name: PO |)WER H | ELECTI | RON | ICS ANI | D DRIVI | ES LAI | B | TY/ LB/ | L | T/ S.Lr | P/ R | С | |
|------------|--------|-------------|---|------------|----------------|-----------------|-------------------------|--------------|----------|----------|------------|---------|-------------------|-------------|----------|--|
| BEE18I | L11 | | | | | | | | | | ED/ ETL | | 0.11 | | | |
| | | Prereq | uisite: BEF | C18010 | | | | | | | L | 0 | 0/0 | 3/0 | 1 | |
| L : Lect | ure T | : Tutoria | al SLr : Su | pervised | l Learnir | ng P | : Project | R : Rese | earch C | : Credi | ts | | | l | 1 | |
| T/L/ETI | . : Th | eory/Lab | o/Embedded | l Theory | and Lab | , | 5 | | | | | | | | | |
| OBJEC | TIVI | E: | | | | | | | | | | | | | | |
| | | • To | obtain an o | overview | of diff | erent | types o | f power | semico | onduct | or devic | es an | d their | switc | ching | |
| | | • To | understand | the oper | ation c | harac | teristics | and ner | forman | ce nar | meters | of cor | ntrolled | Recti | fiers | |
| | | and | Inverters. | une oper | | marac | | und per | ioiiiuii | ee puit | | 01 001 | nionea | 110011 | 11015 | |
| | | • To 1 | understand | the techr | niques to | cont | rol the sp | eed of B | rushles | s DC N | Aotor ar | d SR | Motor | | | |
| | | • To (| understand | the oper | ration of | AC V | /oltage C | Controlle | rs | | | | | | | |
| | | • To 1 | understand | the appl | ications | of Po | wer Elec | tronic de | evices a | nd Ele | ctric dri | ves in | Power | Syster | m | |
| COURS | SE OI | UTCOM | ES (Cos): | (3-5) | | | | | | | | | | | | |
| CO1 | | Student | s will under | rstand th | e operati | ion of | f power e ased on th | lectronic | s devic | es and | gain kn | owled | ge of th | le | | |
| CO2 | | Student | s will under | rstand th | e operati | $\frac{1}{100}$ | character | istics an | d perfo | rmance | e parame | eters o | f contro | olled | | |
| | | Rectifie | ers and Inve | rters | e operad | ,,,, | | | a perro | | Puruin | | | , | | |
| CO3 | | Student | udents capable to understand the techniques to control the speed of Brushless DC Motor and SR | | | | | | | | | | | | | |
| | | Motor | | | | | | | | | | | | | | |
| CO4 | | Student | s able to u | nderstan | d the op | perati | on of AC | Voltage | e Contro | ollers | | | | | | |
| CO5 | | Student | s able to un | derstand | the ope | eratio | n of diffe | erent con | verters | and inc | corporat | e in de | esigning | g the | | |
| Mannin | a of (| HVDC | transmissio | n Syster | m ama ma Ou | 4000 | | -) | | | | | | | | |
| COs/PC | | PO1 | PO2 | PO3 | PO4 | utcon | PO5 | 5) PO6 | P07 | PO8 | PO9 | PO1 |) PO ¹ | 11 P | 012 | |
| CO1 | | H | H | H | H | | M | M | H | L | H | M | <u>, 10</u> Н | | <u>L</u> | |
| CO2 | | H | H | H | H | | M | M | H | L | M | M | H | · · · · · · | L | |
| CO3 | | Н | Н | Н | Н | | Н | Μ | Н | L | Μ | Μ | H | | L | |
| CO4 | | Н | Н | Н | Н | | Н | Н | Н | Μ | H | Μ | H | | L | |
| CO5 | | Н | Н | Н | Н | | Н | Н | Н | Μ | Н | Μ | H | | L | |
| Cos / PS | SOs | Р | SO1 |] | PSO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | | Μ | | Μ | | I | I | I | I |] | H | | | | |
| CO2 | | | Μ | | Μ | | N | 1 | I | I |] | H | | | | |
| CO3 | | | H | | H | | N | 1 | I | | I | N | | | | |
| CO4 | | | L | | L | | H | <u>I</u> | H | I | | H | | | | |
| CO5 | 1. | | M | 1 | M | | H I | <u>I</u> | ŀ | ł | | H | | | | |
| H/M/L i | ndica | ites Stren | gth of Corr | elation | H- H1gl | n, M- | Medium | , L-Low | | <u> </u> | | | | | | |
| | ces | F.0 | | | | ves | | kill | | | | | | | | |
| LZ | ien | ring | ties ial | | S | ecti | \geq | ips al S | lls | | | | | | | |
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BEE18L11POWER ELECTRONICS AND DRIVES LAB00/03/01

LIST OF EXPERIMENTS

- 1. Characteristics of SCR, MOSFET, IGBT and TRIAC
- 2. Gate Pulse Generation using R, RC and UJT
- 3. Single phase half controlled and fully controlled bridge converter with R load and RL loads
- 4. Single phase AC voltage controller using TRIAC, DIAC with R AND RL loads
- 5. IGBT based Chopper
- 6. IGBT Based PWM Inverter
- 7. Single phase parallel inverter
- 8. Single phase Series inverter
- 9. Forced commutation circuits (Class A, Class B, Class C, Class D & Class E).
- 10. Single phase cyclo-converter with R and RL loads
- 11. Step down and step up MOSFET based choppers
- 12. Speed Control of DC Shunt Motor using three phase Rectifier
- 13. Simulation of Single Phase and Three Phase cyclo-converter
- 14. Simulation of the techniques to control the speed of Brushless DC Motor and SR Motor
- 15. Simulation of steady-state and transient performance of a HVDC transmission system

Total No of Hours: 45



| Subject Code: | 5 | Subjec | ct Nam | e: PRO | JEC | ГPF | HASE · | -I | | | TY / LB/ | L | T / S.Lr | P/ R | C |
|------------------|----------------|---------------|---|--------------|-------------|--------------|---------------|--------------------------------|------------------------|----------------|-------------|-------------|-------------|----------|--------------|
| BEE18L12 | | | | | | | | | | | ETL | | | | |
| | I | Prerec | quisite: | | | | | | | | L | 0 | 0/0 | 3/3 | 2 |
| L : Lecture T | : Tt | itorial | SLr : | Superv | vised I | Lear | ning P | : Proje | ect R : H | Researc | h C: Cre | dits | | | |
| T/L/ETL : Th | neory | /Lab/ | Embed | ded The | eory a | nd L | ab | 5 | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | |
| > The | objec | ctive c | of the M | Iain Pro | oject i | s to | culmin | ate the | acaden | nic stuc | ly and p | rovid | e an op | portur | nity to |
| explo | ore a | probl | lem or | issue, | addres | ss th | rough | focuse | d and ap | pplied 1 | research | unde | r the di | rectio | n of a |
| facul | ty m | entor. | The pr | oject de | emons | strate | es the s | tudent | s ability | to syn | thesize a | and ap | oply the | e know | vledge |
| critic | skiin ally | s acqu | med to | real-w | ona i | imal | s and | proble | nis. 1111 ze ethicy | s proje | ions and | lto pr | e siude | ffectiv | unnk velv |
| COURSE O | | | ES (Cos | y; ma a | 0000 | ma | solution | <i>J</i> I , IIa | | | | i to pi | | iieeti v | ciy. |
| CO1 | | Apply | the kno | wledge | and s | skills | s acqui | red in t | he cours | se of stu | ıdv addı | ressin | g a spec | cific | |
| | Ţ | oroble | m or iss | ue. | | | | | | | | | 5 F | | |
| CO2 |] | Го enc | ourage | student | ts to th | nink | critical | lly and | creative | ely abou | it societ | al issu | ies and | devel | ор |
| | ι | iser fr | iendly a | ind reac | chable | solu | utions | | | | | | | | |
| CO3 |] | Γo refi | ne rese | arch ski | ills an | d de | monstr | ate the | ir profic | iency i | n comm | unica | tion ski | 11s. | |
| CO4 |] | Γo tak | o take on the challenges of teamwork, prepare a presentation and demonstrate the innate | | | | | | | | | | | | |
| | t | alents | ilents. | | | | | | | | | | | | |
| Mapping of | Cou | rse O | utcome | s with | Progr | am | Outco | mes (P | Os) | DOG | 200 | D 04 | | | |
| COs/POs | | <u>201</u> | PO2 | PO3 | | 4 | <u>P05</u> | PO6 | PO7 | P08 | PO9 | <u>PO1</u> | | 11 | PO12 |
| | | <u>H</u> | H | H | | r | | H | H | | M | <u>M</u> | | 1 | H |
| | | | H | H | | r | | H | H | M | M | | 1 T | 1 T | H M |
| CO3 | | | п | п | | r r | | п | п | IVI | IVI | | T T | T | |
| C04 | | | M 01 | П | <u>п</u> | | п DS | | | <u>п</u> 04 | П | <u>п</u> | | 1 | п |
| C01 | | 15 | 1 | 1, | 502 ц | | 15 | <u>1</u> | 15 | U4 J | 15 | <u>и</u> | | | |
| CO_2 | | I | 1 T | | H H | | I | 1 1 | | I I | 1 | T T | | | |
| CO3 | | H | Ī | | H | | H | Ŧ | I | Ŧ |] | H | | | |
| CO4 | | H | I | | H | | I | Ī | I | I |] | H | | | |
| H/M/L indica | ites s | Streng | th of C | orrelation | on H | I-H | igh, M· | - Medi | ım, L-L | OW | | | | | |
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| ory | Sciences | ering So | nities Science | m Core | m Ele | Electiv | al / P | hips | cills | | | | | | |
| itegory | ic Sciences | ineering So | nanities ial Science | gram Core | gram Ele | en Electiv | ctical / P | ernships . U | t Skills | | | | | | |
| Category | Basic Sciences | Engineering S | Humanities Social Science | Program Core | Program Ele | Open Electiv | Practical / P | Internships . Skill | Soft Skills | | | | | | |
| Category | Basic Sciences | Engineering S | Humanities Social Scienc | Program Core | Program Ele | Open Electiv | Practical / P | Internships Skill | Soft Skills | | | | | | |



