DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
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**	**C**
1	BEN18001	Technical English - I	Ty	1	0/0	2/0	2
2	BMA18001	Mathematics - I	Ty	3	1/0	0/0	4
3	BPH18001	Engineering Physics - I	Ty	2	0/1	0/0	3
4	BCH18001	Engineering Chemistry - I	Ty	2	0/1	0/0	3
5	BES18001	Basic Electrical and Electronics Engineering	Ty	2	0/1	0/0	3
6	BES18002	Basic Mechanical and Civil Engineering	Ty	2	0/1	0/0	3
PRACTICALS*							
1	BES18L01	Basic Engineering Workshop	Lb	0	0/0	2/0	1
2	BES18ET1	Orientation to Entrepreneurship 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**	**C**
1	BMA18003	Mathematics – II	Ty	3	1/0	0/0	4
2	BPH18002	Engineering Physics –II	Ty	2	0/1	0/0	3
3	BCH18002	Engineering Chemistry – II	Ty	2	0/1	0/0	3
4	BES18003	Environmental Science*	Ty	NON CREDIT COURSE			
PRACTICALS*							
1	BEN18ET1	Communication Lab	ETL	1	0/0	2/0	1
2	BES18ET2	Basic Engineering Graphics	ETL	1	0/0	2/0	2
3	BES18L02	Integrated Physical Science Lab	Lb	0	0/0	2/0	1
4	BES18ET3	C Programming And Lab	ETL	1	0/0	2/0	2

Credits Sub Total: 16

TOTAL CREDITS: 36

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

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III SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BEE18001	Circuit Theory and Network Analysis	Ty	3	1/0	0/0	4
2	BEE18002	DC Machines and Transformers	Ty	3	1/0	0/0	4
3	BEE18003	Electromagnetic Field Theory	Ty	3	0/0	0/0	3
4	BEE18004	Electrical and Electronics Measurements	Ty	3	0/0	0/0	3
5	BME18I03	Thermodynamics and Fluid Mechanics	Ty	3	0/0	0/0	3
PRACTICALS*							
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**	**C**
1	BMA18011	Numerical Methods for Electrical Engineers	Ty	3	1/0	0/0	4
2	BEE18005	AC and Special Machines	Ty	3	1/0	0/0	4
3	BEE18006	Power System - I	Ty	3	0/0	0/0	3
4	BEC18I07	Communication Systems and IOT	Ty	3	0/0	0/0	3
5	BHS18NC1/ BHS18NC2	The Indian Constitution*/ The Indian Traditional Knowledge*	Ty	2	0/0	0/0	NC
PRACTICALS*							
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

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V SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BEE18007	Power System - II	Ty	3	1/0	0/0	4
2	BEE18008	Control System	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective 1	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective 1	Ty	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**	**C**
1	BEE18009	Power System - III	Ty	3	1/0	0/0	4
2	BEE18010	Power Electronics- I	Ty	3	1/0	0/0	4
3	BXX18EXX	Elective II	Ty	3	0/0	0/0	3
4	BXX18OEX	Open Elective 2	Ty	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

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VII SEMESTER							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BEE18011	Microgrid Technology	Ty	3	1/0	0/0	4
2	BXX18EXX	Elective III	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective IV	Ty	3	0/0	0/0	3
4	BMG18002	Management Concepts and Organizational Behavior	Ty	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**	**C**
1	BEE18012	Power Electronics- II	Ty	3	1/0	0/0	4
2	BEE18013	Smart Grid Technology	Ty	3	0/0	0/0	3
3	BXX18EXX	Elective V	Ty	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

Semester: 1 : 20 Credits
Semester: 2 : 16 Credits
Semester: 3 : 20 Credits
Semester: 4 : 22 Credits
Semester: 5 : 20 Credits
Semester: 6 : 22 Credits
Semester: 7 : 22 Credits
Semester: 8 : 18 Credits
TOTAL CREDITS - 160

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

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

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

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

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

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OPEN ELECTIVE							
S.NO.	**SUBJECT CODE**	**SUBJECT NAME**	**Ty/ Lb/ ETL**	**L**	**T/ SLr**	**P/R**	**C**
1	BEE18OE1	Electrical Safety for Engineers	Ty	3	0/0	0/0	3
2	BEE18OE2	Energy Conservation Techniques	Ty	3	0/0	0/0	3
3	BEE18OE3	Electric Vehicle Technology	Ty	3	0/0	0/0	3
4	BEE18OE4	Biomedical Instrumentation	Ty	3	0/0	0/0	3
5	BEE18OE5	Introduction to Power Electronics	Ty	3	0/0	0/0	3
6	BEE18OE6	Industrial Instrumentation	Ty	3	0/0	0/0	3
7	BEE18OE7	Solar Energy Conversion System	Ty	3	0/0	0/0	3
8	BEE18OE8	Wind Energy Conversion System	Ty	3	0/0	0/0	3
9	BEE18OE9	Energy Storage Technology	Ty	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

Subject Code:**BEN18001**	**Subject Name :TECHNICAL ENGLISH - I**	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

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.

COURSE OUTCOMES (Cos) : (3 – 5)
Students completing the course would be able to

CO1		Use appropriate vocabulary and structure in academic communication
CO2		Use structural and functional grammar in academic writings.
CO3		Give instructions, suggestions and recommendations.
CO4		Interpret Charts, diagrams, advertisements, etc
CO5		Take notes, summarize and make power point presentations.

Mapping of Course Outcomes with Program Outcomes (POs)

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

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives		Open Electives	Practical / Project	Internship	Soft Skills
			√							

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

UNIT I VOCABULARYBUILDING 6

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

UNIT II BASIC WRITING SKILLS 6

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

UNIT III IDENTIFYING COMMON ERRORS IN WRITING 6

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 6

(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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING
DEPARTMENT OF MATHEMATICS

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

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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**			**M**	**M**			**H**	**H**		**H**
CO2	**H**	**H**			**H**	**L**						**H**
CO3	**H**	**H**			**M**				**M**	**H**		**L**
CO4	**H**	**H**			**L**				**M**	**H**		**M**
CO5	**H**	**H**				**M**			**M**	**M**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18001 MATHEMATICS – I 3 1/0 0/0 4

UNIT I ALGEBRA 12

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

UNIT II MATRICES 12

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 12

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

UNIT IV DIFFERENTIATION 12

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 12

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

TEXT BOOKS:

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

REFERENCE BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF PHYSICS

Subject Code:**BPH18001**	**Subject Name :ENGINEERING PHYSICS - I**	**TY/Lb/ETL**	L	T/SLr	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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**		**M**	**M**	**M**						
CO2	**H**	**H**	**M**	**M**	**M**	**M**			**M**	**M**		
CO3	**H**	**H**	**H**	**M**	**M**	**M**				**M**		**M**
CO4	**H**	**H**	**M**	**M**		**M**			**M**	**M**		**M**
CO5	**H**	**H**	**M**			**M**		**M**				**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BPH18001 ENGINEERING PHYSICS - I 2 0/1 0/0.3

UNIT I MECHANICS & PROPERTIES OF MATTER 9

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 9

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 9

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 9

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

UNIT V LASER 9

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

Total No of Hours : 45

TEXT BOOKS :

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

REFERENCE BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF CHEMISTRY

Subject Code:**BCH18001**	**Subject Name :ENGINEERING CHEMISTRY – I**	Ty/ Lb/ ETL	L	T/S Lr	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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (1– 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**										**M**
CO2	**H**	**H**	**M**	**H**		**H**	**H**					**M**
CO3	**H**	**M**	**H**				**L**					**L**
CO4	**H**		**L**	**H**								**L**
CO5	**H**											**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BCH18001 ENGINEERING CHEMISTRY – I 2 0/1 0/0 3

UNIT I CHEMICAL THERMODYNAMICS 8

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 9

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 10

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 P^H using these electrodes. Reversible and irreversible cells– Fuel cells- H_2–O_2 fuel cell, Batteries-Lead storage battery,Nickel– Cadmium and Lithium-Battery.

UNIT IV CORROSION AND PROTECTIVE COATING 9

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 9

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 .

Total No of Hours: 45

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).

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ELECTRICAL & ELECTRONICS ENGINEERING

Subject Code:**BES18001**	**Subject Name :BASIC ELECTRICAL AND ELECTRONICS ENGINEERING**	Ty/ Lb/ ETL	L	T/S Lr	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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**							**M**	**L**
CO2	**H**	**H**	**H**	**M**	**M**		**M**				**M**	
CO3	**H**	**M**	**H**	**M**	**H**		**M**		**M**			**L**
CO4	**H**	**M**		**M**			**M**				**M**	**L**
CO5	**H**	**M**	**H**	**M**	**H**				**M**		**M**	**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I ELECTRIC CIRCUITS 9

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 9

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 9

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 9

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 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARMENT OF MECHANICAL ENGINEERING

Subject Code:**BES18002**	**Subject Name :BASIC MECHANICAL AND CIVIL ENGINEERING**	Ty/ Lb/ ETL	L	T/SLr	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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

Students completing the course were able to

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**					**M**		**H**	**H**	**H**		**H**
CO2	**H**				**L**	**M**		**M**	**M**	**M**		**M**
CO3	**H**	**H**			**L**	**L**		**M**	**M**	**M**		**M**
CO4	**H**				**L**	**L**			**M**	**M**		**M**
CO5	**H**				**L**	**L**		**M**	**M**	**M**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I THERMAL ENGINEERING 9

Classification of internal combustion engine – two stroke, four stroke petrol and diesel engines. Classification of Boilers – Cochran boiler – Locomotive boilers – Power plant classification – Working of Thermal and Nuclear power plant

UNIT II MANUFACTURING PROCESS 13

Metal forming processes – Rolling, forging, drawing, extrusion and sheet metal operations- fundamentals only. Metal Joining processes – Welding - arc and gas welding, Soldering and Brazing. Casting process – Patterns -Moulding tools - Types of moulding - Preparation of green sand mould -Operation of Cupola furnace.

Basics of metal cutting operations – Working of lathe- parts-Operations performed. Drilling machine – Classification – Radial drilling machine - Twist drill nomenclature

UNIT III MECHANICS 9

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

UNIT IV BUILDING MATERIALS AND CONSTRUCTION 7

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

Construction:Mortar – Ingredients – Uses – Plastering - Types of mortar - Preparation – Uses – Concrete – Types – Grades – Uses – Curing – Introduction to Building Components (foundation to roof) – Masonry – Types of masonry (Bricks & Stones)

UNIT V ROADS, RAILWAYS, BRIDGES & DAMS 7

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ENGINEERING SCIENCES

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

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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO 2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**M**	**M**			**L**	**M**			**L**
CO2	**H**		**H**	**L**	**M**			**L**	**L**			
CO3	**H**		**M**	**L**				**L**	**L**			
CO4	**H**	**H**	**M**	**L**				**L**	**L**			**M**
CO5												

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Abdul Kalam CoE for Innovation & Entrepreneurship

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

CO1	Develop a Business plan & improve ability to recognize business opportunity
CO2	Do a self analysis to build a entrepreneurial career.
CO3	Articulate an effective elevator pitch.
CO4	Analyze the local market environment & demonstrate the ability to find an attractive market
C05	Identify the required skills for entrepreneurship & develop

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		**M**	**M**	**H**	**M**	**M**	**M**		**M**	**M**	**M**	**L**
CO2	**H**	**M**		**H**	**M**	**H**	**M**	**H**	**H**	**H**	**M**	**M**
CO3		**M**	**M**	**M**		**H**		**H**	**H**	**H**		
CO4		**H**	**M**	**M**	**M**	**M**		**H**	**M**	**M**	**H**	
CO5		**M**	**M**	**H**	**M**	**M**	**H**	**H**	**M**	**M**	**H**	**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I CHARACTERISTICS OF A SUCCESSFUL ENTREPRENEUR 3

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 3

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

UNIT III DESIGN THINKING 3

Introduction to Design thinking – Myth busters – Design thinking Process - Customer profiling – Wowing your customer – Personal selling – concept & process – show & tell concept – Introduction to the concept of Elevator Pitch

UNIT IV RISK MANAGEMENT 3

Introduction to risk taking & Resilience – Managing risks (Learning from failures, Myth Buster) – Understanding risks through risk takers – Why do I do? – what do I do ?

UNIT V PROJECT 3

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

REFERENCE BOOKS & WEBSITE:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF MATHEMATICS

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

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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (3 – 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**	**H**			**M**	**M**			**M**	**M**		**H**
CO2	**H**	**H**			**M**	**H**			**H**	**H**		**M**
CO3	**H**	**H**			**M**	**H**			**H**	**H**		**M**
CO4	**H**	**H**			**L**	**M**			**M**	**H**		**M**
CO5	**H**	**H**			**M**	**M**			**M**	**H**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / [illegible]	Soft Skills
	√								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18003 MATHEMATICS – II 3 1/0 0/0 4

UNIT I INTEGRATION 12

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 12

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 12

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 12

Direction Cosines and Ratios – Equation of a straight line – Angle between two lines – Equation of a plane – Co-planar lines – Shortest distance between skew lines – Sphere – Tangent plane.

UNIT V VECTOR CALCULUS 12

Scalar and Vector functions – Differentiation – Gradient, Divergence and Curl – Directional derivatives – Irrotational and Solenoidal fields– Line, Surface and Volume integrals – Green's, Stoke's and Gauss divergence theorems (statement only) – Verification.

