SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

SCSVMV UNIVERSITY

(University Established under section 3 of UGC Act 1956)

Enathur, Kanchipuram – 631561

CURRICULUM AND SYLLABUS

B.E (Electrical and Electronics Engineering)

FULL TIME PROGRAMME

CHOICE BASED CREDIT SYSTEM

(For Candidates admitted from the year 2023 onwards)

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

Department of Electrical and Electronics Engineering

CURRICULUM

Vision:

To be an eminent and ambient venue for the people community to get excelled in the field of Electrical and Electronics Engineering along with the traditional and cultural ethics of Indian society and to provide quality education at Under Graduate, Post Graduate and Research levels.

Mission:

To constantly put us to improve the infrastructure of our department, which will help the student community to equip themselves with the latest trends. To enhance industry institute teamwork through activities such as in-plant training, industrial visits and sponsored research. To provide continuous help to students to develop and enhance their overall personality skills, to stand with better chances in the core sector jobs including IT industries.

Programme Educational Objectives:

- To work in research and development organizations
- For employment in electrical power industries
- To acquire job in electronic circuit design and fabrication industries
- To work in IT and ITES industries

Programme Outcomes:

PO1: Engineering Knowledge:

Apply the Knowledge of mathematics, science, Engineering fundamentals and an Engineering Specialization to the solution of complex engineering problems.

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PO2: Problem Analysis:

Identify formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural science and engineering sciences.

PO3: Design/ Development of Solutions:

Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety and the cultural, societal and environmental considerations.

PO4: Conduct Investigations of Complex Problems:

Use research based knowledge and research methods including design of experiments analysis and interpretation of data and synthesis of the information to provide valid conclusions.

PO5: Modern Tool usage:

Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: The Engineer and Society:

Apply reasoning informed by the contextual knowledge to assess societal health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

PO7: Environment and Sustainability:

Understand the impact of the professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

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PO8: Ethics:

Apply ethical principle and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: Individual and Team Work:

Function effectively as an individual and as a member or leader in diverse teams and in multidisciplinary settings.

PO10: Communication:

Communicate effectively on complex engineering activities with the engineering community and with society at large such as being able to comprehend and write effective reports and design documentation make effective presentations and give and receive clear instructions.

PO11: Project Management and Finance:

Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work and member and leader in a team to manage projects and in multidisciplinary environments.

PO12: Life – long Learning:

Recognize the need for and have the preparation and ability to engage in independent and lifelong learning in the broadest context of techno logical change.

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Credit Structure:

Semester: I **Year: I**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	HSMC	CHSEN18T10	English	2	1	0	3	40	60	100
2.	BSC	CBSMA18T20	Mathematics – I (Calculus and Differential equations)	3	1	0	4	40	60	100
3.	BSC	CBSPH18T30	Engineering Physics	3	1	0	3	40	60	100
4.	ESC	CESCS18T40	Programming for Problem solving	2	1	0	3	40	60	100
Laboratory										
5.	BSC	CBSPH18P50	Physics Lab	0	0	3	2	40	60	100
6.	ESC	CESCS18P60	Problem Solving Programming Lab	0	0	3	2	40	60	100
7.	ESC	CESME18P70	Workshop/ Manufacturing Practices	0	0	3	2	40	60	100
						Total Credit:	**19**			

Semester: II **Year: I**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	BSC	CBSMA68T10	Mathematics – II (Linear Algebra, Transform calculus and Numerical Methods)	3	1	0	4	40	60	100
2.	BSC	CBSCH18T20	Engineering Chemistry	3	0	0	3	40	60	100
3.	BSC	CESME18P50	Engineering Graphics and design	1	0	2	3	40	60	100
4.	ESC	CESEE18T30	Basic Electrical Engineering	3	0	0	3	40	60	100
5.	MC*	CMCCH28T50	Environmental Science and Engineering	2	0	0	2*	40	60	100
Laboratory										
6.	BSC	CBSCH18P60	Chemistry Lab	0	0	3	2	40	60	100
7.	ESC	CESEE18P70	Basic Electrical Engineering Lab	0	0	3	2	40	60	100
						Total Credit:	**17**			

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Semester: III **Year: II**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	BSC	BEEF183T10	Mathematics–III (Probability and Statistics)	3	1	0	4	40	60	100
2.	PCC	BEEF183T20	Programming In C++ With OOPS	2	0	1	3	40	60	100
3.	ESC	BEEF183T30	Electromagnetic Theory (T&P)	3	0	0	3	40	60	100
4.	PCC	BEEF183T40	Analog Electronics	3	0	0	3	40	60	100
5.	PCC	BEEF183T50	Electric Circuit Theory	2	1	0	3	40	60	100
6.	MC*	BETF183MC2	Sanskrit and Indian Culture	2	0	0	2*	40	60	100
7.	MC*	BETF183MC3	Soft Skills- I	-	0	0	1*	-	-	-
Laboratory										
8.	ESC	BEEF183P60	Object Oriented Programming Systems Lab	0	0	3	2	40	60	100
9.	PCC	BEEF183P70	Analog Electronics Lab	0	0	3	2	40	60	100
10.	PCC	BEEF183P80	Electric Circuits Lab	0	0	3	2	40	60	100
						Total Credit:	**22**			

Semester: IV **Year: II**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	PCC	BEEF184T10	D.C Machines and Transformers	2	1	0	3	40	60	100
2.	PCC	BEEF184T20	Measurement and Instrumentation	3	0	0	3	40	60	100
3.	PCC	BEEF184T30	Data base Management (T&P)	3	0	0	3	40	60	100
4.	PCC	BEEF184T40	Digital Electronics	3	0	0	3	40	60	100
5.	PCC	BEEF184T50	Generation, Transmission and Distribution	3	0	0	3	40	60	100
6.	PCC	BEEF184T60	Data structures (T&P)	3	0	0	3	40	60	100
7.	MC*	BETF184MC4	Soft Skills–II	0	0	0	1*	40	60	100

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Laboratory										
8.	PCC	BEEF184P70	Measurements and Instrumentation Lab	0	0	3	2	40	60	100
9.	PCC	BEEF184P80	DC Machines and Transformers Lab	0	0	3	2	40	60	100
10.	PCC	BEEF184P90	Digital Electronics Lab	0	0	3	2	40	60	100
						Total Credit:	**24**			

Semester: V **Year: III**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	PCC	BEEF185T10	Digital Signal Processing and its Applications	3	0	0	3	40	60	100
2.	PCC	BEEF185T20	Microprocessors and Microcontrollers	3	0	0	3	40	60	100
3.	PCC	BEEF185T30	Control Systems	3	0	0	3	40	60	100
4.	PCC	BEEF185T40	Induction and Synchronous Machines	2	1	0	3	40	60	100
5.	PCC	BEEF185T50	Power Systems- I (Modeling and Components)	3	0	0	3	40	60	100
6.	OEC	BEEF185OE	Open Elective - I	3	0	0	3	40	60	100
7.	MC*	BETF185MC5	Soft Skills - III	-	0	-	1*	-	-	-
Laboratory										
8.	PCC	BEEF185P70	Induction and Synchronous Machines Lab	0	0	3	2	40	60	100
9.	PCC	BEEF185P80	Control Systems Lab	0	0	3	2	40	60	100
10.	PCC	BEEF185P90	DSP and Microcontrollers Lab	0	0	3	2	40	60	100
						Total Credit:	**24**			

Semester: VI **Year: III**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	PCC	BEEF186T10	Power Electronics	3	0	0	3	40	60	100
2.	PCC	BEEF186T20	Embedded Systems	3	0	0	3	40	60	100
3.	PEC	BEEF186E	Professional Elective Course - I	3	0	0	3	40	60	100

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4.	PEC	BEEF186TE	Professional Elective Course - II	3	0	0	3	40	60	100
5.	OEC	BEEF186TOE	Open Elective Course - II	3	0	0	3	40	60	100
6.	OEC	BEEF186TOE	Open Elective Course - III	3	0	0	3	40	60	100
7.	MC*		Soft Skills - IV	0	0	-	1*	-	-	-
Laboratory										
8.	PCC	BEEF186P70	Power System Protection Lab	0	0	3	2	40	60	100
9.	PCC	BEEF186P80	Power Systems Lab - I (Testing)	0	0	3	2	40	60	100
10.	PCC	BEEF186P90	Embedded System Design Lab	0	0	3	2	40	60	100
						Total Credit:	**24**			

Semester: VII **Year: IV**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	PCC	BEEF187T10	Power systems – II (Analysis & control)	2	1	0	3	40	60	100
2.	PCC	BEEF187T20	PLC and SCADA (T&P)	3	0	0	3	40	60	100
3.	PCC	BEEF187T30	Electric Drives	3	0	0	3	40	60	100
4.	PEC	BEEF187TE	Professional Elective Course - III	3	0	0	3	40	60	100
5.	OEC	BEEF187TOE	Open Elective Course - IV	3	0	0	3	40	60	100
Laboratory										
6.	PCC	BEEF187P60	Power System Lab – II (Simulation])	0	0	3	2	40	60	100
7.	PCC	BEEF187P70	Power Electronics & Drives Lab	0	0	3	2	40	60	100
8.	P II	BEEF187P80	Project Work (Phase -1)	0	0	0	2	40	60	100
9.	P II	BEEF187P90	Internship/ Industrial Training	-	-	-	3	40	60	100
						Total Credit:	**24**			

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Semester: VIII **Year: IV**

S. No	Category	Code	Course Title	L	T	P	C	IA	EA	TA
1.	PEC	BEEF188TE	Professional Elective Course - IV	3	0	0	3	40	60	100
2.	PEC	BEEF188TE	Professional Elective Course - V	3	0	0	3	40	60	100
3.	PEC	BEEF188TE	Professional Elective Course - VI	3	0	0	3	40	60	100
Laboratory										
4.	P II	BEEF188Z40	Project Work (Phase -2)	0	0	0	10	40	60	100
						Total Credit:	**19**			

Total Credits: 173

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CURRICULUM

LIST OF PROFESSIONAL ELECTIVE COURSES (PEC)

Professional Elective Course – I (Information Technology)

1. Computer Architecture
2. Java Programming and Applications (T&P)
3. Cloud Computing Fundamentals
4. Fundamentals of Big Data Analysis

Professional Elective Course–II (Machines & Drives)

1. Electrical Machine Design (T &P)
2. Special Electrical Machines
3. Control and Maintenance of Electrical Equipments
4. Electrical Safety and Management

Professional Elective Course–III (Power Systems)

1. Smart grid
2. Design and layout of power apparatus
3. High voltage DC Transmission
4. Power Plant Engineering

Professional Elective Course–IV (Electronics)

1. Automotive Electronics
2. Digital Image Processing
3. Virtual Instrumentation Lab
4. Bio Medical Engineering
5. Principles of Communication Engineering
6. Sensors for Engineering Applications

Professional Elective Course–V (Industrial Control)

1. Process Control Lab (T& P)
2. Digital Control Systems
3. Robotics Lab (T &P)
4. Hardware Networking (NSDC)
5. Real time operating systems

Professional Elective Course–VI (Power Electronics)

1. Advanced power Electronics and Drives
2. Electric Vehicles and Hybrid Vehicle
3. Advanced Power Electronics Lab
4. Power Quality (T &P)

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LIST OF OPEN ELECTIVE COURSES (OEC)

Open Elective I - (Mechatronics)

1. Applied Machines and fluid mechanics (T &P)
2. Thermo dynamics (T&P)
3. Applied Mechanics and Fluid Machineries Lab
4. Electrical Materials

Open Elective II - (Management)

1. Total Quality Management
2. Industrial Management
3. Entrepreneurship Development
4. Human Resource and Management.
5. Finance for Non Finance Managers
6. Business Administration
7. Nuclear and Particle Physics

Open Elective III - (CSE & IT)

1. Internet of Things (IOT) - (T&P)
2. Bio Information
3. Web development using Python (T& P)

Open Elective IV - (Employment Enhancement Course)

1. Solar PV Systems, Design, Simulation and monitoring Control and Maintenance (NSDC)
2. Maintenance of Power Transformer, DG Sets, Industrial Power Distribution
3. Wind Energy, System Design, Control and Maintenance.(NSDC)
4. VLSI Design Lab
5. Artificial Intelligence and machine learning (NSDC)

Open Elective - (Fine Arts)

1. Violin
2. Vocal Music
3. Keyboard
4. Fuel Cell–Batteries
5. Modern Manufacturing Process

Open Elective - (Language)

1. French Primer
2. German Primer
3. Hindi Literature
4. Japanese
5. Panini Grammar
6. Communication Skills
7. Psychology

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Department of EEE

SYLLABUS

FIRST SEMESTER

Course Code	Course Name	Semester	Credit	Hours
CHSEN18T10	English	1	3	45

Course Objective

- To enhance student proficiency in English language skills.
- To develop students ability to think analytically, speculatively, and imaginatively.
- To help students see themselves as professionals, as part of a discipline with skills and abilities valuable in business, teaching, publishing, etc.

Unit 1:
VOCABULARY BUILDING

The concept to Word Formation-Root words from foreign languages and their use in English-acquaintance with prefixes and suffixes from foreign languages in English to form Derivatives-Synonyms, antonyms, and standard abbreviations.

Unit 2:
BASIC WRITING SKILLS

Sentence Structures - Use of phrases and clauses in sentences - Importance of proper punctuation – Creating coherence - Organizing principles of paragraphs in documents -Techniques for writing precisely.

Unit 3:
IDENTIFYING COMMON ERRORS IN WRITING

Subject- verb agreement - Noun pronoun agreement - Misplaced modifiers - Articles - Prepositions - Redundancies- Cliches.

Unit 4:
NATURE AND STYLE OF SENSIBLE WRITING

Describing – Defining – Classifying – Providing examples or evidence-Writing introduction and conclusion.

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SYLLABUS

Unit 5:
WRITING PRACTICES & ORAL COMMUNICATION

Comprehension – Précis Writing – Essay Writing. Listening Comprehension - Pronunciation, Intonation, Stress and Rhythm - Common Everyday Situations: Conversations and Dialogues- Communication at Workplace – Interviews - Formal Presentations.

Course Outcome:

CO:1. Understand the nuances of grammar and vocabulary in speaking and writing.

CO:2. Listen and comprehend different spoken excerpts critically, infer and implied meanings.

CO:3. Speak convincingly, express their opinions clearly, initiate a discussion, negotiate, and argue using appropriate communicative strategies.

CO:4. Read different genres of texts, infer implied meanings and critically analyze and evaluate them for ideas as well as for Method of presentation.

CO:5. Write effectively and persuasively and by using different techniques of writing such as narration, description, exposition and argument as well as creative, critical, analytical and Evaluative writing.

References:

[1]. Liz Hamp – Lyons and Ben Heasly, "Study Writing", Cambridge University Press, 2nd edition, 31st Jan 2007.

[2]. Sanjay Kumar and PushpaLata, "Communication Skills", Oxford University Press, 2nd Edition, 2015.

Text Books:

[1]. MichaelSwan, "Practical English Usage", OUP. 4th edition.

[2]. F.T.Wood, "Remedial English Grammar", Trinity Publication 2019.

[3]. William Zinsser, Harper, "On Writing Well", Resource e Book. 2012.

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SYLLABUS

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	M	L	L	L	M	M	L	M
CO2	-	-	-	-	M	L	L	L	L	L	L	M
CO3	-	-	-	-	L	L	L	L	L	L	L	L
CO4	-	-	-	-	L	L	L	L	L	L	L	L
CO5	-	-	-	-	M	L	L	L	L	L	L	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CBSMA18T20	MATHEMATICS –I (Calculus and Differential Equations)	1	4	45

Course Objective

- The objective of this course is to familiarize the prospective engineers with techniques in calculus, differential equations and sequence and series.
- It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling more advanced level of mathematics

Unit 1:
SEQUENCES AND SERIES

Convergence of sequence and series -Tests for convergence -Comparison,-Ratio- Cauchy's Root-Raabe's test-logarithmic test-Fourier series: Half range sine and cosine series-Parseval's theorem

Unit 2:
DIFFERENTIALE QUATIONS

Second order linear differential equations with constant coefficients – Cauchy- Euler equation, Legendre equation-Method of variation of parameters- First order partial differential equations: Formation of PDE-solutions of first order linear PDEs.

Unit 3:
CALCULUS

Evaluation of definite integral-Applications of definite integrals - To evaluate surface areas and volumes of revolutions; Beta and Gamma functions and their properties.

Unit 4:
MULTI VARIABLE CALCULUS

Multiple Integration- double and triple integrals (Cartesian and polar)-change of order of integration in double integrals-Change of variables (Cartesian to polar), Applications-areas and volumes by double integration- Center of mass and Gravity (constant and variable densities).

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Unit 5:
NUMERICALMETHODS

Solution of polynomial and transcendental equations - Bisection method - Newton- Raphson method- Regular - Falsi method- Finite differences-Interpolation using Newton's forward and backward difference formulae- Central difference interpolation- Gauss's forward and backward formulae.

Course Outcome:

CO:1. The concept of convergence and divergence and their testing that is fundamental to application of analysis to Engineering probes.

CO:2. The effective mathematical tools for the solutions of differential equations that model physical processes.

CO:3. To apply differential and integral calculus to notions of curvature and to improper integrals. Apart from some other applications they will have a basic understanding of Beta and Gamma functions.

CO:4. The mathematical tools needed in evaluating multiple integrals and their usage. To deal with functions of several variables those are essential in most branches of engineering.

CO:5. To improve the ability of numerical computations to find the solutions of a given polynomial and transcendental equations along knowing the process of inter and extrapolations that improves the ability of solving helps to perform computational engineering problems.

References:

[1]. T.Veerarajan, "Engineering Mathematics", Mc Graw-Hill, New Delhi, 3rd Edition 2011.
[2]. V.Ramana, "Higher Engineering Mathematics", Mc Graw Hill, New Delhi, 2010.
[3]. N.P.Baliand M.Goyal, "A text book of Engineering Mathematics", Laxmi Publications, 9th Edition 2016.
[4]. G.B.Thomas and R.L.Finney, "Calculus and Analytic geometry", Pearson, 9th Edition Jan2010.

Text Books:

[1]. B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition Jan2015.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	-	M	-	-	M	M	M
CO2	S	S	S	S	S	-	-	-	M	M	L	M
CO3	S	S	S	S	S	-	M	-	L	M	L	M
CO4	S	S	S	S	S	-	M	L	M	M	M	M
CO5	S	S	S	S	S	-	L	-	L	M	L	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CBSPH18T30	Engineering Physics	1	**3**	45

Course Objective

- Theory of Interference-Newton srings, Michelson Interfero meter and Fresnel and Fraunh offer diffraction, Diffraction due to "n"slits - Plane Transmission grating.
- Energy distribution in black body - Planck"s law, De Broglie matter waves – dual nature and expression, Schrodinger Time Independent and Dependent, wave equation, Expression for particle in1-D box and applications.
- Laser - Principles and Properties, Einstein"s theory, Types of lasers – Nd: YAG and CO2 laser Applications of lasers – IR Thermograph, Optical fibers-Types of optical fibers, Acceptance angle and numerical aperture, Fiber losses, Applications in engineering and medicine.
- PN Junction diode and Zener diode - V-I characteristics, BJT, SCR, FET, D-MOSFET, E-MOSFET Characteristics, Characteristics of CMOS, Logic Gates and Universal Building Blocks.
- Fundamentals of dielectric materials, Internal field and Clausius - Mossotti relation, Super conductors –properties and types - BCS theory, Nano materials – Synthesis, Ball milling and PVD method. Principle and properties of SMA and Biomaterials.

Unit 1:
WAVE OPTICS

Huygens' principle, super position of waves–Theory of interference of light-Young's doubleslit experiment. Thin films- Newton's rings, Michelson interferometer - Anti reflection coating. Fresnel and Fraunhofer diffraction – diffraction due to 'n' slits- plane transmission grating. Rayleigh criterion for limit of resolution - resolving power of grating

Unit 2:
QUANTUM PHYSICS

Black body radiation- Planck's law – Energy distribution function, Wave – particle duality- de Broglie matter waves – Concept of wave function and its physical significance – Heisenberg's Uncertainty Principle–Schrodinger's wave equation–Time independent and Time dependent equations – Particle in a one dimensional rigid box –tunneling (Qualitative)–Scanning tunneling microscope

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Unit 3:
PHOTONICS

Einstein's theory of matter radiation interaction and A and B co - efficients; Properties of laser-spontaneous and stimulated emission, amplification of light by population inversion, different types of lasers: solid-state laser (Neodymium), gas lasers (CO2), applications – IR Thermography. Optical fibre - principle [TIR] – types - material, mode, refractive index - Fibre loss - Expression for acceptance angle and numerical aperture. Application - Communication.

Unit 4:
SEMICONDUCTOR DEVICES AND APPLICATIONS

Introduction to P-N junction Diode and V-I characteristics, Zener diode and its characteristics, Introduction to BJT, its input-output and transfer characteristics, SCR characteristics, FET, MOSFET and CMOS characteristics. Basic logic gates - NAND, NOR as Universal building block.

Unit 5:
NEW ENGINEERING MATERIALS

Dielectric materials: Definition – Dielectric Breakdown – Dielectric loss – Internal field – Claussius Mossotti relation. Superconducting materials: Introduction – Properties- Meissner effect – Type I &Type II super conductors – BCS theory - Applications. Nanomaterials: Introduction – Synthesis of nano materials – Top down and Bottom up approach- Ball milling- PVD method- Applications. Smart materials: Shape memory alloys - Biomaterials (properties and applications)

Course Outcomes:

CO:1. To develop an understanding of the principles of optics.

CO:2. Experience the diverse applications of the wave equation. Learn the mathematical tools needed to solve quantum Mechanics problems.

CO:3. To provide adequate knowledge on laser fundamentals types and applications and to expose the basics of signal propagation through fiber optics

CO:4. Understand the principles and concepts of semiconductor Physics. Understand and utilize the mathematical models of Semi conductor junctions and MOS transistors for circuits and systems

CO:5. Acquire basic knowledge on various newly developed smart materials

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SYLLABUS

References:

[1] Elements of Properties of Matter -D.S.Mathur, S.Chand (2010) (Unit I)
[2] Sound - Brijilal &Subramanian ,S.Chand (2018) (Unit II)
[3] A Textbook of Engineering Physics -M N Avadhanulu& P G Kshirsagar, S Chand (2018)- III
[4] Fiber-Optic Communication Systems- GP Agrawal -Wiley (2015) (Unit III)
[5] Introduction to Solid state Physics – C.Kittal, Wiley (2012) (Unit IV)
[6] Modern Physics - R.Murugesan, S.Chand (2016) (Unit IV, V)
[7] Fundamentals of Physics, 6th Edition, D. Halliday, R. Resnick and J. Walker, John Wiley and Sons, New York (2018)
[8] Fundamentals of Optics -Jenkins A Francis and White E Harvey, McGRaw Hill (2017)

Text Books:

[1] Applied Physics for Engineers – K.Venkatramanan, M.Sundarrajan, R.Raja, Scitech publications (2014)
[2] 2. Engineering Physics – V. Rajendran-McGraw Hill Education (2017)
[3] Modern Engineering Physics – R.K.Gaur&S.L.Gupta, DhanpatRai (2012)
[4] Modern Engineering Physics – A.S.Vasudeva – S Chand Publishing; Ninth edition(2013)
[5] 5.Engineering Physics – Bhattacharya, Bhaskaran – Oxford Publications (2010)
[6] Engineering Physics I & II – G.Senthilkumar, VRB publications (2018)
[7] Optics by Subramaniam N &BrijLal, S Chand & Co. Pvt. Ltd., New Delhi, (2012)
[8] 8.Quantum Mechanics by V. Devanathan, Narosa, Chennai, 2019
[9] Modern physics by R Murugeshan, Kiruthiga, Sivaprasath S Chand & Co.(2017)
[10] Quantum Mechanics by V K Thangappan, New Age International Publishers (2014)

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	L	M	L	M	M	L	L
CO2	S	S	S	S	S	M	M	L	M	M	L	L
CO3	S	S	S	S	S	M	M	M	M	S	S	S
CO4	S	S	S	S	S	L	L	L	M	M	M	M
CO5	M	M	M	M	M	S	S	M	M	M	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESCS18T40	Programming For Problem Solving	1	3	45

Course Objective

- Be exposed to the syntax of C.
- Learn to use arrays, strings, functions, pointers, structures and unions in C.
- Be familiar with programming in C

Unit 1:

Introduction to components of computer system – Generation of programming languages-Types of Computers - Organization of Computers -Types of memory, Number systems - Idea of Algorithm –Pseudo code – Flow Chart with examples.

Unit 2:

Introduction to C - Character set, Constants, Variables, Data Types-Operators – Arithmetic expressions and precedence – Decision Making statement – Looping statements.

Unit 3:

Arrays and its types-Functions –Parameter passing in functions-call by value- call by reference – Passing array to functions-Recursive function.

Unit 4:

Structures and array of structures – Union, Basic searching – Linear and Binary, Basic sorting, String operations.

Unit 5:

Introduction to Pointer, Pointer arithmetic – notion of linked list (no implementation) - File handling.

Course Outcomes:

CO:1. Develop algorithms for solving simple mathematical and engineering problems and examine the suitability of appropriate repetition and or selection structures for given problems

CO:2. Solve matrix problems, merging, searching, sorting and string Manipulation problems using iteration, modularization or recursion as applicable.