| Subject Code: | | Subje | ct Nam | e: FOF | REIG | NL | ANGU. | AGE | | | TY/ LB/ | L | T/ S.Lı | P/ R | C | |
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| BHS18FL | X | Drorod | misito | | | | | | | | ETL T | 0 | 0/0 | 3/0 | 1 | |
| | | 110100 | juisite. | | | | | | | | 1 | U | 0/0 | 5/0 | 1 | |
| L : Lecture | T : 1 | Futorial | SLr: | Super | vised | Lear | ning P | : Proje | ect $\mathbf{R} : \mathbf{F}$ | Researc | h C: Cre | edits | | | | |
| 1/L/EIL: | Theo | ory/Lab/ | Embed | ded Th | eory | and L | Lab | ationa . | | 4000 of | the ferr | | | | | |
| OBJECII | v E:: to of | footivol | cognize | ine cu | longu | | les, pra | clices, a | and neri | ally on | ne lore | ign co | ountry | , ith not | NO. | |
| speakers of | that | langua | у III а IV 0е | Jeigh | langu | lage a | | | a cultur | any ap | рюрпаю | | iner w | itii iiat | lve | |
| | | | <u>ec</u> ES (Cos |): (3-5 |) | | | | | | | | | | | |
| CO1 | | Achiev | ve funct | ional p | , rofici | iencv | in liste | ening, s | peaking | . readi | ng. and | writin | g. | | | |
| CO2 | | Develo | op an in | sight in | nto th | e nat | ure of 1 | | e itself. | the pro | ocess of | langu | age ar | d cult | ıre | |
| 001 | | acquis | ition. | | | | | | ,• 100 • 11, | une pro | •••••••••••• | | -80 m | | | |
| CO3 | | Decod | e, analy | ze, and | l inte | rpret | authen | tic texts | s of diff | erent g | enres. | | | | | |
| Manning of | f Co | urse O | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | | PO1 | Outcomes with Program Outcomes (POs)PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12 | | | | | | | | | | | | | |
| CO1 | | L | L | L |] | L | L | H | L | H | M | H | - | H | L | |
| CO2 | | Μ | L | L |] | Ĺ | L | H | L | Н | Н | Н | | H | L | |
| CO3 | | L | L | Μ | Γ | M | L | H | Μ | Н | Μ | Н | | H | L | |
| Cos / PSOs | | PS | 01 | Р | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | | |
| CO1 | | Ι | | | L | | J | Ĺ | l | Ĺ |] | Ĺ | | | | |
| CO2 | | Ι | | | L | | l | L | J | L |] | L | | | | |
| CO3 | | Ι | | | L | | I | L |] | L |] | L | | | | |
| H/M/L indi | cates | s Streng | th of C | orrelati | on | H- H | igh, M | - Mediu | ım, L-L | ow | | - <u>r</u> | | | | |
| | | ses | anc | | | | | nica | | | | | | | | |
| | | ienc | | | /es | | ct | schr | | | | | | | | |
| | ses | Sci | lces | e | ctiv | /es | oje | Te | | | | | | | | |
| y | enc | ing | es cier | Co | Ele | ctiv | $/P_1$ | / sc | S | | | | | | | |
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| Subject Code: | | Subjec | et Nam | e: POV | VER | ELE | CTRC | ONICS | - II | | TY / LB/ | L | T / S.Lr | P / R | C |
|------------------|-------------------------|-----------------------------------|---|----------------------|---------------------------------|----------------|---------------------|--------------------------------|-------------|---------|-------------|-----------------|-------------|----------|------|
| BEE18012 | _ | <u></u> | • • / | DEE4 | 0000 | DET | 140040 | | | | ETL | | 1/0 | 0.10 | |
| | | Prerec | luisite: | BEE1 | 8009, | , BEF | 218010 | | | | Т | 3 | 1/0 | 0/0 | 4 |
| L : Lecture ' | $\mathbf{T}:\mathbf{T}$ | utorial | SLr : | Super | vised | Learn | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | |
| T/L/ETL : T | heor | y/Lab/ | Embed | ded Th | eory a | and L | .ab | | | | | | | | |
| OBJECTIV | /E: | T | | | | | a | | | | | | | | |
| | • | To at | tain kno | owledg | e on | HVD | C | | | | | | | | |
| | • | Tom | iodel th | | C sys | stem | 11 | | | | | | | | |
| | • | To ki | now abo | Dut FA | CIS | Contr | ollers | | | | | | | | |
| COUDSE | | $\frac{10 \text{ m}}{\text{COM}}$ | iodel th | e Powe | $\frac{r}{10v}$ | v syst | tem | | | | | | | | |
| COURSE C | | Attoin | 25 (Cos |): (3-3 |) about | | \mathbf{r} | | | | | | | | |
| | | Attaint | | vieuge | | | stom | | | | | | | | |
| | | ADIIIIy Knowl | edge or | $\frac{101}{5}$ EACT | <u>חיט</u> רפ | C Sy | stem | | | | | | | | |
| 0.05 | | KIIOWI | euge of | FACI | 3 | | | | | | | | | | |
| CO4 | | Attain | knowle | dge on | FAC | CTS C | Controll | lers | | | | | | | |
| CO5 | | Ability | to mo | iel Pov | ver flo | ow us | sing ST | ATCO | M, TCS | SC etc | | | | | |
| Mapping of | f Cot | irse O | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
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POWER ELECTRONICS - II 3 1/0 0/0 4

UNIT I INTRODUCTION TO HVDC

Introduction of DC Power transmission technology – Classification of HVDC links- Components of HVDC transmission system- Comparison of AC and DC- Planning and Modern trends in DC transmission.

UNIT II HVDC CABLES AND MODELING OF HVDC SYSTEMS

Introduction of DC cables – Basic physical phenomenon arising in DC insulation – Practical dielectrics – Dielectric stressconsideration – Economics of DC cables compared with AC cables- Introduction to converter model of HVDC

UNIT III INTRODUCTION TO FACTS

The concept of flexible AC transmission - reactive power control in Electrical power transmission lines - uncompensated transmission line – series and shunt compensation. Overview of FACTS devices - Static Var Compensator (SVC) – Thyristors Switched Series capacitor (TCSC) – Unified Power Flow controller (UPFC) - Integrated Power Flow Controller (IPFC).

UNIT IV EMERGING FACTS CONTROLLERS

Static Synchronous Compensator (STATCOM) – operating principle – V-I characteristics – Unified Power Flow Controller (UPFC) – Principle of operation - modes of operation – applications

UNIT V POWER FLOW MODELING

Power flow modeling of SVC, TCSC, STATCOM and UPFC.

Total No of Hours:60

TEXT BOOKS:

BEE18012

- 1. Mohan Mathur, R. Rajiv K. Varma, Thyristor Based Facts Controllers for Electrical Transmission Systems. IEEE press and John Wiley & Sons, Inc.
- 2. ACHA etal, E. Power Electronic Control in Electrical Systems. Newness Power Engineering Series.
- 3.Padiyar, K. R.(1990) HVDC power transmission system.1st Ed. New Delhi: Wiley Eastern Limited.
- 4. Edward Wilson Kimbark, (1971) Direct Current Transmission. Vol. I. Wiley inter science. New York: London: Sydney:

REFERENCE BOOKS:

- **1.**John, A.T.(1999) Flexible AC Transmission System. Institution of Electrical and Electronic Engineers (IEEE).
- 2. Narain G. Hingorani, Laszio, Gyugyl, (2001)Understanding FACTS Concepts and Technology of Flexible AC Transmission System. Delhi: Standard Publishers.

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| Subject Code: | | Subje | et Nam | e: SM | ART | GRII |) TEC | HNOI | LOGY | | TY/ LB/ | L | T / S.Lı | P/ R | C | |
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| <u>CO3</u> | 4 | Ability | to desi | gn a S | mart | Grid | | | | | | | | | | |
| CO4 | | Unders | stands t | he stor | age te | echnol | logies | | | | | | | | | |
| CO5 | | Ability | to mod | lel and | l appl | y cont | rol foi | the int | eropera | bility s | tate. | | | | | |
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| Category | Basic Sciences | Engineering Sciences | Humanities and Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technica Skill | Soft Skills | | | | | | | |
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BEE18013 SMART GRID TECHNOLOGY 3 0/0 0/0 3

UNITI INTRODUCTION TO SMART GRID

Traditional power grid- Smart grid Definition- Need for smart grid- Smart Grid Risks- Smart grid risks vs Benefits- Regulations in smart grid- Privacy information impacts and security standards- Smart grid security strategy- smart grid impact- applying security control and managing the overall risks.

UNITII SMART GRID COMMUNICATIONS AND MEASUREMENT TECHNOLOGY 9

Functions of Smart grid Component- Communication and measurement- Monitoring Measurement Technologies- WAMS, PMU, Smart meter, AMI etc. GIS and Google Mapping Tools- MAS- Microgrid and Smart grid Comparison.

UNITIII DESIGNING SMART GRID

Barriers and solution to smart grid development- General Level Automation- Power System Automation at Transmission Level- Distribution Level Automation- End user level- Applications for adaptive control and optimization.

UNIT IV RENEWABLE & STORAGE

Renewable resources- Sustainable energy options for the smart grid-solar Technology- modeling PV- Wind turbine systems- Biomass- Bio-energy- Small and Micro Hydro power- Fuel cell- Geothermal Heat pumps-Penetration and variability issues associated with sustainable energy technology- Demand response issues-Electric Vehicles- PHEV Technology- Environmental implications- Storage Technologies

UNITV INTEROPERABILITY AND CYBER SECURITY

Introduction- Interoperability- State of art- Benefits and challenges- Model- Control- Standards- Cyber security – Risks- Possible operation for improving -Case Study in Smart Grid Activity and Approach for smart grid Application

Total No. of Hours: 45

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TEXT BOOKS:

- 1. Gilbert N. Sorebo, & Michael C. Echols, Smart Grid Security- An end to end view of security in the new Electrical grid. CRC Press.
- 2. James Momoh, Smart Grid- Fundamentals of Design and Analysis. CRC Press.
- 3. Janaka B. Ekanayake, Kithsiri Liyanage, Jian zhong Wu, Akihiko Yokoyama, Nick Jenkins Smart Grid Technology & Application. in Wiley.

REFERENCE BOOKS:

1. S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6

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| CO3 | | Attaine | ed know | vledge | on va | arious | types | of conv | verters | | | | | | |
| CO4 | | Famili | arity in | Power | Elec | tronic | s Devi | ces and | d its per | forman | ce | | | | |
| CO5 | | Ability | to desi | gn Ele | ctrica | al Mac | chines | for Wi | nd Ener | gy Con | version | Syste | m | | |
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| H/M/L indic | cates | Streng | th of Co | orrelati | ion | H- H1 | gh, M | - Medr | um, L-L | LOW | | T | | r – | |
| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technic: Skill | Soft Skills | | | | | | |
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BEE18E01WIND ENERGY CONVERSION TECHNIQUES30/00/03

UNIT I INTRODUCTION TO WIND SYSTEMS

Historical uses of wind – History of wind turbines – Wind characteristics: Meteorology of wind – wind speed distribution across the world – spatial and temporal factors – Eolian features - Biological indicators. Wind measurement: Anemometers – balloon trackers. Wind energy conversion systems (WECS) - classifications

UNIT II WIND ENERGY CONVERSION

Meteorology of wind – Wind speed statistics – Aerodynamic design principles; Aerodynamic theories; Axial momentum, blade element and Strip theory; Maximum power coefficient - tip loss correction; Rotor design and characteristics - Power, torque and speed characteristics – Wind turbine performance measurement – Loading analysis

UNIT III WIND TURBINE SUBSYSTEMS & COMPONENTS

Design of WECS components – Stall, pitch & yaw control mechanisms – Brake control mechanisms - Theoretical simulation of wind turbine characteristics; Test methods

UNIT IV APPLICATION OF WIND ENERGY

Wind pumps - Performance analysis, design concept and testing - Principle of Wind Energy Generators - Stand alone, grid connected and hybrid applications of WECS - Economics of wind energy utilization - Wind energy in India

UNIT V OVERVIEW OF SMALL HYDROPOWER SYSTEM

Overview of micro, mini and small hydro systems- Hydrology- Elements of pumps and turbine - Selection and design criteria of pumps and turbines - Site selection and civil works - Speed and voltage regulation - Investment issues load management and tariff collection; Distribution and marketing issues: case studies; Potential of small hydro power in India.

Total No of 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 Hall Inc
- 3. Bose, B.K. (2001) Modern Power Electronics & AC Drives. Prentice Hall

REFERENCE BOOKS:

- 1. Vaughn Nelson, (2009) Wind Energy Renewable Energy & the Environment. CRC Press
- 2. S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6



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| CO4 | | Knowl | edge or | n Smar | t grid | and M | Micro g | grid | | | | | | | |
| CO5 | | Knowl | nowledge on Smart Space Security System | | | | | | | | | | | | |
| Mapping of | f Co | urse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | r | | | | | |
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IOT APPLIED TO ELECTRICAL ENGINEERING

UNITI **INTRODUCTION TO IOT** 9 Introduction – Need of IOT in Electrical Engineering – Challenges in Implementation of IOT – Trends in Electrical Engineering - Configuration and Scalability - Efficiency - Quality of Service **UNIT II TELEMATICS** 9 Smart Devices - Smart Apps - Wearable Technology - Vehicle Telemetry - Smart Homes and Building Automation - Vehicle Charging Station UNIT III **SMART ENERGY** Generation - Transmission - Distribution and Metering - Storage - Smart Monitoring and Diagnostics System at Major Power Plants - Micro grid and Virtual Power UNIT IV **INDUSTRIAL IOT** 9

Real-Time Monitoring and Control of Processes – Deploying Smart Machine – Smart Sensor – Smart Controllers – SCADA – Proprietary Communication

UNIT V SECURITY MEASURES

Securing Smart Spaces and Smart Grid – Smart Grid – Service that need to be Secure - Security Requirement – Security Smart Spaces – Smart Tracking Firewall – Cryptographic Key in the IoT

Total No of Hours: 45

TEXT BOOKS:

BEE18E02

1. George Mastorakis , (2016), Internet of Things (IoT) in 5G Mobile Technologies,1st ed. Edition,, Publisher SPRINGER

REFERENCE BOOKS:

1. Enterprise IoT: Strategies and Best Practices for Connected Products and Services, Dirk Slama, Frank Puhlmann, Jim Morrish, Rishi M Bhatnagar, Publisher O'REILLY