Total No of Hours : 60

TEXTBOOKS:

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

REFERENCE BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF PHYSICS

Subject Code : BPH18002	**Subject Name : ENGINEERING PHYSICS –II**	Ty / Lb/ ETL	L	T/ SL r	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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1	**H**	**H**	**M**	**M**	**M**	**L**				**M**		**L**
CO2	**H**	**H**		**M**	**M**							**L**
CO3	**H**	**H**	**H**	**H**	**M**					**M**		
CO4	**H**	**H**	**H**	**H**	**M**				**H**	**M**		**L**
CO5	**H**	**M**	**M**	**M**	**M**	**L**			**M**	**M**		**L**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships /	Soft Skills
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BPH18002 ENGINEERING PHYSICS - II 2 0/1 0/0 3

UNIT I QUANTUM PHYSICS 9

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

UNIT II SEMICONDUCTORS 9

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

UNIT III LIGHT SEMICONDUCTOR INTERACTION 9

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

UNIT IV OPTO ELECTRONIC DEVICES 9

Photodetectors - photoconductors - photodiodes principle, construction, working and characteristics - Phototransistors - Laser diodes - LED theory, construction and working - seven segment display, advantages of LED - LCD theory, construction and working.

UNIT V ENGINEERED MATERIALS 9

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

Total No of Hours: 45

TEXT BOOKS :

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

REFERENCE BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF CHEMISTRY

Subject Code : BCH18002	Subject Name:ENGINEERING CHEMISTRY – II	Ty / Lb/ ETL	L	T/SLr	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

OBJECTIVES :

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

COURSE OUTCOMES (Cos) : (1 – 5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**H**											**L**
CO2	**H**		**H**			**L**	**H**					**L**
CO3	**H**					**H**						**L**
CO4	**H**	**M**	**H**	**H**			**H**					**M**
CO5	**H**				**M**							**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BCH18002 ENGINEERING CHEMISTRY – II 2 0/1 0/0 3

UNIT I PHASE EQUILIBRIA 8

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

UNIT II MATERIAL CHEMISTRY 10

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

UNIT III APPLIED CHEMISTRY 9

Soaps and detergents : Soaps – Saponification of oils and fats, manufacture of soaps, classification of soap – soft soap, medicated soap, herbal soap, shaving soap and creams.

Detergents – Anionic detergents – manufacture and applications, Comparison of soaps and detergents.

Rocket propellants and explosives: Rocket propellants – characteristics, solid and liquid propellants – examples. Explosives- Introduction, characteristics, classification, Oxygen balance , preparation, properties and uses of detonators, low explosives and high explosives, Dynamites, Gun cotton, Cordite.

Food adulterants- Common adulterants in different foods – milk and milk products, vegetable oils, and fats, spices and condiments, cereals, pulses, sweetening agents and beverages, Contamination with toxic chemicals – pesticides and insecticides.

UNIT IV FUELS & COMBUSTION 9

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

UNIT V ANALYTICAL AND CHARACTERIZATION TECHNIQUES 9

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).

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ENGINEERING SCIENCES

Subject Code : BES18003	**Subject Name : ENVIRONMENTAL SCIENCE(Non- Credited)**	Ty / Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite : None	**Ty**	**-**	**-**	**-**	**-**

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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**
CO1						**M**	**H**	**M**				**M**
CO2						**M**	**H**			**M**		**M**
CO3						**M**	**H**	**M**				**M**
CO4						**M**	**H**	**M**		**M**		**M**
CO5						**M**	**H**			**M**		**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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. Ifthikarudeen, Etal, **Environmental Studies**, Sooraj Publications,2005.
3. R.Murugesan, **Environmental Studies,** Millennium Publishers and Distributors, 2nd Edition, July, 2009.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF ENGLISH

Subject Code: BEN18ET1	**Subject Name :COMMUNICATION LAB**	Ty / Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite : None	**ETL**	**1**	**0/0**	**2/0**	**1**

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

OBJECTIVES :

The student should be able to

- Use appropriate vocabulary and structure for effective interpersonal and academic communication.
- Interpret charts, diagrams, advertisements, etc..
- Participate in group discussions and present projects effectively.
- Present projects and ideas effectively
- Attend interviews

COURSE OUTCOMES (Cos) : (3 – 5)

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	Participate in group discussions and present projects effectively
CO4	Present projects and ideas effectively
CO5	Attend interviews

Mapping of Course Outcomes with Program Outcomes (POs)

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

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BET18ET1	**COMMUNICATION LAB**	**1**	**0/0**	**2/0**	**1**

UNIT I **6**
Listening and Speaking- Informal and Formal Contexts

UNIT II **6**
Interpretation of charts / Diagrams – Group Discussion

UNIT III **6**
Compeering -Anchoring -Group Discussion

UNIT IV **8**
Formal Presentation -Power point presentation of charts/ Diagrams

UNIT V **4**
Interview

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 ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF MECHANICAL ENGINEERING

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

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

OBJECTIVES :

- 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	Demonstrate the projections of Points, Lines, Planes and Solids.
CO5	Draw the sectional view of simple buildings and utilize Auto CAD Software.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**M**	**M**	**M**			**H**	**H**		**H**
CO2	**H**	**H**	**H**	**M**	**M**	**M**			**H**	**H**		**H**
CO3	**H**	**H**	**H**	**L**		**M**			**M**	**M**		**M**
CO4	**H**	**H**	**M**	**M**		**H**		**M**	**H**	**H**		**H**
CO5	**H**	**H**	**H**	**M**	**H**	**L**		**M**	**H**	**H**		**H**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

Category	Basic Sciences	Engg Sciences	Humanities & Social Sciences	Program core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skills	Soft Skills
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

CONCEPTS AND CONVENTIONS (Not for examination) 3

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 6

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 6

Orthographic projection of simple machine parts – missing views

BUILDING DRAWING

Building components – front, Top and sectional view of a security shed.

UNIT V COMPUTER AIDED DRAFTING 3

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

Total No of Hours :30

Note:First angle projection to be followed.

TEXT BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

OBJECTIVES :

- Demonstrate the ability to make physical measurements & understand the limits of precision in measurements.
- Display the ability to measure properties of variety of electrical, mechanical, optical systems.
- To help learners measure conductivity and EMF using electrical equipment.
- 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	Recognize the correctness and precision in the results of measurements.
CO2	Construct and compare the properties of variety of mechanical, optical, electrical and electronic systems.
CO3	Familiarizing the titration methods using conductometry & potentiometry
CO4	Developing the Research spirit through the knowledge of Cheminformatics & Analytical skills.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**L**	**H**	**H**							
CO2	**H**	**H**	**M**	**H**	**H**					**M**		
CO3	**H**	**H**	**M**	**H**	**H**				**H**			
CO4	**H**	**H**	**H**	**H**	**H**				**H**		**H**	**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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 $R_f$values of various components using thin layer chromatography.
10. Viscosity studies using Digital capillary viscometer.
11. Compute the structures of the given polymers, drugs, biomolecules usingChem Draw.
12. Studies on potential energy surface of the given molecules.
13. Estimate NMR spectra from a Chem Draw structure.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

DEPARTMENT OF COMPUTER SCIENCE

Subject Code : BES18ET3	**Subject Name : C PROGRAMMING AND LAB**	Ty / Lb/ ETL	L	T/S Lr	P/R	C
	Prerequisite : None	**ETL**	**1**	**0/0**	**2/0**	**2**

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

OBJECTIVES :

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**			**M**	**M**		**H**	**M**			**H**
CO2	**H**	**M**			**H**	**M**		**M**	**H**			**M**
CO3	**H**			**H**		**M**		**M**	**H**			**M**
CO4	**H**			**M**		**M**		**H**	**M**			**M**

H/M/L indicates strength of correlation H – High, M – Medium, L – Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BES18ET3 C PROGRAMMING AND LAB 1 0/0 2/0 2

UNIT I INTRODUCTION 6

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

UNIT II EXPRESSION AND STATEMENT 6

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

UNIT III ARRAYS AND FUNCTIONS 6

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 6

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

UNIT V STRINGS AND FILE HANDLING 6

Strings -Syntax for declaring a string -Syntax for initializing a string -To read a string from keyboard, Files in C -File handling functions -Opening a File closing a file --example: fopen, fclose -Reading data from a File- Problem solving in C

Total No of Hours: 30

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

REFERENCE BOOKS:

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

LIST OF PROGRAMS

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18001	**Subject Name: CIRCUIT THEORY AND NETWORK ANALYSIS**	**T /L/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To 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)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**M**	**M**	**L**	**L**	**M**	**H**	**M**	**H**	**M**
CO2	**M**	**L**	**L**	**M**	**M**	**L**	**L**	**M**	**H**	**M**	**H**	**M**
CO3	**M**	**L**	**M**	**L**	**L**	**M**	**M**	**L**	**H**	**M**	**H**	**L**
CO4	**L**	**M**	**L**	**M**	**M**	**M**	**H**	**L**	**M**	**H**	**H**	**L**
CO5	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**L**	**M**	**M**	**H**	**L**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**M**	**M**	**M**		
CO2	**M**	**M**	**M**	**M**	**M**		
CO3	**H**	**M**	**L**	**H**	**L**		
CO4	**H**	**L**	**M**	**M**	**H**		
CO5	**M**	**M**	**H**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I BASIC CIRCUIT CONCEPTS 12

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 12

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

UNIT III NETWORK TOPOLOGY AND TRANSIENT ANALYSIS 12

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 12

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 12

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18002	Subject Name: DC MACHINES AND TRANSFORMERS	T /L/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To provide the knowledge on the basic concepts of the rotating circuits.
- To familiarize and understand the working principle of the DC machines, transformers and their performance characteristics
- To provide knowledge on transformer connections
- To provide knowledge on starting and methods of speed control of motors.
- To study the various losses and different testing methods for DC machines and Transformers

COURSE OUTCOMES (Cos): (3-5)

CO1	Familiar knowledge on the basic concepts of rotating circuits.
CO2	Understand the performance, starting and methods of speed control of the Electrical machines
CO3	Capable of designing different transformer connections
CO4	Incorporate knowledge on different testing methods for DC machines and Transformers
CO5	Perform model and analyze electrical apparatus and their application in power system

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	L	H	M	L	H	M	H	M
CO2	H	M	M	L	L	M	L	L	H	M	M	M
CO3	M	L	M	M	M	M	M	M	M	L	M	L
CO4	M	M	M	L	L	M	L	L	M	M	M	L
CO5	L	H	H	M	M	H	M	M	L	H	H	M

COs / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	H	M	M	M		
CO2	M	M	M	M	M		
CO3	H	M	L	H	L		
CO4	H	L	M	M	H		
CO5	M	M	H	L	M		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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 12

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 12

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 12

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 12

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18003	Subject Name: ELECTROMAGNETIC FIELD THEORY	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: Basic Electrical & Electronics Engg	L	3	0/0	0/0	3

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

OBJECTIVE:

- To acquire knowledge in Electromagnetic field theory
- To provide a solid foundation in Electrostatics such as Dipole, Capacitance
- To attain familiarity in Boundary conditions and Magnetic field
- To understand the relation between field theory and circuit theory
- To identify the electromagnetic wave propagation in medium

COURSE OUTCOMES (Cos): (3-5)

CO1	Understand the fundamentals in Electromagnetic field theory
CO2	Foundation in Electrostatics such as Dipole, Capacitance
CO3	Familiarity in Boundary conditions and Magnetic field
CO4	Understand the relation between field theory and circuit theory
CO5	Determine the electromagnetic wave propagation in medium

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	M	M	H	M	H	M	H	M	H	M
CO2	H	M	H	M	M	M	M	M	H	M	H	M
CO3	H	H	H	H	H	H	H	M	H	M	H	M
CO4	L	L	M	M	L	L	L	L	M	M	M	L
CO5	H	H	H	H	H	H	H	M	H	M	H	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	H	H	H	H		
CO2	H	H	H	H	H		
CO3	M	M	M	M	M		
CO4	M	H	H	H	H		
CO5	M	H	M	H	H		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I ELECTROSTATIC FIELD 9

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 9

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 9

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 9

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 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18004	Subject Name: ELECTRICAL AND ELECTRONICS MEASUREMENTS	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: Basic Electrical and Electronics Engg	T	3	0/0	0/0	3

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

OBJECTIVE:

- To 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.