CO:3. Organize files to perform text operations like editing, pattern Searching using structures

CO:4. Implement the algorithms for matrix problems, merging, searching, sorting, and string manipulation and file problems

CO:5. Debug and test using any procedural programming language

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SYLLABUS

References:

[1]. Yashawant Kanetkar , "Let Us C"-, (Unit2to 5),BPB publications, 18th Edition,2021.
[2]. Ashok N Kamthane,"Computer Programming",Pearson education,3rd Edition,2016.
[3]. Venugopal. K and Kavichithra.C, "Computer Programming", New Age International Publishers, 2nd Edition, 2011.
[4]. Kernighan B.W and Ritchie,D.M , "The C programming language", second edition, Pearson education,2015.

Text Books:

[1]. Byron Gottfried, Schaum's , "Outline of Programming with C", McGraw-Hill. 4th Edition july 2018.
[2]. Balagurusamy.E, "Programming in ANSIC", Tata Mc Graw Hill, 8th edition, 2019.
[3]. V.Ramesh Babu, R.Samyuktha, M.Muniratham , "Fundamentals of Computing and Programming" VRB Publishers Sep-2018 edition.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	L	L	M	M	-	M
CO2	S	S	S	S	S	M	L	L	M	M	-	M
CO3	S	S	M	M	S	M	L	L	M	M	-	M
CO4	S	S	S	S	S	M	L	L	S	S	-	S
CO5	S	S	M	M	S	M	L	L	M	M	-	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CBSPH18P50	Physics Lab	1	2	

List of Experiments

1. Determination of radius of curvature of convex lens by Newton's rings experiment.
2. Determination of the wavelength of spectral lines using plane diffraction grating by minimum deviation method.
3. Determination of numerical aperture and acceptance angle of an optical fiber.
4. Determination of the number of line sings rating.
5. Verification of truth tables of Basic Logic Gates.
6. Verify NAND as Universal Building Block.
7. Verify NOR as Universal Building Block.
8. To study the V-I characteristics of Zener diode.

Course Outcomes:

CO:1. Demonstrate the procedural preparation skill to conduct the experiment
CO:2. Ability to perform the experiment and tabulate the observations made.
CO:3. Skill to obtain an expected experimental out-comes by different techniques and impart practical knowledge in real Time solution.
CO:4. Interpretation of experimental results and conclusions.
CO:5. Understand principle, concept, working and applications of new theory and articulation of the relevant theory.

References:

[1]. Practical Physics - Ouseph and Rangarajan.
[2]. Engineering Practical Physics - K.Srinivasan.2013.
[3]. EngineeringPracticalPhysics-M.N.Avadhanulu.1st Edition April 2015.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESCS18P60	Problem Solving Programming Laboratory	1	2	

List of Experiments

1. Basic programs in data types.
2. Evaluate Expressions using library Function.(i).πr^2
   (i). (A+B+(2C/3A)+2A+2B) (ii). $\sqrt{S(S-A)(S-B)(S-C)}$ (iii).LOG($x^3+y^3+z^3$)
3. Problems in Decision making statements.
4. (i). Find the Biggest among 3 numbers. (ii).Find Even or odd (iii). Arithmetic operations using Switch - Case Statements.
5. Problems in looping statements.
   (i). Find the Sum of digits using (a) For loop (b) While loop.
   (ii).Generate the Fibonacci series (iii).Check whether the number is prime or not.
6. Find the Linear Search.
7. General sorting.
8. Matrix Manipulation - Addition, Subtraction and Multiplication.
9. String operations – string copy, string reverse and string concatenate.
10. Swapping of numbers using call by value, call by reference.
11. Find factorial using recursive functions.
12. Numerical methods – Quadratic Equation.
13. Display the student information & marks using Structure &Unions.
14. Demonstrate array of structures.
15. Pointer Arithmetic and Array access using Pointers.
16. Basic File Operations.

Course Outcomes:

CO:1. Develop algorithms for solving simple mathematical and engineering problems and examine the suitability of appropriate repetition and/or selection structures forgiven problems

CO:2. Solve matrix problems, merging, searching, sorting and string Manipulation problems using iteration, modularization or recursion as applicable.

CO:3. Organize files to perform text operations like editing, pattern searching using structures

CO:4. Implement the algorithms for matrix problems, merging, searching, sorting, and string manipulation and file problems And debug and test using any procedural programming language

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESME18P70	Workshop /Manufacturing Practices	1	2	

List of Experiments

SL.NO	Manufacturing / Fabrication lab	Experiment name
1.	Machine shop	Turning (plain & step) and facing practice
2.		Drilling practice
3.	Fitting shop	V - fitting
4.		Square fitting
5.	Carpentry shop	Half lap t - joint
6.		Half lap cross joint
7.	Welding shop	Lap joint – arc welding process
8.		Butt joint – gas welding process
9.	Smithy shop	Fabrication of round rod
10.	Casting	Preparation of greens and mold using AGL and piece pattern
11.	Electrical and Electronics lab	Two lamps in series controlled by one way switch
12.		Two lamps in parallel controlled by one way switch

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Course Outcomes:

CO:1. Fabricate carpentry components and pipe connections including plumbing works.

CO:2. Study and practice on welding equipments to join the structures.

CO:3. Carry out the basic machining operations including turning, facing, turning, step turning and drilling operations.

CO:4. Illustrate the operations of smithy, foundry and fittings

CO:5. Applied basic engineering knowledge for house wiring practice.

References:

[1]. Roy A.Lindberg, "Processes and Materials of Manufacture", 4thedition, Prentice Hall India, 1998.

[2]. RaoP.N., "Manufacturing Technology", Vol. I and Vol. II,Tata Mc Graw Hill, 2017.

Text Books:

[1]. Hajra Choudhry.S.K., Hajra Choudhury.A.K. and Nirjhar Roy.S.K., "Elements of Workshop Technology", Vol. I 2008 and Vol. II2010, Media promoters and publishers private limited, Mumbai. 14th Edition 2010.

[2]. Kalpakjian S. & Steven S.Schmid, "Manufacturing Engineering and Technology", 4thedition, Pearson Education India Edition, 2018.

[3]. GowriP., Hariharan and A.SureshBabu,"ManufacturingTechnology-I"PearsonEducation,2013.

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SYLLABUS

SECOND SEMESTER

Course Code	Course Name	Semester	Credit	Hours
CBSMA68T10	Mathematics – II (Linear Algebra, Transform Calculus and Numerical Methods)	2	4	45

Course Objective

- This course aims at familiarizing the prospective engineers with techniques in Linear Algebra, Transform Calculus and Numerical Methods.
- To understand the fundamental concepts in the above said topics.
- To develop the ability to evaluate the problems in transform calculus and its application in varies areas.

Unit 1:
MATRICES

Rank of a matrix, System of linear equations; Symmetric, skew-symmetric and orthogonalmatrices; Eigen values and Eigen vectors; Diagonalization of matrices; Cayley-Hamilton theorem, Orthogonal transformation and quadratic to canonical forms.

Unit 2:
NUMERICAL METHODS

Ordinary differential equations: Taylor's series, Euler and modified Eulers methods. Runge-Kutta method of fourth order for solving first order equations. Milne's predicator corrector methods. Partial differential equations: Finite difference solution two dimensional Laplace equation and Poisson equation, Implicit and explicit methods for one dimensional heat equation (Bender - Schmidt and Crank-Nichols on methods), Finite difference explicit method for wave equation.

Unit 3:
TRANSFORM CALCULUS - I

Laplace Transforms: Definition, Properties of Laplace transforms: Linearity Property, First shifting property, Change of scale property–Transforms of derivatives-Transforms of integrals Multiplication by tn-Division by t-Evaluation of integrals by Laplace transform-Inverse transforms: Method of partial fractions– Other methods of finding inverse - Convolution theorem (Without proof) Application to differential equations.

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Unit 4:
TRANSFORM CALCULUS-II

Fourier integral theorem (without proof)- Fourier Sine and Cosine integrals–Complex form of Fourier integral - Fourier transform –Fourier sine and Cosine transforms –Properties of Fourier Transforms: Linear property, Change of scale property, Shifting property –Parseval's identity for Fourier transforms (without proof)–Application of transforms to boundary value problems: Heat conduction, Vibrations of a string, Transmission lines.

Unit 5:
TRANSFORM CALCULUS - III

Standard z-transforms of 1, Linearity property – Damping rule – Shifting rules– Multiplication by Initial and final value theorems (without proof) – inverses–transforms – Convolution theorem (without proof)– Convergence of z-transforms–Two sided z-transform–Evaluation of inverse z-transforms: Power series method, Partial fraction method, inversion integral method.

Course Outcomes:

CO:1. Determine consistency of liner system of equations, Rank, Eigen values and Eigen vectors of the given square matrix also compute power, inverse of the matrix using clayey Hamilton theorem
CO:2. Work numerically on the ordinary differential equations and partial differential equations using different methods through the theory of finite differences
CO:3. Apply Laplace transform and its inverse to solve initial value and other related problems.
CO:4. Use Fourier transforms and its inverse in practical applications of electronics engineering.
CO:5. Solving finite difference equation in z-transforms

References:

[1]. Alan Jeffrey, Advanced Engineering Mathematics, Academic Press, Jun 2001.
[2].Erwin Kreyszig, Advanced Engineering Mathematics, John Wiley & Sons, Dec 2015.
[3].Gerald C.F and Wheatley P.O, Applied Numerical Analysis, Addison-Wesley Publishing Company, 7th Edition 2006.

Text Books:

[1]. Grewal B.S, Higher Engineering Mathematics, 44th Edition, Khanna Publishers, New Delhi, 2015.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	-	M	M	M	L
CO2	S	S	S	S	S	M	M	-	M	M	M	L
CO3	S	S	S	S	S	M	M	-	M	M	M	L
CO4	S	S	S	S	S	M	M	-	M	M	M	L
CO5	S	S	S	S	S	M	M	-	M	M	M	L

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CBSCH18T20	Engineering Chemistry	2	3	45

Course Objectives:

- Analyze microscopic chemistry in terms of atomic and molecular orbital's and intermolecular forces.
- Rationalize bulk properties and processes using thermo dynamic considerations.
- Distinguish the ranges of the electromagnetic spectrum used for exciting different.
- Molecular energy levels in various spectroscopic techniques.
- Rationalize periodic properties.

Unit 1:
ATOMIC STRUCTURE

Comparison between Ruther ford's model of atom and Bohr's model - Bohr-Somerfield model (Concepts only) - its limitations - de Broglie theory-Heisenberg's uncertainty principle – Schrodinger's wave equation (derivation not needed)-significanceof Ψ and Ψ^2 –shapes of different orbital's – Aufbau principle - Pauli Exclusion Principle – Hund's rule. Electronic configuration of atoms – Mosley's law – Modern periodic table periodic properties: atomic size – ionization energies- electron affinity- electro negativity

Unit 2:
CHEMICAL BONDING

Types of bonds — ionic - covalent — coordinate bond - Molecular Orbital Theory – types of molecular orbital's – energy level diagrams - e$^-$ns filling in MO – bond order – MO diagrams of H2, He2, N2, O2, CO and HF molecules- Metallic bond – band theory of solids (primitive treatment only) and the role of doping on band structures - Hybridization — definition - geometry of the molecules- CH4, C2H4, C2H2 –Molecular forces -Ionic, dipolar, vanderwaals interactions.

Unit 3:
THERMAL AND ELECTRO CHEMICAL EQUILIBRIA

Thermo dynamic functions: State functions, Path functions, Internal energy, enthalpy, entropy and free energy – Gibbs Helmholtz equation and its applications. Feasibility of reaction- Ellingham diagrams.
Types of electrodes - Standard electrodes-Standard hydrogen electrode, standard calomel electrode, Single electrode potential, electrochemical series – galvanic cell – EMF – Nernst equation and its applications - Glass electrode, Potentio metric acid base titrations and Solubility equilibrium - Corrosion-types - Chemical corrosion - electro chemical corrosion – factors influencing and control measures

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Unit 4:
SPECTRO SCOPIC TECHNIQUES AND APPLICATIONS

Electromagnetic radiations – wave length – frequency – energy of a radiation–electromagnetic spectrum – changes brought about by the radiations– components of a spectrometer – rotational spectra of diatomic molecules – rigid and non-rigid rotor models (energy expressions only)- selection rule– schematic instrumentation – types of vibrations in molecules (CO2, H2O) – vibrational spectra (primitive treatment) – selection rule – instrumentation and applications – electronic transitions – electronic spectra – – Beer – Lambert's law - instrumentation and applications – NMR – principle – chemical shift –instrumentation – NMR spectra of CH4 – CH3OH – xyleneisomers – MRI (Introduction only).

Unit 5:

STEREO CHEMISTRY & ORGANIC REACTIONS

Stereo Chemistry - Representation of 3D structures **–** Fisher projection, Newman and Sawhorse projection formulae - Ethane, 3-bromo - 2-butanol Conformation of Ethane, Butane & Ethylene glycol, Symmetry and Chirality - Stereo isomers, Enantiomers, Diastereomers. Configuration- R-S system. Optical activity **–** Lactic acid, Tartaric acid- Geometrical isomerism *is* - *trans* & E-Z notations.
Organic Reactions – Substitution - SN^1& SN^2 (simple examples, mechanism not expected) –electro philic substitutions – Friedel Craftsalkylations – Additions –1,2 -addition **–** types – addition of HX-Elimination– E^1 & E^2(Examples only, mechanism not expected) – Oxidations – *cis* – hydroxylation with OsO4, Reductions – Clemmensen & wolff - Kishner reductions, Cyclization – Diels Alder, Ring-Opening – Nylon-6 fromcaprolactum.Synthesis of most commonly used drugs– Aspirin, Paracetamol.

Course Outcomes:

CO:1. Realize the importance of knowledge in atomic structure and wave mechanics in studying the properties of elements
CO:2. Analyze and deduce the properties molecules on the basis of different bonding modes
CO:3. Rationalize bulk properties and processes using thermo dynamic considerations
CO:4. Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques
CO:5. Understand the major types of chemical reactions and effect of three - dimensional structures on the product of reactions

References:

[1]. P.C.Jain and Monika Jain, Engineering Chemistry, Dhanpat Rai Publishing Co Pvt.Ltd. New Delhi, 6thEdition2013.
[2].K. Sivakumar Applied Chemistry, , Anuradha Publications, Chennai,
[3].S.S.Dara & S.S. Umare Text book of Engineering Chemistry, ,S.Chand,Delhi,3rdEditionJuly2004
[4].C.N.Banwell andElaine.M.McCash Fundamentals of Molecular Spectroscopy, ,4thEditionJuly

2017,McGraw Hill Education,
[5].P.W.Atkinsand Julio De Paula Physical Chemistry, , Oxford University Press,11th Edition Dec2017

Text Books:

[1]. P.L.Soni, Sultan "Text book of Inorganic Chemistry", Ch and & Sons,Delhi,2013.
[2].B.R. Puri, L.R. Sharma, Madan S. Pathania, Shoban Lal Nagin "Principles of Physical Chemistry", Chand & Co., Jalandhar, 2000.
[3].B.S.Bahl , ArunBahl, "Advanced Organic Chemistry" S.Chand, Delhi, 5thEditionJan2012

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	L	M	M	-	M	M	M	M
CO2	S	S	M	M	L	M	M	-	M	M	M	M
CO3	S	S	M	M	M	M	M	-	M	M	M	M
CO4	S	S	M	M	M	M	M	-	M	M	M	M
CO5	S	S	M	M	M	M	M	-	M	M	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESME18P50	Engineering Graphics & Design	2	3	45

Course Objectives:

- Introduction to engineering design and its place in society
- Exposure to the visual aspects of engineering design
- Exposure to engineering graphics standards
- Exposure to solid modeling
- Exposure to computer-aided geometric design
- Exposure to creating working drawings
- Exposure to engineering communication

Unit 1:
Introduction to Engineering Drawing

Principles of Engineering Graphics and their significance, usage of Drawing instruments, lettering, Conic sections including the Rectangular Hyperbola (General method only); Cycloid, Epicycloid, Hypocycloid and Involute; Scales–Plain, Diagonal and Vernier Scales;

Unit 2:
Orthographic Projections

Principles of Orthographic Projections-Conventions - Projections of Points and lines inclined to both planes; Projections of planes inclined Planes - Auxiliary Planes;

Unit 3:
Projections of Regular Solids

Inclined to HP & VP-Auxiliary Views; Draw simple annotation, dimensioning and scale. Floor plans that include: windows, doors, and fixtures such as WC, bath, sink, shower, etc

Unit 4:
Sections and Sectional Views of Right Angular Solids

Prism, Cylinder, Pyramid, Cone – Auxiliary Views; Development of surfaces of Right Regular Solids - Prism, Pyramid, Cylinder and Cone; Draw the sectional orthographic views of geometrical solids, objects from industry and dwellings (foundation to slab only)

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Unit 5:
Isometric Projections

Principles of Isometric projection – Isometric Scale, Isometric Views, Conventions; Isometric Views of lines, Planes, Simple and compound Solids; Conversion of Isometric Views to Orthographic Views and Vice-versa, Conventions; Overview of Computer Graphics-theory of CAD software-Drawing Area, Dialog boxes and windows- Different methods of zoom as used in CAD-Isometric Views of lines, Planes, Simple and compound Solids – Customization & CAD Drawing - ISO and ANSI standards for coordinate dimensioning and tolerancing; dimensions to objects-various ways of drawing circles, Annotations, layering & other functions-Setting up and use of Layers, layers to create drawings-color coding according to building drawing practice; Drawing sectional elevation showing foundation to ceiling-Introduction to Building Information Modeling (BIM)

Course Outcomes:

CO:1. Draw orthographic projections of lines, planes and solids
CO:2. Draw projections of solids including cylinder, prism and pyramid.
CO:3. Draw section of solids including cylinder, prisms and pyramids.
CO:4. Draw the development of surfaces including cylinder, Pyramid and prism
CO:5. Draw projection of lines, planes, solids, orthographic projection, Isometric projection, and section of solids including cylinder, cone, prism, pyramid and building drawing using AutoCAD.

References:

[1]. Agrawal B & Agrawal C.M.(2017), "Engineering Graphics", TMH Publishers. July 2017.
[2].Narayana.K.L. & P Kannaiah (2008),"Text book on Engineering Drawing", Scitech Publishers.
[3].AUTO CAD User Manual.

Text Books:

[1]. Bhatt N.D., Panchal V.M. & Ingle P.R.,(2014), "Engineering Drawing", Charotar Publishing House.53rd Edition 2014.
[2].Shah,M.B.& Rana B.C. (2010), "Engineering Drawing and Computer Graphics", Pearson Education. 2nd Edition 2009

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	-	M	M	M	L
CO2	S	S	S	S	S	M	M	-	M	M	M	L
CO3	S	S	S	S	S	M	M	-	M	L	M	L
CO4	S	S	S	S	S	M	M	-	M	M	M	L
CO5	S	S	S	S	S	L	M	-	M	L	M	L

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESEE18T30	Basic Electrical Engineering	2	3	50

Course Objective

- This course equips students to have basic knowledge and understanding in solving algebraic, transcendental equation numerically.
- To make the student knowledgeable in the area of matrix theory so that he/she will be familiar in Matlab applications.
- To familiarize the student with functions of several variables. This is needed in many branches of engineering.

Unit 1:
DC CIRCUITS

Electrical circuit elements (R, L and C), voltage and current sources, Kirchhoff's current and voltage laws, analysis of simple circuits with dc excitation. Superposition, Thevenin and Norton Theorems. Time-domain analysis of first-order RL and RC circuits.

Unit 2:
AC CIRCUITS

Representation of sinusoidal waveforms, peak and RMS values, phasor representation, real power, reactive power, apparent power, power factor. Analysis of single - phase ac circuits consisting of R, L, C,RL, RC, RLC combinations (series and parallel), resonance. Three-phase balanced circuits, voltage and current relations in star and delta connections.

Unit 3:
TRANSFORMERS

Magnetic materials, B-H characteristics, ideal and practical transformer, equivalent circuit, losses in transformers, regulation and efficiency. Auto-transformer and three - phase transformer connections.

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Unit 4:
ELECTRICAL MACHINES

Generation of rotating magnetic fields, Construction and working of a three – phase induction motor, Significance of torque - slip characteristic. Loss components and efficiency, starting and speed control of induction motor. Single - phase induction motor. Construction, working, torque - speed characteristic and speed control of separately excited DC motor. Construction and working of synchronous generators.

Unit 5:

POWER CONVERTERS AND ELECTRICAL INSTALLATIONS

DC - DC buck and boost converters, duty ratio control. Single - phase and three - phase voltage source inverters; sinusoidal modulation. Components of LT Switchgear: Switch Fuse Unit (SFU), MCB, ELCB, MCCB, Types of Wires and Cables, Earthing.
Types of Batteries, Important Characteristics for Batteries. Elementary calculations for energy consumption, power factor improvement and battery backup.

Course Outcomes:

CO:1. Explain the basic electrical quantities and laws.

CO:2. Explain the construction, types and applications of electrical machines

CO:3. Study the working principles of power converters.

CO:4. Show the tariff or a given load and energy consumption.

CO:5. Introduce the components of low voltage electrical installations and its applications.

References:

[1]. L.S.Bobrow,"Fundamentals of Electrical Engineering",Oxford University Press,2011.
[2].E.Hughes,"Electrical and ElectronicsTechnology",Pearson,10th Edition2010.
[3].V.D.Toro,"Electrical Engineering Fundamentals",Prentice Hall India,2nd Edition Paperback 2015.

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SYLLABUS

Text Books:

[1]. D.P. KothariandI.J.Nagrath,"Basic Electrical Engineering",Tata McGraw Hill,2019 4th Edition.

[2].D. C.Kulshreshtha,"Basic Electrical Engineering", McGraw Hill,2nd Edition July2019.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	L	L	M	M	M	-	S	M	-	S
CO2	S	S	M	M	M	S	M	L	S	M	L	M
CO3	S	S	M	M	S	M	M	-	M	M	-	M
CO4	S	S	S	S	S	M	M	M	M	M	L	M
CO5	S	S	M	S	M	M	L	L	S	M	L	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CMCCH28T50	Environmental Science And Engineering	2	2	45

Course Objective

- To study the nature and facts about environment.
- To finding and implementing scientific, technological, economic and political solutions to environmental problems.
- To study the inter relationship between living organism and environment.

Unit 1:
INTRODUCTION TO ENVIRONMENT AND ENVIRONMENTAL STUDIES

1.1. Introduction to environment – components – nature of environment – need of awareness–reasons for environmental problems – anthropocentric and eco centric views. 1.2. Environmental studies - multidisciplinary nature – scope and aim – sustainable development principles – RRR concept-Indian environmental movements–environmental calendar.

Unit 2:
ECO SYSTEM AND BIO DIVERSITY

2.1. Ecosystem – structure – functions – simplified ecosystem models (food chain and food webs and their types, energy flow) - forest – grassland – pond –ecosystems – ecological succession – ecological pyramids–Bio-geo chemical cyclesof water–oxygen-carbon-phosphorous and sulphur. 2.2.Biodiversity – definition – types – species – genetic and ecosystem diversities-values of biodiversity – threats to biodiversity – conservation of biodiversity – endemism – biodiversity hotspots – Indian biodiversity– endemic species of India–IUCN lists – red – green and blue data books.

Unit 3:
NATURAL RESOURCES

3.1 Natural resources – definition – types – forest resources – uses –deforestation- reasons - effects – water resources – dams – effects of dams - food resources – modern agriculture– ill effects –energyr esources-types–hydel–nuclear–solar–wind and biomass energy-world scenario–Indian scenario. 3.2 Population and environment–reasons for over exploitation of resources–population–demography – population curves – population explosion – effects – consumerism – effects – urbanization – reasons and effects – role of an individual.

Unit 4:
ENVIRONMENTAL POLLUTION

4.1 Pollution–definition–types–air pollution –causes and effects–effects of CO2–CO – NOx – SOx –particulates–control of air pollution–water pollution–causes–effects–remedies–soil pollution–

solid waste management – ewaste – ill effects of e-waste – proper recycling – Noise pollution – reasons–effects – control – nuclear pollution – cases – effects and control –thermal pollution causes – effects and remedies. 4.2 Legal provisions for protecting environment – article 48 A – 51 A (g) – Environment act1986 – Air act 1981 – Water act 1974 – wild life protection act – Forest act 1980 - problems in implementation–reasons.

Unit 5:

SOCIALI ISSUES AND ENVIRONMENTAL ETHICS

5.1 Present environmental scenario – green house effect – climate change–The Kyoto Protocol–ozone layer depletion- The Montreal Protocol-acid rain–causes–effects-disparity among the nations– TheCopenhagen UNFCCC summit – carbon currency- virtual water- genetically modified organisms, Disaster management. 5.2 Environmental ethics–introduction–people getting affected-resettlement and rehabilitation – issues involved –Sardhar Sarovar project – Tawa Matsya sang - Melting icebergs of Arctic.

Course Outcomes:

CO:1. Nature of environment and reasons for environmental problems
CO:2. Ecosystem – structure, functions, simplified co-system models
CO:3. Natural resources, reasons for over exploitation of resources
CO:4. The interrelationship between living organism and environment
CO:5. Public awareness of environmental is at infant stage.