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| Subject Code: | | Subjec | et Nam | e: ME | СНА | TRO | | TY/ LB/ | L | T / S.Lr | P/ R | C | | | | |
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| • | то и | inderst | and the | concer | ots of | senso | ors and | transd | ucers | | | | | | | |
| • | Tol | earn in | terface | progra | mmii | ng | | | | | | | | | | |
| • | To a | pply c | ontrol s | ystem | probl | ems | | | | | | | | | | |
| COURSE (| DUT | COME | ES (Cos | s): (3-5 |) | | | | | | | | | | | |
| CO1 | | Attain | knowle | dge on | Sens | sors a | nd Tra | nsduce | rs | | | | | | | |
| CO2 | | Ability | v to inte | rface in | n pro | gramr | ning | | | | | | | | | |
| CO3 | (| Capabl | le to de | sign co | ntrol | techn | iques | | | | | | | | | |
| CO4 | | Ability | v to desi | ign act | uator | s | | | | | | | | | | |
| CO5 | | Capabl | le of un | derstar | nding | recen | t adva | ncemei | nts | | | | | | | |
| Mapping of | f Cou | irse O | se Outcomes with Program Outcomes (POs)01PO2PO3PO4PO5PO6PO7PO8PO9PO10PO11PO12 | | | | | | | | | | | | | |
| COs/POs | | PO1 | I PO2 PO3 PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11 PO1 M M M M H M M M I | | | | | | | | | | | | | |
| CO1 | | H | Μ | M | 1 | M | M | L | H | Μ | Μ | M | | M | L | |
| <u>CO2</u> | | H | H | L | | H | <u>M</u> | L | H | H | L | <u>H</u> | | M | | |
| <u>CO3</u> | | <u>H</u> | H | H | | | <u>H</u> | M | H | H | H | <u>H</u> | | H | M | |
| <u>CO4</u> | | H | H | H | | | H | H | H | H | H | | | H | <u>H</u> | |
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| CO4 | | E | I | - | H | | I | | 1 | M |] | H | | | | |
| CO5 | | Ν | ſ | | Н | | Ι | 1 |] | H |] | H | | | | |
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BEE18E03 MECHATRONICS 3 0/0 0/0 3

UNIT I INTRODUCTION

Mechatronics – definition and key issues – evolution – elements – mechatronics approach to modern Engineering design.

UNIT II SENSORS AND TRANSDUCERS

Types - displacement, position, proximity and velocity sensors - signal processing - data display.

UNIT III ACTUATION SYSTEMS

Mechanical types – applications – electrical types – applications – pneumatic and hydraulic systems – applications – selection of actuators

UNIT IV CONTROL SYSTEMS

Types of controllers – programmable logic controllers – applications – ladder diagrams – microprocessor applications in mechatronics – programming interfacing – computer applications

UNIT V RECENT ADVANCES

Manufacturing mechatronics – automobile mechatronics – medical mechatronics – office automation – case studies.

Total No of Hours: 45

TEXT BOOKS:

- 1. Bulton, N. (1995) Mechatronics : Electronic Control system for Mechanical and Electrical Engineering, Longman.
- 2. Dradly, D.A. Dawson, D. Burd, N.C. and Loader, A.J. (1993) Mechatronics: Electronics in products and processes, Chapman & Hall.

REFERENCE BOOKS:

- 1. HMT Mechatronics. New Delhi: Tata McGraw-Hill.
- 2. Galip Ulsoy, A. and Devices, W.R.(1989) Microcomputer Applications in Manufacturing .USA: John wiley.
- 3. James Harter,(1995) Electromechanics : Principles, concepts and devices. New Jersey: Prentice Hall.

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| Subject Code: | | Subjec | t Nam | e: AR | FIFI | CIAL | INTE | LLIG | ENCE | | TY/ | L | T/ S.Lr | P/ R | C |
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| BEE18E04 | | | | | | | | | | | ETL | | | | |
| | | Prereq | uisite: | | | | | | | | Т | 3 | 0/0 | 0/0 | 3 |
| L : Lecture ' | T : T | utorial | SLr : | Super | vised | Lear | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | |
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| OBJECTIV | /E: | | | | | | | | | | | | | | |
| • | • T | o attair | n famili | arity ir | n Arti | ficial | Intellig | gence | | | | | | | |
| • | • T | o study | / about | Fuzzy | Syste | em. | | | | | | | | | |
| • | • T | o acqui | ire knov | wledge | of A | NN | | | | | | | | | |
| • | • T | o study | / about | genetio | c algo | orithm | 1 | | | | | | | | |
| • | • T | o do pi | ogrami | ning u | sing o | optim | ization | techni | ques. | | | | | | |
| COURSE (| DUT | COME | ES (Cos | s): (3-5 |) | | | | | | | | | | |
| CO1 | | Familia | arity in | Artific | ial In | tellig | ence | | | | | | | | |
| CO2 | | Acquir | ed knov | wledge | on F | uzzy | System | 1 | | | | | | | |
| CO3 | | Acquir | ed knov | wledge | on N | Jeural | l Netwo | ork | | | | | | | |
| CO4 | | Familia | arity in | Geneti | ic Alg | gorith | m | | | | | | | | |
| CO5 | | Capable to solve issues with optimization techniques | | | | | | | | | | | | | |
| Mapping of | f Cou | irse Oi | rse Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PC |)11 | PO12 |
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| CO2 | | Η | Μ | Μ | | H | Η | Μ | Η | Η | Н | Η |] | H | Η |
| CO3 | | М | Μ | L |] | H | Μ | Н | Μ | Μ | Н | Μ |] | H | \mathbf{M} |
| CO4 | | Μ | Η | Μ |] | H | L | Μ | Μ | Μ | Μ | L |] | H | Μ |
| CO5 | | Н | Η | Μ |] | H | Μ | Н | Η | Η | H | Η |] | H | Μ |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
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| H/M/L indic | cates | Streng | th of Co | orrelati | on | <u>H- H</u> | igh, M· | - Medi | um, L-L | ow | | - | | | |
| Category | Basic Sciences | Engineering Sciences | Humanities an Social Sciences | Program Core | Program Electives | Open Electives | Practical / Project | Internships / Technica Skill | Soft Skills | | | | | | |
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BEE18E04 ARTIFICIAL INTELLIGENCE

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE

Computational Intelligence Paradigms - Heuristic Search – Techniques for heuristic search and classification, State Space Search – Strategies for implementation of Graph search based on Recursion patent – directed search production system and learning

UNIT II FUZZY SYSTEMS

Fuzzy Sets: Definitions - Membership Functions-Operators - Fuzzy Set Characteristics - Fuzziness and Probability. Fuzzy Logic and Reasoning: Fuzzy Logic - Linguistics Variables - Fuzzy Rules Fuzzy Inferencing - Fuzzification - Inferencing - Defuzzification - Fuzzy Controllers : Components of Fuzzy Controllers- Types - Mamdani Fuzzy Controller

UNIT III ARTIFICIAL NEURAL NETWORKS

Calculating the Net Input Signal - Activation Functions - Artificial Neuron Learning .Supervised Learning Neural Networks: Neural Network Types Feed forward Neural networks Supervised Learning Rules-Gradient Descent Optimization. Unsupervised Learning Neural Networks: Hebbian Learning Rule - Learning Rule - Stochastic Training Rule

UNIT IV EVOLUTIONARY ALGORITHM

Particle Swarm Optimization: Basic Particle Swarm Optimization -Global Best PSO-Local Best PSO. Genetic Algorithms: Canonical Genetic Algorithm -Crossover -Mutation - Control Parameters. Ant colony Algorithms: Ant Colony Optimization -Foraging Behaviour of Ants-Simple Ant Colony Optimization

UNIT V APPLICATION OF COMPUTATIONAL INTELLIGENCE

Study the Algorithm and Code for travel salesman problems, Traffic monitoring problems, transportations problems, fault diagnosis problems with computational intelligence

Total No of Hours: 45

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TEXTBOOKS:

- 1. Simon Haykin, (1994) Neural Networks: A Comprehensive Foundation, Macmillan College Publishing Company
- 2. Goldberg D.E. (2002) Genetic Algorithms in Search, Optimization and Machine Learning. Pearson Education Asia
- 3. Timothy. J. Ross, (2000) "Fuzzy Logic with Engineering Applications

REFERENCE BOOKS:

- 1. Andries P.Engelbrecht, (2000) Computational intelligence. University of Pretoria-South Africa
- 2. Singiresus. Rao, Engineering optimization. West Lafayette. Indiana
- 3. J. Yen and R. Langari, "Fuzzy Logic: Intelligence, Control, and Information", Prentice-Hall, 1999
- 4. Sudhir K., "Fuzzy Sets and Applications"
- 5. Bhargava A.K. "Fuzzy Set Theory Fuzzy Logic and their Applications



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| Subject Code: BEE18E05 | | Subjec TECH | t Namo NIQUI | e: SOL ES | AR EN | ERGY (| CONVI | ERSIO | N | TY / LB/ ETL | L | T / S.Lr | P/ R | C |
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| L : Lecture 7 | Γ : Τι | utorial | SLr: | Superv | ised Le | arning P | : Proje | ect R : F | Researc | h C: Cre | dits | | I | |
| T/L/ETL : T | heor | y/Lab/ | Embedo | led The | ory and | Lab | | | | | | | | |
| OBJECTIV | E : | | | | | | | | | | | | | |
| • ' | To st | tudy ab | out Sol | ar Radi | ation an | d the co | llector | types | | | | | | |
| • ' | To ir | npart k | nowled | lge on t | he Appl | ication c | of Solar | thermal | Techn | ology | | | | |
| • | To u | ndersta | and the | fundam | entals o | f Solar F | hotovo | oltaic cel | ls | | | | | |
| • | To de | esign the Solar cells in cost effective manner. earn about the solar passive Architecture | | | | | | | | | | | | |
| | <u>Fo</u> le | comes (Cos): (3-5) | | | | | | | | | | | | |
| COURSE O | | COMES (Cos): (3-5) Students understand. Solar Padiation and the collector type: | | | | | | | | | | | | |
| | , | Students understand Solar Radiation and the collector types | | | | | | | | | | | | |
| <u>CO2</u> | 4 | Acquire knowledge on the Application of Solar thermal Technology | | | | | | | | | | | | |
| <u>CO3</u> | | Unders | stand th | e funda | mentals | of Solar | Photo | voltaic c | ells | | | | | |
| <u>CO4</u> | | rammar to design the Solar cells in cost effective manner | | | | | | | | | | | | |
| | | incorporate the knowledge about the solar passive Architecture | | | | | | | | | | | | |
| Mapping of | Cou | Irse O | utcome | $\frac{s \text{ with }}{DO2}$ | Program | n Outco | mes (P | $\frac{OS}{DO7}$ | DOO | DOO | DO1 | | 11 | DO12 |
| COS/POS | | M | PO2 | <u>P03</u> | P04 | PO5 | PO6 | P0/ | PU8 | P09 | | | II . r | <u>PO12</u> |
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| <u>CO4</u> | | M | H | <u>H</u> | M | | M | H | M | | | | | |
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| Category | Basic Sciences | Engineering Science | Humanities a Social Sciences | Program Core | Program Electives Onen Flectives | Practical / Project | Internships / Technic Skill | Soft Skills | | | | | | |
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BEE18E05SOLAR ENERGY CONVERSION TECHNIQUES30/00/03

UNIT I SOLAR RADIATION AND COLLECTORS

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 – classification - tracking systems - compound parabolic concentrators - parabolic trough concentrators - concentrators with point focus - Heliostats – performance of the collectors

UNIT II APPLICATIONS OF SOLAR THERMAL TECHNOLOGY

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 SOLAR PV FUNDAMENTALS

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 - preparation of metallurgical, electronic and solar grade Silicon - production of single crystal Silicon: Czokralski (CZ) and Float Zone (FZ) method

UNIT IV SOLAR PHOTOVOLTAIC SYSTEM DESIGN AND APPLICATIONS

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 - hybrid and grid connected system - System installation - operation and maintenances - field experience - PV market analysis and economics of SPV systems

UNIT V SOLAR PASSIVE ARCHITECTURE

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 - thermal comfort – concept of solar temperature and its significance - calculation of instantaneous heat gain through building envelope

Total No of Hours: 45

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TEXT BOOKS:

- 1. Sukhatme S P, (1984), Solar Energy, Tata McGraw Hill
- 2. Kreider, J.F. and Frank Kreith, (1981), Solar Energy Handbook, McGraw Hill

REFERENCE BOOKS:

- 1. Garg H P., Prakash J., (2000), Solar Energy: Fundamentals & Applications, Tata McGraw Hill
- 2. S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6
- 3. Alan L Fahrenbruch and Richard H Bube, (1983), Fundamentals of Solar Cells: PV Solar Energy Conversion, Academic Press
- 4. Larry D Partain, (1995), Solar Cells and their Applications, John Wiley and Sons, Inc.