COURSE OUTCOMES (Cos): (3-5)

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
CO4	Ability to understand the application of transducers and Converters
CO5	Gain knowledge about the Storage and display devices

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	M	H	H	H	M
CO2	H	H	H	H	M	H	H	H	M	M	H	M
CO3	H	H	H	H	M	H	H	H	H	H	H	L
CO4	H	H	H	H	H	H	H	H	H	H	H	H
CO5	H	H	H	H	H	H	H	L	H	M	H	L

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	M	H	M	H		
CO2	M	M	H	M	M		
CO3	H	M	M	H	M		
CO4	H	L	M	L	H		
CO5	M	M	L	M	L		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18004	**ELECTRICAL AND ELECTRONICS MEASUREMENTS**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BME18I03	**Subject Name: THERMODYNAMICS ANDFLUID MECHANICS**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Mechanical & Civil Engg	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understand the basic Laws of Thermodynamics and the working principle of IC Engines.
- To understand the design of Turbines and boilers.
- To understand the properties of Fluids and implementation of Hydraulic machinery & Pumps.
- To know the importance, application and inter relationship of various properties of fluid
- To study about various types of pumps and turbines

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on the basic Laws of Thermodynamics and the working principle of IC Engines
CO2	Capable of selecting the suitable turbines and boilers depending upon the applications
CO3	Incorporating the knowledge gained in operating the Hydraulic machinery & Pumps
CO4	Knowledge on properties of different fluids and its applications
CO5	Develop knowledge on the working of different types of pumps and turbines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**H**	**M**	**L**	**L**	**M**	**H**	**M**	**H**	**H**
CO2	**M**	**L**	**L**	**M**	**H**	**M**	**H**	**H**	**H**	**M**	**H**	**M**
CO3	**H**	**H**	**H**	**M**	**L**	**M**	**L**	**H**	**H**	**M**	**H**	**L**
CO4	**M**	**M**	**M**	**H**	**M**	**L**	**L**	**L**	**H**	**M**	**H**	**L**
CO5	**L**	**H**	**H**	**M**	**L**	**M**	**H**	**L**	**H**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**H**	**M**	**H**		
CO2	**M**	**H**	**H**	**H**	**H**		
CO3	**M**	**M**	**M**	**M**	**M**		
CO4	**M**	**M**	**M**	**M**	**M**		
CO5	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BME18I03 THERMODYNAMICS ANDFLUID MECHANICS 3 0/0 0/0 3

UNIT I BASIC CONCEPTS AND FIRST LAW OF THERMODYNAMICS 9

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 9

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 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L01	**Subject Name: ELECTRICAL MACHINES- I LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To analyze the Internal and External Load Characteristics for DC Generators and Motors
- To determine the speed control using different methods for DC Motor and Generator
- To find the constant loss and copper loss of DC Machines
- To find the equivalent circuit of transformer
- To determine the efficiency and regulation of DC Machines and transformer

COURSE OUTCOMES (Cos): (3-5)

CO1	Analyze the Load Characteristics of DC Generators and Motors
CO2	Determine different methods of speed control for DC Machines
CO3	Understand the losses incorporated in DC Machines
CO4	Capable of understand the performance of a Transformer
CO5	Compute the efficiency of a D.C. machine without actually loading it.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**H**	**M**	**L**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO2	**M**	**M**	**H**	**M**	**L**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO3	**H**	**H**	**M**	**M**	**L**	**M**	**H**	**L**	**H**	**M**	**H**	**H**
CO4	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**M**	**M**	**M**	**H**	**L**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**M**	**M**	**M**		
CO2	**H**	**M**	**M**	**M**	**M**		
CO3	**H**	**M**	**L**	**M**	**M**		
CO4	**M**	**H**	**M**	**H**	**H**		
CO5	**H**	**M**	**H**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L02	**Subject Name: ELECTRICAL CIRCUITS LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To provide practical experience of electrical circuits
- To impart practical knowledge on solving circuits using network theorems
- To develop practical knowledge on the concepts of resonance in coupled circuits and transient response of circuits
- To design the two port networks, various types of filters and Attenuators
- To provide knowledge on the measurement of various parameters in power system

COURSE OUTCOMES (Cos): (3-5)

CO1	Analyze and solve the Electric circuits
CO2	Knowledge in Circuit theorems and apply in analyzing problems in power system
CO3	Perform analysis of Coupled circuits and Transient Response of Circuits
CO4	Capable of designing various types of filters and Attenuators
CO5	Understand and apply the concepts in engineering applications

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**M**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO2	**M**	**H**	**M**	**H**	**H**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO3	**L**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**M**	**H**	**L**
CO4	**L**	**M**	**L**	**H**	**H**	**H**	**L**	**M**	**H**	**M**	**H**	**L**
CO5	**M**	**L**	**L**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**M**	**M**	**H**		
CO2	**H**	**M**	**M**	**H**	**L**		
CO3	**M**	**H**	**H**	**M**	**L**		
CO4	**M**	**L**	**L**	**M**	**H**		
CO5	**L**	**H**	**H**	**M**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18L02	**ELECTRICAL CIRCUITS LAB**	**0**	**0/0**	**3/0**	**1**

LIST OF EXPERIMENTS

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BME18IL2	**Subject Name: FLUID MECHANICS AND IC ENGINE LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Mechanical & Civil Engg	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To analyze performance of flow using various measuring instruments.
- Providing fair knowledge on the working of various Pumps for testing their performance.
- The graduate will learn the valve timing and port timing diagrams for IC Engines.
- To analyze performance and Heat Balance Test of IC Engines.
- To analyze performance and Heat Balance Test of Refrigerator and boilers.

COURSE OUTCOMES (Cos): (3-5)

CO1	Analyze the performance of flow using various measuring instruments.
CO2	Gain knowledge on the performance and testing of various pumps
CO3	Gain knowledge on the concepts of timing diagrams for IC Engines
CO4	analyze the performance and testing of IC engines
CO5	Analyze the performance and testing of Refrigerator and boilers.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**M**	**M**	**L**
CO2	**L**	**L**	**H**	**M**	**H**	**M**	**L**	**L**	**H**	**M**	**M**	**H**
CO3	**M**	**L**	**M**	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**L**	**L**
CO4	**H**	**M**	**L**	**H**	**H**	**M**	**H**	**M**	**L**	**M**	**H**	**M**
CO5	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**H**	**M**	**H**	**H**		
CO2	**H**	**H**	**M**	**H**	**H**		
CO3	**M**	**H**	**H**	**M**	**H**		
CO4	**H**	**M**	**M**	**M**	**M**		
CO5	**M**	**M**	**L**	**L**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BMA18011	**Subject Name: NUMERICAL METHODS FOR ELECTRICAL ENGINEERS**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Maths I, Maths -II	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To develop the ability in Numerical Skills

COURSE OUTCOMES (Cos): (3-5)	
CO1	To understand the Basic concepts in Numerical Analysis
CO2	To understand the Basic concepts in System of Linear Equations
CO3	To understand the Basic concepts in Non Linear Equations
CO4	To understand the Basic concepts in Interpolation
CO5	To understand the Basic concepts in Numerical Differentiation and Integration

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**H**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**M**
CO2	**L**	**H**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**M**
CO3	**L**	**H**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**M**
CO4	**L**	**H**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**M**
CO5	**L**	**H**	**L**	**L**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**L**	**L**	**L**		
CO2	**M**	**M**	**L**	**L**	**L**		
CO3	**M**	**M**	**L**	**L**	**L**		
CO4	**M**	**M**	**L**	**L**	**L**		
CO5	**M**	**M**	**L**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMA18011	**NUMERICAL METHODS FOR ELECTRICAL ENGINEERS**	**3**	**1/0**	**0/0**	**4**

UNIT I BASICS OF NUMERICAL METHODS 12

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 12

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 12

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 12

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 12

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).

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18005	Subject Name: AC AND SPECIAL MACHINES	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite:BEE17001/ BEE18002	T	3	1/0	0/0	4

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

OBJECTIVE:

- Understands the construction and operation of Synchronous generator
- Acquires Knowledge about synchronous motors used in the Power system
- Able to learn about three phase induction motor and to draw the circle diagram of Induction machine
- Gains knowledge in starting and speed control of three phase induction motor
- Understand the concepts of various special machines involved in the power system network

COURSE OUTCOMES (Cos): (3-5)

CO1	Understand the concepts of synchronous generator
CO2	Capable knowledge about synchronous motors and its performance characteristics
CO3	Can draw the circle diagram of Induction machine
CO4	Knowledgeable in starting and speed control of three phase induction motor
CO5	Acquire knowledge in special electrical machines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	H	H	H	H	H	M	H	M	H	H
CO2	M	M	M	M	M	M	M	M	M	L	H	L
CO3	H	H	H	H	H	H	H	M	M	M	H	L
CO4	M	M	M	M	M	M	M	M	M	M	M	H
CO5	H	H	H	H	H	H	H	M	H	M	H	L

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	M	M	H	M	L		
CO2	M	L	L	M	M		
CO3	L	L	M	M	H		
CO4	H	H	M	L	M		
CO5	M	M	H	L	L		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

BEE18005	**AC AND SPECIAL MACHINES**	**3**	**1/0**	**0/0**	**4**

UNIT I SYNCHRONOUS GENERATOR 12

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

UNIT II SYNCHRONOUS MOTOR 12

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 12

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.

UNIT IV STARTING & SPEED CONTROL OF INDUCTION MOTORS 12

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

UNIT V SPECIAL MACHINE 12

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18006	**Subject Name: POWER SYSTEM - I**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To learn about Power system
- To know about transmission line parameters
- To model the transmission lines
- To learn about distribution and substation
- To know about the fault and protection

COURSE OUTCOMES (Cos): (3-5)

CO1	Attain knowledge on the basic of Power system
CO2	Knowledge on transmission line parameter
CO3	Ability to model the transmission lines
CO4	Knowledge on Distribution system
CO5	Ability to recover the faulted line

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**L**	**H**	**H**	**L**	**H**	**H**	**H**	**H**
CO2	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**L**	**H**	**M**	**M**	**H**
CO3	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**L**	**M**	**M**	**M**
CO4	**H**	**L**	**M**	**H**	**M**	**H**	**H**	**M**	**M**	**H**	**L**	**M**
CO5	**M**	**M**	**L**	**M**	**M**	**M**	**M**	**M**	**H**	**M**	**M**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**L**	**H**	**M**	**M**		
CO2	**M**	**L**	**M**	**L**	**H**		
CO3	**M**	**M**	**M**	**M**	**M**		
CO4	**H**	**M**	**H**	**M**	**L**		
CO5	**M**	**M**	**M**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

BEE18006 POWER SYSTEM - I 3 0/0 0/0 3

UNIT I INTRODUCTION TO POWER SYSTEM 9

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 9

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

UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION LINES 9

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 9

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 9

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
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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEC18I07	**Subject Name: COMMUNICATION SYSTEMS AND IOT**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understand the Analog & Digital Communication.
- To study about the methods to convert Analog to Digital communication using code theory.
- To study about different modulation techniques
- To introduce various media for digital communication
- To apply the concept of Internet of Things in the real world scenario

COURSE OUTCOMES (Cos): (3-5)

CO1	Capable of understanding the concepts of Analog and Digital communication circuits
CO2	Gain knowledge about the Communication conversion methods
CO3	Gain knowledge about the different concepts of modulation techniques
CO4	Develop knowledge about the various digital communication media
CO5	Understand and incorporate the concepts of IOT in different fields.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**M**	**L**	**L**	**M**	**M**	**L**	**H**	**M**	**H**
CO2	**M**	**H**	**H**	**M**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**H**
CO3	**L**	**M**	**M**	**M**	**L**	**L**	**M**	**H**	**M**	**L**	**M**	**H**
CO4	**L**	**M**	**M**	**M**	**M**	**M**	**H**	**H**	**H**	**M**	**M**	**H**
CO5	**M**	**H**	**H**	**M**	**M**	**L**	**M**	**H**	**M**	**H**	**M**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**L**	**L**	**M**	**M**		
CO2	**L**	**M**	**M**	**H**	**M**		
CO3	**H**	**H**	**H**	**M**	**L**		
CO4	**L**	**M**	**L**	**L**	**L**		
CO5	**M**	**L**	**L**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEC18I07	**COMMUNICATION SYSTEMS AND IOT**	**3**	**0/0**	**0/0**	**3**

UNIT I SIGNALS & NOISE 9

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

UNIT II INTRODUCTION TO COMMUNICATION 9

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 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

OBJECTIVES:

- To provide an overview of the history of the making of Indian Constitution
- To understand the preamble and the basic structures of the Constitution.
- To Know the fundamental rights, duties and the directive principles of state policy
- To understand the functionality of the legislature , the executive and the judiciary

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

CO1	To provide an overview of the history of the making of Indian Constitution
CO2	To understand the preamble and the basic structures of the Constitution.
CO3	To Know the fundamental rights, duties and the directive principles of state policy

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1						**H**	**L**	**L**	**L**	**L**		
CO2						**H**	**L**	**L**	**L**	**L**		
CO2						**H**	**L**	**L**	**M**	**L**		

COs / PSOs	**PSO1**	**PSO2**	**PSO3**
CO1	**L**	**L**	**M**
CO2	**L**	**L**	**M**
CO3	**L**	**L**	**M**

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BHS18NC1	**THE INDIAN CONSTITUTION**	**Ty**	**2**	**0/0**	**0/0**	**NC**

UNIT I **3Hrs**

The History of the Making of Indian Constitution, Preamble and the Basic Structures

UNIT II **3Hrs**

Fundamental Rights and Duties , Directive Principles of State Policy

UNIT III **3Hrs**

Legislature, Executive and Judiciary

UNIT IV **3Hrs**

Emergency Powers

UNIT V **3Hrs**

Special Provisions for Jammu and Kashmir, Nagaland and Other Regions, Amendments

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.*

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

OBJECTIVES:

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

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

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1		**H**	**H**	**L**		**M**				**M**		**L**
CO2		**H**	**H**	**L**		**M**				**M**		**L**
CO2		**H**	**H**	**L**		**M**				**M**		**L**

COs / PSOs	**PSO1**	**PSO2**	**PSO3**
CO1	**L**	**L**	**M**
CO2	**L**	**L**	**M**
CO3	**L**	**L**	**M**

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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, Astronomy and Astrology

UNIT IV **3Hrs**

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

UNIT V **3Hrs**

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

Total Hours: 15

TEXT BOOKS:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18ET1	**Subject Name: LINEAR AND DIGITAL INTEGRATED CIRCUITS**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18001	**ETL**	**1**	**0/1**	**3/0**	**3**

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

OBJECTIVE:

- To study the IC fabrication procedure.
- To study characteristics, realize circuits and design for signal analysis using Op-amp ICs.
- To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADC
- Familiarity of different types of gates using truth table with logic circuits.
- Familiarity to use logic gates in sequential and combinational circuits.