References:

[1].N.Nandini, N. Sunitha and SucharitaTandon , “Environmental Studies”, , Sapna Book House,2019.
[2].Ragavan Nambiar ,”Text book of Environmental Science”, , Scitech Publications,2010.
[3].S.S.Dara,”Text book of Environmental Chemistry and Pollution Control”, S.Chandand Co., 7th Edition 2004.
[4].Colin Baird “Environmental Chemistry”, , W.H.Freemanand company, NewYork, 4th Edition 2008.
[5].Gary W.VanLoon and StephenJ. Duffy “Environmental Chemistry”, , Oxford University Press, 9th Edition 2017.

Text Books:

[1]. Anubha Kaushik and C.P. Kaushik, ”Prospects of Environmental Science”, New Age International publishers, 2019.

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SYLLABUS

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	L	L	L	L	-	M	M	S	M	M	M	L
CO2	M	M	M	M	L	M	M	S	M	M	M	L
CO3	-	-	-	-	M	M	M	S	M	M	M	L
CO4	L	L	L	L	M	M	M	S	M	M	M	L
CO5	L	L	L	L	M	M	M	S	M	M	M	L

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CBSCH18P60	Chemistry Lab	2	2	

List of Experiments

Any ten experiments of the following

1. Determination of surface tension and viscosity of a liquid or a solution
2. Thin layer chromatography /Paper chromatography for separation of a mixture.
3. Ion exchange column for removal of hardness of water
4. Determination of chloride content of water by volumetry.
5. Determination of M.wt of an on - volatile solute by Rast‟s method.
6. Determination of therate constant of the reaction between K2S2O8 and KI–Clock reaction method.
7. Conductometry-VerificationofDebye-Huckel-Onsagerequationforastrongelectrolyte.
8. Potentiometry – Determination of formal redox potential of Fe3+/Fe2+couple
9. Synthesis of Nylon 66 by interfacial polymerization method.
10. Determination of Saponification /acid value of oil.
11. Systematic qualitative analysis of a salt
12. Lattice structures and packing of spheres
13. Models of potential energy surfaces–computational experiment.
14. Chemical oscillations – Potentiometric study of the oscillations of Belousov-Zhabotinsky reaction
15. Determination of the partition coefficient of I2 between water and CCl4
16. Verification of Freund lich iso thermforadsorption of acetic acid / oxalic acid by charcoal.
17. Determination of ISO electric point of Gelatinsols by using capillary viscos meter.

Course Outcome:

CO:1. Determination surface tension, viscosity, Conductance of Solutions, chloride content of water.

CO:2. Conductometry- red ox potentials

CO:3. Analyze a salt sample

CO:4. Estimate rate constants of reactions from concentration of Reactants / products as a function of time

Text Books:

[1]. Advanced Practical Physical Chemistry, J.B. Yadhav, Krishna Prakasan Media, 2016.

[2]. Experiments in Applied Chemistry, Sunita Rattan, S.K.Kataria & Sons,2012.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
CESEE18P70	Basic Electrical Engineering Lab	2	2	

List of Experiments

1. Study of Electric Motors (AC & DC Motors)
2. Load Test on Single Phase Induction Motor
3. Load Test on Three Phase Induction Motor
4. Load Test on Single Phase Transformer
5. Load Test on Three Phase Alternator
6. Speed Control of DC Motor
7. Speed Control of Three Phase Induction Motor (Pole Changing Method)
8. Study of Multi meter, CRO and LCR Meter
9. Measurement of Voltage, Current and Power.
10. Verification of Kirchoff's Law
11. Verification of Thevenin's Theorem
12. B-H Curve of a Magnetic Material
13. Rectifier Circuit Analysis (AC–DC)
14. Inverter Circuit Analysis (DC–AC)
15. Chopper Circuit Analysis (DC–DC)
16. Series and Parallel RLC Circuit Analysis

Course Outcomes:

CO:1. Obtain load characteristics of Single Phase Induction Motor, Three Phase Induction Motor, Single Phase Transformer and Three Phase Alternator
CO:2. Obtain Speed Control of DC Motor, Three Phase Induction Motor(Pole Changing Method)
CO:3. To demonstrate the working of Multi meter, CRO and LCR Meter and Measurement of Voltage, Current and Power .To Verify experimentally Kirchhoff's Law and Thevenin's Theorem
CO:4. Obtain the B - H Curve of a Magnetic Material
CO:5. Analysis of RLC circuit, Analysis of Converter circuit

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SYLLABUS

THIRD SEMESTER

Course Code	Course Name	Semester	Credit	Hours
BEEF183T10	Mathematics – III (Probability and Statistics)	3	4	45

Course Objective

- The objective of this course is to familiarize the students with statistical techniques.
- It aims to equip the students with standard concepts and tools at an intermediate to advanced level that will serve them well towards tackling various problems in the discipline.

Unit 1:

BASIC PROBABILITY:

Probability spaces, conditional probability, Independent random variables, sums of independent random variables, Bayes' Theorem, Discrete and Continuous one dimensional random variables - Expectations, Moments, Variance of a sum, Moment generating function,Tchebyshev's Inequality.

Unit 2:

PROBABILITY DISTRIBUTIONS:

Discrete Distributions – Binomial, Poisson and Negative Binomial distributions, Continuous Distributions – Normal, Exponential and Gamma distributions.

Unit 3:

BASIC STATISTICS:

Measures of Central tendency: Averages, mean, median, mode, Measures of dispersion – Range, Mean deviation, Quartile deviation and Standard deviation, Moments, skewness and Kurtosis, Correlation and regression– Rank correlation.

Unit 4:

APPLIED STATISTICS:

Curve fitting by the method of least squares – fitting of straight lines, second degree parabolas and more general curves. Test of significance: Large sample test for single proportion, difference of proportions, single mean, difference of means, and difference of standard deviations.

Unit 5:

SMALL SAMPLES:

Test for single mean, difference of means and correlation coefficients, test for ratio of variances- Chi-square test for goodness off it and independence of attributes.

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SYLLABUS

Course Outcomes:

CO:1. Basic probability axioms and rules and the moments of discrete and continuous random variables as well as be familiar with common named discrete and continuous Random variables.

CO:2. How to derive the probability function of transformations of random variables and use these techniques to generate data from various distributions.

CO:3. How to calculate and apply measures of location and measures of dispersion in grouped and un grouped data cases.

CO:4. Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases.

CO:5. How to translate real-world problems into probability models. Also how to collect data, analyze and deduce information from a real time survey without any un willing bias

References:

[1]. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th Edition, John Wiley & Sons, 10th Edition, Dec 2010.

[2].B.S.Grewal, "Higher Engineering Mathematics", Khanna Publishers, 44th Edition, 2015.

[3].S. Ross, "A First Course in Probability", 6th Ed., Pearson Education India, 9th Edition, 2013.

[4].W.Feller, " An Introduction to Probability Theory and its Applications", Vol.1,3rd Ed.,Wiley, 1968.

Text Books:

[1]. T.Veerarajan, "Probability, Statistics and Random Processes", Third edition, Tata Mc Graw - Hill, New Delhi, 2010.

[2].S.P.Gupta, "Statistical Methods", 31st edition, Sultan chand and sons, New Delhi, 28th Edition, 2002.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	-	M	M	M	M
CO2	S	S	S	S	M	M	M	-	M	M	M	M
CO3	S	S	S	S	M	M	M	-	M	M	M	L
CO4	S	S	S	S	M	M	M	-	M	M	M	L
CO5	S	S	S	S	M	M	M	-	M	M	M	L

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183T20	Programming In C++ With OOPS	3	3	45

Course Objective

- Be exposed to the syntax of C.
- Be familiar with programming in C.
- Learn to use arrays, strings, functions, pointers, structures and union sin C.

Unit 1:
OBJECT ORIENTED PROGRAMMING

Introduction – reusability – security – object oriented programming fundamental – abstraction–encapsulation – derivation – object oriented languages.

Unit 2:
CLASSES AND OBJECTS

Introduction to OOPS Concepts-Introduction to C++ procedural oriented approach to C++ - tokens-expressions - data types – constants and variables – console IO operations - control structures – Array using as an object – static member function - function in C++ – classes and objects – constructors & Destructors.

Unit 3:
POLYMORPHISM AND INHERITANCE

Inheritance – single level – multilevel – multiple – hierarchy inheritance - access control – Function over loading – operator over loading – pointers to object - virtual function – pure virtual function – inline function - dynamic binding – abstract classes.

Unit 4:
TEMPLATE AND STRING MANIPULATION

Class Templates – function Template - Dynamic memory all ocation pointers – new and delete operators – static members – friend classes – friend functions – manipulation of strings.

Unit 5:
ADVANCED FEATURES

Exception handling – working with files – file stream operations – file modes – read ( ) & write operation-error handling during file operations–command line arguments.

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SYLLABUS

Course Outcomes:

CO:1. Write and execute C programs for simple applications.
CO:2. Write and execute Class/ Objects programs for simple applications.
CO:3. Develop object-oriented programs for a given application using the concepts of compile-time and run-time polymorphism
CO:4. Construct object-oriented programs for a given application by demonstrating the inter-relationship between classes using inheritance
CO:5. Develop object-oriented applications that can handle exceptions and file handling.

References:

[1]. Byron S Gottfried,"Programming with C",Schaum's Outlines,Second Edition,Tata Mc Graw-Hill, 2006.
[2].Bertr and Meyer,"Object Software Construction",Prentice Hall, 1988.
[3].Baarkakati.N,"Object Oriented Programming in C++",Prentice Hall of India,1997
[4].Robert Lafore "Object-Oriented Programming in C++ ", Fourth Edition, Kindle
[5].Herbert Schildt,C++ The Complete Reference, Tata Mc Graw Hill Edition, 2003

Text Books:

[1].Yashawant Kanetkar ,Let Us'C'-,(Unit2to5), BP Bpublications, 10th Edition, 2010.
[2].Balagurusami, "Object oriented programming with C++", TATAMC Graw Hill.
[3].K.R.Dittrichetal, "Object Oriented Database System", Springer Verlag, 1991.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	CO1	S	S	S	S	S	L	-	-	M	-	M
CO2	CO2	S	M	S	S	M	M	-	-	M	-	M
CO3	CO3	S	S	S	M	M	L	-	-	M	-	M
CO4	CO4	S	M	S	S	M	L	-	-	M	-	-
CO5	CO5	S	S	S	M	M	M	L	-	M	-	-

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183T30	Electro Magnetic Theory (T&P)	3	3	50

Course Objective

- To introduce the basic mathematical concepts related to electromagnetic vector fields.
- To impart knowledge on the concepts of electrostatics, electrical potential, energy density and their applications, Faraday's law, induced Emf and Maxwell's equations.
- To impart knowledge on the concepts of magnetostatics, magnetic flux density, scalar and vector potential electromagnetic waves and Pointing vector and its applications.

Unit 1:
ELECTROSTATICS

The field concept – Sources of electromagnetic fields – Charges – Columb's Law – electric field intensity – Electric flux – Gauss's law – Potential – Boundary value problems – Laplace and Poissons equations – Electro static energy – Dielectrics – Capacitance.

Unit 2:
MAGNETOSTATICS

Current density– Magnetic field – Magnetic flux – Biot – Savart's – Ampere's law – Torque – Force – Vector potential – Boundary value problem.

Unit 3:
ELECROMAGNETICFIELDS

Faraday's Law – Lenz's law – Maxwell's equations – Displacement current – Eddy current – Relation between field theory and circuit theory

Unit 4:
ELECTRO MAGNETIC WAVES

Generation – Propagation of waves in dielectrics – Conductors and Transmission lines – Pointing vector – Skin effect.

Unit 5:
FIELD MODELLING AND COMPUTATION

Problem formulation – Boundary conditions – Solutions – Analytical methods – Variables Separable methods – Conformal transformation – Method of images – Numerical methods – Finite difference method – Finite element method – Charge Simulation Method.

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SYLLABUS

Course Outcomes:

CO:1. To differentiate different types of coordinate systems.
CO:2. To use different coordinate systems for solving the problems of electromagnetic field theory
CO:3. To describe static electric and magnetic fields, their behavior in different media, associated laws, boundary conditions and electromagnetic potentials.
CO:4. To use integral and point form of Maxwell`s equations for solving the problems of electromagnetic field theory.
CO:5. To describe time varying fields, propagation of electromagnetic waves in different media, pointing theorem.

References:

[1]. David J Griffith, "Introduction to Electro dynamics", Prentice Hall of India Pvt.Ltd,New Delhi, 4th Edition Paperback 2015.
[2].Richard E.Dubroff, S.V.Marshall, G.G. Skitek,"Electro magnetic concepts and applications", Fourth Edition, Prentice Hall of India Pvt.Ltd., New Delhi,1996.
[3].Kraus and Fleish,"Electromagnetics with Applications", Mc Graw-Hill International Editions 5th Edition 2017.

Text Books:

[1]. John D Kraus,"Electro magnetics", Mc Graw-Hill Book Co.,New York, Revised Edition,1991.
[2].Joseph A Edminister, "Theory and Problems of Electromagnetics", Mc Graw-Hill book company NewYork, 2nd Edition Paperback 2017.
[3].William H.Hayt, "Engineering Electromagnetic", Tata McGraw-Hill Edition, New Delhi, 2nd Edition Paperback 2017.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-		-	-	L
CO2	S	S	M	L	M	-	-	-	L	-	-	M
CO3	S	S	S	M	M	-	-	-	M	-	-	S
CO4	S	S	M	M	M	-	-	-	L	-	-	M
CO5	S	S	M	L	M	-	-	-	-	-	-	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183T40	Analog Electronics	3	3	45

Course Objective

- Design and analyze various rectifier and amplifier circuits
- Understand the functioning of OP-AMP and design OP-AMP based circuits.
- Design sinusoidal and non-sinusoidal oscillators.
- Understand the functioning of OP-AMP and design OP-AMP based circuits.

Unit 1:

DIODE CIRCUITS

P-N junction diode, I-V characteristics of a diode; review of half - wave and full - wave rectifiers, Zener diodes, clamping and clipping circuits. Modeling and Analysis of Diode.

Unit 2:

BJT AND AMPLIFIER CIRCUITS

Structure and I-V characteristics of a BJT; BJT as a switch. BJT as an amplifier:, biasing circuits; common - emitter, common-base and common - collector amplifiers Differential amplifier; power amplifier; direct coupled multi - stage amplifier, Modeling and Analysis of Amplifier circuits

Unit 3:

MOSFET AND AMPLIFIER CIRCUITS

MOSFET structure and I-V characteristics. MOSFET as a switch; MOSFET as an amplifier: small-signal model and biasing circuits, common-source, common-gate and common-drain amplifiers; gain, input and output impedances, trans-conductance. Modeling and Analysis of Amplifier circuits.

Unit 4:

OPERATIONAL AMPLIFIERS AND LINEAR APPLICATIONS

Internal structure of an operational amplifier, ideal op-amp, non-idealities in an op-amp (Output off set voltage,input bias current,input offset current, slewrate, gain bandwidth product) Inverting and non-inverting amplifier, differential amplifier, instrumentation amplifier, Integrator and Differentiator.

Unit 5:

NON-LINEAR APPLICATIONS OF OP-AMP

Active filter, P, PI and PID controllers and lead/lag compensator using an op-amp, voltage regulator, oscillators (Wein bridge and phase shift).Astable multivibrator and Schmitt trigger Analog to Digital Conversion. Zero Crossing Detector, Square-wave and triangular-wave generators.

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Course Outcomes:

CO:1. Acquire basic knowledge of physical and electrical conducting properties of semi conductors
CO:2. Develop the Ability to understand the design and working of BJT/FET
CO:3. Able to design amplifier circuits using BJT s And FET's and observe the amplitude and frequency responses of common amplifier circuits
CO:4. Understand the fundamentals and areas of applications for the Integrated Circuits. Analyze important types of integrated circuits of day-to-day requirements.
CO:5. Understand the differences among theoretical, practical & simulated results in integrated circuits. Choose the appropriate integrated circuit modules to build a given application

References:

[1] Thomas L.Floyd, "Electronic devices" Conventional current version, Pearson prentice hall, 10th Edition, 2017.
[2] Robert L.Boylestad, "Electronic devices and circuit theory", 11th edition, Pearson prentice Hall 2013
[3] Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016 – Fourth Edition
[4] Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', McGraw Hill, 2nd Edition, 2017

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1] David A. Bell , "Electronic devices and circuits", Oxford University higher education, 5th edition 2008.
[2] Sedra and smith, "Microelectronic circuits",7th Edition., Oxford University Press, 2017
[3] Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, PHI 2021
[4] D. Roy Choudhary, Sheil B. Jani, 'Linear Integrated Circuits', , New Age, Fourth Edition, 2018.

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SYLLABUS

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	L	L	L	S	M	-	L	-	M	M
CO2	S	M	M	M	M	L	L	-	L	-	L	L
CO3	S	S	S	S	M	L	L	-	M	-	-	L
CO4	M	S	M	S	M	S	M	-	L	L	-	M
CO5	L	M	L	M	S	M	M	-	L	L	S	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183T50	Electric Circuit Theory	3	3	50

Course Objective

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuits using network theorems
- To introduce the phenomenon of resonance in coupled circuits

Unit 1:

CIRCUIT CONCEPTS AND MESH & NODAL METHODS:

Lumped circuits – Kirchhoff's Laws – Voltage - Current relationships of R, L and C –Independent sources Dependent sources – Simple resistive circuits – Network reduction –Voltage division–Current division– Source transformation. Formation of matrix equations and analysis of AC and DC circuits using mesh-current and nodal-voltage. Methods – Mutual inductance – Coefficient of coupling – Ideal transformer.

Unit 2:

SINUSOIDAL STEADY STATE ANALYSIS:

Phasor – Sinusoidal steady state response– concepts ofimpedance and admittance- analysis of simple circuits – Power and Power factor – series resonance and parallel resonance –Bandwidth and Q factor Solution of three-phase balanced and unbalanced circuits

Unit 3:

NETWORK THEOREMS AND APPLICATIONS:

Super position theorem – Reciprocity theorem – Compensation theorem–Substitution theorem - Maximum Power transfer theorem – Thevenin's theorem – Norton's theorem and Millman's theorem with applications

Unit 4:

TRANSIENT ANALYSIS:

Forced and free response of RL, RC and RLC circuits with D.C.and sinusoidal excitations.

Unit 5:

TWO PORT NETWORKS AND SYNTHESIS:

Characterization of two port networks in terms of Z,Y,H and T parameters – networksequivalents–relations between network parameters–Analysis of T, Ladder, Bridged–Tandlattice networks–Characteristics Ideal filter-low pass and high pass filter. Reliability of one port network–Hurwitz polynomials and properties–P.R.functions and properties–synthesis of RL, RC and LC one port networks.

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Course Outcomes:

CO:1. Concepts, Nodal, Mesh methods
CO:2. Sinusoidal Analysis, Resonance, three phase circuits
CO:3. Network Theorem and Application
CO:4. Circuit Response RLC, DC & AC Excitation
CO:5. Two Port Networks and synthesis Networks

References:

[1]. EdministerJ.A.,"Theory and Problems of Electric Circuits", Schaum's outline series McGraw Hill Book Company, 2nd Edition, 1983.

[2].Sudhakar A and Shyam Mohan S.P.,"Circuits and Network Analysis and Synthesis",Tata Mc Graw – Hill Publishing Ltd., New Delhi, 5th Edition 2017.

[3].VanValkenburg M.E.,"Network Analysis",Prentice–Hallof India Private Ltd., New Delhi, Third Edition, 2019.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1]. Hyatt W.H.and Kemmerly,"Engineering Circuits Analysis", McGraw-Hill International 7t Edition,2010.

[2].KuoF.F.,"Network Analysis and Synthesis",Wiley International Edition, Second Edition, 1966.

[3].Paranjothi S.R.,"Electric Circuit Analysis", New Age International Ltd.,Delhi, 2nd Edition 2011.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	L	-	-	M	L	-	S
CO2	S	S	S	S	M	-	-	-	M	L	-	M
CO3	S	S	M	M	M	M	-	-	M	L	-	S
CO4	S	M	S	M	M	M	-	-	L	L	-	M
CO5	S	S	S	S	M	L	-	-	L	L	-	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183P60	Object Oriented Programming Systems Lab	3	2	

List of Experiments

1. Develop a C++ program to Add, Subtract TwoVectors.
2. Develop a C++ program to perform the quadratic equations ax2+bx+c=0.
3. Develop a C++ program to perform mxn matrix operations addition subtraction.
4. Create a class Mat A and Mat B to and store the result in Mat C toper for mmxn matrix operations.
5. Develop a C++ program to perform string manipulation.
6. Implementation of arithmetic operations on complex numbers using construct or over loading.
7. Develop a C++ program to compute the employee details using inheritance concept.
8. Write a C++ program to generate Fibonacci series using constructor and copy constructor.
9. Develop a C++ program to swapth evalues using template function

Course Outcomes:

CO:1. Write and execute C programs for simple applications.

CO:2. Write and execute Class/ Objects programs for simple applications.

CO:3. Develop object-oriented programs for a given application using the concepts of compile-time and run-time Polymorphism.

CO:4. Construct object-oriented programs for a given application by demonstrating the inter-relationship between classes Using inheritance.

CO:5. Develop object-oriented applications that can handle exceptions and file handling.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183P70	Analog Electronics Lab	3	2	

List of Experiments

1. VI Characteristics of Semi conductor diode/ Zener diode
2. Input and output characteristics of a BJT in CE configuration
3. Characteristics of JFET/MOSFET
4. Clipper and Clamper
5. Series and shunt voltage regulator
6. Single phase half wave rectifier and Full Wave Rectifier with filter
7. Frequency response of CE amplifier
8. Frequency response of Darling to n amplifier
9. Operational Amplifiers (IC741) – Characteristics and Applications
10. Differential Amplifier
11. Instrumentation amplifier using OP-AMP, ICs
12. Wein's bridge oscillator using OP-AMP,IC.
13. RC-Phase Shift Oscillator using OP-AMP, IC.
14. Astable multivibrator and Schmitt trigger using OP-AMPIC.
15. Simulation of above experiments using MULTISIM Software.

Course Outcomes:

CO:1. Set up testing strategies and select proper instruments to evaluate performance characteristics of electronic circuit.

CO:2. Choose testing and experimental procedures on different types of electronic circuit and analyze their operation different operating conditions

CO:3. Evaluate possible causes of discrepancy in practical experimental observation sin comparison to theory

CO:4. Practice different types of wiring and instruments connections keeping in mind technical, Economical, safety issues

CO:5. Prepare professional quality textual and graphical presentations of laboratory data and Computational results, incorporating accepted data analysis and synthesis methods, Mathematical software and word-processing tools.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF183P80	Electric Circuit Theory Lab	3	2	

List of Experiments

1. Verification of Kirchhoff's laws.
2. Verification of Super position theorem.
3. Verification of Thevenin's theorem.
4. Verification of Norton's theorem.
5. Verification of Maximum Power Transfer theorem.
6. Verification of Reciprocity theorem.
7. Verification of Compensation theorem.
8. Verification of Millman's theorem.
9. Three phase power and power factor Measurement by two wattmeter method.
10. Plotting of B-H curve of a magnetic material.
11. Series and Parallel resonance in RLC Circuits.
12. Verification of theorem using Digital simulation.
13. Circuit Transients by Digital simulation.

Course Outcomes:

CO:1. Verification of theorems

CO:2. Measurement by two wattmeter method

CO:3. Series and Parallel resonance in RLC Circuits

CO:4. Circuit Transients by Digital simulation

CO:5. Obtain the B-H Curve of a magnetic material

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FOURTH SEMESTER

Course Code	Course Name	Semester	Credit	Hours
BEEF184T10	DC Machines And Transformers	4	3	45

Course Objective

- To understand the generation of D.C. voltages by using different types of generators and Study their performance.
- To study the working principles of D.C. motors and their load characteristics, starting and Methods of speed control.
- To familiarize with the constructional details of different type of transformers, working principle and their performance.

Unit 1:

D.C MACHINE CONSTRUCTION

Field System – Armature Core-Commutator and Brushes-Armature winding - E.M.F equation – Methods of Excitation – Armature Reaction – Commutation – Load Characteristics of D.C generators-Series shunt and compound machines – Parallel operation of D.C Generators.

Unit 2:

D.C MOTORS

Principle – Back EMF – Torque – Load characteristics of series, shunt and compound motors-Three point, Four point & Automatic starter for D.C Motors –Speed Control of D.C Motors. Losses-Efficiency of D.C motors & Generators – Braketest, Swinburne's test, Hopkinson's test, Field test for Series Machines.

Unit 3:

TRANSFORMERS

Principle – EMF equation and Transformation Ratio – Types of transformers - Construction-phas or diagram at different load Equivalent circuit – voltage regulation – losses and efficiency – All day efficiency.

Unit 4:

TRANSFORMERS TESTING & PARALLEL OPERATION

Polarity and ratio test - O.C and S.C test - Load test - Parallel operation -Three phase Transformer connections – Open delta – Leblanc connection – Three phase to single phase conversion – Tap changing

Unit 5:

SPECIAL TYPE OF TRANSFORMERS

Auto Transformers - current & potential transformers - Earthling-Transformer -Welding Transformer-Distribution Transformer – Power Transformer – Construction & Operating principle.