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| L : Lecture 7 | : Tı | utorial | SLr : | Super | vised | Lear | ning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | |
| T/L/ETL : T | heor | y/Lab/. | Embed | ded Th | eory | and L | ab | 5 | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | |
| • To e | duca | te the | concept | t of Gr | een B | uildi | ng | | | | | | | | |
| • To u | nder | stand t | the Des | ign coi | ncepts | s of G | Green B | uilding | 5 | | | | | | |
| • To a | ttain | knowl | ledge o | n reduc | ction | of car | bon fo | oting | | | | | | | |
| • To in | npar | t the in | nportar | nce of l | Envir | onme | ntal iss | sues | | | | | | | |
| • To e | xplo | re the | e the future trends in Green Building and to revamp the ecological design. | | | | | | | | | | | | |
| COURSE O | UT | COME | OMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 |] | Knowledge on Green building | | | | | | | | | | | | | |
| CO2 | | Ability to understand the Design concepts of Green building | | | | | | | | | | | | | |
| CO3 | | Attained knowledge on reduction of Carbon footing | | | | | | | | | | | | | |
| CO4 | | Acquired knowledge on the importance of Environmental issues | | | | | | | | | | | | | |
| CO5 | | Ability to explore the future trends on Green building | | | | | | | | | | | | | |
| Mapping of | Cou | irse Oi | utcome | s with | Prog | gram | Outco | mes (P | Os) | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | Η | Μ | H | Ι | N | Μ | L | L | Μ | Μ | L | L | <i>,</i> | Η |
| CO2 | | Μ | L | Μ | Ι | M | Η | Μ | Μ | H | Μ | L | Ν | [| Μ |
| CO3 | | Μ | Μ | L | Ι | N | Μ | L | Μ | Μ | Μ | Μ | L | , | L |
| CO4 | | Μ | Η | L |] | H | Η | Μ | Η | Μ | Η | Μ | Ν | [| Μ |
| CO5 | | Μ | Μ | L | Ι | N | L | H | Μ | H | Μ | L | N | [| Н |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
| CO1 | | H | I | | Μ | | I | H |] | Ĺ | N | 1 | | | |
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| CO3 | | H | [| | Μ | | Ν | A |] | H | I | | | | |
| CO4 | | N | 1 | | Μ | | Ν | N | I | М | N | 1 | | | |
| CO5 | | N | 1 | | Μ | | ŀ | H | | H | H | I | | | |
| H/M/L indic | ates | Streng | $\frac{\text{th of } C}{T}$ | orrelati | on | <u>H- H</u> | igh, M | - Medi | um, L-L | .ow | | 1 | | | |
| Category | Basic Sciences | Engineering Sciences Humanities ar Social Sciences Program Electives Open Electives Practical / Project Internships / Technic Soft Skills | | | | | | | soft Skills | | | | | | |
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BEE18E06GREEN BUILDING TECHNOLOGY30/00/03

UNIT I INTRODUCTION TO GREEN BUILDING

Basics of Green - Sustainable Design – ecological Design – Green Design – Green Buildings- Progress & Obstacles- High Performance Green Buildings

UNIT II DESIGN OF GREEN BUILDING

Foundations of Green Building-Environmental concerns- Assessment- Design process- Green building excecution project- Heat Island Mitigation – Sustainable sites

UNIT III REDUCTION OF CARBON FOOTING

Building energy Issues – Design Strategy – Renewable Energy Systems- Smart Building & energy Management Systems - Reducing the Carbon footprint

UNIT IV ENVIRONMENTAL ASPECTS

Hydrological cycle - Sustainable storm water management - Construction Operations and commissioning of Green Building – Construction & Demolition Waste management - Indoor Environmental Quality

UNIT V FUTURE TRENDS

Economics in Green Building – Managing First costs – Financial barriers - Articulating Performance goals for future Green Buildings – Revamping Ecological Design

Total No of Hours: 45

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TEXT BOOKS:

- 1. Charles J.Kibert Sustainable Construction: Green Building Design and Delivery, 3rd Edition Wiley Publisher, (2012)ISBN :978-0-470-90445-9
- 2. Francis D, K, Ching, Ian M, Shapiro, Green Building Illustrated, Wiley

REFERENCE BOOKS:

- 1. Sam Kubba, Handbook of Green Building Design, and Construction, Elsevier Publisher(2012) ISBN: 978-0-12-385128-4
- Charles J.Kibert, Martha C.Monroe, Anna L.Peterson, Richard R.Plate, Leslie Paul Thiele, Working Toward Sustainability: Ethical Decision –Making in a Technological World, Wiley Publisher, ISBN : 978-0-470-53972-9
- S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6



| Subject Code: BEE18E07 | | Subjec APPL | et Nam ICATI | e: NEU ON | JRAL | . NE' | TWOF | RKS A | ND ITS | 5 | TY / LB/ ETL | L | T / S.Lr | P/ R | C |
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| L : Lecture T | T:T | Tutorial | SLr : Embed | Superv | vised | Learr | ning P ab | : Proje | ct R : I | Researc | h C: Cre | dits | 1 | | 1 |
| OBJECTIV | /E: | I y/ Luo/ | Linoca | | | | ao | | | | | | | | |
| • To ! | knov | v the fu | ndamer | ntals of | Neur | al net | twork | | | | | | | | |
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| COURSE C |)UT | COME | COMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 | | Knowl | Knowledge on the fundamental of Neural network | | | | | | | | | | | | |
| CO2 | | Attain | Attain knowledge on the architecture of the network topology | | | | | | | | | | | | |
| CO3 | | Knowl | Inowledge on different types of topologies | | | | | | | | | | | | |
| CO4 | | Ability | Ability to apply control using Neural network | | | | | | | | | | | | |
| CO5 | | Ability | Ability to design Digital Filters | | | | | | | | | | | | |
| Mapping of | f Co | urse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
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BEE18E07 NEURAL NETWORKS AND ITS APPLICATION 3 0/0 0/0 3

UNIT I FUNDAMENTALS OF NEURAL NETWORKS

Introduction- Basic Structure of a Neuron- Model of Biological Neurons- Elements of Neural Networks Weighting Factors- Threshold- Activation Function.

UNIT II NEURAL NETWORKS THEORY

ADALINE- Linear Separable Patterns- Single Layer Perceptron- General Architecture- Linear Classification- Perceptron Algorithm- Multi-Layer Perceptron General Architecture- Input-Output Mapping.

UNITIII NEURAL NETWORK ARCHITECTURES

Introduction- NN Classifications- Feed forward and feedback networks- Supervised and Unsupervised Learning Networks- Back Propagation Algorithm- Delta Training Rule- Radial Basis Function Network (RBFN)- Kohonen Self Organization Network- Hopfield Network.

UNIT IV NEURAL NETWORKS FOR CONTROL

Schemes of neuro-control – identification and control of dynamical systems – adaptive neuro controller – case study.

UNIT V APPLICATION OF NEURAL NETWORKS

Introduction -Application of neural network in Design of digital filters- computer networking –Electrical Fault Diagnosis.

Total No of Hours: 45

TEXT BOOKS:

- 1. Ali Zilouchian Mo Jamshidi, (2000) Intelligent Control Systems Using Soft Computing Methodologies.
- 2. Englewood cliffs, N.J. Laurance Fausett, (1992) Fundamentals of Neural Networks. Prentice Hall.

REFERENCE BOOKS:

- 1. Tsoukala, L.H. and Robert E. Uhrig, (1997) Fuzzy and Neural approach in Engineering. John Wiley and Sons.
- 2. Jacek M. Zurada, (1997) Introduction to artificial Neural Systems. Mumbai: Jaico Publishing House.
- 3. Millon, W.T. Sutton, R.S. and Webrose, P.J.(1992) Neural Networks for control. MIT: Press.



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| Subject Code: | | Subjec | et Nam | e: DIG | ITAL | SIC | GNAL | PROC | ESSIN | G | TY / LB/ | L | T / S.Lr | P/ R | C |
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| L : Lecture ' | T : T | utorial | SLr : | Super | vised | Lear | ning P | : Proje | ect R : I | Researc | h C: Cre | edits | | | |
| T/L/ETL : T | heor | y/Lab/ | Embed | ded Th | eory a | nd L | Lab | J | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | |
| • | , T | o unde | rstands | the fur | ndame | entals | s of sig | nals & | systems | 5. | | | | | |
| • | • Ir | npart k | nowled | lge on 2 | Z- trar | nsfor | m cond | cepts. | - | | | | | | |
| • | , T | o Unde | erstand | the De | signin | g of | signals | susing | filters. | | | | | | |
| • | , T | o avail | the kno | owledg | e on d | lesig | n IIR a | nd FIR | filters | with Fo | urier sei | ies m | ethod | | |
| • | , T | o understand the Architecture and features of various signal processing chips | | | | | | | | | | | | | |
| COURSE (| DUT | COMES (Cos): (3-5) | | | | | | | | | | | | | |
| CO1 | | Acquire knowledge in fundamentals of signals & systems. | | | | | | | | | | | | | |
| CO2 | | Capable of solving problems using Z- transform | | | | | | | | | | | | | |
| CO3 | | Familiar to design of signals using filters. | | | | | | | | | | | | | |
| CO4 | | Capable of design IIR and FIR filters with Fourier series method | | | | | | | | | | | | | |
| CO5 | | Incorporate the knowledge in development of projects. | | | | | | | | | | | | | |
| Mapping of | f Coı | ırse Ö | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | |
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BEE18E08DIGITAL SIGNAL PROCESSING30/00/03

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS

Periodic and pulse signals – examples of sequences – pulse step, impulse, ramp, sine and exponential – differential equations – linear time invariant – stability, causality – DT systems – time domain analysis

UNIT II Z- TRANSFORM AND DFT

Z-transform and its properties – convolution – inverse Z-transform – discrete Fourier series – properties – sampling the Z-transform – Discrete Fourier Transform – properties for frequency domain analysis – linear convolution using discrete Fourier transform – overlap add method, overlap save method

UNIT III FAST FOURIER TRANSFORM (FFT)

Introduction to Radix 2 FFT's – decimation in time FFT algorithm – decimation in frequency FFT algorithm – computing inverse DFT using FFT – mixed radix FFT algorithm

UNIT IV IIR AND FIR FILTER DESIGN

Classification – reliability constrains – IIR design – bilinear transform method – impulse invariant method – step – invariance method – FIR design – Fourier series method – window function method

UNIT V PROGRAMMABLE DSP CHIPS

Architecture and features of TMS 320C50, TMS3201and ADSP 2181signal processing chips

Total No of Hours: 45

TEXT BOOKS:

- 1. Openheim A.V., and Schafer R.W., Discrete Time Signal Processing, Prentice Hall of India, New Delhi, 1992
- 2. Proakis J.G. and Manolakis, D.G., Digital Signal Processing Principles, Algorithms and Applications, Prentice Hall of India, New Delhi, 1997

REFERENCE BOOKS:

- 1. Antonian A., Digital Filters analysis and Design, Tata McGraw-Hill Publishing Co., New Delhi, 1988
- 2. Stanley W.D., Digital Signal Processing, Restion Publishing House, 1989. ADSP2181 Datasheet



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| Subject Code: BEE18E09 | | Subjec DISTI | ct Nam RIBUT | e: : RI ION S | ESTRU YSTEI | UCT M | URIN | G OF | | | TY / LB/ ETL | L | T / S.Lr | P / R | C |
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| CO1 | | Knowl | edge or | the D | istribut | tion | Systen | n and t | he load | pattern. | | | | | |
| CO2 | | Attaine | ed knov | vledge | on the | Dist | ributic | on feed | er | | | | | | |
| CO3 | | Ability | bility to restructure the Distribution network | | | | | | | | | | | | |
| CO4 | | Knowl | nowledge on self healing control techniques | | | | | | | | | | | | |
| CO5 | | Attaine | ttained confidence on Automation of Distribution network. | | | | | | | | | | | | |
| Mapping of | Cou | ırse O | utcome | s with | Progra | am (| Outco | mes (P | Os) | | | | | | |
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| CO4 | | Μ | Μ | Н | Μ | | Μ | Н | Н | Н | Μ | Μ | I | M | Μ |
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BEE18E09 RESTRUCTURING OF DISTRIBUTION SYSTEM 3 0/0 0/0 3

UNIT I INTRODUCTION TO DISTRIBUTION SYSTEM

Development of Power Distribution Network –Load Growth and Diversified Demands – Load Modeling-Load Demand Forecasting - Self healing Techniques – Line parameters- Overhead lines, Insulators and Supports- Cables- Insulation Resistance – Voltage drop and Power loss in Conductor