COURSE OUTCOMES (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	Knowledge about the basic gates
CO5	Capable to design logic Circuits using gates

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**L**	**L**	**M**	**M**
CO2	**H**	**H**	**M**	**M**	**H**	**L**	**M**	**L**	**M**	**M**	**L**	**M**
CO3	**M**	**M**	**H**	**H**	**M**	**L**	**L**	**L**	**M**	**H**	**M**	**L**
CO4	**L**	**L**	**M**	**M**	**L**	**M**	**L**	**L**	**M**	**M**	**H**	**M**
CO5	**M**	**M**	**H**	**H**	**M**	**L**	**L**	**L**	**M**	**H**	**M**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**L**	**M**	**M**		
CO2	**M**	**H**	**L**	**M**	**L**		
CO3	**H**	**M**	**L**	**L**	**L**		
CO4	**M**	**L**	**M**	**L**	**L**		
CO5	**M**	**H**	**L**	**M**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I IC FABRICATION 9

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 9

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 9

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 9

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 9

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

Total No. of Hours: 45

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L03	**Subject Name: ELECTRICAL MACHINES - II LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18001	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To analyze the Load Characteristics of Synchronous machines
- To find Voltage Regulation of Synchronous machines.
- To study the effect of frequency and voltage control action of Three phase induction machines.
- To be familiar with the equivalent circuit of single phase induction machines.
- To study the Performance Characteristics of Special Machines

COURSE OUTCOMES (Cos): (3-5)

CO1	Determine the characteristics of transformers and induction motors.
CO2	Understand the basic knowledge of alternators
CO3	Analyze the effect of frequency and voltage control action of Three phase induction machines.
CO4	Familiar with the equivalent circuit of single phase induction machines
CO5	Analyze the Performance Characteristics of Special Machines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**H**
CO2	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**L**	**H**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**H**
CO4	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**M**		
CO2	**M**	**M**	**M**	**M**	**M**		
CO3	**H**	**H**	**H**	**H**	**M**		
CO4	**M**	**M**	**M**	**M**	**M**		
CO5	**H**	**H**	**H**	**H**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L04	Subject Name: MEASUREMENT AND INSTRUMENTATION LAB	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: BEE18004	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To understand the Measurement and control concepts
- Students will obtain knowledge about different types of Transducers, bridges and its characteristics.
- To calibrate energy meters in single phase, three phase and measure the power , iron loss and power factor .
- To familiarize the students with the measurement of low resistance, inductance and capacitance-factor using simulation package such as LABVIEW /MATLAB etc.

COURSE OUTCOMES (Cos): (3-5)

CO1	Students get familiarized about different types of Transducers, bridges and its characteristics.
CO2	Understands the concept of calibration of energy meters in single/three phase and measure the power
CO3	The students gets familiarized with the measurement of low resistance, inductance and capacitance-factor using simulation packages etc.
CO4	Attained knowledge on P/I and I/P Converters
CO5	Attained knowledge on Smart Transducers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	H	M	H	M	H	M	H	M	H	H
CO2	M	L	M	H	H	H	H	M	M	L	H	M
CO3	L	M	H	H	H	H	H	H	H	H	H	L
CO4	M	H	H	H	H	H	H	H	H	H	H	M
CO5	H	M	H	H	H	L	H	L	H	M	H	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	M	H	H	H	H		
CO2	H	H	H	H	H		
CO3	H	H	H	H	H		
CO4	H	H	H	H	H		
CO5	L	M	HM	M	H		

H/M/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			
				√								

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEC18IL5	**Subject Name: SIGNAL PROCESSING AND COMMUNICATION LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- Analyze and implement digital signal processing systems in time domain.
- Understand the implementation of the DFT in terms of the FFT, as well as some of its application
- Use MATLAB for DSP system analysis and design.
- To implement the various analog and digital modulation and demodulation Techniques.
- Students will be able to determine the suitability of a particular communication system to a given problem.

COURSE OUTCOMES (Cos): (3-5)

CO1	Acquired knowledge DFT and FFT
CO2	Ability to design linear digital filters both FIR and IIR using different techniques.
CO3	Ability to understand the concept of Multi-rate signal processing and sample rate conversion.
CO4	Acquired knowledge of analog and digital communication.
CO5	Acquired knowledge different Modulation Techniques.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**H**	**H**	**M**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**
CO2	**M**	**H**	**H**	**M**	**M**	**M**	**M**	**M**	**H**	**H**	**H**	**L**
CO3	**L**	**M**	**M**	**L**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**
CO4	**M**	**L**	**L**	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**L**	**M**	**M**	**M**	**H**	**H**	**H**	**M**	**H**	**L**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**M**	**H**	**H**	**H**		
CO2	**L**	**M**	**H**	**H**	**H**		
CO3	**M**	**H**	**M**	**M**	**H**		
CO4	**M**	**M**	**L**	**L**	**H**		
CO5	**M**	**L**	**M**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18TS1	**Subject Name: TECHNICAL SKILL 1(Computer Software Packages)**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: -	**ETL**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- The objective is to develop the technical skill of the students

COURSE OUTCOMES (Cos): (3-5)

CO1	Develop the technical skills required in the field of study
CO2	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.
CO3	Enhance the employability of the students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO2	**H**	**H**	**M**	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**H**	**H**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**H**		
CO2	**H**	**H**	**H**	**H**	**H**		
CO3	**H**	**H**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEN18SK1	**Subject Name: SOFT SKILL - I (Career & Confidence Building)**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: -	**ETL**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

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

COURSE OUTCOMES (Cos): (3-5)

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

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**
CO2	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**
CO3	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**
CO4	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**L**	**H**	**L**	**L**		
CO2	**L**	**L**	**H**	**L**	**L**		
CO3	**L**	**L**	**H**	**L**	**L**		
CO4	**L**	**L**	**H**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I **6**

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

UNIT II **6**

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

UNIT III **6**

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

UNIT IV **6**

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

UNIT V **6**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18007	**Subject Name: POWER SYSTEM - II**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: Basic Electrical & Electronics Engg, BEE18006	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- Toattain knowledge about the basic principles of Relay
- To know about the apparatus protection
- To attain knowledge on Numerical relays, Circuit breakers
- To model the power system components

COURSE OUTCOMES (Cos): (3-5)

CO1	Ability to work on Relay
CO2	Attained knowledge on the protection of Apparatus
CO3	Ability to work on Numerical Relays
CO4	Ability to design Circuit breakers
CO5	Ability to model Power System Components

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**L**	**H**	**H**	**L**	**H**	**H**	**H**	**H**
CO2	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**L**	**H**	**M**	**M**	**H**
CO3	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**L**	**M**	**M**	**M**
CO4	**H**	**L**	**M**	**H**	**M**	**H**	**H**	**M**	**M**	**H**	**L**	**M**
CO5	**M**	**M**	**L**	**M**	**M**	**M**	**M**	**M**	**H**	**M**	**M**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**L**	**H**	**M**	**M**		
CO2	**M**	**L**	**M**	**L**	**H**		
CO3	**M**	**M**	**M**	**M**	**M**		
CO4	**H**	**M**	**H**	**M**	**L**		
CO5	**M**	**M**	**M**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18007	**POWER SYSTEM - II**	**3**	**1/0**	**0/0**	**4**

UNIT I RELAYS **12**

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 **12**

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

UNIT III STATIC AND NUMERICAL RELAYS **12**

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

UNIT IV CIRCUIT BREAKERS **12**

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 **12**

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. ofHours: 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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18008	**Subject Name: CONTROL SYSTEM**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BMA18001, BMA18003, BEE18002	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- Understand the basic components of control systems
- Capable to solve problems in time domain & frequency domain
- Understand the frequency response for the stability of the system
- Understand the concept of Compensators
- Understand the State space Analysis of different variables

COURSE OUTCOMES (Cos): (3-5)

CO1	The students understand the basic components of control systems.
CO2	The students are capable to solve problems in time domain & frequency domain
CO3	The students understand the frequency response for the stability of the system.
CO4	The students understand the concept of Compensators
CO5	The students understand the State space Analysis of different variables

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**H**	**H**	**M**	**M**	**L**	**M**	**M**	**H**	**L**
CO2	**H**	**M**	**H**	**H**	**H**	**M**	**H**	**M**	**M**	**M**	**H**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**	**M**	**H**	**H**	**M**
CO4	**M**	**H**	**L**	**M**	**L**	**L**	**L**	**L**	**M**	**L**	**L**	**L**
CO5	**H**	**H**	**H**	**H**	**H**	**L**	**L**	**L**	**M**	**L**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**M**	**H**		
CO2	**H**	**H**	**H**	**H**	**H**		
CO3	**H**	**H**	**H**	**M**	**H**		
CO4	**L**	**L**	**M**	**L**	**M**		
CO5	**M**	**H**	**H**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18008	**CONTROL SYSTEM**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO CONTROL SYSTEMS COMPONENTS 9

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 9

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 9

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 9

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

UNIT V STATE SPACE REPRESENTATION 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18ET2	**Subject Name: DESIGN OF ELECTRICAL MACHINES**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18002, BEE18005	**ETL**	**1**	**0/1**	**3/0**	**3**

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

OBJECTIVE:

- The graduate will be capable of designing the transformers
- To understand the designing the rotor bars & slots.
- The graduate will be capable of designing machine parameters related to the Industrial needs.
- The graduate will be capable of designing the Electrical machines
- To understand the characteristics like speed, torque etc. of different electrical machines.

COURSE OUTCOMES (Cos): (3-5)

CO1	Capable of designing the transformers
CO2	Ability to design the rotor bars and slots
CO3	Capable of designing machine parameters related to the Industrial needs.
CO4	Familiar with design of Electrical machines
CO5	Understand the characteristics like speed, torque etc. of different electrical machines

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**H**	**M**	**M**	**H**	**H**	**H**	**M**	**H**	**H**
CO2	**H**	**H**	**H**	**M**	**L**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO3	**M**	**M**	**M**	**H**	**H**	**M**	**L**	**M**	**H**	**L**	**M**	**L**
CO4	**M**	**M**	**H**	**M**	**L**	**L**	**M**	**H**	**H**	**H**	**H**	**H**
CO5	**H**	**H**	**M**	**L**	**M**	**H**	**M**	**H**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**M**	**M**	**H**		
CO2	**H**	**H**	**H**	**M**	**L**		
CO3	**M**	**M**	**M**	**H**	**L**		
CO4	**H**	**M**	**M**	**M**	**H**		
CO5	**H**	**H**	**H**	**M**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L05	**Subject Name: ELECTRONICS LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18ET1, BEE18001	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To know the basic knowledge of logic gates
- Design knowledge on implementation of Boolean Function
- Students able to design Counters, Registers using flip-flops
- Students acquire knowledge in programming of verilog HDL
- To study about multiplexers and demultiplexers

COURSE OUTCOMES (Cos): (3-5)

CO1	Understand the basic concepts of logic gates
CO2	Familiarization to the Design and implementation of Boolean Function
CO3	Understand about Counters, Registers using flip-flops
CO4	Understand the concepts in programming of verilog HDL
CO5	Capable to understand about multiplexers and demultiplexers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**H**	**M**	**L**	**M**
CO2	**M**	**M**	**M**	**M**	**H**	**H**	**M**	**M**	**M**	**L**	**M**	**H**
CO3	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**H**	**M**	**H**	**M**	**L**
CO4	**H**	**H**	**M**	**M**	**L**	**L**	**M**	**H**	**M**	**M**	**H**	**M**
CO5	**M**	**M**	**M**	**M**	**L**	**M**	**M**	**H**	**M**	**L**	**M**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**M**	**L**	**M**		
CO2	**M**	**M**	**H**	**M**	**H**		
CO3	**H**	**M**	**M**	**M**	**L**		
CO4	**H**	**M**	**L**	**H**	**M**		
CO5	**H**	**M**	**L**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L06	**Subject Name: CONTROL SYSTEM LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18002, BEE18005	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To know the basic knowledge of control system
- Design knowledge on P,PI, PID Controllers
- Students able to design smart Controller
- Students acquire knowledge in Time variant system

COURSE OUTCOMES (Cos): (3-5)

CO1	Attained knowledge on Synchros
CO2	Ability to design P,PI,PID Controller
CO3	Ability to design smart Controller for the system
CO4	Attains knowledge on transfer function
CO5	Attains knowledge on lead-lag compensator

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**
CO2	**M**	**H**	**H**	**M**	**M**	**H**	**M**	**M**	**M**	**M**	**M**	**M**
CO3	**M**	**M**	**M**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**
CO4	**M**	**L**	**L**	**M**	**H**	**L**	**M**	**H**	**M**	**H**	**H**	**M**
CO5	**M**	**L**	**M**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**L**	**H**	**M**		
CO2	**M**	**M**	**M**	**M**	**M**		
CO3	**H**	**H**	**M**	**H**	**H**		
CO4	**H**	**M**	**H**	**H**	**M**		
CO5	**H**	**M**	**M**	**H**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18IL1	**Subject Name: MICROPROCESSOR, MICROCONTROLLER AND ARM PROCESSOR LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18ET1	**T**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To understand program the Assembly language in Microprocessor
- Interfacing of peripheral devices using 8085.
- To know the program Assembly language in Microcontroller
- To understand simple programming using ARM processor
- To make program using KEIL software.

COURSE OUTCOMES (Cos): (3-5)

CO1	Capable of programming the Assembly language in Microprocessor
CO2	Familiar with Interfacing of peripheral devices using 8085
CO3	Capable of understand the program Assembly language in Microcontroller
CO4	Capable of understand simple programming using ARM processor
CO5	Understand the program using KEIL software.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**H**	**M**	**H**	**H**	**H**	**L**	**H**	**M**	**H**	**M**
CO2	**M**	**M**	**M**	**M**	**M**	**L**	**L**	**L**	**M**	**L**	**M**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO4	**H**	**M**	**H**	**M**	**H**	**M**	**M**	**M**	**H**	**M**	**H**	**M**
CO5	**H**	**M**	**H**	**M**	**H**	**M**	**M**	**M**	**H**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**M**	**M**	**L**	**M**		
CO2	**M**	**M**	**M**	**M**	**H**		
CO3	**M**	**M**	**M**	**M**	**H**		
CO4	**M**	**M**	**M**	**L**	**H**		
CO5	**L**	**M**	**M**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

BEI18IL1	**MICROPROCESSOR, MICROCONTROLLER AND ARM PROCESSOR LAB**	**0**	**0/0**	**3/0**	**1**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18TS2	**Subject Name: TECHNICAL SKILL 2 (Electrical Software Packages)**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:
The objective is to develop the technical skill of the students.