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Course Outcome:

CO:1. EMF Equation

CO:2. D.C Machine construction and DC Motor and Generator characteristics, Starting methods of DC motors Transformer and special transformer Construction

CO:3. Testing of DC Machines, Parallel operation of DC motor and generator Parallel operation of transformers

CO:4. Determination of losses and efficiency of DC Machines Determination of losses, efficiency and regulation of Transformers

CO:5. Equivalent circuit of transformer

References:

[1]. Dr.Murgesh Kumar, "D.C Machines and Transformer", Vikas Publishers, 2nd Edition 2013.

[2]. A. E. Fitzgerald and C. Kingsley, "Electric Machinery", New York, McGraw Hill Education, 6th Edition 2017.

[3]. A. E. Clayton and N. N. Hancock, "Performance and design of DC machines", CBS Publishers, 2018.

[4]. M. G. Say, "Performance and design of AC machines", CBS Publishers, First Edition 2008.

[5]. Sahdev S. K. "Electrical Machines", Cambridge University Press, 2018.

Text Books:

[1].Theraja & A.K.Theraja, "Electrical Technology", Vol II, S.Chand Company Ltd, New Delhi, 2008.

[2].R.K Rajput, "Electrical Machines", 4th Edition, Laxmi publications, 2008 .

[3].I. J. Nagrath and D. P. Kothari, "Electric Machines", McGraw Hill Education, 5th Edition, 2017

[4]. P. S. Bimbhra, "Electric Machinery", Khanna Publishers, 2nd Edition, 2021

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	-	-	-	-	L	L	-	M
CO2	M	L	L	L	M	L	-	-	L	M	-	M
CO3	M	L	S	L	M	L	-	-	L	L	-	S
CO4	S	S	M	S	S	L	-	-	M	L	-	M
CO5	M	S	S	M	L	-	-	-	-	L	-	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184T20	Measurements And Instrumentation	4	3	45

Course Objective

- Acquire the knowledge on basic measurement concepts.
- Acquire the knowledge on basic electronic measurements.
- Acquire the knowledge on recording devices.

Unit 1:

SCIENCE OF MEASUREMENT AND CHARACTERISTICS OF TRANSDUCERS

Functional elements of an instrument – Unitsand standards – calibration methods – errors in measurement – statistical methods – Static characteristics -accuracy, precision, sensitivity, linearity, Reproducibility, Repeatability and Noise- Dynamic characteristics – impulse, step, ramp and sinusoidal inputs. Classification of transducers – Selection of Transducer – Applications of Transducer – Resistive Transducer: Straingauges, Resistance Thermometers, Thermistor - Inductive Transducers: LVDT, RVDT – Capacitive Transducers – Piezo electric Transducer.

Unit 2:

POTENTIO METERS AND ELECTRICAL INSTRUMENTS

DC potentiometer – Loading effect – Application – Basic circuit - standardization–Laboratory type (Crompton's) – AC potentiometer – Drysdale (polartype) type – Gall – Tinsley (coordinate) type – Limitations & applications – Instrument Transformer- C.T and V.T construction, theory, operation, phasor diagram, characteristics, testing, error elimination – Applications –Single and three Phase Wattmeters and Energy meter.

Unit 3:

MEASUREMENT OF RESISTANCE AND IMPEDANCE

Low Resistance: Kelvin's double bridge – Ductor Ohm meter-Medium Resistance: Voltmeter Ammeter method, Substitution method, Wheatstone bridge method – High Resistance: Megger, Direct deflection method, Megohm bridge method - Earth resistance measurement. Introduction to A.C. bridges –Sources and Detector sin A.C.bridges - Measurement of Inductance – Anderson Bridge - Measurement of Capacitance: Schering's bridge, De-Sauty's bridge - Measurement of frequency using Wien‟s bridge-LCR meter – Q meter.

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Unit 4:

CRO AND RECORDING INSTRUMENTS

Oscilloscope: CRO - CRT, Deflection System, Specifications, Controls, Phosphors-Dual Beam/ Dual trace oscilloscope - Storage Oscilloscope, Digital Storage Oscilloscope and Sampling Oscilloscope. Recording Instruments: Method of Recording – Frequency Modulated (FM) recording-Pulse Duration Modulation (PDM) Recording – Strip Chart Recorders, X-Y, UV Recorders, and Plotters.

Unit 5:

ANALOG & DIGITAL INSTRUMENTS

Operating Forces – Deflecting Force,Controlling Force, Damping Force-Galvanometer, PMMC & moving iron instruments – Principle of operation, construction and sources of errors and compensation – Dynamometer – True RMS meter – electronic voltmeter – Digital Voltmeter – Multimeter–vector voltmeter.

Course Outcomes:

CO:1. Understand Measurement systems, Bridge measurements
CO:2. Know the principles of cathode ray oscilloscopes and other Measuring instruments.
CO:3. Compare analog and digital techniques of Measurement
CO:4. Understand measurement errors
CO:5. Understand about the measurement of Resistance and Impedance.

References:

[1]. Doeblin E.O. “Measurement System Applications and Design”, Mc GrawHill, 6th Edition, July 2017.
[2]. S.Ranganathan, “Transducer Engineering”, Allied Publishers Pvt. Ltd., 2003.
[3]. Stout M.B., “Basic Electrical Measurement”, Prentice Hall of India, 2012.
[4]. Dalley, J.W., Riley, W.F. and Meconnel, K.G., “Instrumentation for Engineering Measurement”, John Wiley & Sons, 1999.

Online Resources

Swayam-NPTELhttps://onlinecourses.nptel.ac.in/

Text Books:

[1]. Patranabis, “Sensors and Transducers”, Prentice Hall of India, 2nd Edition, 2013.
[2]. Cooper W.D.,“Electronic Instrumentation and Measurement Techniques”, Prentice Hall of India, New Delhi, 2003.
[3]. Joseph J Carr, “Elements of Electronic Instrumentation & Measurement”, Pearson, 3rd Edition, 1995.
[4]. Kalsi.H.S, “Electronics Instrumentation”, Tata Mc Graw Hill, New Delhi, 4th Edition, 2019.
[5]. D.V.S.Moorthy, “Transducers and Instrumentation”, Prentice Hall of India Pvt Ltd, 2nd Edition, 2018.
[6]. Sawhney A.K., “A Course in Electrical, Electronic measurement & Instrumentation”, Dhanpat Rai & sons, 18th Edition, Reprint, 2015.
[7]. Oliver B.H., and Cage J.M., “Electronics Measurements and Instrumentation”, Mc Graw Hill, 2017.
[8]. M.M.S.Anand,”Electronic instruments and instrumentation technology, PHI, 2006.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	S	M	M	L	L	-	L	L	-	M
CO2	M	M	M	M	S	L	-	-	M	L	-	S
CO3	M	S	S	S	S	L	-	-	M	M	-	S
CO4	M	M	M	M	S	L	-	-	M	L	-	S
CO5	M	S	S	S	S	L	-	-	M	M	-	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184T30	Database Management [T&P]	4	3	45

Course Objective

- To understand the different database models and language queries to access databases.
- To understand the normalization forms in building an effective database tables
- To protect the data and the database from unauthorized access and manipulation

Unit 1:

Databases - Need - Concepts - Architecture - Data independence - Data modeling: Entity relationship model –Weak entity sets-Mapping ER model to Relational model.

Unit 2:

Concepts - Integrity constraints - Relational algebra - Relational calculus - Tuple relational calculus –Domain relational calculus - Overview of QBE.

Unit 3:

SQL Queries – Nested queries – Aggregate operators – Null values – Embedded SQL– Database security-Views-Queries on views.

Unit 4:

Schema Refinement – Functional dependencies - Normalization - Decomposition - 3NF, BCNF, 4NF – Multi - valued dependencies.

Unit 5:

Object-oriented data model - Object identity and pointers - Object definition and manipulation language – Object -oriented databases - Object relational databases-Recent trends-Mobile databases

Course Outcomes:

CO:1. Explain the features of database management systems and Relational database.
CO:2. Design conceptual models of a database using ER modeling For real life applications and also construct queries in Relational Algebra.
CO:3. Create and populate a RDBMS for a real life application, with Constraints and keys, using SQL.
CO:4. Retrieve any type of information from a data base by formulating complex queries in SQL.
CO:5. Analyze the existing design of a database schema and apply concept so normalization to design an optimal Database.

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References:

[1]. R. Elmasri and S. B. Navathe, "Fundamentals of Database Systems", 7th illustrated Edition, Pearson Education Jun 2017.

[2].Raghu Ramakrishnan ,Johannes Gehrke "Database Management Systems", 3rd illustrated Edition, WCB, Mc Graw Hill, July2014

Text Books:

[1]. Silberchatz, F.Korth,and S.Sudarshan, "Database System Concepts", 7th Edition,McGrawHill March 2019.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	M	-	-	S	M	M	S
CO2	S	S	S	S	S	M	-	-	S	M	M	S
CO3	M	M	M	S	S	M	-	-	S	M	M	S
CO4	S	S	M	M	S	M	-	-	S	M	M	M
CO5	M	M	S	M	M	M	-	-	M	M	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184T40	Digital Electronics	4	3	50

Course Objective

- Study various number systems and to simplify the mathematical expressions using Boolean functions-simple problems.
- Study implementation of combinational circuits.
- Study the design of various synchronous and asynchronous circuits.

Unit 1:

NUMBER SYSTEMS AND CODES

Review of Number systems: Binary, Octal and Hexa decimal. Representations of numbers and their conversions. Binary arithmetic's. Conversion algorithms.Weighted binary codes and Non-weighted binary codes. Error detecting and error correcting codes. Alpha numeric codes.

Unit 2:

BOOLEAN ALGEBRA AND LOGIC FUNCTIONS

Boolean Algebra: Introduction to Boolean algebra-The AND, OR and NOT operations. Laws of Boolean algebra. Minimization of Boolean expression. Boolean expressions and logic diagrams. Universal building blocks. Negative logic. Logic Simplifications: Truth tables and maps. Sum-of-products and product-of-sums. Simplification of logic functions using Karanaugh map Minimization and Quine-Mc Cluskey method of minimization.

Unit 3:

COMBINATIONAL CIRCUITS

Arithmetic circuits: Half Adder, Full Adder, Half Subtractor and Full Subtractor, Number complements. Multiplexer - Demultiplexer, Decoder and Encoder code converters – BCD to Excess, Gray, and Seven Segment Display Conversions – Parity Generator and Checkers.

Unit 4:

SEQUENTIAL CIRCUITS

Synchronous sequential circuits: Basic latch circuits - Flip-flops, truth table and excitation table. Shift Registers. Synchronous counter design using JK, T, D flip flops, Up-down counter, General BCD counter and Ring counters. Asynchronous Sequential Circuits – State Reduction, Multiple Inputs.

Unit 5:

LOGIC FAMILIES AND PROGRAMMABLE LOGIC DEVICES

Logic Families: BJT as a switch –Logic Specifications –RTL, DTL, IIL, TTL open Collector O/P, Totempole O/P,Tristate O/P,Schottky TTL gate, ECL, MOS, CMOS Logic – Comparison of Logic Families. VHDL Implementation Programmable Logic Devices: PAL, PLA, PROM.

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Course Outcome:

CO:1. Explain the different number systems and coding schemes and arithmetic operations onbinary numbers

CO:2. Explain the basic theorems and properties of Boolean algebra

CO:3. Construct combinational logic circuits for the given requirement and determine their performance

CO:4. Utilize K- Map for gate level minimization of the given Boolean function

CO:5. Know about Flipflops and synchronous sequential circuits and their design

References:

[1]. Tocci R.J., Neal S. Widmer, 'Digital Systems: Principles and Applications', Pearson Education Asia, 12th Edition, 2017.

[2]. Donald P Leach, Albert Paul Malvino, Goutam Sha, 'Digital Principles and Applications', Tata McGraw Hill, 7th Edition, 2010.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1] Thomas L Floyd, 'Digital fundamentals', Pearson Education Limited, 11th Edition, 2018

[2] W.H. Gothmann: Digital Electronics - An Introduction, Theory and Practice, Prentice Hall of India, Secondedition, 1992.

[3] A.AnandKumar: Switching Theory and Logic Design –PHI,3rd Edition, July 2016

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	S	L	-	-	-	M	M	-	M
CO2	S	S	S	M	L	-	-	-	-	-	-	S
CO3	S	S	S	S	M	L	-	-	M	M	M	S
CO4	M	M	S	S	L	-	-	-	-	M	-	M
CO5	M	M	S	M	M	L	-	-	-	M	-	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184T50	Generation, Transmission And Distribution	4	3	50

Course Objective

- To develop expressions for the computation of transmission line parameters.
- To obtain the equivalent circuits for the transmission lines based on distance and operating
- Voltage for determining voltage regulation and efficiency.
- Also to improve the voltage profile of the transmission system.

Unit 1:

GENERATION AND DISTRIBUTION SYSTEMS

Hydel, thermal, nuclear, tidal, Biogas, Biomass plants – structure of electric power system-Oneline diagram - Generation, Transmission and Distribution systems – Comparison of distribution systems – Radial and ring systems – two wire DC, AC single phase and three phase systems Current and voltage calculation distribution with concentrated and distributed loads – Kelvin's for the design of feeders and its limitations.

Unit 2:

LINE PARAMETERS AND CORONA

Resistance and capacitance of single phase and three phase line –Stranded bundled conductor configuration – Symmetrical and unsymmetrical spacing –Transposition of line conductor – Double circuitlines – Application of self and GMD – Skin and proximity effects – Earth effect on capacitance –Interference – Corona characteristics – Effect on performance of lines.

Unit 3:

PERFORMANCE OF OVER HEADLINE

Equivalent circuits for short, medium (PI and T circuits) and longlines – Efficiency and Regular –Tuned power lines – Attenuation and surge impedance loading – Power circle diagrams for receiving and sending ends –Transmission capacity –Steady state power limit – Voltage control of lines –Shunt and series compensation.

Unit 4:

UNDER GROUND CABLES AND INSULATOR

Under ground cables – types Construction – Capacitance of cables – Insulation resistance –Dielectric stresses and grading – Capacitance and intersheath grading – Dielectric loss – Thermal characteristics - Capacitance of three corecables – Fault location –Short circuit and open circuit in – Insulators - Types and comparison – Voltage distribution in string insulators – String efficiency –Methods of improving efficiency.

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Unit 5:

MECHANICAL DESIGN AND HVDC TRANSMISSION

Stress and sag calculations – Effect of wind and ice-Supports at different levels –Stringing chart condition erection – Dampers – HVDC transmission: Comparison of AC and DC systems Economics distance for DC –Terminal equipment for DC systems.

Course Outcomes:

CO:1. Calculate the transmission network parameters for various configurations

CO:2. Calculate the performance characteristics of the given transmission line using nominal - T ,π, rigorous methods and power circle diagram

CO:3. Explain the effect of corona and over head transmission lines Calculate the sag of a over head line for various conditions

CO:4. Explain the various types of insulators, cables and their construction Calculate string efficiency of the suspension type insulators

CO:5. Compute the insulation resistance, capacitance and grading of cables Calculate the voltage at a point on the given type of distribution system

References:

[1].D.P.Kothari, I.J.Nagarath, 'Power System Engineering' Mc Graw -Hill Education pvt ltd, 2019.

[2]. Luces M.Fualkenberry ,Walter Coffer, 'Electrical Power Distribution and Transmission', Prentice Hall, 2011.

[3]. J.Brian, Hardy and Colin R.Bayliss' Transmission and Distribution in Electrical Engineering',Newnes;FourthEdition,2012.

[4]. W.L.Stevenson, 'Elements of power systems analysis' Mc Grawhill,1982.

[5]. Dr.S.L.Uppal,Prof.Sunil.S.Rao, 'Electrical power systems', khanna publishers,15th Edition, 1987.

[6]. M.L.Soni, U.S.Bhatnagar and P.V.Gupta, 'A course in electrical power' Dhanpat Rai &Sons,9th revised Edition,1987.

Text Books:

[1]. C.L.Wadhwa, 'Electrical Power Systems', New Age International Publishers, 6th edition,2018

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	-	-	-	-	-	M	-	M
CO2	S	S	S	M	L	-	-	-	-	M	-	M
CO3	M	M	S	S	M	S	M	M	M	M	M	S
CO4	M	M	S	M	L	M	M	M	S	S	L	M
CO5	M	M	M	S	M	S	S	M	S	M	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184T60	Data Structures [T&P] [Common To EEE/CSE]	4	3	45

Course Objective

- Learn linear data structures – list, stack, and queue.
- Learn Non linear data Structures -Trees and Graphs.
- Be exposed to sorting, searching and hashing algorithms.

Unit 1:

INTRODUCTION TO DATA STRUCTURES AND LINKED LIST

Definitions of Data Structure and Algorithm - Arrays - Structures, Unions, Pointers- Abstract Data Type (ADT)–Introduction to Linked list – Single and Double linked lists.

Unit 2:

LINEAR DATA STRUCTURES

Stacks - Array representation, linked list representation - Application - Infix, Postfix and prefix notation, Evaluating Postfix Expression, Converting an infix Expression to Postfix. Queue - Array representation, linked list representation – Double ended queue-Circular queue – Priority queue.

Unit 3:

NON LINEAR DATA STRUCTURES

Trees - Basic tree concepts - Binary trees -Tree Traversal Techniques - Pre order, Post order, IN order - Application of tree

Unit 4:

SORTING

Bubble sort - Radix sort – Binary Tree sort – Heap sort - Insertion sort – Shell sort – selection sort.

Unit 5:

SEARCHING

Searching – Introduction to search-Linear search, Binary search, Hash search. Hashing –Hashing Fundamentals – Hash function – Hashing methods – collision resolution technique.

Course Outcomes:

CO:1. Select appropriate data structures as applied to specified Problem definition

CO:2. Implement operations like searching, insertion, and deletion,Traversing mechanism etc. on various data structures.

CO:3. Students will be able to implement Linear and Non - Linear data structures

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CO:4. Implement appropriate sorting / searching technique forgiven problem.
CO:5. Determine and analyze the complexity of given Algorithms.

References:

[1]. Mark Allen Weiss–"Data Structures and Analysis in C"–2nd Edition, Pearson Education Pubs,2000.
[2].Aho, Hopcroft, Ullman–"Data Structures and Algorithms"–Pearson Education, 1998.
[3].Behrouz A.Forouzan, Richard Gilberg, "Computer Science–Structured Programming Approach Using C", Thomson Asia, 3rd Edition Nov2007
[4]. Robert L Kruse, Bruce P Leung and Vlovis L Tondo, "Data Structures and Program Design in C", 2nd Edition, Pearson Education, 2006.

Text Books:

[1]. Seymour Lipschutz–"Theory and Problems of Data Structures", (AVL Trees,B-Trees), Edition 2006, Tata mcgraw Hill, 12th Edition 2011.
[2].Ellis Horowitz & Sartaj Sahani –"Fundamentals of Data Structures in C"–W.H.Free man and Co., 2nd Edition,2007.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	-	-	S	M	L	S
CO2	M	S	M	S	S	M	-	-	S	M	L	S
CO3	M	M	M	M	S	M	-	-	S	M	L	S
CO4	M	S	M	S	S	M	-	-	S	M	M	M
CO5	M	S	M	S	S	M	-	-	S	M	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184P70	Measurements and Instrumentation Lab	4	2	

List of Experiments

1. Calibration of Wattmeter.
2. Calibration of Energy meter – Conventional and Electric type
3. Measurement of Resistance using Whetstone's bridge.
4. Measurement of Resistance using Kelvin's bridge.
5. Measurement of displacement Using LVDT.
6. Measurement of temperature by thermocouples.
7. Measurement of Speed by Photo – Electric Effect.
8. Measurement of Inductance by Anderson bridge.
9. Measurement of Capacitance by Schering bridge.
10. Usage of CT and PT for the measurement of High current and high voltage.
11. Study of Maximum demand Indicator and Trivector Meter.
12. Calibration of voltmeter and Ammeter.
13. Murray's & Vorley's test for Cable fault location.
14. Measurement of Earth Resistance by Megger.
15. Study of Phase Shifting Transformer.
16. Simulation using Lab View Software

Course Outcomes:

CO:1. Measurements of unknown electrical parameter using bridge measurements
CO:2. Analysis of performance of Electrical instruments.
CO:3. Simulation of basic mathematical operations, logic gate operations, conversion of temperature and bridge circuit using LABVIEW

Text Books:

[1]. Patranabis, Sensors and Transducers, Prentice Hall of India, 2nd Edition, 2004.
[2].Cooper W.D., "Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, New Delhi, 2003.
[3].Joseph JCarr, Elements of Electronic Instrumentation & Measurement, Pearson, 3rd Edition 2010.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF184P80	DC Machines And Transformers Lab	4	2	

List of Experiments

1. Load test on D.C shunt Generator
2. Load test on D.C Series Generator
3. Load test on D.C Shunt Motor
4. Load test on D.C Series Motor
5. Speed control of D.C Shunt Motor.
6. Load test on Compound Generator
7. Predetermination of Efficiency of D.C Shunt Generator by Swinburne's test
8. O.C & S.C Test on Single phase Transformer
9. Load test on Single Phase Transformer
10. Sumpner's test.
11. Parallel Operation of Single phase transformers
12. Three Phase Transformer Connections

Course Outcomes:

CO:1. Three Phase Transformer Connections
CO:2. Load test on D.C shunt Generator, D.C Series Generator, Compound Generator
CO:3. Load test on D.C shunt Motor, D.C Series Motor.
CO:4. Speed control of D.C shunt Motor
CO:5. Parallel Operation of Single phase transformers
CO:6. Predetermination of Efficiency of D.C Shunt Generator by Swinburne's test
CO:7. Sumpner's test, O.C & S.C Test on Single phase Transformer

References:

[1]. Dr.Murgesh Kumar,"D.C Machines and Transformer",Vikas Publishers, 2013.

Text Books:

[1]. Theraja &A.K.Theraja,"Electrical Technology",Vol II, S.Chand Company Ltd, New Delhi, 2002.
[2].R.K Rajput,"Electrical Machines", 4th Edition, Laxmi publications, 2008.

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SYLLABUS

Course Code	Course Name	Semester	Credit	
BEEF184P90	Digital Electronics Lab	4	2	

List of Experiments

1. Verification of Truth table of various logic gates.
2. Design and implementation of half and full adder circuits.
3. Design and implementation of half and full subtractor circuits.
4. Design and implementation of Multiplexer.
5. Design and implementation of Demultiplexer.
6. Design and implementation of Decoders.
7. Design and implementation of Encoders.
8. Design and implementation of Shift register.
9. Design and implementation of Code Converters.
10. Design and implementation of Counter Circuits.
11. Realization of different Flip – Flops using logic gates.

Course Outcomes:

CO:1. Demonstrate minimization of the given Boolean function using K-Map using logic gates

CO:2. Construct combinational logic circuit for the given application and analyse its performance using PSIM software

CO:3. Construct synchronous/ asynchronous sequential logic circuits for the given application and analyse its performance Using PSIM software

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SYLLABUS

FIFTH SEMESTER

Course Code	Course Name	Semester	Credit	Hours
BEEF185T10	Digital Signal Processing And Its Applications	5	3	45

Course Objective

- To introduce discrete Fourier transforms.
- To teach the design of infinite and finite impulse response filters for filtering undesired signals.
- To study the architecture of TMS320F24XX process or and about communication interface

Unit 1:

INTRODUCTION

Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; classification of signals: continuous and discrete, energy and power; mathematical representation of signals; spectral density; sampling techniques, quantization, quantization error, Nyquistrate, aliasing effect. Digital signal representation.

Unit 2:

DISCRETE TIME SYSTEM ANALYSIS

Z-transform and its properties, inverse z-transforms; Fourier transform of discrete sequence –Discrete Fourier series. Computation of DFT using FFT algorithm - DIT & DIF - FFT using radix 2 –Butter fly structure.

Unit 3:

DESIGN OF DIGITAL FILTERS

FIR & IIR filter realization - Direct I, Direct II Parallel & cascade forms- IIR design: Analog filter design – Butter worth and Chebyshev approximations; digital design using impulse in variant and bilinear transformation.

Unit 4:

DIGITAL SIGNAL PROCESSORS

Introduction – Architecture of TMS320F24XX – Event Manager – General purpose Timer –Serial Communication interface – Serial Peripheral Interface – CAN –Features– pipeline- Instruction set.

Unit 5:

DSP APPLICATIONS TO MOTOR CONTROL

PWM generation using LF24XX - Procedure; DSP control of BUCK-BOOST converter-Block diagram; DSP Control of BLDC Motor – Block diagram; SVPWM generation using LF24XX–Procedure.

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SYLLABUS

Course Outcomes:

CO:1. Characteristics of different digital systems
CO:2. Compute Discrete Fourier Transform for the given signals
CO:3. Design the Digital Infinite Impulse Response Filters (IIR) from given Specifications
CO:4. To describe about TMS320F24XX processor
CO:5. Use of TMS320F24 XX processor for power electronic applications.

References:

[1]. M.H.Hayes, "Digital signal processing", Schum's outlines, Tata McGraw Hill, 2011.

[2].A.V.Oppenheim, R. W. Schafer and J. R. Buck, "Discrete-time signal processing", Pearson, 2004.