UNITII DISTRIBUTION FEEDER

Primary Distribution system – Secondary Distribution system – Design Considerations - Substation location and planning – Feeder Loading – Voltage drop considerations – Drop with different loadings –Voltage drop constant with different loading

UNITIII RESTRUCTURING THE NETWORK

Design of Network – Voltage selection – Sizing –Voltage control- Current loading- Earthing –Cost Factor - LV Distribution Networks – Switchgear for Distribution Substation and LV Networks – Extended Control of Distribution Substations and LV Network

UNIT IV SELF HEALING CONTROL

Self Healing –Principle –Characteristics- Control method – Urban Distribution network self-healing control method based on Quantity of State – Based on Distributed Power and Microgrid- Based on Coordination Control model

UNIT V AUTOMATION IN DISTRIBUTION SYSTEM

Implementation of Distribution Network self-healing – Relay Protection Units – Basic Requirements – Self Adaption – SCADA / RTU- History and Development of SCADA -Principle and Operation – Automation of Distribution System – PMU /WAMS and SCADA /EMS – Application of PMU or WAMS

Total No of Hours: 45

TEXT BOOKS:

- 1. Kamaraju, V (2009), Electrical power Distribution System, Tata McGraw Hill
- 2. Abdelhay A, Sallam, Om, P, Malik, (2011), Electric Distribution Systems, Wiley

REFERENCE BOOKS:

- 1. Xinxin Gu, Ning Jiang (2017), Self Healing Control Technology for Distribution Networks, Wiley
- 2. James Northcote-Green, Robert Wilson, Control and Automation of electrical Power Distribution Systems, Taylor & Francis

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| Subject Code: BEE18E10 | 2 | Subjec DG | ct Name AND | e: ENER | RGY S | STOI | RAGE | TECH | INOLC | OGY | TY / LB/ ETL | L | T / S.Lr | P/ R | C |
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| • To s | study | about | the Ene | ergy Sto | orage | Tech | nology | y | | | | | | | |
| • To k | cnow | the wo | orking l | Princip | le of I | Batter | ries and | d its ty | pes | | | | | | |
| • To i | mpar | t knov | vledge o | on Fuel | Cells | s alon | g with | its adv | antage | and dis | advantag | ges | | | |
| • To a | inaly | se vari | ous typ | es of ei | nergy | stora | ge dev | vices. | | | | | | | |
| • To h | nave | a wide spread knowledge on Electric Venicle COMES (Cos): (3-5) | | | | | | | | | | | | | |
| COURSE C | DUTO | COMES (Cos): (3-5) | | | | | | | | | | | | | |
| | 4 | Attain Knowledge on various energy resources | | | | | | | | | | | | | |
| | | Knowledge on the concept of Distributed generation | | | | | | | | | | | | | |
| <u>CO3</u> | | Ability to analyze various types of energy storage devices | | | | | | | | | | | | | |
| <u>CO4</u> | 4 | Ability to analyze various types of energy storage devices | | | | | | | | | | | | | |
| <u>CO5</u> | | Knowledge on Electric vehicles | | | | | | | | | | | | | |
| Mapping of | | Irse U | utcome | $\frac{\text{s with}}{\text{DO2}}$ | Prog | ram (| Dutco | mes (P | $\frac{US}{DO7}$ | DOP | DOD | DO1 | | 11 | DO12 |
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| CO3 | | N | 1 | | L | | N | Л |] | H |] | H | | | |
| CO4 | | N | 1 | | Μ | | N | Л | I | М |] | H | | | |
| CO5 | | N | 1 | | H | | ł | Ι | Ι | М | Γ | Л | | | |
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| 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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BEE18E10DG AND ENERGY STORAGE TECHNOLOGY30/00/03

UNIT I INTRODUCTION

Conventional Power generation – Advantages and disadvantages – energy crisis – Non- conventional energy resources – review of solar, Wind energy system, biomass, tidal sources

UNITII DISTRIBUTED GENERATION

Concept of distributed generation – topologies – selection of sources – regulatory standards – Security issues in DG implementation – Energy storage element - Necessity of energy storage – types of energy storage – comparison of energy storage technologies - Application

UNITIII BATTERIES & FUEL CELL

Batteries – Measurement – Storage and types - 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 ENERGY STORAGE TECHNOLOGIES

Flywheel – Super Capacitors – Principles & applications, Compressed Air Energy Storage- Concept of Hybrid Storage – Microgrid economics - Applications

UNIT V ELECTRIC VEHICLE

Electric Vehicle – Types – Hybrid Vehicle – Battering Charging – Usage of batteries in Hybrid vehicle – Fundamentals of Electric vehicle modeling – Types of PHEVs and Automotive system

Total No of Hours: 45

TEXT BOOKS:

- Ibrabim Dincer, marc A,Rosen, (2011) Thermal Energy Storage Systems and Applications, 2nd Ed, John Wiley
- 2. James Larminie, John Lowry (2003), Electric Vehicle Technology Explained, John Wiley & Sons
- 3. Sumedha Rajakaruna, Farhad Shahnia, Arindham Ghosh, "Plug-in-ElectricVehicles in Smart Grid Integration Techniques", Springer, 2015

REFERENCE BOOKS:

- 1. Seth Leitman, Bob Brant (2013) Build Your Own Electric Vehicle, 3rd Ed, McGraw Hill
- 2. S.T.Rama,E.Sheeba Percis, A.Nalini, S.Bhuvaneswari, (2017), Handbook on Standalone Renewable Energy Systems, 1st Edn, Research India Publication ISBN No 978-93-87374-12-6
- 3. James larminie, Andrew Dicks, (2003), Fuel Cell Systems Explained, Wiley

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| Subject Code: | Subj | ect Nam | e: MA | TERIA | L SCIE | ΓION | TY/ | L | T/ SIr | P/ P | C | | | |
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| OBJECTIVE | : | | | | | | | | | | | | | |
| To ga | n basic | knowled | lge on C | Cryogen | ic Techn | ology | | | | | | | | |
| To im | part kno | wledge | on Supe | er Alloy | and its A | Applica | tions | | | | | | | |
| To kn | ow the i | mportan | ce of Fl | exible I | Electroni | cs | | | | | | | | |
| • To ha | ve a wic | le spread | knowle | edge ab | out Nanc | science | and nat | no mate | rial | | | | | |
| To le | arn aboi | it Drone | | | | | | | | | | | | |
| COURSE OU | TCOM | OMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 | Attai | Attained basic knowledge on Cryogenic Technology | | | | | | | | | | | | |
| CO2 | Knov | Knowledge on Super Alloy and its application | | | | | | | | | | | | |
| CO3 | Knov | Knowledge on Flexible Electronics | | | | | | | | | | | | |
| CO4 | Attai | Attained knowledge on nano science and nano material | | | | | | | | | | | | |
| CO5 | Knov | Knowledge on Drone | | | | | | | | | | | | |
| Mapping of (| Course (| se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
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| CO3 | Н | Н | L | Μ | Μ | Μ | Μ | Μ | Μ | Μ | H | I | Μ | |
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| CO5 | Н | L | Η | Н | Н | Μ | Μ | Μ | Μ | Μ | I | _ | Μ | |
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| CO5 | | Μ | | Μ | | H | | L | | H | | | | |
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BEE18E11MATERIAL SCIENCE IN AVIATION30/00/03

UNIT I INTRODUCTION TO CRYOGENIC TECHNOLOGY

Terms & Phenomena associated with Cryogenic Systems – Prominent contributors- Critical Aspects and Issues involved – Benefits from Integration – Early applications of Cryogenic Technology- Gas Separation process – Industrial Applications of Cryogenic fluid technology

UNIT II SUPER ALLOY

Introduction- Basic Metallurgy – characteristics & Facts –Properties – Microstructure – Strengthening – Melting & Conversion – Investment casting- Corrosion & Protection of Super Alloy - Applications

UNIT III FLEXIBLE ELECTRONICS

History – Materials for Flexible Electronics – Degrees – Substrates – Backplanes Electronics – Frontplane Technologies – Encapsulation - Fabrication Technology – Sheets by batch Processing and Web by Roll to Roll Processing

UNIT IV NANOSCIENCE AND NANO TECHNOLOGY

Nano – Current Technologies – Energetics – Implications – Electron Microscopes – Optical Microscopes – Photoelectron Spectroscopy for the study of nano materials – Metal clusture and nano particles – nano crystals – Raman Scattering – Basics of nanomaterials

UNIT V DRONE AND AIR VEHICLE

Introduction – Types of flying drones – Current Uses – Drone Components – Concepts and Systems – Regulations & Safety – Applications – Future Trends

Total No. ofHours: 45

TEXT BOOKS:

- 1. Jha, AR, (2006), Cryogenic Technology and Applications, Elsevier
- 2. John, K Tien, Superalloys, Supercomposites and Superceramics, Elsevier
- 3. William S, Wong, Alberto Salleo, Flexible Electronics: Materials and Applications, Springer
- 4. Pradeep, T, (2012) Nanoscience and Nanotechnology, Mc Graw Hill

REFERENCE BOOKS:

- 1. Mattew, JD, Stephen JD, Superalloys, A Technical guide, 2nd Ed, ASM International.
- 2. Murty, BS, Shankar, P, Baldev Raj, BB Rath, James Murday, Nanoscience and Nanotechnology, Springer
- 3. Robokingdom LLC, (2016)Drone Book



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| Subject Code: BEI18013 | 1 | Subjec | et Name POW | e: ER PL | ANT | ' INS' | TRUN | IENTA | ATION | | TY / LB/ ETL | L | T / S.Lr | P/ R | С |
|------------------------------|----------------|--|---|-------------|---------|----------|---------------------|---------------------------------|-------------|------------|--------------------|------------|-------------|---------|------|
| |] | Prereg | quisite: | | | | | | | | Т | 3 | 0/0 | 0/0 | 3 |
| L : Lecture ' | T : Tı | utorial | SLr: | Superv | vised | Learr | ning P | : Proje | ect R:1 | Researc | h C: Cre | edits | | | |
| T/L/ETL : T | heor | y/Lab/. | Embedo | ded The | eory a | and L | ab | | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | |
| • | Fami | liarity | to Buil | ding bl | ocks | and b | oilers. | | | | | | | | |
| • | Capa | ble to | measur | e Electi | rical j | paran | neters. | | | | | | | | |
| • | Capa | ble to | analyse | variou | s par | amete | ers in p | ower p | olants | | | | | | |
| • | Unde | erstand | the cor | ntrol lo | ops ir | n boil | er | | | | | | | | |
| • | Capa | ble to monitor and control the renewable energy systems | | | | | | | | | | | | | |
| COURSE O | DUT | COME | OMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 | , | The students get familiarized to Building blocks and boilers. | | | | | | | | | | | | | |
| CO2 | , | The student becomes capable to measure Electrical parameters | | | | | | | | | | | | | |
| CO3 | r | The stu | ident w | ill be a | ble to | o anal | yse va | rious p | aramete | rs in po | wer pla | nts | | | |
| CO4 | r | The students understand the control loops in boiler | | | | | | | | | | | | | |
| CO5 | , | The student becomes Capable to monitor and control the renewable energy systems | | | | | | | | | | | | | |
| Mapping of | f Cou | irse Oi | se Outcomes with Program Outcomes (POs) | | | | | | | | | | | | |
| COs/POs |] | PO1 | PO2 | PO3 | PO | 94 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | H | Μ | Μ | Ι | | L | L | L | L | Μ | Μ | I | I | L |
| CO2 | | Μ | Μ | L | Ι | | Η | L | L | Μ | Μ | L | I | I | Μ |
| CO3 | | Н | Н | Η | H | I | Η | Μ | Μ | Μ | Н | Μ | 1 | I | Н |
| CO4 | | Н | Μ | L | N | I | L | L | L | Μ | Μ | Μ |] | H | Μ |
| CO5 | | Η | Н | Μ | I | I | Η | Μ | Η | Μ | Н | Μ |] | I | Н |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | O4 | PS | 05 | | | |
| CO1 | | H | I | | L | | Ι | | I | M |] | Ĺ | | | |
| CO2 | | H | I | | L | | N | A | I | M | Ν | N | | | |
| CO3 | | H | I | | Η | | N | A |] | H | Ν | N | | | |
| CO4 | | N | 1 | | Μ | | I | I | I | Μ | Ν | N | | | |
| CO5 | | H | I | | Η | | I | H | Ι | Ν |] | H | | | |
| H/M/L indic | cates | Streng | th of Co | orrelati | on l | H- Hi | igh, M | - Medi | ım, L-L | ow | | | | | |
| Category | Basic Sciences | Engineering Sciences Humanities and Social Sciences Program Core Program Electives Open Electives | | | | | Practical / Project | Internships / Technica Skill | Soft Skills | | | | | | |
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BEI18013 POWER PLANT INSTRUMENTATION 0/0 3 0/0 3

UNIT I **OVERVIEW OF POWER GENERATION**

Brief survey of methods of power generation - hydro, thermal, nuclear, solar and wind power - importance of instrumentation in power generation – thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.