COURSE OUTCOMES (Cos): (3-5)

CO1	Develop the technical skills required in the field of study
CO2	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.
CO3	Enhance the employability of the students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	H	H	H	H	H	H	M	M	H	M	H	M
CO2	H	H	M	H	H	H	M	M	H	H	H	H
CO3	H	H	H	H	H	H	M	M	H	H	H	H

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	H	H	H	H	H		
CO2	H	H	H	H	H		
CO3	H	H	H	H	H		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18009	**Subject Name: POWER SYSTEM - III**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18004, BEE18007	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To attain basic knowledge on Power Quality and power System operation
- To plot load duration curve and understand the need for regulation
- To impart knowledge on Frequency control and Voltage Control
- To study the economic operation of power system and Unit commitment
- To know the importance of System Monitoring and Power Quality Measurement Equipments

COURSE OUTCOMES (Cos): (3-5)

CO1	Acquire knowledge on Power Quality and power System operation
CO2	Understanding of load duration curve and regulation needs
CO3	Familiar to Frequency control and Voltage Control
CO4	Knowledge on economic operation of power system and Unit commitment
CO5	Understand the importance of System Monitoring and Power Quality Measurement Equipments

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO2	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**	**M**	**L**	**H**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**	**M**	**L**	**H**	**L**
CO4	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**L**	**M**	**M**	**H**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**H**		
CO2	**H**	**M**	**M**	**H**	**H**		
CO3	**H**	**H**	**H**	**M**	**M**		
CO4	**H**	**M**	**L**	**H**	**H**		
CO5	**H**	**L**	**M**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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 12

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 12

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 12

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

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18010	Subject Name: POWER ELECTRONICS - I	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: Basic Electrical & Electronics Engg	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To attain Power Electronic Devices and its characteristics.
- To design the triggering of firing circuits.
- To learn the inverters, choppers and Industrial drives.
- To attain knowledge on DC & AC Drives

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on Power Electronic Devices and its characteristics
CO2	Ability to design the triggering of firing circuits
CO3	Knowledge on choppers, inverters
CO4	Knowledge on AC & DC Drives
CO5	Knowledge on Control circuits and Vector control

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	M	M	M	M	M	M	L
CO2	M	H	H	M	M	H	H	H	H	H	H	L
CO3	L	M	H	H	H	M	M	M	M	M	M	M
CO4	H	M	M	M	M	M	M	M	M	M	M	L
CO5	M	M	L	L	L	M	M	M	M	M	M	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	M	M	H	M		
CO2	H	M	M	H	M		
CO3	H	H	H	H	H		
CO4	M	M	M	M	M		
CO5	L	L	L	L	L		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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

UNITI POWER SEMICONDUCTOR DEVICES 12

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 12

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 12

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

UNIT IV DC DRIVES 12

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 12

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. ofHours: 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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18ET3	**Subject Name: ENERGY UTILIZATION AND CONSERVATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: --	**ETL**	**1**	**0/1**	**3/0**	**3**

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

OBJECTIVE:

- To study the energy conservation on buildings
- The analyse the heating and cooling of buildings
- Understand the energy efficient equipments
- Understands and analyse energy auditing
- Design the house wiring

COURSE OUTCOMES (Cos): (3-5)

CO1	Can able to study the energy conservation on building
CO2	Can analyse the heating and cooling of building
CO3	Can able to analyse the energy efficient equipments
CO4	Ability to perform energy audit
CO5	Ability to find solution for energy conservation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**L**	**H**	**H**	**M**	**L**	**H**	**H**	**M**	**L**	**H**	**H**
CO2	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
CO3	**M**	**L**	**H**	**M**	**M**	**L**	**H**	**M**	**M**	**L**	**H**	**M**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**M**	**M**	**H**	**H**	**M**	**M**	**H**	**H**	**M**	**M**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**L**	**H**	**H**		
CO2	**H**	**M**	**M**	**M**	**H**		
CO3	**M**	**M**	**L**	**H**	**H**		
CO4	**M**	**H**	**H**	**H**	**H**		
CO5	**H**	**M**	**M**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18ET3 ENERGY UTILIZATION AND CONSERVATION 1 0/1 3/0 3

UNITI HEATING AND WELDING 9

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 9

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 9

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 9

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

UNITV ENERGY CONSERVATION 9

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

Total No of Hours: 45

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L07	Subject Name: ELECTRICAL PRACTICE LAB	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite:BEE18004	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To know about various electrical apparatus and its symbol
- To know how to draw a single line diagram of a Power Network
- To learn about the wiring systems in domestic and commercial markets

COURSE OUTCOMES (Cos): (3-5)

CO1	Ability to design a wiring system for Domestic and Industrial load
CO2	Attain knowledge on various Electrical Gadgets
CO3	Ability to troubleshoot the domestic appliances
CO4	Ability to design a simple substation
CO5	Attain knowledge on Earthing

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	H	M	H	M	L	M	M	L	L	L	M
CO2	H	H	H	H	M	M	L	M	M	H	H	M
CO3	M	M	M	L	L	M	M	H	M	L	M	L
CO4	L	M	M	M	L	L	M	H	M	M	L	M
CO5	M	L	H	H	M	M	H	H	M	L	M	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	M	L	M	M		
CO2	H	M	M	L	M		
CO3	L	L	M	M	H		
CO4	M	L	L	M	H		
CO5	H	M	M	H	H		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18L07	**ELECTRICAL PRACTICE LAB**	**0**	**0/0**	**3/0**	**1**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L08	**Subject Name: POWER SYSTEM LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18007	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To know about the transmission lines
- To understand Load Flow Analysis
- To understand about Fault Analysis
- To gain knowledge on Power Electronic Circuits
- To familiar about Simulation of Electrical drives using Electrical Software

COURSE OUTCOMES (Cos): (3-5)

CO1	Students will know about the transmission lines
CO2	Students will understand Load Flow Analysis
CO3	Students will understand Load Fault Analysis
CO4	Students will have knowledge on Power Electronic Circuits
CO5	Students will understand Simulation of Electrical drives using MATLAB, PSCAD

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**M**	**L**	**L**	**M**	**M**	**L**	**L**	**L**	**M**
CO2	**M**	**M**	**M**	**H**	**H**	**H**	**M**	**M**	**L**	**M**	**H**	**M**
CO3	**M**	**M**	**L**	**L**	**L**	**L**	**H**	**H**	**H**	**M**	**M**	**M**
CO4	**H**	**H**	**M**	**H**	**H**	**M**	**M**	**L**	**H**	**H**	**M**	**M**
CO5	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**H**	**M**	**M**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**L**	**M**	**M**		
CO2	**M**	**M**	**M**	**M**	**M**		
CO3	**M**	**L**	**H**	**H**	**L**		
CO4	**H**	**M**	**M**	**M**	**M**		
CO5	**M**	**H**	**L**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18L08	**POWER SYSTEM LAB**	**0**	**0/0**	**3/0**	**1**

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 onPerformance ofDifferentialProtection 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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEN18SK2	**Subject Name: SOFT SKILL –II (Qualitative and Quantitative Skills)**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BSK18ET1	**ETL**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To help students to improve their Logical reasoning.
- To help students to improve their arithmetic reasoning.
- To help students improve their data interpretation skills

COURSE OUTCOMES (Cos): (3-5)

CO1	Prepare students for Logical reasoning
CO2	Prepare students for arithmetic reasoning
CO3	Prepare students for data interpretation skills

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**
CO2	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**
CO3	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**L**	**H**	**L**	**L**		
CO2	**L**	**L**	**H**	**L**	**L**		
CO3	**L**	**L**	**H**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEN18SK2 SOFT SKILL –II (Qualitative and Quantitative Skills) 0 0/0 3/0 1

UNIT I LOGICAL REASONING I 6

Logical Statements – Arguments – Assumptions – Courses of Action.

UNIT II LOGICAL REASONING II 6

Logical conclusions – Deriving conclusions from passages – Theme detection.

UNIT III ARITHMETICAL REASONING I 6

Number system – H.C.F & L.C.M – Problem on ages – Percentage – Profit & Loss – Ratio & Proportion – Partnership.

UNIT IV ARITHMETICAL REASONING II 6

Time & Work – Time & Distance – Clocks – Permutations & Combinations – Heights & Distances – Odd man out and Series.

UNIT V DATA INTERPRETATION 6

Tabulation – Bar graphs – Pie graphs – Line graphs.

Total No. of Hours : 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).

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L09	**Subject Name: MINI PROJECT/ INPLANT TRAINING/ INDUSTRIAL TRAINING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: --	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- The main objective of the Inplant training is to provide a short-term work experience in an Industry/ Company/ Organization

COURSE OUTCOMES (Cos): (3-5)

CO1	To get an insight of an industry / organization/company pertaining to the domain of study.
CO2	To acquire skills and knowledge for a smooth transition into the career.
CO3	To gain field experience and get linked with the professional network.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**L**	**L**	**L**	**L**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO2	**H**	**M**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**M**
CO3	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**H**		
CO2	**H**	**H**	**H**	**H**	**H**		
CO3	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18TS3	**Subject Name: TECHNICAL SKILL 3 (Evaluation of Design & Implementation Practice)**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:
The objective is to develop the technical skill of the students.

COURSE OUTCOMES (Cos): (3-5)

CO1	Develop the technical skills required in the field of study
CO2	Bridge the gap between the skill requirements of the employer or industry and the competency of the students.
CO3	Enhance the employability of the students.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	H	H	H	H	H	H	M	M	H	M	H	M
CO2	H	H	M	H	H	H	M	M	H	H	H	H
CO3	H	H	H	H	H	H	M	M	H	H	H	H

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	H	H	H	H	H		
CO2	H	H	H	H	H		
CO3	H	H	H	H	H		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities AndSocial Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
							√					

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18011	**Subject Name: MICROGRID TECHNOLOGY**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18010, BEE18009	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To study about various conventional & Nonconventional source of energy resources
- To study the concept of Microgrid and the control modes
- To impart knowledge on Distributed Generation
- To analyse the impact of Grid Integration.
- To understand various power quality issues and the protection schemes for Microgrid.

COURSE OUTCOMES (Cos): (3-5)

CO1	Understanding of various conventional and Nonconventional source of energy resources
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 Microgrid.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**H**	**H**	**M**	**L**	**H**	**H**	**H**	**H**	**H**
CO2	**L**	**L**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO3	**M**	**M**	**M**	**L**	**M**	**H**	**H**	**M**	**M**	**M**	**H**	**M**
CO4	**H**	**L**	**M**	**H**	**M**	**M**	**L**	**M**	**M**	**M**	**H**	**M**
CO5	**H**	**H**	**L**	**L**	**M**	**H**	**H**	**M**	**H**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**H**	**L**	**H**		
CO2	**H**	**H**	**M**	**L**	**M**		
CO3	**H**	**H**	**M**	**L**	**M**		
CO4	**M**	**M**	**L**	**M**	**H**		
CO5	**H**	**H**	**M**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18011	**MICROGRID TECHNOLOGY**	**3**	**1/0**	**0/0**	**4**

UNIT I INTRODUCTION 12

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 12

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 12

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 12

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:

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
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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BMG18002	**Subject Name: MANAGEMENT CONCEPTS AND ORGANISATION BEHAVIOUR**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: -	**L**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- This course is aimed at addressing the contemporary issues, which fall under the broad title of management, and its functions.
- There will also be an attempt to analyze the behavior of individuals within an organization and the issues of working with other group or teams.

COURSE OUTCOMES (Cos): (3-5)

CO1	Effective leadership skills
CO2	Accommodating with co workers and at Work environment
CO3	Enhanced leadership skills
CO4	Understanding and implementing good policies for the welfare of management and workers

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**		**M**		**M**		**L**		**M**		**L**	
CO2	**M**	**M**				**M**		**H**	**M**	**M**	**L**	**H**
CO3	**L**		**H**	**H**	**M**		**M**	**H**	**M**	**L**	**M**	
CO4	**M**	**L**				**M**			**M**			**M**
CO5												

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**L**	**L**	**L**	**L**		
CO2	**L**	**L**	**L**	**L**	**L**		
CO3	**L**	**L**	**L**	**L**	**L**		
CO4	**L**	**L**	**L**	**L**	**L**		
CO5							

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BMG18002	**MANAGEMENT CONCEPTS AND ORGANISATION BEHAVIOR**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO MANAGEMENT 9

Definition of Management – Science or Art or Profession – Manager v_s Entrepreneur vs Leader – Types of Managers – Managerial roles and skills – Evolution of Management – Scientific, Human relations and system approaches

UNIT II PLANNING AND ORGANIZING 9

Nature and purpose of planning – planning process – types of planning – planning premises – Nature and purpose of organizing – Formal and Informal organization – organization chart – organization structure – types - Line and staff authority

UNIT III DIRECTING AND CONTROLLING 9

Leadership – Types and theories of leadership – communication – process of communication – barriers in communication – System and process of controlling – Budgetary and non budgetary control techniques – Direct and preventive control – reporting

UNIT IV INDIVIDUAL BEHAVIOR 9

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

UNIT V GROUP BEHAVIOR 9

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

Total No of Hours :45

TEXT BOOKS:

1. Harold Koontz and Heinz Weihrich “Essentials of Management” Tata McGraw Hill Education 2015
2. Stephen. P. Robbins, Timothy A. Judge and Seema Sanghi “Essentials of Organizational Behavior” Pearson 10th Edition 2010

REFERENCE BOOKS:

1. Tripathi PC & Reddy PN “Principles of Management” Tata McGraw Hill 2012
2. Stephen P. Robbins, David A.De.Cenzo, Mary Coulter “Fundamentals of Management” Pearson Education 2016