[3].R.G.Lyons, "Understanding Digital Signal Processing", Addison Wesley, 4th Edition,2010.

[4].TMS320C2xx User's Guide,Texas Instruments,2005.

Text Books:

[1]. John G. Proakis, Dimitris K Manolakis, "Digital Signal Processing – Principles,Algorithms and Appications", Pearson Education,5th Edition, 2021.

[2]. Sanjit.K.Mitra, "Digital Signal Processing – A computer Based Approach", Tata Mc Graw–Hill Edition, Edition 4, 2013.

[3].Hamid A.Toliyat Steven Campbell, "Dsp-Based Electro mechanical Motion Control", CRC Press, 1st Edition, 2019.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	M	-	-	M	M	L	L
CO2	S	S	S	S	M	M	-	-	M	S	L	M
CO3	S	S	M	M	M	M	-	-	S	S	M	S
CO4	M	M	M	M	M	M	-	-	S	S	M	M
CO5	M	M	S	S	M	S	-	-	S	S	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185T20	Micro Processor and Micro Controllers	5	3	45

Course Objective

- To learn the concepts of microprocessor, microcontroller and its applications.
- To design microprocessor & micro controller along with interfacing devices
- To understand the impact of micro controller in engineering applications.

Unit 1:

INTEL 8086 MICRO PROCESSOR

Micro processor Evolution and Types- Architecture of 8086- Pin configuration-Instruction Set-Addressing Modes–Interrupts-Simple Programs

Unit 2:

INTEL 8051 MICRO CONTROLLER

8051 Architecture - pin configuration – flags and PSW - CPU registers-Internal RAM & ROM-Special Function Registers- I/O Ports & Circuits.

Unit 3:

INTEL 8051 PROGRAMMING

Instruction Set - Data Transfer Instruction - Arithmetic and Logical Instruction - Jump Loop and Call Instruction - Simple Programs.

Unit 4:

PERIPHERAL INTERFACING

Parallel I/O (8255) Programmable Interval Timer (8253/8254) - Keyboard/ Display Controller 8279) – Serial I/O (8251) using 8086 Microprocessor. A/D and D/A Interfacing –Temperature Sensor Interfacing-Stepper Motor Interfacing using 8051 Microcontroller.

Unit 5:

ADVANCED MICROPROCESSOR AND MICROCONTROLLER

Architecture of AVR, PIC and ARM Micro controllers - JTAG Concepts and Boundary Scan Architecture-Core 2 duo Processor - i7 Core Processor (Qualitative Study).

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Course Outcome:

CO:1. Demonstrate potential knowledge in internal hardware details of microprocessor& microcontroller

CO:2. Assembly language programs for data manipulating and accessing on -chip hardware units.

CO:3. Design suitable interfaces for real time applications.

CO:4. Exhibit programming skills, choose suitable hardware and program the devices to solve engineering problems.

CO:5. Design suitable interfaces for real time applications

References:

[1]. Douglas V.Hall, " Micro processors and Interfacing : Programming and Hardware", Tata Mc Graw Hill, 3rd Edition, July 2017.

[2].Mohamed Ali Mazidi, Janice Gillispie Mazidi, "The 8051micro controller and embedded systems using Assembly and C", second edition, Pearson education /Prentice hall of India, 2007.

[3].A.K.Ray, K.M.Bhurchandi, "Advanced Microprocessor and Pheripherals", Tata Mc Graw Hill, 3rd Edition, 2013.

Text Books:

[1]. AmarK.Ganguly,"AnuvaGanguly, Micro processor and Micro controller 8085, 8086 and 8051", Narosa Publication House Pvt. Ltd, 2012.

[2].Kenneth J.Ayala,"The 8051micro controller Architecture, Programming and applications", Third edition, Cengage Learning India pvt ltd, 2017.

[3].D.Karunasagar, "The 8051 micro controller", Cengage Narosa Publication House Pvt.Ltd,1st Edition, 2011.

[4]. Atul.P.Godse,.Deepali.A.Godse, "Microprocessor and microcontroller",technical publication,second edition,December 2020

[5].A.K.Gautam,"Advance microprocessor",Khanna publishers,2019

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	S	M	L	-	M	M	L	M
CO2	S	S	S	S	S	S	L	L	S	S	M	S
CO3	S	S	S	S	S	S	L	L	S	S	M	S
CO4	S	S	S	S	S	M	L	L	S	S	M	S
CO5	S	S	S	S	S	S	L	L	S	S	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185T30	Control Systems	5	3	50

Course Objective

- Analyze representation of systems and to derive transfer function models.
- Provide adequate knowledge in the time response of systems and steady state error analysis.
- Give basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.

Unit 1:

SYSTEM AND THEIR REPRESENTATION

Basic elements of control systems- open and close loop systems – Differential equation -Transfer function – Modelling of Electrical systems, translational and rotational mechanical systems–Block diagram reduction techniques –Signal flow graphs.

Unit 2:

TIME RESPONSE

Time response –Timedomain specifications – types of input – I and II order system response – Error coefficients – Generalized error series – Steady state error – Effect of P, PI, PD and PID mode so feed back control, Analysis using MATLAB.

Unit 3:

FREQUENCY RESPONSE

Frequency response – Bode plot – Polar plot – Nyquist plot – Frequency domain specifications from plots – Constant M and N circles – Nichol's char t– Analysis using MAT LAB.

Unit 4:

STABILITY AND COMPENSATOR DESIGN

Characteristic equation – BIBO stability - Routh Hurwitz criterion - Root locus technique Construction of Root locus - Nyquist stability criterion – Effect of Lag, Lead and lag-lead compensation on frequency response, Analysis using MAT LAB.

Unit 5:

STATE VARIABLE ANALYSIS

Concept of state variables – State models for linear and time invariant systems – solution ofstate and output equation in controllable canonical form – concept of controllability and observability–Effect of state feedback

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Course Outcome:

CO:1. Basics of systems, Modelling of various kind of systems, detection of transfer function from the pictorial representation
CO:2. Analyse the performance of the systems with time base
CO:3. Analyse the performance of the systems with frequency base
CO:4. Stability analysis and compensation techniques
CO:5. State space condition of the systems

References:

[1].Benjamin C.Kuo, "Automatic control systems", PHI, 9th Edition, 2014.
[2].Nagrath I.J and Gopal M, "Control Systems Engineering", New Age Publishers, 6th Edition, 2018.
[3]. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/

Text Books:

[1] . M.Gopal, "Control system – Principle and Design", Tata McGraw Hill, 4thEdition, 2012.
[2] . K.Ogata, "Modern control engineering", 5th Edition, PHI, 2015.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	L	L	M	M	L	M
CO2	S	S	S	S	M	M	M	L	S	S	M	M
CO3	S	S	S	S	M	S	M	L	S	M	M	M
CO4	S	S	S	S	S	S	M	L	S	M	M	S
CO5	S	S	S	S	S	M	M	L	S	M	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185T40	Induction And Synchronous Machines	5	3	45

Course Objective

- To know the Construction and performance of salient and non – salient type synchronous generators.
- To provide deep understanding of Principle of operation and performance of synchronous motor.
- To impart knowledge on Construction, principle of operation and performance of induction machines.

Unit 1:
ALTERNATORS

Construction- types - circuit model - synchronous reactance - voltage regulation - EMF, MMF, Potierand ASA methods – armature reaction – synchronizing –parallel operation.

Unit 2:
SYNCHRONOUS MOTORS

Principle -Starting-Speed-torque curves -phasor diagrams - V & inverted V curves- phase modifiers-Hunting in synchronous machines and its prevention – applications.

Unit 3:
THREE PHASE INDUCTION MACHINES

Construction - types - principle of operation - equivalent circuit - torque and power output -testing - circle diagram - cogging and crawling - starting and speed control double cage rotor – induction generator.

Unit 4:
SINGLE PHASE INDUCTION MACHINE

Single phase induction motor - double revolving field theory - equivalent circuit – performance analysis-load characteristics – starting methods

Unit 5:
FRACTIONAL HORSE POWER MOTORS

Shaded - pole induction motor - variable reluctance motor - stepper motor - AC series motor – repulsion motor - linear motor - permanent magnet DC and AC motors.

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Course Outcome:

CO:1. Types of alternators, induction motors Applications of alternators, induction motors and fractional horse power motors

CO:2. Construction and working of synchronous, Induction and special types of machines. Armature reaction and synchronizing methods. Double Field revolving Theory.

CO:3. Determination Voltage Regulation of Alternator by EMF, MMF, ZPF and ASA methods.

CO:4. Performance analysis of three phase and single phase induction motors. Phasor diagrams, v - curve and inverted v - curves of synchronous machines.

CO:5. Estimation of torque and power output. Equivalent circuits of alternator, three and single phase Induction machines.

References:

[1]. Fitzgerald, A.E.Charles KingsleyJr.Stephen D.Umans,"Electric Machinery", Mc Graw-Hill Book Company, 5th Edition, 2005.

[2].Syed A.Nassar, "Electric Machines and Power System", Vol - I, Mc Graw – Hill Inc., NewYork.

[3].Dr.Murgesh Kumar, "Induction and synchronous machines", vikas publications, NewDelhi, 1stEdition 2004.

[4].Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 2016.

[5]. M.N. Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2011.

[6]. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers,3rd Edition, Reprint 2015.

[7]. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt. Ltd, First edition 2010.

[8]. Alexander S. Langsdorf, 'Theory of Alternating-Current Machinery', McGraw Hill Publications, 2001.

Text Books:

[1]. B.L.Theraja & A.K.Theraja, "Electrical Technology",Vol - II, S.Chand Company Ltd, New Delhi, 23rd Edition, 2007.

[2].A.E. Fitzgerald, Charles Kingsley, Stephen. D. Umans, 'Electric Machinery', McGraw Hill publishing Company Ltd, 6th Education 2017.

[3]. Stephen J. Chapman, 'Electric Machinery Fundamentals'4th edition, McGraw Hill Education Pvt. Ltd, 4th Edition 2017.

[4]. D.P. Kothari and I.J. Nagrath, 'Electric Machines', McGraw Hill Publishing Company Ltd, 5th Edition 2017

[5]. P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, edition 2, 2021.

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SYLLABUS

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	L	L	M	M	L	M	M	L	M
CO2	M	M	M	L	L	M	L	L	L	L	M	M
CO3	S	S	S	S	M	M	L	L	S	S	L	M
CO4	S	S	S	S	M	M	L	L	S	S	L	M
CO5	M	M	S	S	M	M	-	-	S	S	L	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185T50	Power Systems – I (Modelling And Components)	5	3	50

Course Objective

- Understand the concepts of power systems.
- Understand the various power system components.
- Evaluate fault currents for different types of faults.
- Understand the generation of over-voltages and in sulation coordination.
- Understand basic protection schemes.

Unit 1:

BASIC CONCEPTS

Evolution of Power Systems and Present – Day Scenario. Structure of a power system: Bulk Power Grids and Micro-grids. Generation: Conventional and Renewable Energy Sources. Distributed Energy Resources. Energy Storage. Transmission and Distribution Systems: Line diagrams, transmission and distribution voltage levels and topologies (meshed and radialsystems). Synchronous Grids and Asynchronous (DC) inter connections. Review of Three-phase systems. Analysis of simple three-phase circuits. Power Transfer in AC circuits and Reactive Power.

Unit 2:

POWER SYSTEM COMPONENTS

Overhead Transmission Lines and Cables: Types of Travelling-wave Equations. Sinusoidal Steady state representation of Lines: Short, medium and long lines. Power Transfer, Voltage profile and Reactive Power. Characteristics of transmission lines. Surge Impedance Loading. Series and Shunt Compensation of transmission lines.Transformers: Vector Representation and Phase-shifts. Three-winding transformers, auto-transformers, Neutral Grounding transformers.Tap-Changing in transformers. Synchronous Machines: Steady-state performance characteristics. Operation when connected to infinite bus. Real and Reactive Power Capability Curve of generators. Typical wave for munder balanced terminal short circuit conditions - steady state, transient and sub-transient equivalent circuits. Loads: Types, Voltage and Frequency Dependence of Loads. Per-unit System and per-unit calculations.

Unit 3:

OVER – VOLTAGES AND INSULATION REQUIREMENTS

Generation of Over - voltages: Lightning and Switching Surges. Protection against Over-voltages, Insulation Coordination. Propagation of Surges, lighting arresters, surge arresters.Voltages produced by traveling surges. Bewley Diagrams, Ground wire, protector tube.

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SYLLABUS

Unit 4:

FAULT ANALYSIS AND PROTECTION SYSTEMS

Method of Symmetrical Components (positive, negative and zero sequences). Balanced and Unbalanced Faults. Representation of generators, lines and transformer sinsequencenet works. Computation of Fault Currents. Neutral Grounding.

Switchgear: Types of Circuit Breakers. Attributes of Protection schemes, Back-up Protection. Protection schemes (Over-current, directional, distance protection, differential protection) and their application. Earthing switches.

Unit 5:

NUMERICALPROTECTION

Introduction, Block Diagram of a Numerical Relay, Numerical over current Protection, Numerical Transformer Differential protection, Numerical distance protection of Transmissionline, Software and Hardware.

Course Outcome:

CO:6. Explain the Structure of a power system.

CO:7. Analysis of simple three – phase circuits – Power Transfer in AC circuits and Reactive Power.

CO:8. Calculation of Surge Impedance Loading. Comparison of Series and Shunt Compensation of transmission lines.

CO:9. Per-unit System and per-unit calculations. Explain Lightning and Switching Surges.

CO:10. Method of Symmetrical Components. Types of Circuit Breakers.

References:

[1].Wadhwa C.L., "Electrical Power Systems", New Age International Pvt. Ltd., Publishers, 2016, 7th Edition.

[2].Patra S.P., Basu S.K. and Chowduri S., "Power systems Protection", Oxford and IBH Publishing Co,1983.

[3].Sunil.S.Rao,"Switch gear Protection and power systems", Khanna Publishers, New Delhi,14th Edition, 2019.

Text Books:

[1]. Ravindranath.B and Chander.N, "Power System Protection and Switchgear", New Age International 2nd Edition, 2018

[2].Chakrabarti.A, Soni.M.L, Gupta.P.V, "A text book on power system Engineering", Dhanpatrai & Co. pvt.Ltd., 2013.

[3].Y.G.Paithankar andS.R.Bhinde,"Fundamentals of power system protection",PHI,NewDelhi,2010.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	M	M	L	M	M	M	L
CO2	S	S	S	S	M	M	L	L	S	S	L	M
CO3	S	S	S	S	M	M	L	L	M	S	L	L
CO4	S	S	S	S	S	M	M	L	S	S	M	M
CO5	S	S	S	S	M	M	M	L	S	S	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185P70	Induction and Synchronous Machines Lab	5	2	

List of Experiments

1. Load test on alternator.
2. Predetermination of Regulation of Alternator by EMF /MMF/ ZPF methods.
3. Parallel operation of Alternators.
4. Determination of "V" & inverted "V" Curves.
5. Load test on three phase Induction motors.
6. Speed control of Induction Motors.
7. Determination of Equivalent circuit of Three – phase induction Motor.
8. Predetermination of efficiency by Circle Diagram for three - phase induction motor.
9. Load test on Induction Generators.
10. No load and Blocked Rotor test on Single Phase Induction Motor.
11. Load test on Single Phase Induction Motor.
12. Study of Induction Motor starters.

Course Outcome:

CO:1. Study of Induction Motor starters

CO:2. Load test on alternator. Load test on three phase Induction motors, Load test on Induction Generators, Load test on Single Phase Induction Motor.

CO:3. Predetermination of Regulation of Alternator by EMF / MMF/ZPF methods, Predetermination of efficiency by Circle Diagram for three – phase induction motor.

CO:4. Determination of "V"& inverted "V" Curves. No load and Blocked Rotor test on Single Phase Induction Motor.

CO:5. Determination of Equivalent circuit of Three – phase induction Motor

Text Books:

[1]. B.L. Theraja & A.K.Theraja, "Electrical Technology", Vol-II, S.Chand Company Ltd, NewDelhi,2007.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185P70	Control Systems Lab	5	2	

List of Experiments

1. Transfer function of separately Excited DC generator.
2. Transfer function of field controlled of DC Motor.
3. Transfer function of Armature controlled of DCMotor.
4. DC Position control of Servo System.
5. AC Servo Motor Speed – torque characteristics.
6. AC Position control of Servo System.
7. Experiments using PID Controller.
8. Studies of phase Lead, phase lag, lag lead compensators.
9. Magnetic amplifier characteristics.
10. Experiments using MAT LAB.
11. Synchro-Transmitter-Receiver and Characteristics

Course Outcome:

CO:1. Determinations of transfer function of various electrical machines
CO:2. Analysis of performance of compensation techniques.
CO:3. Analysis of performance of the closed loop systems with controllers.
CO:4. Analysisof time response, frequency response, stability and modelling of system using MATLAB

Text Books:

[1]. M.Gopal,"Control system – Principle and Design, " Tata Mc Graw Hill,4th edition, 2012.
[2].K.Ogata, "Modern control Engineering,"fifth edition, PHI, 5th Edition, 2015.

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SYLLABUS

Course Code	Course Name	Semester	Credit	
BEEF185P90	DSP And Micro Controllers Lab	5	2	

List of Experiments

1. Using Assembly/ Embedded 'C' Program with 8051micro controller Addition, Subtraction, Multiplication, Division.
2. Interfacing of 7segment LED/LCD display
3. Interfacing of ADC/DAC conversion
4. Interfacing of Stepper Motor
5. Relay Interface
6. Keyboard Interface
7. I2C based serial EEPROM/RTC using I2C
8. Using Code Composer Studiowith TMS320F2418DSP
9. Study of special instruction in C2418 and its programming.
10. Wave form generation using C2418 and 12bit DAC.
11. Generation of fixed pulse width modulation using full compare unit/ Generation of pulse width modulation with specified switching frequency.
12. Reading the analog voltage through on chipADC module.
13. Generation of Sinepulse width modulation with constant output frequency.
14. Interfacing of limit switches and its programming / Interfacing of LCD display.
15. Model based design and verification using simulink and realization with 2418.
16. Model based design to access Input port using Simulink and realized with C2418 kit.
17. Model based design to access pulse width modulator for generate fixed PWM using Simulink and realized with C2418 kit.

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Course Outcomes:

CO:1. Write 8051assembly language programs and embedded,, C‟ Programs for micro controller to implement arithmetic operations and code conversions

CO:2. Develop 8051based embedded , C ‟programs for ADC and DAC interfacing, 7segment LCD/LED display, stepper motor interface, Relay interface.

Text Books:

[1]. John G. Proakis, Dimitris K Manolakis, “Digital Signal Processing”, Pearson Prentice Hall PublishingLtd, 2007.

[2].Kenneth J.Ayala,“The 8051 micro controller Architecture, Programming and applications” , Third edition, Cengage Learning India pvt ltd,2009.

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SYLLABUS

SIXTH SEMESTER

Course Code	Course Name	Semester	Credit	Hours
BEEF186T10	Power Electronics	6	3	45

Course Objective

- To get an overview of different types of power semiconductor devices and their switching characteristics.
- To understand the operation, characteristics and performance parameters of controlled rectifier.
- To study the operation, switching techniques and basic topologies of DC-DC switching regulators.

Unit 1:

POWER SEMI CONDUCTOR DEVICES

Basic structure and switching characteristics of Power Diode, Power Transistor, Power MOSFET, IGBT and GTO. SCR – Basic Operation-VI characteristics-Turn-on, Turn – off methods –Switching characteristics – Combination of SCRs – Snubber circuits- Ratingsand Protection circuits.

Unit 2:

AC-DC CONVERTERS

Principles of Phase control - Natural commutation - Operation of 1Φ H.Wcontrolled converters with R, RL, RL + FWD, RLE Loads-1ΦF. W controlled converters with R, RL load, RL+FWD for bridge type converters. Operation of 3Φ H.W. controlled converters & F.W. controlled converters with R, RL –Effect of Source inductance on1Φ and 3ΦF.W controlled converters- Operation of Dual converters.

Unit 3:

DC-DC CONVERTERS

Voltage, Current and Load commutation – Principles of chopper – Control strategies - T.R.C, C.L.C - Step-up, Step-down, Step-up-down choppers-Classification and operation of Choppers (A, B, C, D, and E). Introduction to Resonant converters – Effect of EMI on converters.

Unit 4:

DC-AC CONVERTERS

Classification of Inverters – Basic Series Inverter – Basic Parallel Inverter –VSI Operation –single phase half Bridge and Full Bridge - three phase 180^o & 120^o conduction modes. CSI – Operation of single phase CSI with ideal switches – voltage control techniques in single phase inverters.

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Unit 5:

AC – AC CONVERTERS

Types of control (phase & Integrated cycle control), Operation of single phase voltage regulator with R,RL Loads. Operation of three phase AC voltage controls (with Antiparallel SCR configuration) with R load operation. Cycloconverters: single phase-stepup & step down cycloconverters, three phase cyclo converter with R, RL loads.

Course Outcome:

CO:1. Understand the Basic structure, working and Switching characteristics of Power semi conductor devices
CO:2. Various protection circuits for power semi conductor devices.
CO:3. Principle and working of AC-DC controlled converters
CO:4. AC-DC Converters with different types of load
CO:5. Working of Different types of DC Choppers
CO:6. Voltage Control strategies for DC Choppers
CO:7. Working of different types of DC-AC Converters
CO:8. Calculating voltage in 120 degree and 180 degree modes operation
CO:9. Operation of AC-AC Converters and control techniques
CO:10. Calculate voltage and frequency for AC-AC Converters

References:

[1]. M. D.Singh & K.B.Kanchandhani, "Power Electronics", Tata Mc Graw–Hill Publishing Company, 2nd Edition, 2014.

[2].N.Mohan, T.M.Undeland, W.P.Robbins, "Power Electronics, Converters and Applications & Design", 3rd Edition John Wiley & sons. 2007.

[3].Dr.P.S.Bimbhra, "Power Electronics", Khanna Publishers, New Delhi, Edition, 2012.

Text Books:

[1]. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition, 2014.

[2].Theory of Power Electronics, "K.L.Rao, C.H.SaiBabu - S.Chand& Company Ltd.", New Delhi.5th Edition, 2010.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	L	L	L	M	M	-	M
CO2	M	S	M	S	S	M	M	L	M	M	L	M
CO3	S	S	M	M	S	M	M	L	M	M	-	M
CO4	S	S	S	S	S	M	M	-	S	S	-	M
CO5	S	M	M	M	S	M	M	-	S	S	-	M
CO6	S	S	S	S	S	M	L	L	S	S	L	M
CO7	M	M	M	M	S	M	M	M	S	S	L	M
CO8	M	M	S	S	S	M	M	L	S	S	L	M
CO9	M	M	M	M	S	M	L	L	S	S	L	M
CO10	S	S	S	S	S	L	L	L	S	S	L	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186T20	Embedded Systems	6	3	45

Course Objective

- To study the architecture of LPC2148 ARM processor.
- To learn the design aspects of LPC2148 S I/O and memory interfacing circuits.
- To study about communication and bus interfacing.

Unit 1:

ARM INTRODUCTION

Introduction - The ARM Architecture Overview - Instruction set Summary - Processor operating states- Memory formats - Memory Interface - Bus interface signals -Addressing signals Addressing timing – Data Timed Signals - Debug interface - Debug systems - Debug interface signals - ARM7TDMI Core and system state- About Embedded ICE- RT Logic–Instruction Set.

Unit 2:
LPC2148ARM CPU

Introduction: - Architectural Overview - Memory Mapping -Block Diagram System control block functions: PLL - Power Control - Reset - VPB Divider - Wakeup Timer - Memory Acceleration Module – Timer 0 and Timer1-PWM -RTC-On Chip ADC-On Chip DAC-Interrupts-Vector Interrupt Controller.

Unit 3:
LPC2148 –PERIPHERALS

General Purpose Input/ Output Ports (GPIO)-Universal Asynchronous Receiver/Transmitter (UART) - I2C Interface – Multi master and Multi slave communication - SPI Interface - SSP Controller –USB2.0 Device Controller.

Unit 4:
OPERATING SYSTEM OVERVIEW

Introduction – I OS – Function of OS – Definingan RTOS – Differences in Embedded Operating Systems– Introduction to Kernel – Resources – Shared Resources – Defining a Task – Task States – Multitasking – Scheduling and Scheduling Algorithms – Context Switching – Clock Tick – Timing of Task.

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Unit 5:
MC/OS – II

Introduction – II Task Management Functions – Creating a Task - Time Management Functions – OS Delay Functions- Implementation of Scheduling and rescheduling.

Course Outcome:

Understand basic concept to embedded systems.

CO:1. Analyze the applications in various processors and domains of embedded system
CO:2. To describe about ARM architecture
CO:3. To understand the building blocks of ARM LPC 214X and its peripherals
CO:4. To describe about the Real time Operating Systems
CO:5. To understand the micro C/Os Real time operating system and its functions

References:

[1]. Micro C/ OS–II - Real Time, Kernel Jean J.Labrosse McGraw Hill, 2nd Edition 2002.
[2].Real Time Concepts for Embedded Systems–by Qing Li and Caroline Yao, 2003.
[3].Embedded / Real Time Systems: Concepts, Design & Programming by Dr.K.V.K.K Prasad Dreamtech Press, 2000.
[4]. ARM Architecture Reference Manual, LPC214x User Manual.
[5]. David. E. Simon, "An Embedded Software Primer", 1st Edition, Pearson India, 2007.