UNIT II **MEASUREMENTS IN POWER PLANTS**

Electrical measurements – current, voltage, power, frequency, power factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature - steam pressure and steam temperature - drum level measurement - radiation detector - smoke density measurement - dust monitor.

UNIT III ANALYZERS IN POWER PLANTS

Flue gas oxygen analyzer - analysis of impurities in feed water and steam - dissolved oxygen analyzer chromatography – PH meter – fuel analyzer – pollution monitoring instruments.

UNIT IV **CONTROL LOOPS IN BOILER**

Combustion control - air/fuel ratio control - furnace draft control - drum level control - main stem and reheat steam temperature control - super heater control - attemperator - de aerator control - distributed control system in power plants - interlocks in boiler operation.

TURBINE – MONITORING AND CONTROL UNIT V

Speed, vibration, shell temperature monitoring and control - steam pressure control - lubricant oil temperature control - cooling system

Total No of Hours: 45

TEXT BOOKS:

- 1. Sam G. Dukelow, (1991) The control of Boilers, instrument .Society of America
- 2. Modern Power Station Practice.Vol.6.Instrumentation, Controls and Testing. Pergamon Press. Oxford

REFERENCE BOOKS:

- 1. Elonka, S.M. and Kohal, A.L. (1994) Standard Boiler Operations. New Delhi: McGraw-Hill
- 2. Jain, R.K.(1995) Mechanical and industrial Measurements. Delhi: Khanna Publishers



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| Subject Code: | | Subjec S | et Nam SAFET | e: Y FOI | REL | ECTI | S | TY / LB/ | L | T / S.Lr | P/ R | C | | | |
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| DEE10E13 | - | Prerec | uisite: | | | | | | | | | 3 | 0/0 | 0/0 | 3 |
| L : Lecture | T : T | utorial | SLr : | Super | vised | Learr | ning P | : Proje | ct R : F | Researc | h C: Cre | dits | | | |
| T/L/ETL : T | heor | y/Lab/ | Embed | ded Th | eory a | and L | ab | 5 | | | | | | | |
| OBJECTIV | /E: | | | | | | | | | | | | | | |
| • To a | attain | h know | ledge of | n Elect | rical | Safety | У | | | | | | | | |
| • To l | know | about | the ope | eration | of Ele | ectric | al Safe | ty Equ | ipments | | | | | | |
| • To l | earn | about | the safe | ty proc | cedure | es | | | | | | | | | |
| • To I | know | about | the elec | ctrical a | safety | code | es | | | | | | | | |
| | rain | the stu | OMES (Cos): (3-5) | | | | | | | | | | | | |
| COURSE C | | Attaina | UMES (Cos): (3-5) trained knowledge on the basics of Electrical Safety | | | | | | | | | | | | |
| 01 | | Attaint | trained knowledge on the basics of Electrical Safety | | | | | | | | | | | | |
| CO2 | | Knowl | nowledge about the operation of the Safety equipments | | | | | | | | | | | | |
| CO3 | | Knowl | Inowledge on the safety procedures | | | | | | | | | | | | |
| CO4 | | Famili | amiliarity on the electrical safety codes | | | | | | | | | | | | |
| CO5 | | Ability to become consultant and to attend the Vendors. | | | | | | | | | | | | | |
| Mapping of | f Cou | ırse O | utcome | s with | Prog | ram | Outco | mes (P | Os) | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | Η | Μ | L | N | Л | Η | Η | Η | Μ | Μ | L | Ν | 1 | Μ |
| CO2 | | Η | Н | L | N | A | Μ | Н | Η | Η | Μ | Μ | I | I | Η |
| CO3 | | Μ | Μ | Μ | I | H | L | Μ | Μ | \mathbf{M} | Η | Μ | N | 1 | L |
| CO4 | | Н | L | Н | N | A | Μ | L | L | L | L | Η |] | | М |
| CO5 | | L | Μ | Μ | J | Ĺ | Н | Μ | Μ | Μ | Μ | Μ | N | 1 | М |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
| CO1 | | H | I | | Μ | | N | ſ | N | Л | I | I | | | |
| CO2 | | H | I | | Μ | | N | 1 | N | Л | I | I | | | |
| CO3 | | Ν | 1 | | Η | | I | I | I | L | N | 1 | | | |
| <u>CO4</u> | | H | [| | M | | <u>N</u> | <u> </u> | N | <u>л</u> | | | | | |
| | | N. | | 1 / | L | | <u>N</u> | <u>/I</u> | | Λ | Ν | / | | | |
| H/M/L indic | cates | Streng | th of Co | orrelati | on | H- Hi | ign, M· | | ım, L-L | OW | | | | | |
| Category | Basic Sciences | Basic Sciences Engineering Science Humanities a Social Sciences a V Program Core V Program Electives Practical / Project b Internships / Techni Soft Skills | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | |



BEE18E13SAFETY FOR ELECTRICAL ENGINEERS30/00/03

UNIT I GENERAL PRINCIPLES OF ELECTRIC SAFETY

Electricity and Human Body – Earthing – Grounding – General Inspection and testing requirement for electrical safety equipment – Flash and thermal production – head and Eye Protection – Electricians Safety kits

UNIT II HAZARDS IN ELECTRICITY

Lighting Hazards - Hazardous area –Hazard Analysis – shock effect - Electrical Insulation – Electrical fires – Arc Flash – Arc energy – arcing voltage – Injury and death – Protective Strategies - Eectrical safety in hospitals

UNIT III REGULATORY OF SAFETY REQUIREMENT AND STANDARDS

Risk assessment and Management – Safety against over voltage, extra-low and residual voltages – safety practice – Safety Audits – ANSI-IEEE Electrical safety code – Electrical standards at work place – Accident prevention

UNIT IV SAFETY PROCEDURES

Residual current detectors - effects of electric and magnetic fields and electromagnetic radiation – electro surgical hazards – electrical fires and their investigation – Indian electricity safety Act – Area Classification – Safety issues with emerging energy sources

UNITV SAFETY TRAINING METHODS

Introduction – Elements of a Training Program – On the Job Training – Training Consultants and Vendors-Training Program Setup – Step by Step Method electrical safety

Total No of Hours: 45

TEXT BOOK:

1. Electrical safety handbook - John Cadick - McGRAW-HILL, Third Edition



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| Subject Code: | | Subjec PROT | et Name ECTIC | e: WII DN AN | DE AH D CC | REA DNTI | | TY/ LB/ | L | T / S.Lr | P/ R | C | | | |
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| DEE10E14 | | Prereg | uisite: | | | | | | | | | 3 | 0/0 | 0/0 | 3 |
| L : Lecture 7 | [] : T | utorial | SLr : | Superv | vised | Learr | ning P | : Proje | ect R : F | Researc | h C: Cre | edits | | | |
| T/L/ETL : T | heor | y/Lab/ | Embedo | ded Th | eory a | and L | ab | 5 | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | |
| • To k | now | about | the Pha | sor Me | easure | ement | Unit a | and its | importa | nce | | | | | |
| • To in | mpa | rt know | vledge (| on State | e Estir | matio | on and | the Op | timal pla | acemen | t of PM | U | | | |
| • To a | ttain | 1 tamili | arity or | Wide | Area | Meas | sureme | ent Sys | tem | | 1.1 5 | | | 1 6 | D |
| • To f | nave | a wide | e spread | l know | ledge | aboi | it the I | Protect | ion sche | emes an | d the L | ynam | nc mod | el of | Power |
| Syst | em | tha la | he learnt concept for the real time issues. | | | | | | | | | | | | |
| | ppiy TTT | $\frac{1}{1}$ COME | The learnt concept for the real time issues. | | | | | | | | | | | | |
| COURSE O | | Familia | DMES (Cos): (3-5) miliarity in PMU | | | | | | | | | | | | |
| CO2 | | Acquir | equired knowledge in State estimation and the Optimal Placement of PMU | | | | | | | | | | | | |
| CO3 | | Familia | miliarity on Wide Area Measurements | | | | | | | | | | | | |
| CO4 | | Attaine | ttained a wide spread knowledge about the Protection Schemes | | | | | | | | | | | | |
| CO5 | | Ability to apply the concepts for real time | | | | | | | | | | | | | |
| Mapping of | Mapping of Course Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PO | 4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 |
| CO1 | | H | Η | Μ | L | | Μ | H | L | Н | Μ | L | I | ł | Μ |
| CO2 | | H | Μ | Η | N | 1 | Η | Μ | L | Μ | L | Μ | N | 1 | L |
| CO3 | | Η | Η | Η | H | I | L | Μ | Η | Η | Μ | Μ | I | I | Μ |
| CO4 | | Η | Η | Μ | N | 1 | L | Μ | Μ | Μ | L | Η | N | 1 | L |
| CO5 | | Η | Μ | Μ | L | | Μ | Μ | Η | Μ | L | Μ | N | 1 | L |
| Cos / PSOs | | PS | 01 | P | SO2 | | PS | 03 | PS | 04 | PS | 05 | | | |
| CO1 | | H | [| | L | | ł | I | I | |] | L | | | |
| CO2 | | H | [| | L | | H | H | I | | 1 | M | | | |
| <u>CO3</u> | | <u> </u> | [| | | | N | <u>/</u> | I | - | 1 | M | | | |
| <u>CO4</u> | | <u>H</u> 1 | | | H | | 1 T | 1 | | 1 | 1 | | | | |
| LO5 | otoc | Strong | th of C | orralati | H on I | <u>и п</u> : | t ah M | 1 Madir | | | | 1 | | | |
| H/WI/L IIIdic | ales | Sueing | | Jitelati | | п- пі | gn, w | - Meur | 1111, L-L | 0w | | | | | |
| Category | Basic Sciences | Engineering Science Humanities & Social Sciences Program Electives Open Electives Practical / Project Internships / Techni Skill Soft Skills | | | | | | | | | | | | | |
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BEE18E14 WIDE AREA MONITORING PROTECTION AND 3 0/0 0/0 3 CONTROL

UNIT I INTRODUCTION

PMU – History of PMU – Basic definition of Synchrophasor, Frequency, Accuracy Indexes – Sensors of PMUs – PMU Architecture- Data Acquisition System – Communication & Data Collector- Distributed PMU- International Standards.