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18ET4	**Subject Name: INDUSTRIAL DRIVES AND AUTOMATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18009, BEE18010, BEE18005	**ETL**	**1**	**0/1**	**3/0**	**3**

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

OBJECTIVE:

- To develop Introduction to Industrial Drives
- To develop knowledge on DC Drives
- To develop knowledge on Energy Conservation And Special Class Of Drives
- To gain Knowledge on SCADA
- To gain knowledge on PLC

COURSE OUTCOMES (Cos): (3-5)

CO1	To develop Introduction to Industrial Drives
CO2	To develop knowledge on DC Drive
CO3	To develop knowledge on Energy Conservation And Special Class Of Drives
CO4	To gain Knowledge on SCADA
CO5	To gain knowledge on PLC

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**L**	**L**	**M**	**M**	**L**	**H**	**H**	**H**	**L**	**M**	**M**
CO2	**H**	**H**	**M**	**M**	**M**	**L**	**L**	**H**	**M**	**H**	**L**	**M**
CO3	**M**	**M**	**L**	**M**	**M**	**M**	**H**	**L**	**M**	**M**	**H**	**L**
CO4	**H**	**M**	**M**	**L**	**L**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO5	**M**	**H**	**M**	**H**	**M**	**L**	**H**	**M**	**H**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**H**	**M**	**L**	**L**		
CO2	**M**	**H**	**M**	**H**	**M**		
CO3	**H**	**L**	**L**	**M**	**H**		
CO4	**L**	**M**	**H**	**M**	**L**		
CO5	**M**	**M**	**L**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18ET4 INDUSTRIAL DRIVES AND AUTOMATION 1 0/1 3/0 3

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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

UNIT V PLC 9

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

Total No of Hours: 45

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L10	**Subject Name: MICROGRID LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18010, BEE18009	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- Students can obtain knowledge about specific wind power, calculate the wind frequency, turbines characteristics, time period and frequency of the rotating turbine at different speeds.
- To understand the Characteristics of Solar Modules when connected in series and parallel
- To help the students to understand the modelling, simulation, implementation and performance characteristics of solar photovoltaic and wind turbine.
- To help the students to design and simulate the performance characteristics of a Micro-grid

COURSE OUTCOMES (Cos): (3-5)

CO1	Students can obtain knowledge about generated wind power, turbines characteristics, performance of turbine at different speeds.
CO2	Students can understand the concept of semiconductors and p-n junction energy band, Illumination effect on PV Modules, effect of Temperature, Effect of Shading on PV Modules, Effect of Angle of Inclination of Solar Modules.
CO3	Capable of understanding the concept of the Characteristics of Solar Modules when connected in series and parallel
CO4	Students will be able to model, simulate, implement and perform the characteristics of solar photovoltaic and wind turbine.
CO5	Students will be able to design and simulate the performance characteristics of a Micro-grid

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO 7**	**PO 8**	**PO 9**	**PO10**	**PO1 1**	**PO1 2**
CO1	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**
CO2	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**
CO3	**M**	**M**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**L**	**H**	**H**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**M**	**H**	**H**		
CO2	**M**	**L**	**M**	**L**	**H**		
CO3	**H**	**H**	**M**	**H**	**L**		
CO4	**H**	**M**	**M**	**H**	**L**		
CO5	**M**	**H**	**H**	**M**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic	Engineering Sciences	Humanities and Social Sciences	Program C	Program Electives	Open Electives	Practical / Project	Internships / Technical	Soft Skills			
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18L10	**MICROGRID LAB**	**0**	**0/0**	**3/0**	**1**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L11	**Subject Name: POWER ELECTRONICS AND DRIVES LAB**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18010	**L**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:

- To obtain an overview of different types of power semiconductor devices and their switching characteristics with different triggering methods.
- To understand the operation , characteristics and performance parameters of controlled Rectifiers and Inverters.
- To understand the techniques to control the speed of Brushless DC Motor and SR Motor
- To understand the operation of AC Voltage Controllers
- To understand the applications of Power Electronic devices and Electric drives in Power System

COURSE OUTCOMES (Cos): (3-5)

CO1	Students will understand the operation of power electronics devices and gain knowledge of the comparative study of different devices based on their switching characteristics .
CO2	Students will understand the operation , characteristics and performance parameters of controlled Rectifiers and Inverters
CO3	Students capable to understand the techniques to control the speed of Brushless DC Motor and SR Motor
CO4	Students able to understand the operation of AC Voltage Controllers
CO5	Students able to understand the operation of different converters and incorporate in designing the HVDC transmission System

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**L**	**H**	**M**	**H**	**L**
CO2	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**L**	**M**	**M**	**H**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**L**	**M**	**M**	**H**	**L**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**H**	**H**	**H**		
CO2	**M**	**M**	**M**	**H**	**H**		
CO3	**H**	**H**	**M**	**L**	**M**		
CO4	**L**	**L**	**H**	**H**	**H**		
CO5	**M**	**M**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18L11	**POWER ELECTRONICS AND DRIVES LAB**	**0**	**0/0**	**3/0**	**1**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L12	**Subject Name: PROJECT PHASE -I**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**L**	**0**	**0/0**	**3/3**	**2**

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

OBJECTIVE:

- The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (Cos): (3-5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**L**	**M**	**M**	**H**	**H**
CO2	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**H**
CO3	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**M**
CO4	**H**	**M**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**H**		
CO2	**H**	**H**	**H**	**H**	**H**		
CO3	**H**	**H**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BHS18FLX	**Subject Name: FOREIGN LANGUAGE**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**0**	**0/0**	**3/0**	**1**

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

OBJECTIVE:: To recognize the cultural values, practices, and heritage of the foreign country, communicate effectively in a foreign language and interact in a culturally appropriate manner with native speakers of that language

COURSE OUTCOMES (Cos): (3-5)

CO1	Achieve functional proficiency in listening, speaking, reading, and writing.
CO2	Develop an insight into the nature of language itself, the process of language and culture acquisition.
CO3	Decode, analyze, and interpret authentic texts of different genres.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**L**	**L**	**L**	**L**	**H**	**L**	**H**	**M**	**H**	**H**	**L**
CO2	**M**	**L**	**L**	**L**	**L**	**H**	**L**	**H**	**H**	**H**	**H**	**L**
CO3	**L**	**L**	**M**	**M**	**L**	**H**	**M**	**H**	**M**	**H**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**L**	**L**	**L**	**L**		
CO2	**L**	**L**	**L**	**L**	**L**		
CO3	**L**	**L**	**L**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18012	**Subject Name: POWER ELECTRONICS - II**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: BEE18009, BEE18010	**T**	**3**	**1/0**	**0/0**	**4**

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

OBJECTIVE:

- To attain knowledge on HVDC
- To model the HVDC system
- To know about FACTS Controllers
- To model the Power flow system

COURSE OUTCOMES (Cos): (3-5)

CO1	Attained knowledge about HVDC
CO2	Ability to model the HVDC System
CO3	Knowledge on FACTS
CO4	Attain knowledge on FACTS Controllers
CO5	Ability to model Power flow using STATCOM, TCSC etc

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**L**	**L**	**M**	**M**	**L**
CO2	**H**	**H**	**H**	**H**	**M**	**M**	**L**	**L**	**M**	**M**	**H**	**M**
CO3	**M**	**H**	**H**	**M**	**L**	**L**	**M**	**H**	**M**	**M**	**H**	**H**
CO4	**M**	**M**	**M**	**M**	**M**	**H**	**H**	**M**	**M**	**L**	**L**	**L**
CO5	**L**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**M**	**H**	**L**		
CO2	**H**	**M**	**M**	**L**	**L**		
CO3	**M**	**L**	**L**	**M**	**H**		
CO4	**M**	**M**	**H**	**H**	**M**		
CO5	**H**	**H**	**M**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18012	**POWER ELECTRONICS - II**	**3**	**1/0**	**0/0**	**4**

UNIT I INTRODUCTION TO HVDC 12

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 12

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 12

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 12

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 12

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

Total No of Hours:60

TEXT BOOKS:

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18013	**Subject Name: SMART GRID TECHNOLOGY**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:BEE18009, BEE18010, BEE18011	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understand smart grid need and its regulations.
- To provide solution in various levels of smart grid.
- To understand Microgrid, Communication and Measurement technology.

COURSE OUTCOMES (Cos): (3-5)

CO1	Understands the difference between smart grid and traditional grid design a Smartgrid
CO2	Understands the Smartgrid communication and measurement technology
CO3	Ability to design a Smart Grid
CO4	Understands the storage technologies
CO5	Ability to model and apply control for the interoperability state.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**H**	**H**	**L**	**M**	**L**	**H**	**L**	**M**	**L**	**H**
CO2	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**H**	**M**	**H**	**H**	**H**
CO3	**L**	**H**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO4	**M**	**L**	**H**	**H**	**M**	**L**	**H**	**L**	**M**	**L**	**H**	**L**
CO5	**H**	**H**	**L**	**L**	**L**	**M**	**M**	**H**	**L**	**M**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**M**	**L**	**H**	**H**		
CO2	**M**	**H**	**H**	**H**	**M**		
CO3	**H**	**M**	**H**	**M**	**M**		
CO4	**M**	**L**	**H**	**L**	**L**		
CO5	**L**	**M**	**M**	**H**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18013	**SMART GRID TECHNOLOGY**	**3**	**0/0**	**0/0**	**3**

UNITI INTRODUCTION TO SMART GRID 9

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 9

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 9

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 9

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. ofHours: 45

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18L13	**Subject Name: PROJECT PHASE - II**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**L**	**0**	**0/0**	**12/12**	**8**

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

OBJECTIVE: The objective of the Main Project is to culminate the academic study and provide an opportunity to explore a problem or issue , address through focused and applied research under the direction of a faculty mentor. The project demonstrates the student's ability to synthesize and apply the knowledge and skills acquired to real-world issues and problems. This project affirms the students to think critically and creatively, find an optimal solution, make ethical decisions and to present effectively.

COURSE OUTCOMES (Cos): (3-5)

CO1	Apply the knowledge and skills acquired in the course of study addressing a specific problem or issue.
CO2	To encourage students to think critically and creatively about societal issues and develop user friendly and reachable solutions
CO3	To refine research skills and demonstrate their proficiency in communication skills.
CO4	To take on the challenges of teamwork, prepare a presentation and demonstrate the innate talents.

Mapping of Course Outcomes with Program Outcomes (POs)

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

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**H**	**H**	**H**		
CO2	**H**	**H**	**H**	**H**	**H**		
CO3	**H**	**H**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E01	**Subject Name: WIND ENERGY CONVERSION TECHNIQUES**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To know the basics of Wind Energy Conversion System
- To solve the Energy crisis.
- To know the Power Electronic Devices and its characteristics.
- To understand different converters
- To design wind Energy conversion system such as subsystems and its components

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on Wind Energy Systems
CO2	Capability to find solution for Energy Crisis
CO3	Attained knowledge on various types of converters
CO4	Familiarity in Power Electronics Devices and its performance.
CO5	Ability to design Electrical Machines for Wind Energy Conversion System

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**L**	**L**	**M**	**M**	**H**	**M**	**L**	**L**	**H**	**H**	**L**
CO2	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**H**	**H**
CO3	**H**	**M**	**M**	**H**	**M**	**H**	**M**	**M**	**M**	**L**	**H**	**M**
CO4	**M**	**M**	**M**	**M**	**L**	**H**	**M**	**M**	**H**	**M**	**H**	**L**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**L**	**L**	**M**	**L**		
CO2	**L**	**H**	**M**	**H**	**L**		
CO3	**L**	**M**	**H**	**M**	**L**		
CO4	**M**	**M**	**H**	**M**	**L**		
CO5	**H**	**H**	**H**	**H**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E01	**WIND ENERGY CONVERSION TECHNIQUES**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO WIND SYSTEMS 9

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 9

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 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E02	**Subject Name: IOT APPLIED TO ELECTRICAL ENGINEERING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To study IOT in Electric Engineering
- To study Telematics Devices
- To Study IOT Sensors
- To Study Smart grid and Micro grid
- To Study Smart Space Security System

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge of IOT in Electrical Engineering
CO2	Attain knowledge on Telematic Devices
CO3	Ability to work on IOT sensors
CO4	Knowledge on Smart grid and Micro grid
CO5	Knowledge on Smart Space Security System

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**H**	**L**	**H**	**M**	**H**	**M**	**H**	**M**	**L**
CO2	**M**	**H**	**M**	**H**	**L**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
CO3	**M**	**M**	**M**	**H**	**L**	**M**	**H**	**M**	**H**	**M**	**M**	**M**
CO4	**L**	**M**	**M**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**L**	**M**
CO5	**M**	**H**	**H**	**L**	**M**	**L**	**M**	**L**	**M**	**M**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**M**	**M**	**M**		
CO2	**H**	**M**	**M**	**H**	**M**		
CO3	**M**	**L**	**H**	**M**	**H**		
CO4	**L**	**M**	**M**	**M**	**M**		
CO5	**M**	**M**	**M**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E02 IOT APPLIED TO ELECTRICAL ENGINEERING 3 0/0 0/0 3

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 9

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 9

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:

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E03	**Subject Name: MECHATRONICS**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:--	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understand the concepts of sensors and transducers
- To learn interface programming
- To apply control system problems

COURSE OUTCOMES (Cos): (3-5)

CO1	Attain knowledge on Sensors and Transducers
CO2	Ability to interface in programming
CO3	Capable to design control techniques
CO4	Ability to design actuators
CO5	Capable of understanding recent advancements

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**M**	**M**	**L**	**H**	**M**	**M**	**M**	**M**	**L**
CO2	**H**	**H**	**L**	**H**	**M**	**L**	**H**	**H**	**L**	**H**	**M**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**M**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**H**	**H**	**M**		
CO2	**M**	**M**	**H**	**M**	**M**		
CO3	**L**	**L**	**M**	**L**	**L**		
CO4	**H**	**H**	**L**	**M**	**H**		
CO5	**M**	**H**	**L**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

BEE18E03	**MECHATRONICS**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION 9

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

UNIT II SENSORS AND TRANSDUCERS 9

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

UNIT III ACTUATION SYSTEMS 9

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

UNIT IV CONTROL SYSTEMS 9

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

UNIT V RECENT ADVANCES 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E04	**Subject Name: ARTIFICIAL INTELLIGENCE**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To attain familiarity in Artificial Intelligence
- To study about Fuzzy System.
- To acquire knowledge of ANN
- To study about genetic algorithm
- To do programming using optimization techniques.