Text Books:

[1]. Embedded Systems Architecture- Tammy Noergaard, Newnes 2nd Edition 2013.
[2].ARM System Developer's Guide: Designing and Optimizing System Software 1st Edition, Andrew N.Sloss Publisher Morgan Kaufmann Publishers,2011.
[3].ARM Architecture Reference Manual –David Seal Addison Wesley, 2000.
[4].ARM System-on-Chip Architecture (2nd Edition) by Steve Furbe ,Addison Wesley, 2015.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	M	M	M	M	M	L	L	S	S	L	M
CO2	S	M	M	M	M	M	L	L	S	S	L	M
CO3	S	S	S	S	S	M	L	L	S	S	L	M
CO4	S	S	M	S	S	M	M	L	S	S	M	M
CO5	S	S	M	S	S	M	M	L	S	S	M	M

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Course Code	Course Name	Semester	Credit	Hours
BEEF186P70	Power System Protection Lab	6	2	

List of Experiments

1. Study of fuse and MCB.
2. Study and testing of CONTACTORS.
3. Study and testing of thermal over load relay.
4. Study and testing of three phase induction motor Protection.
5. To study and testing of DMT type over current relay.
6. To study the Power factor improvement of three phase induction motor.
7. To study the characteristics of Reverse Power relay.
8. To study the characteristics of earth fault relay.
9. To perform symmetrical/ Un symmetrical fault analysis using PSCAD.
10. Line parameter calculation using MIPOWER / MATLAB.
11. To study the performance of transmission line using ABCD parameters.
12 To study voltage in stability analysis using MIPOWER

Course Outcomes:

CO:1. Study off use and MCB, Study and testing of CONTACTORS and thermal over load relay, Study and testing of three phase induction motor over current Protection, Study and testing of alternator protection

CO:2. Study and testing of impedance relay, Study and testing of three phase induction motor over current Protection, To study and test the unbalancing protection of three phase induction motor, To study the characteristics of Reverse Power relay.

CO:3. To study the characteristics of earth fault relay.

CO:4. perform symmetrical/ Un symmetrical fault analysis using PSCAD

CO:5. Line parameter calculation using MIPOWER / MATLAB

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186P80	Power System Lab – I (Testing)	6	2	

List of Experiments

1. Study of Instantaneous Relay and determination of pick up and reset values
2. Study and testing of Directional Over current relay
3. Study and testing of percentage Differential relay.
4. To plot Burden curve and to find Ratio and phase angle error of CT and PT.
5. To determine the breakdown voltage of transformer oil and insulators.
6. Control of three-phase induction motor for forward and reverse direction.
7. Plugging and jogging of three-phase induction motor.
8. Dynamic breaking of D.C and A.C motors.
9. Control of three phase induction motor using star/delta, delta/star, semi and fully automatic and stator-rotor starter.
10. Single-phase preventer circuit for motors.
11. Preparing of single line layout of Industrial and Domestic distribution for given capacity.
12. Measuring Insulation strength of machines & Measuring Earth resistance.

Course Outcome:

CO:1. Study and Obtain the pickup values and reset values of instantaneous relay

CO:2. Obtain the break down voltage of transformer oil.

CO:3. Analysis of single phase preventer circuit for motor

CO:4. Preparing of single line layout of Industrial and Domestic distribution system.

CO:5. Measuring Insulation strength of machines & Measuring Earth resistance.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186P90	Embedded Systems Design Lab	6	2	

List of Experiments

1. Study of ARM evaluation system
2. Interfacing ADC and DAC
3. Interfacing LED and PWM
4. Interfacing realtime clock and serial port
5. Interfacing keyboard and LCD
6. Interfacing EPROM and interrupt
7. Mailbox.76
8. Interrupt performance characteristics of ARM and FPGA
9. Flashing of LEDS
10. Interfacing stepper motor and temperature sensor
11. Implementing zigbee protocol with ARM

Course Outcome:

CO:1. Analyze the architecture of a ARM processor

CO:2. Write and execute program to generate PWM waveforms

CO:3. Write and execute program to interface ADC and DAC with ARM Processor

CO:4. Write and execute program to interface stepper motor, temperature sensor and others with ARM Processor

CO:5. Design an embedded system for a specific application

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SYLLABUS

SEVENTH SEMESTER

Course Code	Course Name	Semester	Credit	Hours
BEEF187T10	Power System - II (Analysis & Control)	7	3	45

Course Objective

- Understand the monitoring and control of a power system.
- Understand the basics of power system economics.
- Understand the stability constraints in synchronous grids.

Unit 1:
POWER FLOW ANALYSIS

Review of the structure of a Power System and its components. Analysis of Power Flows: Formation of Bus Admittance Matrix. Real and reactive power balance equations at a node. Load and Generator Specifications. Application of numerical methods for solution of nonlinear algebraic equations – Gauss Seidel and Newton-Raphson methods for the solution of the power flow equations. Computational Issues in Large-scale Power Systems.

Unit 2:
STABILITY CONSTRAINTS IN SYNCHRONOUS GRIDS

Swing Equations of a synchronous machine connected to an infinite bus - Power angle curve - Description of the phenomena of loss of synchronism in a single-machine infinite bus system following a disturbance like a three--phase fault - Analysis using numerical integration of swingequations (using methods like Forward Euler, Runge-Kutta 4th order methods), as well as the Equal Area Criterion - Impact of stability constraints on Power System Operation - Effect of generation rescheduling and series compensation of transmission lines on stability.

Unit 3:
CONTROL OF FREQUENCY AND VOLTAGE

Turbines and Speed - Governors, Frequency dependence of loads, Droop Control and Power Sharing. Automatic Generation Control - Generation and absorption of reactive power by various components of a Power System - Excitation System Control in synchronous generators, Automatic Voltage Regulators - Shunt Compensators, Static VAR compensators and STATCOMs - Tap Changing Transformers - Power flow control using embedded dc links, phase shifters.

Unit 4:
MONITORING AND CONTROL

Overview of Energy Control Centre Functions: SCADA systems. Phasor Measurement Units and Wide-Area Measurement Systems. State – estimation. System Security Assessment. Normal, Alert, Emergency, Extremis states of a Power System – Contingency Analysis – Preventive Control and Emergency Control.

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Unit 5:
POWER SYSTEM ECONOMICS AND MANAGEMENT

Basic Pricing Principles: Generator Cost Curves, Utility Functions, Power Exchanges, Spot Pricing. Electricity Market Models (Vertically Integrated, Purchasing Agency, Whole – sale competition, Retail Competition), Demand Side – management, Transmission and Distributions charges, Ancillary Services. Regulatory framework – Power System Management – Formulation of Economic Dispatch Problem – Incremental cost calculations – Co ordination equation with and without losses - Unit Commitment Problems.

Course Outcomes:

CO:1. Review of the structure of a Power System and its components . Calculation of Y Bus.
CO:2. Explain the N-R and G-S Method for load flow studies.
CO:3. Derive the swing equation for Single Machine Infinite Bus System.
CO:4. Explain the Concept of Equal area criterion. Calculation of bus voltages and line flows.
CO:5. Calculation of fuel cost for thermal unit system. Explain the concept of UC problem.

References:

[1].D.P.Kothari and I.J.Nagrath, "Modern Power System Analysis", Mc Graw Hill Education, 2003.
[2].B.M.Weedy, B.J.Cory, N.Jenkins, J.Ekanayake and G.Strbac, "Electric Power Systems", Wiley, 2012.

Text Books:

[1].J.Grainger and W.D.Stevenson, "Power System Analysis", Mc Graw Hill Education, 2010.
[2].O.I. Elgerd, "Electric Energy Systems Theory", Mc Graw Hill Education, 2012.
[3].R.Bergen and V.Vittal, "Power System Analysis", Pearson Education Inc., 2009

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	L	L	L	M	M	L	M
CO2	S	S	S	M	S	M	L	L	S	S	L	M
CO3	S	S	S	M	S	M	L	L	S	M	L	M
CO4	M	S	S	M	S	M	L	L	S	M	L	M
CO5	S	S	M	M	M	M	L	L	M	M	L	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187T20	PLC and SCADA	7	3	45

Course Objective

- To study about PLC.
- To study about programming of PLC.
- To gives an introducing knowledge about SCADA.

Unit 1:

PLC HARDWARE & CONFIGURATION

Analog input modules, Analog output module , Digital input module , Counter or accumulator digital inputs module, Digital output module, Mixed analog and digital modules, Communication interfaces, Power supply module, Processor module, Logical sensors – logical actuators – PLC operation.

Unit 2:

INTRODUCTION TO LOGIC

Conventional ladder vs. LPLC ladder, series and parallel functions of OR, AND, NOT, XOR logics, analysis of rungs, the basic relay instruction, NO, NC,output latching instruction, interface programs.

Unit 3:

TIMER & COUNTER INSTRUCTION – PLC

On delay, OFF delay, retentive timer instruction, PLC counter Up and Down instructions, combining counter and timers, simple application program using timer and counters , FBD concepts and programming.

Unit 4:

SCADA SYSTEMS, HARDWARE AND SOFTWARE

Introduction and brief history of SCADA – Fundamental principles of modern SCADA systems SCADA hardware – SCADA software – Modem use in SCADA systems – DCS concepts as LAN of PLC's, Comparison of the terms SCADA, DCS, PLC and smart instrument – benefits of SCADA system – Specialized SCADA protocols – Error detection – Distributed network protocol–New technologies in SCADA systems

Unit 5:

CASE STUDIES

PLC application, process description, process automation (machine or equivalent), DCS/ SCADA application, process description, process automation design (Power plant orequivalent), DCS/ SCADA with process description and process automation design (Railway traction power supply or equivalent).

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Course Outcome:

CO:1. Understand the PLC architecture
CO:2. Understand the programming of PLC
CO:3. Understand the SCADA architecture
CO:4. Implement the PLC based automation in simple industrial application
CO:5. Implement the SCADA based automation in simple industrial application

References:

[1].Krishna Kant , "Computer based Industrial Control", PHI, 2nd Edition, 2011.
[2].JR Hack worth Programmable Logic Controllers, , Pearson Education, 1st Edition, 2003.
[3].W Bolton ,Programmable Logic Controllers, , Elsevier, 4th Edition, 2006.
[4].PK Srivstava ,Programmable Logic Controllers with Applications, , BPB Publications 2004.
[5].Programmable Logic Controllers, Frank D. Petruzella, 5th Edition, McGraw- Hill, New York, 2016.
[6].PLCs & SCADA Theory and Practice, Rajesh Mehra , Vikrant Vij, Laxmi Publications Private Limited,2019.

Text Books:

[1].Garry Dunning, Introduction to Programmable Logic Controllers by, 3rd edition,Thomson, ISBN: 981-240-625-5, 2005.
[2].M.Chidambaram, Computer control of Process by Narosha Publishing 2nd Edition 2006.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	M	M	L	L	S	M	M	M
CO2	S	S	S	M	S	M	-	-	S	M	L	M
CO3	S	S	M	M	S	M	-	-	S	M	L	M
CO4	S	S	M	M	S	M	-	-	S	M	M	S
CO5	S	S	S	S	S	M	M	M	S	S	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187T30	Electric Drives	7	3	45

Course Objective

- To understand the basic concepts of different types of electrical machines and their performance.
- To study the different methods of starting and controlling speed of D.C motors and induction motors using electric drives.
- To study the conventional and solid state drives.

Unit 1:

CHARACTERISTICS OF ELECTRIC DRIVES

Requirements of a Variable speed drive - Types of Drives - Comparison of AC and DC drives - Mechanical characteristics - Rating and selection of Motors.

Unit 2:

DC DRIVES

Speed control of dc motors - Ward - Leonard scheme - draw backs - thyristor converter fed dc drives: 1Φ and 3Φ half and fully controlled DC drives. Chopper fed Dc Drives: Advantages over rectifier drives - Principle of operation - Time ratio control and current limit control - four quadrant operations - Closed loop control.

Unit 3:

INDUCTION MOTOR DRIVES

Speed control of three phase induction motors - stator control - stator voltage and frequencycontrol - Ac chopper, inverter and Cycloconverter fed induction motor drives, rotorcontrol - rotor resistance control and slip power recovery schemes - static control of rotor resistance using dc chopper – static Kramer and Scherbius drives.

Unit 4:

SYNCHRONOUS MOTOR DRIVES

Speed control of three phase synchronous motors – voltage source and current source inverter fed synchronous motors – commutator less dc motors - Cyclo converter fed synchronous motors - effects of harmonics on the performance of ac motors - closed loop control of drive motors.

Unit 5:

DIGITAL CONTROL AND DRIVE APPLICATIONS

Digital techniques in speed control - advantages and limitations - microprocessor based control of drives - selection of drives and control schemes for steel rolling mills, paper mills, lifts and cranes.

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Course Outcomes:

CO:1. Variable Speed Drives- Requirements and differenttypes, characteristics.
CO:2. Rating and Selection of motors. Working of different types of DC converters fed DC Drives
CO:3. Apply different control methods for DC drives
CO:4. Speed control of different types of AC converters fed Induction motor Drives
CO:5. Different types of inverters and cyclo converter fed Synchronous motor drive. Harmonics and closed loop control

References:

[1] Kothari D.P, Rakesh Singh Lodhi," Electric Drives" , I.K. International Publishing House, 2016

[2] Bimal K.Bose , " Modern Power Electronics and AC Drives" Pearson Education India, 2015

[3] R.Krishnan , " Electric Motor Drives, Modeling, Analysis and Control ", Pearson Education India, 2015

Text Books:

[1].Pillai S.K., "A First Course on Electrical Drives", New Age International Publishers, 4th Edition,2022.

[2].Vedam Subrahmanyam, Thyristor Control of Electric Drives", Tata Mc Graw Hill, publishing company Ltd., New Delhi, 1994.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	M	M	M	M	-	S	M	M	M
CO2	M	M	M	M	M	S	S	M	S	M	L	M
CO3	S	S	M	M	S	M	M	M	S	S	M	M
CO4	M	M	S	M	S	M	M	M	S	M	M	M
CO5	S	S	M	M	S	M	M	L	S	M	M	M

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187P60	Power System Lab – II (Simulation)	7	2	

List of Experiments

1. Modeling of Transmission Lines using MIPOWER
2. Formation of Network Matrices and Solution of Networks using MIPOWER.
3. Power Flow Analysis - I: Solution of Power Flow and Related Problems Using Gauss-Seidel Method using MIPOWER.
4. Power Flow Analysis - II: Solution of Power Flow and Related Problems Using Newton – Raphson and Fast-Decoupled Methods using MIPOWER.
5. Short Circuit Analysis using MIPOWER.
6. Transient and Small Signal Stability Analysis using MIPOWER.
7. Transient Stability Analysis of Multi machine Power Systems Using Matlab.
8. Electro Magnetic Transients Analysis in Power Systems using MIPOWER.
9. Load – Frequency Dynamics of Single and Two – Area Power Systems using Matlab.
10. Economic Dispatch in Power Systems using MIPOWER.

Course Outcomes:

CO:1. Load flow, short circuit and transient stability analysis in power system

CO:2. Form a network matrices and Model in a transmission line

CO:3. Finding solution to Economic dispatch

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Course Code	Course Name	Semester	Credit	Hours
BEEF187P70	Power Electronics And Electric Drives Lab	7	2	

List of Experiments
Using Matlab, PSIM Software's

1. Single phase half and full converter with R, RL and RLE load
2. IGBT based single phase PWM inverter
3. Three phase AC voltage regulator
4. Resonant DC to DC converter
5. Micro controller based speed control of VSI three phase Induction motor drive
6. Simulation of Single Phase Full Converter with different loads
7. Simulation of Single Phase Semi Converter with different loads
8. Simulation of BUCK Converter
9. Simulation of BOOST Converter
10. Simulation of BUCK – BOOST Converter

Course Outcomes:

CO:1. Performance of AC-DC converters with R, RL, RLE Loads

CO:2. Inverter applied with PWM control

CO:3. VSI fed Induction motor drive-microcontroller interfaced

CO:4. Simulation of different types of converters and inverters

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SYLLABUS

PROFESSIONAL ELECTIVE COURSE–I

(Information Technology)

Course Code	Course Name	Semester	Credit	Hours
BEEF186EA0	Computer Architecture	6	3	45

Course Objective

- To have a thorough understanding of the basic structure and operation of a digital computer.
- To discuss in detail the Arithmetic and Logical operations, fixed and floating point operations including the algorithms & implementation.
- To study in detail the different types of controls and the concept of pipe lining.
- To study in detail the different types of Bus, Memory systems and I/O systems.
- To study in detail the different types of parallel process or model and its architectures

Unit 1:

BASIC STRUCTURE OF COMPUTER & INSTRUCTIONS

Functional componentsandoperationsofgeneralcomputersystem,Interconnectionofcomponents, Computer Evolution and Performance, Representation of Instructions - Machineinstructions, Operands, Addressing modes, Instruction cycles, Instruction formats, Instructionsets, Instructionset architectures - CISC and RISC architectures

Unit 2:

BASIC PROCESSING UNITS

Number Systems and conversions, Integer Arithmetic operations, Fixed and Floating point representation and operations, Organization of aprocessor – Single and Multiple busorganization, Processing units elements, Control unit, Data path in a CPU, Department of Computer Science and Engineering Page 27 of 40 Organization and operations of a control unit, Hardwired and Micro programmed control unit.

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Unit 3:
MEMORY SYSTEM

Classification of memory – Internal Organization of a memory chip, Cache memories – Virtual memory– Secondary Storage Devices, Associative Memories and Memory management requirements.

Unit 4:
I/O ORGANIZATION

Accessing I/O devices – Programmed Input/output –Interrupts – Direct Memory Access – Buses – Interface circuits –Standard I/O Interfaces (PCI, SCSI, USB).

Unit 5:
PIPE LINING

Basic concepts – Single - Cycle versus Pipe lined Performance- Pipeline Hazards - Data hazards-forwarding vs. stalling, Control hazards–Pipeline Data path and control – Branch prediction-Performance considerations

Course Outcome:

CO:1. Understand the theory and architecture of central processing unit. Exemplify in a better way the I/O and memory organization.

CO:2. Analyze some of the design issues in terms of speed, technology, cost, performance.

CO:3. Design a simple CPU with applying the theory concepts. Use appropriate tools to design verify and test the CPU architecture

CO:4. Learn the concepts of parallel processing, Pipe lining and inter processor communication.

CO:5. Understand the architecture and functionality of central processing unit

References:

[1]. William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016

[2]. J.L.Hennessy and D.A.Patterson,“Computer Architecture-A Quantitative Approach”, Morgan Kauffman, 2011.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

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Text Books:

[1] David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Sixth Edition, Morgan Kaufmann/Elsevier, 2020.

[2] Kai H wang, "Advanced ComputerArchitecture, Parallelism, Scalability, Programmability", Mc Graw Hill, 3rd Edition 2017.

[3] Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, "Computer Organization and Embedded Systems", Sixth Edition, Tata McGraw-Hill, 2012.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	M	M	S	M	L	L	S	S	L	M
CO2	S	S	S	S	S	M	L	L	S	S	L	L
CO3	S	S	M	M	S	M	L	L	S	S	M	L
CO4	S	S	M	M	S	L	L	L	S	M	M	M
CO5	S	S	M	M	M	L	L	-	S	M	M	L

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186E	Java Programming And Applications (T&P)	6	3	45

Course Objective

- To understand the concept of OOP as well as the purpose and usage principles of inheritance, polymorphism, encapsulation and method over loading.
- To identify classes, objects, members of a class and the relationships among them needed for a specific problem.
- To create Java application programs using sound OOP practices (e.g.,interfaces and APIs) and proper program structuring (e.g., by using access control identifies, automatic documentation through comments,error exception handling)

Unit 1:

Introduction to Java: Fundamentals of OOPS - Java Evolution, Java Vs C++ - JVM – Java Tokens – Constants, Data Types & Variables, Operators and Expressions – String Handling: String Basics,String Operations, Character Extraction, String Buffer, Arrays, Classes, objects and Methods, Final, Static-Exception Handling :Types of Errors, Exceptions, Exception Handling Mechanisms, Advantages, Throwing User defined Exceptions - Exploring java.io: Buffered Input Stream & Buffered Output Stream-Modifiers-Inheritance.

Unit 2:

Interfaces: Defining Interfaces, Extending Interfaces, Implementing Interfaces, Accessing Interfaces - Packages: Creating and Accessing Packages, Mechanisms of Using Packages, Hiding Classes, Import command.

Unit 3:

Multithread Programming: Fundamental Concepts, Thread Creations, Thread Life Cycle, Thread Priorities and Thread Scheduling, Thread Synchronization, Inter Thread Communication- Managing I/O Files: Concepts of I/O Streams, Stream classes, character Streams, Byte Streams, File Streams, random Access Files, and Serializations-Exploring java.net: Inet Address, Server Socket, socket, Datagram Packet, Datagram Socket and Multicast Socket.

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Unit 4:

Exploring java.Util: collections, Enumerations, iterations, String Tokenizer, Bitset, Date, Calendar, Gregorian Calendar, Time Zone, Currency-Applet Programming: Applet Fundamentals - Java Application Vs Java Applets, Applet life Cycle, Building the Applet code, Running the Applet-Passing Parameters to Applet, Applet tag, Java Applet Package.

Unit 5:

Exploring javax.swing: J Component, containers, panes, Layout Managers, Basic Components, Advanced Components – Handling Events: Listener, Interfaces and Adapter classed for various components –JDBC principles: Exploring java.sql-connection, Driver Manager, Statement, Result set, Callable statement, prepared Statement, Resultset Meta data & Data base Meta Data.

Course Outcomes:

CO:1. Design, implement, test, debug, and document programs that use basic data types and computation, simple I/O, conditional and iterative structures and function.

CO:2. Describe and use the mechanics of Interfaces and Packages.

CO:3. Discuss and use of Multi threads Programming.

CO:4. Implement a pplet exception handling.

CO:5. Develop network and window application using awt and Swings.

References:

[1]. Kogent Solution Inc, Java 6 Programming Black Book, New Ed, Dream tech Press,2007.

[2]. Campione, Walrath and Huml, "The Java Tutorial", Addison Wesley, 2001.

[3]. Elliotte Rusty Harold, Java Network Programming, Second Edition, O'Reilly Media, Inc.", 2013, (for Java.net package in Unit-III)

[4]. Java Data base Programming Bible, John O' Donahue, illustrated Edition,Wiley, 2002 (forUnit-V)

[5]. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.

Text Books:

[1].Herbert Schildt, "Java The Complete Reference", 8th Edition, Tata Mc Graw Hill, 2011.

[2].James Jaworski, "Java Unleashed", 4th revised edition, SAMS Techmedia Publications, Digitized - 2010.

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SYLLABUS

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	S	S	M	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	S	M	S	L	M	S
CO3	S	S	M	S	S	M	M	M	S	M	M	S
CO4	M	M	S	M	M	M	S	S	S	M	M	S
CO5	S	S	S	M	S	S	M	S	S	M	M	S

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Course Code	Course Name	Semester	Credit	Hours
BEEF186E	Cloud Computing Fundamentals	6	3	45

Course Objective

- To understand the concepts of virtualization and virtual machines.
- To gain expertise in server, network and storage virtualization.
- To understand and deploy practical virtualization solutions and enterprise solutions.

Unit 1:
VIRTUALIZATION

Basics of Virtual Machines - Process Virtual Machines – System Virtual Machines – Emulation – Interpretation– Binary Translation – Taxonomy of Virtual Machines. Virtualization – Management Virtualization - Hardware Maximization – Architectures – Virtualization Management – Storage Virtualization – Network Virtualization.

Unit 2:
VIRTUALIZATION INFRASTRUCTURE

Comprehensive Analysis – Resource Pool – Testing Environment – Server Virtualization –Virtual Work loads – Provision Virtual Machines – Desktop Virtualization – Application Virtualization - Implementation levels of virtualization – virtualization structure – virtualization of CPU, Memory and I/O devices – virtual clusters and Resource Management – Virtualization for data center automation.

Unit 3:
CLOUD PLATFORM ARCHITECTURE

Cloud deployment models: public, private, hybrid, community – Categories of cloud computing: everything as a service: infrastructure, platform, software. A generic cloud architecture design-layered cloud – architectural development – virtualization support and disaster recovery - architectural design challengers – public cloud platform - GAE, AWS – intercloud resource management.

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Unit 4:
PROGRAMMING MODEL

Introduction to Hadoop Frame work – Map Reduce, Input splitting, map and reduce functions, specifying input and output parameters, configuring and running a job – Developing Map Reduce Applications -Design of Hadoop file system – Setting up Hadoop Cluster – Cloud Software Environments - Eucalyptus, Open Nebula, Open Stack, Nimbus.

Unit 5:
CLOUD SECURITY

Cloud Infrastructure security: network, host and application level – aspects of data security, provider data and its security, Identity and access management architecture, IAM practices in the cloud, SaaS, PaaS, IaaS availability in the cloud - Key privacy issues in the cloud –Cloud Security and Trust Management

Course Outcomes:

CO:1. Define Cloud Computing and memorize the different Cloud service and deployment models.