UNIT II STATE ESTIMATION AND PMUS

Introduction – Formulation of the SE problem – SE measurement Model – SE Classification – Role & Impact of PMU in SE – PMU based Transmission System SE and Distribution SE - Optimal PMU Placement – SE Applications – Automation Architecture with integrated PMU Measurement for SE

UNIT III WIDE AREA MEASUREMENT SYSTEMS

WAMS – Definition, Data resource, Communication Systems, Applications- Monitoring System Components – Substation Configuration and Communication – Substation Monitoring System- Voltage Stability Assessment – Adaptive load shedding -

UNIT IV SMART GRID

Smart Transmission grid – Demands & Requirement– Wide Area Disturbances – SIPS Architecture – Components and Applications - Dynamic Model of large Power system- Eigen Values & Eigen vectors – Optimization model for equilibrium tracing – Q-V Sentivity – Small Signal Stability Analysis

UNIT V WAMPAC APPLICATION

WAMPAC Application in Frequency Stability, Voltage Stability, Transient Stability, Small Signal Stability

Total No of Hours: 45

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TEXT BOOKS:

- 1. Antonello Monti, Carlo Muscas, Ferdinanda Ponci, Phasor Measurement Units and Wide Area Monitoring Systems, Elsevier
- 2. Alfredo Vaccaro, Ahmed Faheem Zobaa, Wide Area Monitoring, Protection and Control Systems, IET

REFERENCE BOOKS:

- 1. Begovic, Miroslav, M, Electrical Transmission Systems and Smart Grids, Springer
- 2. Fahd Hashiesh, Mansour, MM, Hossam E Mostafa (2011), Wide Area Monitoring, Protection and Control, Lambert



| Subject Code: | Subje | ct Nam | e: ROB | BOTICS | S AND A | N | TY / LB/ | L | T / S.Lr | P/ R | С | | | |
|---------------------|--|---|------------------------|------------|-----------------------|------------|-------------|-----------------|-------------|-----------------|----------|--------|------------------|--|
| BEE18E15 | | | | | | | | | ETL | | | | | |
| | Prerec | quisite: | | | | | | | Т | 3 | 0/0 | 0/0 | 3 | |
| L : Lecture T : 7 | Futorial | SLr : | Superv | vised Le | arning F | ? : Proje | ct R : F | Researc | h C: Cre | dits | | | · | |
| T/L/ETL : Theo | ory/Lab/ | Embed | ded The | eory and | Lab | | | | | | | | | |
| OBJECTIVE: | 1 | . 1 | | (. | | 1 | | | | | | | | |
| • To intro | bauce th | the wor | concept king of | ts and p | arts of ro | obots. | a of rob | oto | | | | | | |
| • To unde | erstand | udente f | king of | robols a | | ous type | s of rod | ols. of roho | ta conc | | dthair | onnlia | otiona | |
| • To mak | te une su | rogrami | aiiiiiai ning of | robots | | surves | systems | 01 1000 | us, sense | JIS all | ia men a | applic | ations | |
| To disc | uss the | various | annlica | tion of | obots ii | istificat | ion and | imnlen | nentatio | n of r | obots | | | |
| To alse To stud | v about | about the manipulators, activators and grippers and their design considerations | | | | | | | | | | | | |
| COURSE OUT | | OMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 | Knowl | Inowledge on Robots | | | | | | | | | | | | |
| CO2 | Ability | bility to understand the working of robots and various types of robots. | | | | | | | | | | | | |
| CO3 | Knowl | nowledge on various drive systems of robots, sensors and their applications in robots and | | | | | | | | | | | | |
| | progra | rogramming of robots. | | | | | | | | | | | | |
| CO4 | Knowl | Knowledge on various application of robots, justification and implementation of robots. | | | | | | | | | | | | |
| CO5 | Attained knowledge on manipulators, activators and grippers and their design | | | | | | | | | | | | | |
| Manufactor | considerations | | | | | | | | | | | | | |
| COs/POs | PO1 | PO2 | <u>s with 1</u> PO3 | Progra | $\frac{n Outco}{PO5}$ | PO6 | | PO8 | PO9 | PO1 | | 11 | PO12 | |
| CO3/1 O3 | <u>н</u> | 102 L | <u>105</u> M | H | 105 L | L | <u> </u> | 100 M | L | <u>101</u> M | | I | <u>1012</u> L | |
| CO2 | H | M | H | M | M | L | M | L | M | M | | 1 | M | |
| CO3 | H | M | M | H | M | L | H | M | H | H | | 1 | M | |
| CO4 | M | H | L | M | L | M | M | L | M | M | I | | L | |
| CO5 | L | M | M | M | M | M | L | M | M | M | N | 1 | M | |
| Cos / PSOs | PS | 01 | PS | SO2 | PS | 503 | PS | 04 | PS | 05 | | | | |
| CO1 | H | I | | Μ |] | L | Ν | ſ | ľ | M | | | | |
| CO2 | Ν | 1 | | Μ | I | М | I | ł | J | H | | | | |
| CO3 | N | 1 | | H | 1 | М | Ν | Λ | ľ | N | | | | |
| CO4 | Ν | 1 | | Μ |] | H |] | |] | L | | | | |
| CO5 | H | I | | Μ | 1 | M | I | | Ι | N | | | | |
| H/M/L indicates | s Streng | th of Co | orrelatio | on H- | High, M | - Mediu | ım, L-L | ow | | <u> </u> | | | | |
| | ces | an | | | | nica | | | | | | | | |
| | ien | s | | ves | sct | schi | | | | | | | | |
| ses | | | | | | | | | | | | | | |
| y ienc | ing | ies cieı | C | Ele | / P | / sd | S | | | | | | | |
| Sci | eer | l S | am | am | cal | shi | kil | | | | | | | |
| ate aic | gin | uma cial | ngc | ngr ne | acti | ern ill | ft S | | | | | | | |
| Ba | En | Ht So | Prí | <u>Pr</u> | Pr | Int Sk | So | | | | | | | |
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ROBOTICS AND AUTOMATION BEE18E15 3 0/0 0/0 3

UNIT I **INTRODUCTION**

Anatomy of robotics - History & Terminology of Robotics - various generations of robots - degrees of freedom - Asimov's laws of robotics

UNIT II SENSORS IN ROBOTICS

Position sensors - optical, non-optical, Velocity sensors, Accelerometers, Proximity Sensors - Contact, noncontact, Range Sensing, touch and Slip Sensors, Force and Torque Sensors.

MANIPULATORS, ACTUATORS AND GRIPPERS UNIT III

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations

UNIT IV **ROBOTICS IN MATERIAL HANDLING**

General considerations in robot material handling – material transfer application – pick & place operations – machine loading & unloading – characteristics of robot application – Robot cell design – processing operations - Spot welding, Spray painting, Plastic moulding, forging

UNIT V **ROBOTICS IN FUTURE**

Robot intelligence, Advanced Sensors, Capabilities, Tele robotics, Mechanical design Features, Mobility, locomotion and Navigation. The universal Hand Systems Integration and Networking

Total No of Hours: 45

TEXTBOOKS:

- 1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore,
- 2. Ghosh, Control in Robotics and Automation: Sensor Based Integration, Allied Publishers, Chennai, 1998.

REFERENCE BOOKS:

- 1. Deb.S.R., (1992), Robotics technology and flexible Automation, John Wiley.
- 2. Asfahl C.R., (1992), Robots and manufacturing Automation, John Wiley.
- 3. Klafter R.D., Chimielewski T.A., Negin M., (1994)., Robotic Engineering An integrated approach, Prentice Hall of India.
- 5. Mc Kerrow P.J. (1991)., Introduction to Robotics, Addison Wesley.
- 6. Issac Asimov (1986.), I Robot, Ballantine Books, New York.

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| Subject Code: | | Subjec | et Nam | e: IMA | GE PRO | | TY / LB/ | L | T/ S.Lr | P / R | C | | | | | |
|-------------------|-----------|--|--|-----------------|-----------------|------------|-------------|-----------|------------|-------------|------|-----|----------|------------------|--|--|
| BEE18E16 | | | | | | | | | | ETL | | | | | | |
| | | Prerec | luisite: | | | | | | | Т | 3 | 0/0 | 0/0 | 3 | | |
| L : Lecture 7 | [: T | 'utorial | SLr: | Superv | ised Lea | rning P | : Proje | ect R : I | Researc | h C: Cre | dits | | | - | | |
| T/L/ETL : T | heor | ry/Lab/ | Embed | ded The | ory and | Lab | | | | | | | | | | |
| OBJECTIV | E: | | | | | | | | | | | | | | | |
| • To a | pply | y transf | ormatio | on techr | niques in | Digital | Image | Process | ing | | | | | | | |
| • To a | ppl | y techn | image restoration and image compression | | | | | | | | | | | | | |
| • To l | earn | 1mage restoration and image compression COMES (Cos): (3-5) | | | | | | | | | | | | | | |
| COURSE O | | | COMES (Cos): (3-5) | | | | | | | | | | | | | |
| | _ | Capabi | Capability to transform techniques in Digital image processing | | | | | | | | | | | | | |
| | _ | Capab | Capable to apply techniques in image enhancement Ability to process and restore images | | | | | | | | | | | | | |
| <u>CO3</u> | | Ability | bility to process and restore images | | | | | | | | | | | | | |
| C04 | | Ability | Ability to segment the images | | | | | | | | | | | | | |
| CO5 Monning of | Car | Attain | Attain knowledge on implementing various algorithm in image processing | | | | | | | | | | | | | |
| COs/POs | | DO1 | | | Program | | mes (P | | DUS | DO 0 | DO1 | | 11 | PO12 | | |
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BEE18E16

IMAGE PROCESSING

UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS

Elements of visual perception – Image sampling and quantization Basic relationship between pixels – Basic geometric transformations-Introduction to Fourier Transform and DFT - properties of 2D Fourier Transform - FFT - Separable Image Transforms -Walsh - Hadamard - Discrete Cosine Transform, Haar, Slant – Karhunen – Loeve transforms.

UNIT II **IMAGE ENHANCEMENT TECHNIQUES**

Spatial Domain methods: Basic grey level transformation – Histogram equalization – Image subtraction – Image averaging –Spatial filtering: Smoothing, sharpening filters – Laplacian filters – Frequency domain filters: Smoothing-Sharpening filters-Homomorphic filtering.

UNIT III **IMAGE RESTORATION**

Model of Image Degradation/restoration process - Noise models - Inverse filtering -Least mean square filtering - Constrained least mean square filtering - Blind image restoration - Pseudo inverse - Singular value decomposition.

UNIT IV **IMAGE COMPRESSION**

Lossless compression: Variable length coding – LZW coding – Bit plane coding- predictive coding-DPCM. Lossy Compression: Transform coding – Wavelet coding – Basics of Image compression standards: JPEG, MPEG, Basics of vector quantization.

UNIT V **IMAGE SEGMENTATION AND REPRESENTATION**

Edge detection - Thresholding - Region Based segmentation - Boundary representation: chair codes-Polygonal approximation - Boundary segments - boundary descriptors: Simple descriptors-Fourier descriptors - Regional descriptors - Simple descriptors- Texture- Implementation of various algorithms in image processing using related simulation packages.

Total No of Hours: 45

TEXT BOOKS:

1. Rafael C Gonzalez, Richard E. Woods, (2003) Digital Image Processing.2nd Ed. Pearson Education.

REFERENCE BOOKS:

- 1. William K. Pratt, (2001) Digital Image Processing. John Willey.. ChandaDutta Magundar, (2000) Digital Image Processing and Applications. Prentice Hall of India:
- 2. Millman Sonka, Vaclav hlavac, Roger Boyle, Broos, colic,(1999) Image Processing Analysis and Machine Vision. Thompson Learning
- 3. Jain, A.K.(1995) Fundamentals of Digital Image Processing. New Delhi: PHI.

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| Subject | Subje | ct Nam | e: SUB | STATIC | ON DES | | TY/ | L | Τ/ | P / | С | | | | |
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| • To | study al | oout the | e import | ance of S | Substati | on and | its types | | | | | | | | |
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| • To | know th | ne work | ing prin | ciple and | 1 charac | teristic | s of Air- | Insulat | ed Subs | station | S | | | | |
| • To | have a v | e a wide spread knowledge about High voltage Power Electronics Substation such as HVDC | | | | | | | | | | | | | |
| sta | tion | erstand the Integration and Automation of Substations | | | | | | | | | | | | | |
| • To | understa | lerstand the Integration and Automation of Substations OMES (Cos): (3-5) | | | | | | | | | | | | | |
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| | Attaine | tained the knowledge about the importance of Substation and its types | | | | | | | | | | | | | |
| CO2 | Attain | ained familiarity about the Gas insulated substations and its principles | | | | | | | | | | | | | |
| CO3 | Famili | niliarity in the working of Air-insulated Substations | | | | | | | | | | | | | |
| CO4 | Knowl | nowledge on High voltage Power Electronics Substation | | | | | | | | | | | | | |
| CO5 | Knowl | nowledge on the integration of Substation | | | | | | | | | | | | | |
| Mapping of C | ourse O | rrse Outcomes with Program Outcomes (POs) | | | | | | | | | | | | | |
| COs/POs | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | | |
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BEE18E17 SUBSTATION DESIGNING 3 0/0 0/0 3

UNIT I INTRODUCTION TO SUBSTATION AND ITS TYPES

Need for Substation – Budgeting – Traditional & Innovative Substation Design – Site Selection and Acquisition- Station Design – Station Construction – Station Commissioning- bas bar arrangements in Switchyard

UNIT II GAS INSULATED SUBSTATION

Sulfur Hexafluoride – Construction – Circuit Breaker – Current and Voltage Transformers – Disconnect and Ground Switches – Interconnecting Bus – Air, Power Cable and Direct Transformer Connections – Surge Arrester – Control System – Gas monitoring System – Gas compartments and Zones – Electrical & Physical Arrangement – Grounding – Testing – Installation – Operation and Interlocks – Economics.