COURSE OUTCOMES (Cos): (3-5)

CO1	Familiarity in Artificial Intelligence
CO2	Acquired knowledge on Fuzzy System
CO3	Acquired knowledge on Neural Network
CO4	Familiarity in Genetic Algorithm
CO5	Capable to solve issues with optimization techniques

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**L**	**L**	**H**	**H**	**L**	**H**	**L**	**L**	**M**	**M**	**H**	**M**
CO2	**H**	**M**	**M**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**
CO3	**M**	**M**	**L**	**H**	**M**	**H**	**M**	**M**	**H**	**M**	**H**	**M**
CO4	**M**	**H**	**M**	**H**	**L**	**M**	**M**	**M**	**M**	**L**	**H**	**M**
CO5	**H**	**H**	**M**	**H**	**M**	**H**	**H**	**H**	**H**	**H**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**M**	**L**	**M**		
CO2	**M**	**L**	**H**	**M**	**M**		
CO3	**L**	**L**	**H**	**L**	**L**		
CO4	**M**	**M**	**M**	**L**	**L**		
CO5	**H**	**M**	**H**	**H**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E04	**ARTIFICIAL INTELLIGENCE**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO ARTIFICIAL INTELLIGENCE 9

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 9

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 9

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 9

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 9

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

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E05	**Subject Name: SOLAR ENERGY CONVERSION TECHNIQUES**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To study about Solar Radiation and the collector types
- To impart knowledge on the Application of Solar thermal Technology
- To understand the fundamentals of Solar Photovoltaic cells
- To design the Solar cells in cost effective manner.
- To learn about the solar passive Architecture

COURSE OUTCOMES (Cos): (3-5)

CO1	Students understand Solar Radiation and the collector types
CO2	Acquire knowledge on the Application of Solar thermal Technology
CO3	Understand the fundamentals of Solar Photovoltaic cells
CO4	Familiar to design the Solar cells in cost effective manner
CO5	Incorporate the knowledge about the solar passive Architecture

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**H**	**H**	**M**	**M**	**L**	**M**	**M**	**M**	**L**	**M**	**L**
CO2	**M**	**M**	**M**	**L**	**M**	**H**	**M**	**L**	**M**	**H**	**M**	**H**
CO3	**L**	**M**	**L**	**M**	**H**	**M**	**L**	**M**	**H**	**M**	**L**	**M**
CO4	**M**	**H**	**H**	**M**	**L**	**M**	**H**	**M**	**L**	**M**	**H**	**M**
CO5	**H**	**H**	**H**	**M**	**L**	**M**	**H**	**M**	**L**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**M**	**H**	**M**	**L**		
CO2	**M**	**M**	**L**	**M**	**H**		
CO3	**M**	**L**	**M**	**H**	**M**		
CO4	**H**	**H**	**M**	**L**	**M**		
CO5	**H**	**H**	**M**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E05 SOLAR ENERGY CONVERSION TECHNIQUES 3 0/0 0/0 3

UNIT I SOLAR RADIATION AND COLLECTORS 9

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 9

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 9

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 9

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 9

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

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E06	Subject Name: GREEN BUILDING TECHNOLOGY	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite: ---	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To educate the concept of Green Building
- To understand the Design concepts of Green Building
- To attain knowledge on reduction of carbon footing
- To impart the importance of Environmental issues
- To explore the future trends in Green Building and to revamp the ecological design.

COURSE OUTCOMES (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 Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	H	M	M	L	L	M	M	L	L	H
CO2	M	L	M	M	H	M	M	H	M	L	M	M
CO3	M	M	L	M	M	L	M	M	M	M	L	L
CO4	M	H	L	H	H	M	H	M	H	M	M	M
CO5	M	M	L	M	L	H	M	H	M	L	M	H

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	M	H	L	M		
CO2	M	H	H	M	H		
CO3	H	M	M	H	L		
CO4	M	M	M	M	M		
CO5	M	M	H	H	H		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E06	**GREEN BUILDING TECHNOLOGY**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO GREEN BUILDING 9

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

UNIT II DESIGN OF GREEN BUILDING 9

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

UNIT III REDUCTION OF CARBON FOOTING 9

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

UNIT IV ENVIRONMENTAL ASPECTS 9

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

UNIT V FUTURE TRENDS 9

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

Total No of Hours: 45

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
2. 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
3. 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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E07	**Subject Name: NEURAL NETWORKS AND ITS APPLICATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite: ---	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To know the fundamentals of Neural network
- To learn the theory about Neural network
- .To learn the control using Neural Network

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on the fundamental of Neural network
CO2	Attain knowledge on the architecture of the network topology
CO3	Knowledge on different types of topologies
CO4	Ability to apply control using Neural network
CO5	Ability to design Digital Filters

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**H**	**L**	**M**	**H**	**M**	**H**	**L**	**L**	**L**	**H**
CO2	**M**	**H**	**H**	**M**	**H**	**M**	**H**	**H**	**M**	**L**	**M**	**M**
CO3	**H**	**M**	**M**	**H**	**L**	**H**	**M**	**M**	**H**	**M**	**L**	**L**
CO4	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**
CO5	**M**	**M**	**H**	**H**	**H**	**M**	**M**	**H**	**H**	**L**	**M**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**H**	**L**	**L**	**L**		
CO2	**H**	**H**	**M**	**L**	**M**		
CO3	**M**	**M**	**H**	**M**	**L**		
CO4	**M**	**M**	**M**	**M**	**M**		
CO5	**M**	**H**	**H**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E07	**NEURAL NETWORKS AND ITS APPLICATION**	**3**	**0/0**	**0/0**	**3**

UNIT I FUNDAMENTALS OF NEURAL NETWORKS 9

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

UNIT II NEURAL NETWORKS THEORY 9

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 9

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 9

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

UNIT V APPLICATION OF NEURAL NETWORKS 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E08	**Subject Name: DIGITAL SIGNAL PROCESSING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understands the fundamentals of signals & systems.
- Impart knowledge on Z- transform concepts.
- To Understand the Designing of signals using filters.
- To avail the knowledge on design IIR and FIR filters with Fourier series method
- To understand the Architecture and features of various signal processing chips

COURSE OUTCOMES (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 Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**M**	**L**
CO2	**H**	**H**	**L**	**H**	**M**	**L**	**L**	**L**	**H**	**L**	**M**	**L**
CO3	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**M**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**M**	**H**	**M**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**H**	**H**	**H**	**H**		
CO2	**L**	**L**	**L**	**L**	**L**		
CO3	**M**	**H**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		
CO5	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E08	**DIGITAL SIGNAL PROCESSING**	**3**	**0/0**	**0/0**	**3**

UNIT I DISCRETE TIME SIGNALS AND SYSTEMS 9

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 9

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) 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E09	**Subject Name: : RESTRUCTURING OF DISTRIBUTION SYSTEM**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To study about Distribution system and Load Pattern
- To impart knowledge on the Distribution feeder
- To restructure the Distribution network and extent control for Low voltage network
- To understand the self healing control techniques
- To attain confidence on Automation in Distribution field

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on the Distribution System and the load pattern.
CO2	Attained knowledge on the Distribution feeder
CO3	Ability to restructure the Distribution network
CO4	Knowledge on self healing control techniques
CO5	Attained confidence on Automation of Distribution network.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**H**	**M**	**M**	**M**	**L**	**M**	**L**	**M**	**M**
CO2	**H**	**M**	**H**	**M**	**M**	**M**	**H**	**M**	**M**	**M**	**M**	**M**
CO3	**M**	**H**	**M**	**L**	**H**	**H**	**M**	**M**	**H**	**L**	**H**	**H**
CO4	**M**	**M**	**H**	**M**	**M**	**H**	**H**	**H**	**M**	**M**	**M**	**M**
CO5	**L**	**L**	**M**	**M**	**H**	**H**	**M**	**M**	**L**	**H**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**L**	**M**	**M**	**M**		
CO2	**H**	**M**	**M**	**M**	**M**		
CO3	**M**	**M**	**H**	**H**	**H**		
CO4	**H**	**L**	**M**	**M**	**M**		
CO5	**M**	**M**	**L**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E09	**RESTRUCTURING OF DISTRIBUTION SYSTEM**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO DISTRIBUTION SYSTEM 9

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 9

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 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E10	**Subject Name: DG AND ENERGY STORAGE TECHNOLOGY**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	T	3	0/0	0/0	3

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

OBJECTIVE:

- To study about the Energy Storage Technology
- To know the working Principle of Batteries and its types
- To impart knowledge on Fuel Cells along with its advantage and disadvantages
- To analyse various types of energy storage devices.
- To have a wide spread knowledge on Electric Vehicle

COURSE OUTCOMES (Cos): (3-5)

CO1	Attain Knowledge on various energy resources
CO2	Knowledge on the concept of Distributed generation
CO3	Knowledge on Fuel cells and Batteries
CO4	Ability to analyze various types of energy storage devices
CO5	Knowledge on Electric vehicles

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**H**	**M**	**H**	**M**	**M**	**M**	**L**	**H**	**H**	**M**
CO2	**H**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**M**	**M**
CO3	**H**	**H**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**L**
CO4	**M**	**L**	**L**	**L**	**M**	**H**	**M**	**H**	**L**	**L**	**M**	**L**
CO5	**H**	**L**	**M**	**M**	**L**	**L**	**H**	**M**	**H**	**M**	**H**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**H**	**M**	**L**	**L**		
CO2	**M**	**M**	**L**	**M**	**M**		
CO3	**M**	**L**	**M**	**H**	**H**		
CO4	**M**	**M**	**M**	**M**	**H**		
CO5	**M**	**H**	**H**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E10	**DG AND ENERGY STORAGE TECHNOLOGY**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION 9

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

UNITII DISTRIBUTED GENERATION 9

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 9

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 9

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

UNIT V ELECTRIC VEHICLE 9

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:

1. 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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E11	**Subject Name: MATERIAL SCIENCE IN AVIATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To gain basic knowledge on Cryogenic Technology
- To impart knowledge on Super Alloy and its Applications
- To know the importance of Flexible Electronics
- To have a wide spread knowledge about Nanoscience and nano material
- To learn about Drone

COURSE OUTCOMES (Cos): (3-5)

CO1	Attained basic knowledge on Cryogenic Technology
CO2	Knowledge on Super Alloy and its application
CO3	Knowledge on Flexible Electronics
CO4	Attained knowledge on nano science and nano material
CO5	Knowledge on Drone

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**L**	**L**	**M**	**M**	**M**	**H**	**M**	**M**	**M**
CO2	**H**	**M**	**M**	**L**	**L**	**H**	**M**	**H**	**H**	**H**	**M**	**M**
CO3	**H**	**H**	**L**	**M**	**M**	**M**	**M**	**M**	**M**	**M**	**H**	**M**
CO4	**M**	**M**	**M**	**M**	**M**	**L**	**H**	**L**	**L**	**L**	**M**	**H**
CO5	**H**	**L**	**H**	**H**	**H**	**M**	**M**	**M**	**M**	**M**	**L**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**M**	**H**	**L**		
CO2	**H**	**L**	**M**	**M**	**M**		
CO3	**M**	**M**	**L**	**H**	**L**		
CO4	**H**	**H**	**M**	**M**	**M**		
CO5	**M**	**M**	**H**	**L**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E11	**MATERIAL SCIENCE IN AVIATION**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO CRYOGENIC TECHNOLOGY 9

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 9

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

UNIT III FLEXIBLE ELECTRONICS 9

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 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEI18013	**Subject Name: POWER PLANT INSTRUMENTATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- Familiarity to Building blocks and boilers.
- Capable to measure Electrical parameters.
- Capable to analyse various parameters in power plants
- Understand the control loops in boiler
- Capable to monitor and control the renewable energy systems

COURSE OUTCOMES (Cos): (3-5)

CO1	The students get familiarized to Building blocks and boilers.
CO2	The student becomes capable to measure Electrical parameters
CO3	The student will be able to analyse various parameters in power plants
CO4	The students understand the control loops in boiler
CO5	The student becomes Capable to monitor and control the renewable energy systems

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**M**	**M**	**L**	**L**	**L**	**L**	**L**	**M**	**M**	**H**	**L**
CO2	**M**	**M**	**L**	**L**	**H**	**L**	**L**	**M**	**M**	**L**	**H**	**M**
CO3	**H**	**H**	**H**	**H**	**H**	**M**	**M**	**M**	**H**	**M**	**H**	**H**
CO4	**H**	**M**	**L**	**M**	**L**	**L**	**L**	**M**	**M**	**M**	**H**	**M**
CO5	**H**	**H**	**M**	**H**	**H**	**M**	**H**	**M**	**H**	**M**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**L**	**L**	**M**	**L**		
CO2	**H**	**L**	**M**	**M**	**M**		
CO3	**H**	**H**	**M**	**H**	**M**		
CO4	**M**	**M**	**H**	**M**	**M**		
CO5	**H**	**H**	**H**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEI18013	**POWER PLANT INSTRUMENTATION**	**3**	**0/0**	**0/0**	**3**

UNIT I OVERVIEW OF POWER GENERATION 9

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 9

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 9

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 9

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.