CO:2. Describe importance of virtualization along with their technologies.

CO:3. Use and Examine different cloud computing services. Analyze the components of open stack & Google Cloud platform and understand Mobile Cloud Computing.

CO:4. Design & develop backup strategies for cloud data based on features.

CO:5. Illustrate the capabilities of Cloud Security.

References:

[1]. Kai H wang, Geoffrey C Fox, Jack G Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.

[2].Tim Mather, Subra Kumaraswamy and Shahed Latif, Cloud Security and Privacy, O‘ Reilly Media, Inc.,2009.

[3].Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach", Mc Graw – Hill Osborne Media, 2009.

[4].TomWhite,"Hadoop: The Definitive Guide", Yahoo Press,2012.

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Text Books:

[1]. Danielle Ruest, Nelson Ruest, Virtualization: A Beginner‟s Guide, Mc Graw-Hill Osborne Media, 2009.

[2].Jim Smith, Ravi Nair ,Virtual Machines: Versatile Platforms for Systems and Processes,Elsevier/ Morgan Kaufmann, 2005.

[3].John W.Ritting house and James F.Ransome, Cloud Computing: Implementation, Management and Security, CRC Press,2010.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	S	S	S	S	M	M	S	M	M	S
CO3	S	S	S	S	S	S	M	M	S	M	M	S
CO4	S	S	S	S	S	S	M	M	S	M	M	S
CO5	S	S	S	S	S	S	M	M	S	M	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186E	Fundamentals Of Big Data Analysis	6	3	45

Course Objective

- To study in detail about principle of big data architecture and its technology foundations.
- To study Compare and contrast the nature of data in distributed file systems.

Unit 1:

INTRODUCTION TO BIG DATA

Evolution of Big data – Best Practices for Big data Analytics – Big data characteristics –Validating–The Promotion of the Value of Big Data – Big DataUse Cases – Characteristics of Big Data Applications– Perception and Quantification of Value -Understanding Big Data Storage – A General Overview of High-Performance Architecture – HDFS – Map Reduce and YARN – Map Reduce Programming Model.

Unit 2:

ADVANCED ANALYTICAL THEORY AND METHODS:

Overview of Clustering – K - means–Use Cases – Overview of the Method – Determining the Number of Clusters – Diagnostics – Reasons to Choose and Cautions - Classification: Decision Trees – Overview of a Decision Tree – The General Algorithm –Decision Tree Algorithms – Evaluating a Decision Tree – Decision Treesin R–Naïve Bayes –Bayes, Theorem–Naïve BayesClassifier.

Unit 3:

ASSOCIATION AND RECOMMENDATION SYSTEM

Advanced Analytical Theory and Methods: Association Rules – Overview – Apriori Algorithm–Evaluation of Candidate Rules – Applications of Association Rules – Finding Association & finding similarity Recommendation System: Collaborative Recommendation – Content Based Recommendation Knowledge Based Recommendation - Hybrid Recommendation Approaches.

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Unit 4:
STREAM MEMORY

Introduction to Streams Concepts – Stream Data Model and Architecture – Stream Computing, Sampling Data in a Stream – Filtering Streams – Counting Distinct Elements in a Stream –Estimating moments – Counting oneness in a Window – Decaying Window – Real time Analytics Platform (RTAP) applications – Case Studies –Real Time Sentiment Analysis, Stock Market Predictions. Using Graph Analytics for Big Data: Graph Analytics.

Unit 5:
NOSQL DATA MANAGEMENT FOR BIG DATA AND VISUALIZATION

NOSQL Databases: Schema – less Models: Increasing Flexibility for Data Manipulation - KeyValue Stores- Document Stores – Tabular Stores – Object Data Stores – Graph Data bases Hive – Sharding H base – Analyzing big data witht witter – Big data for E –Commerce Big data for blogs–Review of Basic Data Analytic Methods using R.

Course Outcomes:

CO:1. Explain the big data perspective and its real world requirement

CO:2. Illustrate the working principle of big data architecture and its technology foundations.

CO:3. Compare and contrast the nature of data in distributed file systems.

CO:4. Utilize the HAD oop platform to work on huge data. Make use of certain analytical techniques on bigdata.

CO:5. Determine the results of big data analysis using certain Analytical techniques or tools.

References:

[1]. Michael Minelli, Michelle Chambers and Ambiga Dhiraj,"Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.

[2].P.J.Sadalage and M.Fowler, "NoSQL Distilled: A Brief Guide to the Emerging Worldof Polyg lot Persistence", Addison – Wesley Professional, 2012.

[3].Richard Cotton,"Learning R– A Step –by –step Function Guide to Data Analysis, O Reilly Media, 2013.

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Text Books:

[1]. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with Advanced Analytics, Wiley and SAS Business Series, 2012.

[2].David Loshin, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph", 2013.

[3].Michael Berthold, David J.Hand, Intelligent Data Analysis, Springer, Second Edition, 2007.

MAPPING CO – PO

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CO1	S	S	S	M	S	S	M	M	S	M	M	S
CO2	S	S	S	M	S	S	S	M	S	M	M	S
CO3	S	S	S	M	S	S	S	M	S	M	M	S
CO4	S	S	S	M	S	S	M	S	S	M	M	S
CO5	S	S	S	M	S	S	S	M	S	M	M	S

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PROFESSIONAL ELECTIVE COURSE – II

(Machines & Drives)

Course Code	Course Name	Semester	Credit	Hours
BEEF186TE	Electrical Machine Design	6	3	45

Course Objective

- To study MMF calculation and thermal rating of various types of electrical machines.
- To design armature and field systems for D.C.machines.
- To design core, yoke, windings and cooling systems of transformers

Unit 1:

MAGNETIC CIRCUIT CALCULATIONS

Magnetization characteristics - loss curves - estimation of total mmf - mmf for airgap - mmf for teeth - significance of Carter's coefficient - real and apparent flux densities - leakage flux - Leakage reactance in transformer - leakage reactance in rotating machines - Heating and cooling characteristics

Unit 2:

DESIGN OF DC MACHINES

Standard specifications - output equation - output coefficient - choice of specific magnetic and electric loadings - choice of number of poles - length of airgap - design of armature slot - dimensions of pole - design of field windings - design of commutator and brushes - design of interpole and its winding.

Unit 3:

DESIGN OF TRANSFORMERS

Design of transformers- standard specification - EMF per turn- output equation – window space factor - specific loadings - dimensions of core and yoke - design of winding – cooling tubes - estimation of no load current of transformer - change of parameters with change off requency.

Unit 4:

DESIGN OF SYNCHRONOUS MACHINES

Standard specifications - output equation - choice of specific loadings - design of salient polemachines - short circuit ratio - length of air gap - armature design - design of rotor - design of damper winding - design of turbo alternator design of three phase induction motor – output equation - choice of specific loadings - main dimensions - design of stator windings and core – length of airgap – design of cage rotor -design of wound rotor.

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Unit 5:

COMPUTER AIDED DESIGN

Introduction of computer aided design - advantages - methods of approach- Analysis method -synthesis method– optimization - general procedure- variables and constraints- optimal design of power transformer- optimal design of induction motor- optimal design of synchronous machine (Only for Demo). Design of DC Machines, single phase & three phase transformer, single phase & three phase induction motor, synchronous machines using MAGNET software.

Course Outcomes:

CO:1. Calculation of MMF for air gap and teeth sections
CO:2. Explain heating and cooling characteristics of rotating machines
CO:3. Derive the output equations of DC and AC Machines.
CO:4. Design of main dimensions of DC & AC machines and Transformers
CO:5. Explain the concept of computer aided design. Concept of analysis and synthesis methods

References:

[1].The Performance and Design of DC Machines, Clayton & Hancock, oxford and IBH Publishing co, 2002.
[2].The Performance and Design of AC Machines, M.G.Say, ELBS, 2017.
[3].Electrical Machine Design Data Book, A.Shanmugasundram, G.Gangadhar & R.palani, wiley Estern Ltd., New Delhi, 2000.

Text Books:

[1]. A course in Electrical Machine Design, A.K.Sawhney, Dhanpatrai & co, 2010.
[2].Principles of Electrical Machine Design, R.K.Agarwal, S.K.Kataria & sons, 2003.
[3].Computer Aided Design of Electrical Equipment, M.Ramamoorthy, Associated East West Press, 2012.

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	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	S	M	M	S
CO2	S	S	S	S	S	M	M	M	S	S	S	S
CO3	S	S	S	S	S	M	M	M	S	S	M	S
CO4	S	S	S	S	S	S	M	M	S	M	M	S
CO5	S	S	S	S	S	S	M	M	S	S	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TE	Special Electrical Machines	6	3	45

Course Objective

- To impart knowledge on Construction, principle of operation and performance of synchronous reluctance motors.
- To impart knowledge on the Construction, principle of operation, control and performance of stepping motors.
- To impart knowledge on the Construction, principle of operation, control and performance of switched reluctance motors.

Unit 1:

SYNCHRONOUS RELUCTANCE MOTORS

Constructional features – types – axial and radial air gap motors – operating principle – reluctance–phasor diagram- characteristics – Vernier motor.

Unit 2:

STEPPINGMOTORS

Constructional features – principle of operation – variable reluctance motor – Hybrid motor –single and Multi stack configurations – theory of torque predictions – linear and non-linearanalysis–characteristics– drivecircuits.

Unit 3:

SWITCHED RELUCTANCE MOTORS

Constructional features – principle of operation – torque prediction – power controllers – Non linear analysis – Microprocessor based control – characteristics – computer control.

Unit 4:

PERMANENT MAGNET BRUSHLESS D.C.MOTORS

Principle of operation – types – magnetic circuit analysis – EMF and Torque equations – Power Controllers – Motor characteristics and control.

Unit 5:

PERMANENT MAGNET SYNCHRONOUS MOTORS

Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers-converter –volt – ampere equirements – torque speed characteristics – microprocessor based control.

Course Outcomes:

CO:1. Illustrate the basic construction and operating principle of synchronous reluctance motor, SRM, Stepper motor, PMSM, PMBLDC motor and linear induction motor.

CO:2. Explain the motor characteristics, power input and torque developed for Synchronous Reluctance Motor, SRM, Stepper motor, PMSM and PMBLDC Motor

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CO:3. Develop the drive systems and control schemes for stepper motors. SRM, PMSM and PMBLDC motor
CO:4. Select the suitable special purpose motor for the specific application. Explain the Microprocessor /DSP based control of stepper motors, SRMPMSM and PMBL DC motor
CO:5. Analyse the performance of a drive system using Matlab-Simulink

References:

[1].Kenjo T., "Stepping Motors and their microprocessor Controls", Claredon Press London, 2012.
[2].Kenjo T and Nagamori S., "Permanent Magnet and Brushless DC Motors", Clarendon Press, London, 2011.

Text Books:

[1].Miller, T.J.E., "Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press, Oxford, 2001.
[2].Aearnley, P.P., "Stepping Motors - A Guide to Motor Theory and Practice", Peter Perengrinus, London, 2000.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	S	S	S	M	M	S
CO2	S	S	S	M	S	S	S	M	S	M	S	S
CO3	M	M	M	S	S	S	S	S	S	S	S	S
CO4	S	M	S	S	M	M	M	S	M	S	S	S
CO5	S	S	S	M	S	S	S	M	M	M	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TE	Control And Maintenance Of Electrical Equipments	6	3	45

Course Objective

- To enable the students to understand the basic operation of Electrical Equipments.
- To enable the students to understand the principle of control and maintenance of Electrical Equipments.

Unit 1:

CONTROL COMPONENTS

Fuses and combination fuse switch units, Miniature circuit breaker, Contactors -Solenoid type, Clapper type, Over - load relays - Thermal over - load relay, Ratchet type over load relay, Magnetic over load relay, dash pot type oil filled relay,Timing relays, Phase failure relay, Push buttons, Selector switches, Limit switches - types, Temperature controller (Thermostat), Float switches, Mechanical brakes for motors, Control transformer, Symbols for various components, Control diagram-Two wire control circuit, three wire control circuit.

Unit 2:

A.C.CONTROL CIRCUITS

Forward/ reversing of 3 phase motors - with push button inter - locking, with Auxillary contactinter -locking, sequence starting of motors, starting multispeed squirrel cage motor, Dynamic braking of squirrel cage induction motor, plugging of squirrel cage induction motor, Over – load protection of motors, single phase protection, Over - temperature protection, voltage stabilizer for 3 phase and single phase motors.

Unit 3:

CONTROL OF ELECTRIC DRIVES

Requirements of electric drive, Solid state devices used in electric drive – DC Motor Drives – AC Motor Drives.

Unit 4:

MAINTENANCE OF ROTATING MACHINES

Mechanical – site testing and checking – care – service and maintenance of motors - Maintenance management of rotating machines, preventive and predictive maintenance of electric machines.

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Unit 5:

MAINTENANCE OF BATTERIES

Primary cell – storage batteries; charging and maintenance – fuel cells, fuels and fuel cell power plants - acid water -selection of batteries- trouble shooting of batteries – Digital UPS testing systems.

Course Outcomes:

CO:1. Symbols for various components, Control diagram - Two wire control circuit, Three wire control circuit. Primary cell – storage batteries. Requirements of electric drive, Solid state devices used in Electric drive

CO:2. Fuses and combination fuse switch units, Miniature circuit breaker, Contactors - Solenoid type, Clapper type, Over - load relays - Thermal over - load relay, Ratchet type over load relay, Magnetic over load relay, Dashpot type oil filled relay,Timing relays, Phase failure relay, Push buttons, Selector switches, Limit switches - types, Temperature controller (Thermostat), Float switches, Mechanical brakes for motors, Control transformer

CO:3. Forward/ reversing of 3 phase motors - with push button inter - locking, with Auxillary contact inter - locking, Sequence starting of motors, Starting multi speed squirrel cage motor, Dynamic braking of squirrel cage induction motor, Plugging of squirrel cage induction motor, Over-load protection of motors, Single phase protection, Over-temperature protection,Voltage Stabilizer for 3 phase and single phase motors Requirements of electric drive, Solid state devices used in electric drive – DC Motor Drives – AC Motor Drives Care – service and maintenance of motors

CO:4. Preventive and predictive maintenance of electric machines Selection of batteries – trouble shooting of batteries Maintenance management of rotating machines

CO:5. Mechanical Maintenance, Digital UPS testing systems

References:

[1].SK Sharotri, Katson , “Preventive Maintenance of Electrical Apparatus”, Publishing House, Ludhiana.

[2].Praveen Kumar , “Installation and Maintenance of Electrical Equipment”, North Publication, Jalandhar

[3]. Installation commissioning and Maintenance of Electrical Equipment by Tarlok singh, S.K.KATARIA AND SONS Publication, 2ND EDITION 2001- reprint 2022

[4]. Installation Maintenance and repair of Electrical machines and Equipment by by Madhavigupta S.K.KATARIA Publication, 2ND EDITION 2019

Text Books:

[1]. Ragnar Halm , “Electric Contacts – Theory and Application”, Springer Publication 3rd printing edition November 1999

[2].S.K.Bhattacharya & S.Chatterji , “Industrial Electronics & Control”, Tata Mc Graw –hill education (P) Ltd., 2004

[3].S Rao, , “Testing, Commissioning, Operation and Maintenance of Electrical Equipment” , Technical Khanna Publication, New Delhi 6th edition 2019.

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MAPPING CO – PO

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	S	S	S	S	S	S	S	S	S	M	S	M
CO2	M	S	S	M	S	S	S	S	S	S	S	S
CO3	S	S	M	S	S	M	S	S	M	S	M	S
CO4	M	M	S	S	S	S	M	M	S	M	M	M
CO5	S	S	S	M	S	S	S	S	S	S	S	S

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Course Code	Course Name	Semester	Credit	Hours
BEEF186TE	Electrical Safety And Management	6	3	45

Course Objective

- Explain the importance of electrical safety measurements tools available.
- Different types of grounding methods for electrical equipment.
- Necessary core to handle electrical protection systems.

Unit 1:

Primary and secondary hazards- arc, blast, shocks - causes and effects - safety equipment – flash and thermal protection, head and eye protection – rubber insulating equipment.

Unit 2:

General requirements for grounding and bonding- definitions - grounding of electrical equipment- hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers - safety electrical one line diagram - electrician's safety kit.

Unit 3:

The six step safety methods - pre job briefings - hot - work decision tree - safe switching of power system lockout - tag out - safety equipment, procedure for low, medium and high voltage systems - the one minute safety audit.

Unit 4:

Electrical safety programme structure, development - company safety team - safety policy - programme implementation - employee electrical safety teams - safety meetings - safety audit – accident prevention – first aid - rescue techniques – accident investigation.

Unit 5:

Safety related case for electrical maintenance - reliability centered maintenance (RCM) – eight step maintenance programme - frequency of maintenance - maintenance requirement for specific equipment and location – regulatory bodies.

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Course Outcomes:

CO:1. To understand different types of protection systems, electrical hazards and safety equipments

CO:2. To analyse the importance of grounding of electrical equipment - hot sticks, insulated tools, barriers and signs, safety tags, locking devices - voltage measuring instruments - proximity and contact testers.

CO:3. To understand the six step safety methods - pre jobbriefings- hot -work decision tree - safe switching of power system lock out - tag out – safety equipment.

CO:4. To evaluate Electrical safety programme structure, development -company safety team – safety policy - programme implementation - employee electrical safety teams - safety meetings - safety audit - accident prevention – first aid – rescue techniques – accident investigation.

CO:5. To apply Safety related case for electrical maintenance-reliability centered maintenance (RCM) - eight step maintenance programme - frequency of maintenance – maintenance requirement for specific equipment.

References:

[1].John Cadick, 'Electrical Safety Hand book', Mc Graw – Hill School Professional, Sept -2005.

[2].Maxwell Adams.J, "Electrical safety- a guide to the causes and prevention of electric hazards", The Institution of Electric Engineers, 1994.

[3].Ray A. Jones, Jane G. Jones, 'Electrical safety in the workplace', Jones & Bartlett Learning, 2000.

Text Books:

[1].Dennis Neitzel, Al Win field, "Electrical Safety Hand book', Mc Graw-Hill Education, 5th Edition, 2019.

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CO2	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	S	S	S	S	S	S	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S
CO5	S	S	S	S	S	S	S	S	S	S	S	S

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PROFESSIONAL ELECTIVE COURSE–III

(Power Systems)

Course Code	Course Name	Semester	Credit	Hours
BEEF187TE	Smart Grid	7	3	45

Course Objective

- To Study about Smart Grid technologies, different smart meters and advanced metering infrastructure.
- To familiarize the recent communication and security technologies in Smart Grid.
- To familiarize with the high performance computing for Smart Grid applications.

Unit 1:

INTRODUCTION TO SMART GRID

Evolution of Electric Grid, Concept and Definitions, Need for Smart Grid, drivers for Smart grid, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient and self- healing grid, Low carbon central generation, Micro - grid and distributed energy resources, Power quality issues connection of renewable energy sources, Need for is landing, National and International Initiatives in Smart Grid, Smart cities and pilot projects in India, Case study.

Unit 2:

SMART GRID TECHNOLOGIES (Transmission)

Technology Drivers, Smart energy resources, Smart sub stations, Sub station Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control.

Unit 3:

SMART GRID TECHNOLOGIES (Distribution)

DMS, Fault Detection, Isolation and service restoration, Volt/VAr control, Outage management system (OMS), High - Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV).

Unit 4:

MARTMETERS AND ADVANCED METERING INFRASTRUCTURE

Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.

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Unit 5:

IT, COMMUNICATION TECHNOLOGY AND SECURITY FOR SMART GRID

Local Area Network (LAN), Home Area Network (HAN), Wide Area Network (WAN), Broadband over Power line (BPL), IP based Protocols, Basics of Web Service and CLOUD Computing for Smart Grids, Cyber Security for Smart Grid.

Course Outcome:

CO:1. Explain the fundamentals of smart power grids and its international & Indian scenarios.
CO:2. Calculate voltage and power loss for the given distribution system.
CO:3. Explain advanced metering infrastructure and demand side management.
CO:4. Describe the operation of transmission system with synchro phasor measurement.

References:

[1]. Vehbi C.Güngör, Dilan Sahin, Taskin Kocak, Salih Ergüt, Concettina Buccella, Carlo Cecati, and Gerhard P.Hancke, Smart Grid Technologies: Communication Technologies Standards IEEE Transactions On Industrial Informatics, Vol.7,No.4, November, 2011.

[2].Xi Fang, Satyajayant Misra, Guoliang Xue and DejunYang "SmartGrid–The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids

[3].A.G.Phadke and J.S. Thorp, "synchronized Phasor Measurements and their applications", Springer Edition, 2010.

Online resources:

1. www.nptel.co.in
2. www.electrical4u.com

Text Books:

[1]. Stuart Borlase " Smart Grid : Infrastructure, Technology and Solutions", CRC Press, 2017.

[2].Janaka Ekanayake, Nick Jenkins, Kithsiri Liyanage, Jian zhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley 2015.

[3]. Radian Belu "Smart Grid Fundamentals Energy Generation, Transmission and Distribution", CRC Press, 2022

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	S	M	M	M	S
CO2	M	S	S	S	M	S	S	S	M	M	M	S
CO3	S	M	S	M	M	S	S	S	S	M	M	S
CO4	S	S	S	S	M	S	S	S	S	M	M	S

SRI CHANDRASEKHARENDRA SARASWATHI VISWA MAHAVIDYALAYA

Department of EEE

SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187TE	Design And Layout Of Power Systems Apparatus	7	3	45

Course Objective

- This course offers the preliminary instructions and techniques to design the main dimensions and other major part of the transformer and DC and AC rotating machines.
- The course also provides the students with an ability to understand the step by step procedure for the complete design of electrical machines.

Unit 1:

DESIGN AND LAYOUT OF TRANSMISSION LINES

Requirement soft transmission Lines – Selection of voltage levels for H.T.transmission lines - Choice of conductors – spacing of conductors – Types of Insulators – specifications of transmission lines – Electrical and Mechanical design of transmission lines – Surge Impedance loading - stringing of transmission lines - Tower designs - Types, single circuit, Double circuit towers - Transmission line Earth wires – IEE rules

Unit 2:

DESIGN AND LAYOUT OF DISTRIBUTION SYSTEMS

Primary and secondary distribution system design - Calculation of distribution sizes, voltage drops - voltage regulation – Design scheme for Rural Distribution system – Design scheme for industrial distribution schemes - Power distribution for computer automation - layout for Town Electrification - types of distribution cables – Switch gear for L.T. and H.T.Distributions - IEE rules for Distribution.

Unit 3:

LAYOUT AND INSTALLATION OF POWER EQUIPMENT'S

Installation of power transformers - Reactors -Installation of Insulators - Erection of earthing systems and secondary circuits - Installation of CT's and PT's and CVT's - Installation off uses and their rating- Installation of Isolators and Circuit breakers - Installation of Capacitor banks – IEE rules.

Unit 4:

LAYOUT AND DESIGN FOR ELECTRIC DEVICE

Low voltage and metal clad and Switch gear for Electric drives – single – phase preventer - Contactors Types and their definition - Contactor starters for motors - limit switches for process control devices – IEE rules for Motors Erection.

Unit 5:

DESIGN AND LAYOUT OF SUBSTATIONS

Types of Substations - Indoor and outdoor substations - Selection of Site and Location – Layout diagram of 11 kV/ 440V, 220/ 11KV substations – Substations requirements, their functions and location–Substation – Switchgear installations – Busbar arrangements and design – Load break switches - Switching substations - Location CT's and PT's - materials for Busbar –Substations earthing.

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SYLLABUS

Course Outcomes:

CO:1. Design of main dimensions and other major part of the transformer
CO:2. Design of main dimensions and other major part DC and AC rotating machines
CO:3. Procedure for the design of main dimensions and other major Part of the transformer
CO:4. Procedure for the design of main dimensions and other major Part of the AC and DC machines

References:

[1].Suni S Rao,"Switch gear Protection & power systems", Khanna publishers,1999.
[2].Power System Analysis and Design,J.Dungan Glover, MulukutlaS.Sharma,Thomas J.Overbye,5th edition

Text Books:

[1].M.V.Deshpande, "Electric Power system design", Edition illustrated, Tata Mc graw hill education, 2001
[2].Power System Analysis and Design.J.Duncan Glover, MulukutlaS.Sarma. Thomas Overbye,AdamBirchField Cengage Learning,Technology and Engineering ,1st January 2022

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	M	M	M	M	M
CO2	S	S	S	M	S	S	S	S	S	M	M	S
CO3	M	S	S	S	S	M	M	S	M	S	S	M
CO4	S	S	S	S	S	S	S	M	S	S	M	S

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Department of EEE

SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187TE	High Voltage DC Transmission	7	3	45

Course Objective

- To understand the concept, planning of DC power transmission and comparison with AC Power transmission.
- To analyze HVDC converters.
- To study about the HVDC control.

Unit 1:

GENERAL ASPECTS

Historical development HVAC and DC links-Kinds of DC links – HVDC Projects in India and a broad-Advantages and disadvantages of HVDC transmission - Principle Application of DC transmission – Economic factors – Development of power devices for HVDC Transmission - Thyristor-Light activated thyristors - MOS controlled Thyristors (MCTS) - Switching and steady state characteristics.