UNIT III AIR-INSULATED SUBSTATIONS

Introduction – Single and Double Bus Arrangement – Main and Transfer Bus Arrangement – Double Bus-Single Breaker Arrangement – Ring Bus Arrangement – Breaker and a Half Arrangement – Comparison of Configurations

UNIT IV HIGH VOLTAGE POWER ELECTRONIC SUBSTATION

High Voltage Power Equipments - Converter Station(HVDC) – FACTS Controllers – Control & Protection System – Losses and cooling – Civil works – Reliability and Availability – Future Trends

UNIT V SUBSTATION INTEGRATION AND AUTOMATION

Definitions and Terminology – Open Systems- Architecture Functional Data paths – Substation Integration and Automation Systems – New Vs Existing Substations – Equipment conditioning Monitoring – Substation Integration and Automation Technical issues – Protocol Fundamentals and Considerations – Communication Protocol Application Areas

Total No of Hours: 45

TEXT BOOKS:

- 1. John D, Mc Donald (2007), Electric Power Substations Engineering, 2nd Ed, CRC Press
- 2. Sunil, S, Rao (2010), Switchgear Protection and Power Systems, 4th Ed. Khanna Publishers

REFERENCE BOOKS:

- 1. Khedkar, MK, Dhole, GM, Electric Power Distribution Automation, University Science Press
- 2. Satnam, PS and Gupta PV, Substation Design & Equipment, Dhanpat Rai Publications



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| Subject Code: BFF18F18 | | Subje | et Namo II | e: NDUST | FRIA | L C(| | TY / LB/ | L | T / S.Lr | P/ R | C | | | | |
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| COURSE C | | Attain | ttain knowledge on Power Regulatory systems | | | | | | | | | | | | | |
| | | Knowl | adga or | uge on | allar | ond | convor | tors | 21115 | | | | | | | |
| CO2 | | Canab | apable to use the techniques for temperature and pressure measurement | | | | | | | | | | | | | |
| CO4 | | Attain | tain knowledge on Thermocouple and pyrometers | | | | | | | | | | | | | |
| C05 | | Ability | bility to work in an Instrumentation Industry | | | | | | | | | | | | | |
| Mapping of | f Coi | urse O | Any to work in an Instrumentation Industry | | | | | | | | | | | | | |
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| CO5 | | Н | Н | Η | I | Ι | Н | Н | Н | Н | Н | Н | | H | Н | |
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BEE18E18 INDUSTRIAL CONTROL AND INSTRUMENTATION 3 0/0 0/0 3

UNIT I REGULATORY POWER SUPPLY

Overview of Switching Regulators and switch mode power supplies – Uninterrupted Power Supplies – Solid state circuit breakers - PLC

UNIT II CONTROLLERS AND CONVERTERS

Analog Controllers – Proportional controllers – Proportional Integral Controllers – PID Controllers – Feed forward Controllers – Signal Conditioners – Instrumentation Amplifiers – Voltage to Current, Current to Voltage, Voltage to Frequency, Frequency to Voltage Converters – Isolation Circuits

UNIT III PRESSURE MEASUREMENT

Units of pressure - Manometers – Different types – Elastic type pressure gauges – Bourdon type bellows – Diaphragms – Electrical methods – Elastic elements with LVDT and strain gauges – Capacitive type pressure gauge – Piezo resistive pressure sensor – Resonator pressure sensor – Measurement of vacuum – McLeod gauge – Thermal conductivity gauges – Ionization gauge, cold cathode and hot cathode types – Testing and calibration of pressure gauges – Dead weight tester.

UNIT IV THERMOCOUPLE

Thermocouples – Laws of thermocouple – Fabrication of industrial thermocouples – Signal conditioning of thermocouples output – Thermal block Reference Books functions – Commercial circuits for cold junction compensation – Response of thermocouple – Special techniques for measuring high temperature using thermocouples – Radiation methods of temperature measurement

UNIT V APPLICATION IN INDUSTRIES

Stepper Motors and Servo motors – Control and Application – Servo Amplifiers – Selection of Servo motor and Application – Fibre Optics – Barcode Equipment and Application of Barcode in Industry

Total No. of Hours :45

TEXT BOOKS:

- 1. Doebelin, E.O.(2003) Measurement Systems Application and Design. Tata McGraw Hill publishing company.
- 2. Jain, R.K. (1999) Mechanical and Industrial Measurements. New Delhi: Khanna Publishers.
- 3. Michael Jacob,(1988) 'Industrial Control Electronics Applications and Design', Prentice Hall
- 4. Thomas, E.Kissel, (2003) Industrial Electronics, PHI

REFERENCE BOOKS:

- 1. Patranabis, D.(1996) Principles of Industrial Instrumentation. Tata McGraw Hill Publishing Company Ltd.
- 2. Sawhney, A.K. and Sawhney, P.(2004) A Course on Mechanical Measurements, Instrumentation and Control Dhanpath Rai and Co.
- 3. Nakra, B.C. & Chaudary, B.C.Instrumentation Measurement & Analysis.Tata McGraw Hill Publishing Ltd.
- 4. Singh, S.K.(2003) Industrial Instrumentation and Control. Tata McGraw Hill.
- 5. Eckman, D.P. Industrial Instrumentation. Wiley Eastern Ltd.

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| • | To a | apply concepts in electrical Machines | | | | | | | | | | | | | |
| COURSE C | $\overline{\mathbf{UT}}$ | COME | OMES (Cos): (3-5) | | | | | | | | | | | | |
| CO1 | | Familiarity in Traction drive and its services | | | | | | | | | | | | | |
| CO2 | | Capable to estimate motor rating with Reference Books to Indian Standards | | | | | | | | | | | | | |
| CO3 | | Capab | Capable to apply concepts in Electrical machines | | | | | | | | | | | | |
| CO4 | | Attain | Attain knowledge on special electric drive | | | | | | | | | | | | |
| CO5 | | Capable to model equivalent system of motor load. | | | | | | | | | | | | | |
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| CO5 | | Η | Η | Η | I | Ι | Η | Η | Н | Η | Н | Η |] | I | Η |
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ELECTRIC TRACTION 3 0/0 0/0 3

UNIT I INTRODUCTION

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Basic drive components, classification and operating modes of electric drive, nature and type of mechanical loads, review of speed torque, characteristics of electric motors and load, joint speed torque characteristics. Electric Braking: Plugging, dynamic and regenerative braking of DC and AC motors.

UNIT II DYNAMICS OF ELECTRIC DRIVES SYSTEM

Equation of motion, equivalent system of motor load combination, stability considerations, electro mechanical transients during starting and braking, calculation of time and energy losses, optimum frequency of starting.

UNIT III TRACTION DRIVE

Electric traction services, duty cycle of traction drives calculations of drive rating and energy consumption, desirable characteristics of traction drive and suitability of electric motors, control of traction drives. Energy Conservation in Electric Drive: Losses in electric drive system and their minimization energy, efficient operation of drives, load equalization.

UNIT IV ESTIMATION OF MOTOR POWER RATING

Heating and cooling of electric motors, load diagrams, classes of duty, Reference Books to India standards, estimation of rating of electric motors for continuous, short time and intermittent ratings.

UNIT V SPECIAL ELECTRIC DRIVE

Servo motor drive, step motor drive, linear induction motor drive, permanent magnet motor drive. Selection of electric drive: Selection criteria of electric drive for industrial applications, case studies related to steel mills, paper mills, textile mills and machine tool etc.

Total No of Hours: 45

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TEXT BOOKS:

- 1. Dubey, G.K. (1995) Fundamentals of Electric Drive. Narosa Publishing House.
- 2. Chilkin, M. Electric Drive. Mir Publications.

REFERENCE BOOKS:

- 1. Pillai, S.K. A first course on Electric Drive. New age international publishers.
- 2. Dev, N.K. Sen, P.K. (1999) Electric Drives. Prentice Hall of India .
- 3. Vedam Subhramanyam, (1994) Electric Drive : Concepts and Applications. Tata McGraw Hill.



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| • To unde | | nd and | gain kn | owledg | ge on | sour | ces of (| Over Vo | oltage a | nd Tran | sients | | 1' | | | |
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| To prov To attain | n for | strong F | iliarity about the Insulators and analyze the various types of Insulators for coordination | | | | | | | | | | | | | |
| • To attai | iiro k | moulo | iowledge on testing of various Electrical Apparatus | | | | | | | | | | | | | |
| COURSE OUT | | MES (| TES (Cos): (3-5) | | | | | | | | | | | | | |
| CO1 | | Acouir | IES (Cos): (3-5) Acquire knowledge on sources of Over Voltage and Transients | | | | | | | | | | | | | |
| <u>CO2</u> | | Acquire knowledge on sources of Over Voltage and Transients | | | | | | | | | | | | | | |
| | | Familiar to Travelling waves and the switching operation in Transmission lines | | | | | | | | | | | | | | |
| 03 | | Acquire knowledge on Generation and Measurement of High DC, AC, Impulse voltages | | | | | | | | | | | | | | |
| CO4 | | Familiarity to Insulators and analyze the various types of Insulators for coordination | | | | | | | | | | | | | | |
| CO5 | | knowledge on testing of various Electrical Apparatus | | | | | | | | | | | | | | |
| Mapping of Co | urse | Outco | omes wi | ith Pro | ogran | n Ou | tcomes | (POs) | | _ | | | | | | |
| COs/POs | | PO1 | PO2 | PO3 | PC |)4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO1 | 0 PO | 11 | PO12 | |
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| CO2 | | Μ | Μ | H |] | L | Μ | Μ | H | Μ | Н | Μ |] | I | L | |
| CO3 | | Μ | Μ | L |] | L | L | L | H | L | H | L | I | I | L | |
| CO4 | | Η | H | L | N | N | L | Μ | H | M | H | Μ | | ł | L | |
| CO5 | | M | M | M | I | H | M | L | H | L | H | H | | I | H | |
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BEE18E20 ELECTRIC TRANSIENTS AND HIGH VOLTAGE 3 0/0 0/0 3 ENGINEERING

UNIT I OVER VOLTAGE & TRANSIENTS

Power System Transients – Types - Over Voltage due to Lightning– Characteristics – Theory of Formation of Cloud – Mechanism of Lighting – Over Voltage due to Switching Surge – Characteristics – Current Suppression – Current Chopping – Capacitance Switching – Multiple Re-striking Transients – Ferro Resonance- Tower Footing Resistance

UNIT II TRAVELLING WAVES & TRANSIENTS ON TRANSMISSION LINES 9

Circuits with Distributed Constants – Wave Equation – Reflection & Refraction of Travelling waves – Behavior of Travelling waves at Line Terminations – lattice Diagrams – Attenuation and Distortion of Travelling waves – Switching Operation involving Transmission lines – Multi conductor systems and Multi velocity waves – Switching Surges on an Integrated System

UNIT III GENERATION OF HIGH VOLTAGE

Generation of Direct Voltages – AC to DC Conversion- Electrostatic Generators – Alternating Voltages – Testing Transformers – Series Resonant Circuits- Impulse Voltages – Impulse Voltage Generator Circuits- operation, Design & Construction of Impulse Generators- Control Systems

UNIT IV MEASUREMENT OF HIGH VOLTAGES

Measurement of AC, DC, Impulse Voltage, Switching Surge Voltages-Peak Voltage Measurements by Spark Gap- Electrostatic Voltmeter- Generating Voltmeter- Measurement of Peak Voltmeters – Voltage Dividing System- Impulse voltage measurement- Fast Digital Transient recorders for impulse measurements

UNIT V INSULATION COORDINATION & APPARATUS TESTING

Insulation Characteristics- Types of Insulation- Insulation Level- Statistical Approach to Insulation Coordination – HV Testing Lab – Classification- Testing of Insulators – Bushing – Cables – Transformers – Surge Diverters

TEXT BOOKS:

- 1. Kuffel, E, Zaengl, WS, Kuffel, J, (2000) High Voltage Engineering Fundamentals, 2nd Ed
- 2. Naidu, MS, Kamaraju, V, High Voltage Engineering, Tata Mc Graw Hill
- 3. Allan Greenwood, (2012) Electrical Transients in Power Systems, John Wiley

REFERENCE BOOKS:

- 1. Wadhwa, CL, High Voltage Engineering, New Age International Publishers
- 2. Akihiro Ametani, Naoto Nagaoka, Yoshihiro Baba, Teruo Ohno, (2013) Power System Transients: Theory and Applications, CRC Press.
- 3. Dieter Kind, Kurt Feser, (1999), High Voltage Test Techniques, SBA Electrical Engineering Series, New Delhi
- 4. Gallagher, T.J, and Pearmain A, (1983), High Voltage Measurements, Testing and Design, John Wiley & Sons



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Total No of Hours: 45