UNIT V TURBINE – MONITORING AND CONTROL 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E13	Subject Name: SAFETY FOR ELECTRICAL ENGINEERS	TY / LB/ ETL	L	T / S.Lr	P / R	C
	Prerequisite:	T	3	0/0	0/0	3

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

OBJECTIVE:

- To attain knowledge on Electrical Safety
- To know about the operation of Electrical Safety Equipments
- To learn about the safety procedures
- To know about the electrical safety codes
- To train the students on the Safety training.

COURSE OUTCOMES (Cos): (3-5)

CO1	Attained knowledge on the basics of Electrical Safety
CO2	Knowledge about the operation of the Safety equipments
CO3	Knowledge on the safety procedures
CO4	Familiarity on the electrical safety codes
CO5	Ability to become consultant and to attend the Vendors.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H	M	L	M	H	H	H	M	M	L	M	M
CO2	H	H	L	M	M	H	H	H	M	M	H	H
CO3	M	M	M	H	L	M	M	M	H	M	M	L
CO4	H	L	H	M	M	L	L	L	L	H	L	M
CO5	L	M	M	L	H	M	M	M	M	M	M	M

Cos / PSOs	PSO1	PSO2	PSO3	PSO4	PSO5		
CO1	H	M	M	M	H		
CO2	H	M	M	M	H		
CO3	M	H	H	L	M		
CO4	H	M	M	M	L		
CO5	M	L	M	M	M		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E13	**SAFETY FOR ELECTRICAL ENGINEERS**	**3**	**0/0**	**0/0**	**3**

UNIT I GENERAL PRINCIPLES OF ELECTRIC SAFETY **9**

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 **9**

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 **9**

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 **9**

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 **9**

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E14	**Subject Name: WIDE AREA MONITORING PROTECTION AND CONTROL**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To know about the Phasor Measurement Unit and its importance
- To impart knowledge on State Estimation and the Optimal placement of PMU
- To attain familiarity on Wide Area Measurement System
- To have a wide spread knowledge about the Protection schemes and the Dynamic model of Power System
- To apply the learnt concept for the real time issues.

COURSE OUTCOMES (Cos): (3-5)

CO1	Familiarity in PMU
CO2	Acquired knowledge in State estimation and the Optimal Placement of PMU
CO3	Familiarity on Wide Area Measurements
CO4	Attained a wide spread knowledge about the Protection Schemes
CO5	Ability to apply the concepts for real time

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**L**	**M**	**H**	**L**	**H**	**M**	**L**	**H**	**M**
CO2	**H**	**M**	**H**	**M**	**H**	**M**	**L**	**M**	**L**	**M**	**M**	**L**
CO3	**H**	**H**	**H**	**H**	**L**	**M**	**H**	**H**	**M**	**M**	**H**	**M**
CO4	**H**	**H**	**M**	**M**	**L**	**M**	**M**	**M**	**L**	**H**	**M**	**L**
CO5	**H**	**M**	**M**	**L**	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**L**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**L**	**H**	**L**	**L**		
CO2	**H**	**L**	**H**	**L**	**M**		
CO3	**H**	**L**	**M**	**L**	**M**		
CO4	**H**	**H**	**H**	**H**	**M**		
CO5	**H**	**H**	**H**	**M**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E14	**WIDE AREA MONITORING PROTECTION AND CONTROL**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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 9

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

Total No of Hours: 45

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E15	**Subject Name: ROBOTICS AND AUTOMATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To introduce the basic concepts and parts of robots.
- To understand the working of robots and various types of robots.
- To make the students familiar with the various drive systems of robots, sensors and their applications in robots and programming of robots.
- To discuss the various application of robots, justification and implementation of robots.
- To study about the manipulators, activators and grippers and their design considerations

COURSE OUTCOMES (Cos): (3-5)

CO1	Knowledge on Robots
CO2	Ability to understand the working of robots and various types of robots.
CO3	Knowledge on various drive systems of robots, sensors and their applications in robots and programming of robots.
CO4	Knowledge on various application of robots, justification and implementation of robots.
CO5	Attained knowledge on manipulators, activators and grippers and their design considerations

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**L**	**M**	**H**	**L**	**L**	**M**	**M**	**L**	**M**	**H**	**L**
CO2	**H**	**M**	**H**	**M**	**M**	**L**	**M**	**L**	**M**	**M**	**M**	**M**
CO3	**H**	**M**	**M**	**H**	**M**	**L**	**H**	**M**	**H**	**H**	**M**	**M**
CO4	**M**	**H**	**L**	**M**	**L**	**M**	**M**	**L**	**M**	**M**	**L**	**L**
CO5	**L**	**M**	**M**	**M**	**M**	**M**	**L**	**M**	**M**	**M**	**M**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**L**	**M**	**M**		
CO2	**M**	**M**	**M**	**H**	**H**		
CO3	**M**	**H**	**M**	**M**	**M**		
CO4	**M**	**M**	**H**	**L**	**L**		
CO5	**H**	**M**	**M**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E15 ROBOTICS AND AUTOMATION 3 0/0 0/0 3

UNIT I INTRODUCTION 9

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

UNIT II SENSORS IN ROBOTICS 9

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

UNIT III MANIPULATORS, ACTUATORS AND GRIPPERS 9

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 9

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 9

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 integratedapproach, 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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E16	**Subject Name: IMAGE PROCESSING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To apply transformation techniques in Digital Image Processing
- To apply techniques in image enhancement, restoration, compression, segmentation etc
- To learn image restoration and image compression

COURSE OUTCOMES (Cos): (3-5)

CO1	Capability to transform techniques in Digital image processing
CO2	Capable to apply techniques in image enhancement
CO3	Ability to process and restore images
CO4	Ability to segment the images
CO5	Attain knowledge on implementing various algorithm in image processing

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**H**	**M**	**M**	**L**	**M**	**H**	**M**	**M**	**M**	**M**	**M**
CO2	**L**	**M**	**L**	**H**	**M**	**L**	**M**	**L**	**L**	**M**	**L**	**M**
CO3	**H**	**H**	**H**	**M**	**L**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**M**	**M**	**M**	**H**	**H**	**M**	**M**	**M**	**M**	**M**	**M**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**H**	**M**	**H**	**H**		
CO2	**M**	**M**	**M**	**M**	**M**		
CO3	**L**	**M**	**L**	**M**	**L**		
CO4	**M**	**H**	**M**	**H**	**L**		
CO5	**H**	**L**	**H**	**L**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

BEE18E16	**IMAGE PROCESSING**	**3**	**0/0**	**0/0**	**3**

UNIT I DIGITAL IMAGE FUNDAMENTALS AND TRANSFORMS 9

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 9

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 9

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 9

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 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E17	**Subject Name: SUBSTATION DESIGNING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	T	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To study about the importance of Substation and its types
- To impart knowledge on Gas Insulated Substation and its working Principle
- To know the working principle and characteristics of Air-Insulated Substations
- To have a wide spread knowledge about High voltage Power Electronics Substation such as HVDC station
- To understand the Integration and Automation of Substations

COURSE OUTCOMES (Cos): (3-5)

CO1	Attained the knowledge about the importance of Substation and its types
CO2	Attained familiarity about the Gas insulated substations and its principles
CO3	Familiarity in the working of Air-insulated Substations
CO4	Knowledge on High voltage Power Electronics Substation
CO5	Knowledge on the integration of Substation

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**H**	**L**	**M**	**M**	**M**	**H**	**M**	**L**	**M**	**M**	**H**	**L**
CO2	**M**	**M**	**M**	**L**	**M**	**H**	**M**	**H**	**M**	**M**	**H**	**M**
CO3	**H**	**L**	**L**	**L**	**L**	**H**	**M**	**L**	**M**	**M**	**M**	**M**
CO4	**H**	**M**	**M**	**H**	**M**	**H**	**H**	**M**	**M**	**M**	**M**	**L**
CO5	**M**	**M**	**L**	**H**	**L**	**H**	**H**	**M**	**H**	**M**	**H**	**M**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**H**	**M**	**H**	**M**	**L**		
CO2	**M**	**M**	**H**	**M**	**L**		
CO3	**M**	**H**	**H**	**M**	**M**		
CO4	**M**	**M**	**H**	**M**	**L**		
CO5	**L**	**M**	**H**	**M**	**M**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E17	**SUBSTATION DESIGNING**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION TO SUBSTATION AND ITS TYPES 9

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 9

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 9

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

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UNIT IV HIGH VOLTAGE POWER ELECTRONIC SUBSTATION 9

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 9

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E18	**Subject Name: INDUSTRIAL CONTROL AND INSTRUMENTATION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To know about force, torque, velocity
- To learn the measurement of acceleration, vibration, density and viscosity
- To understand the Pressure and Temperature measurement

COURSE OUTCOMES (Cos): (3-5)

CO1	Attain knowledge on Power Regulatory systems
CO2	Knowledge on Controllers and converters
CO3	Capable to use the techniques for temperature and pressure measurement
CO4	Attain knowledge on Thermocouple and pyrometers
CO5	Ability to work in an Instrumentation Industry

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**L**	**H**	**M**	**M**	**M**	**L**	**H**	**M**	**M**	**H**	**M**
CO2	**M**	**L**	**H**	**H**	**L**	**M**	**L**	**H**	**H**	**L**	**H**	**H**
CO3	**H**	**M**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**H**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**L**	**H**	**M**	**M**		
CO2	**M**	**L**	**H**	**H**	**L**		
CO3	**H**	**M**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		
CO5	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E18 INDUSTRIAL CONTROL AND INSTRUMENTATION 3 0/0 0/0 3

UNIT I REGULATORY POWER SUPPLY 9

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

UNIT II CONTROLLERS AND CONVERTERS 9

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 9

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 9

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 9

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E19	**Subject Name: ELECTRIC TRACTION**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To know about traction drive
- To estimate motor rating with Reference Books to Indian Standards
- To apply concepts in electrical Machines

COURSE OUTCOMES (Cos): (3-5)

CO1	Familiarity in Traction drive and its services
CO2	Capable to estimate motor rating with Reference Books to Indian Standards
CO3	Capable to apply concepts in Electrical machines
CO4	Attain knowledge on special electric drive
CO5	Capable to model equivalent system of motor load.

Mapping of Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**L**	**H**	**M**	**M**	**M**	**L**	**H**	**M**	**M**
CO2	**M**	**H**	**M**	**L**	**H**	**H**	**L**	**M**	**L**	**H**	**H**	**L**
CO3	**L**	**H**	**H**	**M**	**H**	**H**	**H**	**H**	**M**	**H**	**H**	**H**
CO4	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**
CO5	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**M**	**L**	**H**	**M**	**M**		
CO2	**M**	**L**	**H**	**H**	**L**		
CO3	**H**	**M**	**H**	**H**	**H**		
CO4	**H**	**H**	**H**	**H**	**H**		
CO5	**H**	**H**	**H**	**H**	**H**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

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

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E19	**ELECTRIC TRACTION**	**3**	**0/0**	**0/0**	**3**

UNIT I INTRODUCTION 9

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 9

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 9

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 9

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 9

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

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.

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

Subject Code: BEE18E20	**Subject Name: ELECTRIC TRANSIENTS AND HIGH VOLTAGE ENGINEERING**	**TY / LB/ ETL**	**L**	**T / S.Lr**	**P / R**	**C**
	Prerequisite:	**T**	**3**	**0/0**	**0/0**	**3**

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

OBJECTIVE:

- To understand and gain knowledge on sources of Over Voltage and Transients
- To impart knowledge on Travelling waves and the switching operation in Transmission lines
- To provide strong knowledge on Generation and Measurement of High DC, AC, Impulse voltages
- To attain familiarity about the Insulators and analyze the various types of Insulators for coordination
- To acquire knowledge on testing of various Electrical Apparatus

COURSE OUTCOMES (Cos): (3-5)

CO1	Acquire knowledge on sources of Over Voltage and Transients
CO2	Familiar to Travelling waves and the switching operation in Transmission lines
CO3	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 Course Outcomes with Program Outcomes (POs)

COs/POs	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**M**	**M**	**M**	**H**	**H**	**L**	**H**	**L**	**M**	**L**	**H**	**L**
CO2	**M**	**M**	**H**	**L**	**M**	**M**	**H**	**M**	**H**	**M**	**H**	**L**
CO3	**M**	**M**	**L**	**L**	**L**	**L**	**H**	**L**	**H**	**L**	**H**	**L**
CO4	**H**	**H**	**L**	**M**	**L**	**M**	**H**	**M**	**H**	**M**	**H**	**L**
CO5	**M**	**M**	**M**	**H**	**M**	**L**	**H**	**L**	**H**	**H**	**H**	**H**

Cos / PSOs	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**		
CO1	**L**	**H**	**H**	**M**	**M**		
CO2	**M**	**M**	**M**	**H**	**L**		
CO3	**L**	**L**	**M**	**M**	**H**		
CO4	**H**	**H**	**H**	**M**	**L**		
CO5	**M**	**M**	**L**	**L**	**L**		

H/M/L indicates Strength of Correlation H- High, M- Medium, L-Low

Category	Basic Sciences	Engineering Sciences	Humanities and Social Sciences	Program Core	Program Electives	Open Electives	Practical / Project	Internships / Technical Skill	Soft Skills			
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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

BEE18E20	**ELECTRIC TRANSIENTS AND HIGH VOLTAGE ENGINEERING**	**3**	**0/0**	**0/0**	**3**

UNIT I OVER VOLTAGE & TRANSIENTS 9

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 9

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 9

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 9

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

Total No of Hours: 45

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