Unit 2:

THYRISTOR CONVERTERS

Three phases fully controlled Thyristor bridge converters – Operation as rectifiers and line commutated inverters – Converter equivalent circuits Parameters and characteristics of rectifiers and inverters-Series and parallel arrangements of Thyristors – Multi bridge converters.

Unit 3:

CONTROL OF CONVERTERS

Gate control – basic means of control – Power reversal – Desired Features of control –Control characteristics - Constant current control - Constant extinction angle Control - Stability of control-Tap changer control – Power control and current limits.

Unit 4:

PROTECTION

Oasis of protection of HVDC systems - DC reactors - Voltage and current Oscillations - DC line oscillations – Clearing line fault and re-energizing the line – Circuit breakers – Overvoltage protection.

Unit 5:

HARMONICS, FILTERS AND GROUND RETURN

Characteristics and uncharacteristic Harmonics-Troubles caused by harmonics. Means of reducing harmonics- Telephone Interference- Harmonic filters- ground return-Current fields-Compatibility with other services - Electrodes.

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Course Outcomes:

CO:1. Explain the modern technology used in HVDC
CO:2. Describe control strategies used in HVDC system with HVDC converters.
CO:3. Apply suitable method for power flow analysis in AC / DC systems.
CO:4. Simulate simple HVDC system for the given specifications.

References:

[1] Dragan Jovcic ,"High Voltage Direct Current Transmission Converters, Systems and DC Grids", Wiley,2019
[2] Vijay K. Sood ·,"HVDC and FACTS Controllers Applications of Static Converters in Power Systems", Springer US,2004
[3] Chan-Ki Kim, Vijay K. Sood, Gil-Soo Jang, Seong-Joo Lim, Seok-Jin Lee,"HVDC Transmission Power Conversion Applications in Power Systems", Wiley, 2009

Text Books:

[1]. EWKelmark, "Direct current Transmission", Vol.I. willey Interscience, NewYork, 1971.
[2].K R Padiyar, "HVDC Power Transmission System Technology and System interactions", Willey Eastern Ltd.,1991.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	S	S	S	0	S
CO2	M	M	M	M	S	S	S	M	S	M	S	S
CO3	S	S	S	S	S	M	M	S	S	S	M	S
CO4	S	M	M	M	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF187TE	Power Plant Engineering	7	3	45

Course Objective

- Providing an overview of power plants and developing the role of mechanical and electrical engineering in their operation and maintenance.

Unit 1:
THERMAL POWER PLANTS

Basic thermo dynamic cycles, various components of steam power plant – layout pulverize dc oal burners- Fluidized bed combustion - coal handling systems - ash handling systems – Forced draft and induced draft fans – Boilers - feed pumps-super heater - regenerator - condenser - deaerators - cooling tower.

Unit 2:
HYDRO ELECTRIC POWER PLANTS

Layout - dams- selection of water turbines – types - pumped storage hydel plants.

Unit 3:
NUCLEAR POWER PLANTS

Principles of nuclear energy – Fission reactions – nuclear reactor – nuclear power plants.

Unit 4:
GAS AND DIESEL POWER PLANTS

Types open and closed cycle gas turbine, work output & thermal efficiency, methods to improve performance - reheating, inter coolings, regeneration – advantage and Disadvantages – Diesel engine power plant – component and layout.

Unit 5:
NON - CONVENTIONAL POWER GENERATION

Solar energy collectors, OTEC, wind power plants, tidal power plants and geo thermal resources, fuel cell, MHD power generation - principle, thermo electric power generation, thermionic power generation.

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Course Outcomes:

CO:1. Able to get the basics of Power Plants.

CO:2. Able to get the idea about the power generation by renewable and non-renewable energy resources

CO:3. Able to know about the different types of cycles and natural resources used in power plants and their applications.

References:

[1]. Bernhardt G.A.Skrot, "Power station Engineering and Economy",Vopat-Tata Mc Graw Hill Publishing Company Ltd., New Delhi, 20.

[2].G.D. Rai-Khanna , "An introduction to power plant technology", M.M. El-Wakil Mc Graw Hill, 1984

Text Books:

[1]. Arora and Domkundwar,"A Course in Power Plant Engineering", Co.Pvt.Ltd., New Delhi.

[2].P.K.Nag, "Power Plant Engineering", Tata Mc Graw Hill, Fifth Edition 2017.

[3]. R.K.Rajput"A Text book of Power Plant Engineering", 5th Edition, 2016

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	M	M	M	M	S	M	S
CO2	M	S	S	S	S	M	M	L	M	M	M	S
CO3	S	S	S	S	S	M	S	M	S	M	M	S

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SYLLABUS

PROFESSIONAL ELECTIVE COURSE – IV

(Electronics)

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Automotive Electronics	8	3	45

Course Objective

- To understand the concepts of Automotive Electronics and it's evolution and trends.
- Automotive systems & sub systems overview.
- To understand sensors and sensor monitoring mechanisms aligned to automotive systems.

Unit 1:

FUNDAMENTAL OF AUTOMOTIVE ELECTRONICS

Current trends in modern Automobiles, Open loop and closed loop systems - Components for electronic engine management.Electronic management of chassis system – Vehicle motion control.

Unit 2:

SENSORS AND ACTUATORS

Introduction, basic sensor arrangement, types of sensors such as - oxygen sensors, Crankangle positionsensors - Fuel metering / vehicle speed sensor and detonation sensor – Altitude sensor, flow sensor. Throttle position sensors, solenoids, stepper motors, relays.

Unit 3:

ELECTRONIC FUEL INJECTION AND IGNITION SYSTEMS

Introduction, Feed back carburetor systems (FBC) Throttle body injection and multiport or point fuel injection, Fuel injection systems, injection system controls. Advantages of electronic ignition systems. Types of solid state ignition systems and their principle of operation, Contact less electronic ignition system, Electronics park timing control.

Unit 4:

DIGITAL ENGINE CONTROL SYSTEM

Open loop and closed loop control systems – Engine cranking and warmup control-Acceleration enrichment – Deceleration leaning and idle speed control. Distributor less ignition - Integrated engine control system, Exhaust emission control engineering.

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Unit 5:
ELECTRO MAGNETIC INTERFERENCE SUPPRESSION
Electromagnetic compatibility – Electronic dash board instruments-On board diagnosis system. Security and warning system.

Course Outcomes:

CO:1. Understand concepts of Automotive Electronics
CO:2. Understand various the sensor and Actuators used in the Automotive Electronics
CO:3. Understand the various Electronics fuel and ignition system
CO:4. Apply the control techniques in different subsystem of the automobiles.

References:

[1] Young .A.P. and Griffths.L. "Automobile Electrical Equipment", English Language Book Societyand New Press.
[2] Crouse.W.H.," Automobile Electrical equipment", Mc Graw Hill Book CoInc., NewYork,1955.
[3] Robert N Brady, "Automotive Computers and Digital Instrumentation", Areston Book, Prentice Hall, Eagle Wood Cliffs, New Jersey, 1988
[4] William B.Riddens,"Understanding Automotive Electronics-An Engineering Perspective", 8th Edition, Butterworth, Heinemann Woburn, 2017.
[5] A.Galip, HueiPeng, MelihCakmakci, "Automotive Control Systems", Cambridge University Press,2014.
[6] Tom Denton"Automobile Electrical& Electronic Systems", 5th Edition, Taylor & Francis Publishers,2018.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/

Text Books:

[1] William B.Riddens,"Understanding Automotive Electronics", 5th Edition, Butterworth, Heinemann Woburn, 2003.
[2] Tom Weather Jrand Cland C.Hunter,"Automotive Computers and Control System". Prentice Hall Inc., New Jersey 1984.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	M	M	S	M	S
CO2	S	S	M	M	S	S	S	M	S	S	M	S
CO3	S	S	S	S	S	M	S	S	M	M	S	S
CO4	S	S	S	S	M	M	M	S	M	S	S	S

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Department of EEE

SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Digital Image Processing	8	3	45

Course Objective

- Provide the student with the fundamentals of digital image processing
- Introduce the students to some advanced topics in digital image processing.
- Give the students a useful skill base that would allow them to carry out further study should they be interested and to work in the field..

Unit 1:

Digital image fundamentals & Image Transforms: Digital Image fundamentals, Sampling and quantization, Relationship between pixels.
Image Transforms: 2-D FFT, Properties. Walsh transform, Hadamard Transform, Discrete cosine Transform, Discrete Wavelet Transform.

Unit 2:

Image enhancement (spatial domain): Introduction, Image Enhancement in Spatial Domain, Enhancement Through Point Operation, Types of Point Operation, Histogram Manipulation, gray level Transformation, local or neighborhood operation, median filter, spatial domain high pass filtering.
Image enhancement (Frequency domain): Filtering in Frequency Domain, Obtaining Frequency Domain Filters from Spatial Filters, Generating Filters Directly in the Frequency Domain, Low Pass (smoothing) and High Pass (sharpening) filters in Frequency Domain

Unit 3:

Image Restoration: Degradation Model, Algebraic Approach to Restoration, Inverse Filtering, Least Mean Square Filters, Constrained Least Squares Restoration.

Unit 4:

Image segmentation: Detection of discontinuities. Edge linking and boundary detection, Thresholding, Region oriented segmentation
Morphological Image Processing :Dilation and Erosion, Dilation, Structuring Element Decomposition, Erosion, Combining Dilation and Erosion, Opening and Closing, The Hit or Miss Transformation.

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Unit 5:
Image Compression: Redundancies and their Removal Methods, Fidelity Criteria, Image Compression Models, Huffman and Arithmetic Coding, Error Free Compression, Lossy Compression, Lossy and Lossless Predictive Coding, Transform Based Compression, JPEG 2000 Standards.

Course Outcomes:

CO:1. Have an appreciation of the fundamentals of Digital Image Processing including the topics of filtering, transforms and morphology, and image analysis and compression
CO:2. Be able to implement basic image processing algorithms in MATLAB.
CO:3. Have the skill base necessary to further explore advanced topics of Digital Image Processing.
CO:4. Be in a position to make a positive professional contribution in the field of Digital Image Processing.
CO:5. At the end of the course the student should have a clear impression of the breadth and practical scope of Digital Image Processing and have arrived at a level of understanding that is the foundation for most of the work currently underway in this field

References:

[1] Scotte Umbaugh, "Digital Image Processing and analysis-human and computer vision application with using CVIP Tools" , Second Edition, CRC Press,2011
[2] A.K. Jain," Fundamentals of Digital Image Processing", PHI, 1989
[3] Milan Sonka, Vaclav Hlavac and Roger Boyle, "Image Processing, Analysis and Machine Vision", Third Edition, Cengage Learning, 2008.
[4] Rafeal C. Gonzalez, Richard E. Woods, Steven L. Eddins, "Digital Image Processing using Matlab", Pearson Education, Third edition 2011.

Text Books:

[1] Rafeal C. Gonzalez, Richard E. Woods, "Digital Image Processing", Third Edition, Pearson, 2008.
[2] 2. S Jayaraman, S. Essakkirajan, T. Veerakumar, "Digital Image Processing", Tata Mc Hill, 2010

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	M	M	M	M	S	M	S
CO2	S	S	M	M	S	S	S	M	S	S	M	S
CO3	S	S	S	S	S	M	S	S	M	M	S	S
CO4	S	S	S	S	M	M	M	S	M	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	
BEEF188TE	Virtual Instrumentation Lab	8	2	

List of Experiments
List of Experiments Using MATLAB

1. Time responses of various system compensation, stability and analysis using MATLAB.
2. Simulation of complex control system using MATLAB.
3. Design of filters and resonant circuits using MATLAB.
4. List of Experiments Using LABVIEW
5. Creating virtual instrumentation for simple applications using LABVIEW.
6. Programming exercises for loop and charts using LABVIEW.
7. Programming exercises for clusters and graphs using LABVIEW.
8. Programming exercises on case and sequence structure, file input/ output in LABVIEW.
9. Data acquisition through virtual instrumentation using LABVIEW.
10. Simulating reactor control using virtual instrumentation using LABVIEW.
11. Realtime temperature control using virtual instrumentation using LABVIEW.
12. Realtime sequential control of any batch process using LABVIEW.

Course Outcomes:

CO:1. Understand the fundamental principles of virtual instrumentation using MATLAB & LABVIEW

CO:2. Understand various functions available in Lab VIEW for engineering applications

CO:3. Understand the Data acquisition through virtual instrumentation using LABVIEW

CO:4. Understand Realtime industrial application programs

CO:5. Implement the simple realtime application using LABVIEW

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Department of EEE

SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Bio Medical Instrumentation	8	3	45

Course Objective

- To Introduce Fundamentals of Biomedical Engineering.
- To study the communication mechanics in a biomedical system with few examples.
- To study measurement of certain important electrical and non-electrical parameters.

Unit 1:

INTRODUCTION

Cell structure – electrode – electrolyte interface, electrode potential, resting and action potential –electrodes for their measurement, ECG, EEG, EMG – machine description – methods of measurement–three equipment failures and trouble shooting.

Unit 2:

TRANSDUCERS FOR BIO-MEDICAL INSTRUMENTATION

Basic transducer principles – source of bio electric potentials - resistive, inductive, capacitive, fiber-optic, photo electric and chemical transducers – their description and feature applicable for biomedical instrumentation.

Unit 3:

SIGNAL CONDITIONING, RECORDING AND DISPLAY

Inputisolation, DC amplifier, power amplifier and differential amplifier – feedback, op Amp-electro meter amplifier, carrier Amplifier – instrument power supply. Oscillagraphic – galvanometric – X -Y, magnetic recorder, storage oscilloscopes – electron microscope – PMMC writing systems.

Unit 4:

CARDIAC MEASUREMENTS

Electro cardiograph measurements – blood pressure measurement: by ultrasonic method- lethysonography – blood flow measurement by electromagnetic flow meter - cardiac output measurement by dilution method – phonocardiography – vector cardiography. Heart lung machine – artificial ventilator–Anesthetic machine – Basic ideas of CT scanner – MRT and ultrasonic scanner – bio - telemetry–laser equipmentand application – cardiacpace maker – DC – defibrillator patient safety – electricalshockhazards.,Nano-robots(Basicsonly)

Unit 5:

A COMPUTERS IN BIO-MEDICAL INSTRUMENTATION

Introduction – computers in medicine – basics of signal conversion and digital filtering data reduction technique – time and frequency domain technique – ECG Analysis.

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Course Outcomes:

CO:1. Understand the basic structure of a cell, its functionalities.To understand various recording systems like ECG, EEG & EMG.
CO:2. To analyse the importance of pick-ups,transducers .Significance of transducers.
CO:3. To understand the applications of transducers in BMI field.
CO:4. To analyse the need for recorders, plotters and signal conditioners
CO:5. To understand various display devices.
CO:6. To understand various cardiac measurements
CO:7. To apply how computers can be applied for medicines

References:

[1]. GeddesL.A and Baker L.E., "Principles of Applied Bio-medical Instrumentation" , 3rd Edition, John Wiley and Sons,1995.
[2].Cromwell, Weibell and Pfeiffer, "Bio medical Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, 1999.
[3].Tompkins W.J., Bio medical Digital Signal Processing, Prentice Hall of India, 1998.
[4].Ieee xplore.ieee.org

Text Books:

[1]. Khandpur R.S., "Hand book of Bio medical Instrumentation", TMH, 1989.
[2].Arumugam M., "Bio Medical Instrumentation", Anuradha agencies, Pub.,2002.
[3].Bio-Medical Engineering, Cambridge Texts in Biomedical Engineering.Author:W Mark Sahzman.,2nd edition
[4].Bio-medical Engineering Fundamentals , Author: Myer Kutz,3rd edition

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	M	S	S	S	S	S	S	S	M	S
CO3	S	M	S	M	S	S	M	M	S	M	M	S
CO4	S	S	S	S	S	S	M	M	S	M	M	S
CO5	S	M	S	M	S	S	M	S	S	S	M	S
CO6	M	S	S	S	S	S	S	S	S	M	S	S
CO7	S	M	S	S	S	S	M	S	S	M	S	S

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Department of EEE

SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Principles Of Communication Engineering	8	3	45

Course Objective

- To introduce different methods of analog communication and their significance
- To introduce Digital Communication methods for high bit rate transmission
- To introduce the concepts of source and line coding techniques for enhancing rating of transmission of minimizing the errors in transmission

Unit 1:

RADIO COMMUNICATION SYSTEMS

Frequency spectrum – principle of AM and FM – AM and FM transmitters and receivers-introduction to microwave communication systems – principle of satellite communication

Unit 2:

PULSE COMMUNICATION SYSTEMS

PAM, PPM, PDM, PCM – delta modulation – differential PCM – merits and demerits – comparison of pulse modulation schemes.

Unit 3:

DATA TRANSMISSION

Base band Signal receiver – error probability - optimum and matched filter techniques - coherent reception - digital modulation systems - FS, PSK - comparison of data transmission systems.

Unit 4:

TRANSMISSION MEDIUM

Characteristics of cables – optical fibers – effects of EM radiation-bandwidth and noise restrictions statistical measurement of random noise – concept of multiplexing – FDM and TDM.

Unit 5:

TELEVISION

Scanning methods-B/W and colour systems - camera and picture tubes-synchronization-transmitters and receivers.

Course Outcomes:

CO:1. Describe the basic principle of communication system

CO:2. Demonstrate and solve communication system parameters for various types of modulation and demodulation techniques

SYLLABUS

CO:3. Use of different modulation and demodulation techniques used in analog communication
CO:4. Identify and solve basic communication problems
CO:5. Analyze transmitter and receiver circuits
CO:6. Compare and contrast design issues, advantages, Disadvantages and limitations of analog communication systems

References:

[1]. Simon Haykins,"Communication Systems", 5th Edition, John Wiley,Inc.,
[2].Bruce Carlson.A, "Communication Systems", 5th Edition, Tata Mc Graw- Hill, 2009.
[3].Roody and Coolen, "Electronic Communication", 4th Edition Prentice Hall of India,2008.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1]. Kennedy G, "Electronic Communication Systems", Mc Graw - Hill, 5th Edition, 2011.
[2].Taub and Schilling Principles of Communication Systems, 4th Edition, Mc Graw - Hill, 2015.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	M	S	M	S	M	M	S	S	S
CO2	M	M	S	S	S	S	S	M	M	S	M	S
CO3	S	S	S	S	M	S	S	M	S	S	M	S
CO4	S	S	S	M	S	S	M	M	M	S	S	S
CO5	S	S	M	M	S	M	S	M	S	M	M	S
CO6	S	S	S	M	M	S	S	S	M	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Sensors For Engineering Applications	8	3	45

Course Objective

- Sensors and transducers for man indispensible part in Industrial automation today.
- With the competition in industries there is a necessity that down time need to be controlled as well as the process parameters be monitored accurately for making quality products.
- Digitalization of the automation process also requires new sensors.

Unit 1:

STRAIN AND PRESSURE MEASUREMENT:

Resistance strain guage, piezoelectric pressure gauge, characteristics - Electronic circuits for straingauge, load cells. Interferometer, Fibre-optic methods. Pressure gauges aneroid capacitance pressure gauge, ionization gauge, using the transducers for applications.

Unit 2:

MOTION SENSORS:

Capacitor plate sensor, Inductive sensors, LVDT Accelerometer systems, rotation sensors dragc up devices, piezo electric devices. Rotary encoders.

Unit 3:

LIGHT RADIATION:

Color temperature, light flux, photo sensors, photo multiplier, photo resistor and photo conductors, photo diodes, photo transistors, photo voltaic devices, fiber - optic applications, light transducer, solid-state, transducers liquid crystal devices.

Unit 4:

HEAT AND TEMPERATURE:

Bimetallic strip, Bourdon temperature gauge, thermocouples, Resistance thermometers, thermistors, PTC thermistors, bolometer, Pyroelectric detector.

Unit 5:

ELECTRONIC SENSORS:

Proximity detectors – Inductive and capacitive, ultrasonic, photo beam detectors Reed switch, magnet and Hall-effect units, Doppler detectors, liquid level detectors, flow sensors, smoke sensors.

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Course Outcomes:

CO:1. Explain the static and dynamic characteristics of transducers
CO:2. Explain the operation of electrical, magnetic, piezoelectric, fiber optic transducers
CO:3. Explain the operation of digital transducers and their application
CO:4. Explain the application of smart sensors
CO:5. Identify a sensor for a particular industrial application

References:

[1]. Jack P Holman, Experimental Methods for Engineers, 8th Edition, Mc Graw Hill, USA, 2011.
[2]. Robert G Seippel, Transducers, Sensors and Detectors, Reston Publishing Company, USA, 1983.
[3]. Patranabis.D, -Sensors and Transducers, PHI learning,2nd edition,2003
[4]. Jacob Fraden-Hand Book of Modern Sensors: Physics, Designs and Application, Fourth edition, Springer, 2014

Text Books:

[1]. Doebelin EO - Measurement Systems, Application and Design, Mc Graw Hill, 7th Edition, 2019
[2]. Ian R Sinclair – Sensors and Transducers, Third Edition, New Age publishers, 2011.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	M	L	-	-	-	-	-	-	-	M	S	S
CO2	M	L	-	-	M	S	S	M	M	-	-	-
CO3	M	L	-	-	-	-	-	-	-	-	-	-
CO4	M	L	-	-	-	M	S	S	M	-	-	-
CO5	S	M	L	L	-	-	-	-	-	-	-	-

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PROFESSIONAL ELECTIVE COURSE – V

(Industrial Control)

Course Code	Course Name	Semester	Credit	
BEEF188TE	Process Control Lab	8	2	

List of Experiments

1. Operation of interacting and non-interacting systems.
2. Responses of different order processes with and without transportation lag.
3. Response of on-off controller.
4. Response of PID controller.
5. Characteristics of control valve with and without positioned.
6. Operation of on-off controlled thermal process.
7. Closed loop response off low control loop.
8. Closed loop response of level control loop.
9. Closed loop response of temperature control loop.
10. Closed loop response of pressure control loop.
11. Tuning of controllers.
12. Study of complex control system (ratio/cascade/feedforward).

Course Outcomes:

CO:1. Design the ON/OFF controller and PID Controller using EDA tool

CO:2. Apply the PID controller on various bench mark processes.

CO:3. Apply the different PID controller tuning methods on various bench mark processes

CO:4. Analyze the characteristics of control valve with and without positioner.

CO:5. Demonstrate the PID implementation issues using EDA tool.

CO:6. Design and implement PID controller for multi variable systems.

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Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Digital Control Systems	8	3	45

Course Objective

- Design and analyse digital controllers.
- Design state feedback and output feedback controllers.

Unit 1:

DISCRETE REPRESENTATION OF CONTINUOUS SYSTEMS

Basics of Digital Control Systems. Discrete representation of continuous systems. Sample and hold circuit. Mathematical Modelling of sample and hold circuit. Effects of Sampling and Quantization. Choice of sampling frequency. ZOH equivalent.

Unit 2:

DISCRETE SYSTEM ANALYSIS

Z-Transform and Inverse Z Transform for analyzing discrete time systems. Pulse Transfer function. Pulse transfer function of closed loop systems. Mapping from s-plane to z plane. Solution of Discrete time systems. Time response of discrete time system.

Unit 3:

STABILITY OF DISCRETE TIME SYSTEM

Stability analysis by Jury test. Stability analysis using bilinear transformation. Design ofdigital control system with dead beat response. Practical issues with dead beat response design.

Unit 4:

STATE SPACE APPROACH FOR DISCRETE TIME SYSTEMS

State space models of discrete systems, State space analysis. Lyapunov Stability.Controllability,reach-ability, Reconstructibility and observability analysis. Effect of polezero cancellation on the controllability & observability.

Unit 5:

DESIGN OF DIGITAL CONTROL AND OUTPUT FEEDBACK CONTROL SYSTEM

Design of Discrete PID Controller, Design of discrete state feedback controller. Design of setpoint tracker. Design of Discrete Observer for LTI System. Design of Discrete compensator. Feedback control -Fast output sampling (FOS).

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Course Outcomes:

CO:1. Basics of discrete control systems.
CO:2. Z & inverse Z transforms for discrete system with time response analysis.
CO:3. Analyse the performance of the discrete systems with stability.
CO:4. State Space Approach for discrete time systems.
CO:5. Design of controllers and compensators for discrete System.
CO:6. Feedback controllers design for discrete time systems.

References:

[1] G. F. Franklin, J. D. Powell and M. L. Workman, "Digital Control of DynamicSystems", Pearson Education, 2002
[2] B.C. Kuo, "Digital Control System", Holt, Rinehart and Winston, 1980.
[3] M.Gopal, Digital Control and State Variable Methods, McGraw Hill Publication, 2017.
[4] Marcus Bednara, AvadhPati, "Digital Control Systems", Scitus Academics,2019.
[5] Anastasia Veloni&NikolaosMiridakis , "Digital Control Systems: Theoretical Problems and Simulation Tools", 1st Edition, CRC Press, 2018,

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1]. K. Ogata, "Digital Control Engineering", Prentice Hall of India Pvt. Ltd, 2nd Edition 2012.
[2].M. Gopal, "Digital Control Engineering", 2nd Edition, New Age International Pvt.Ltd, 2014.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	S	S	S	S	S	M	M	S	M	M	S
CO3	S	S	S	S	S	S	S	M	S	M	M	S
CO4	S	S	S	S	S	S	M	M	M	M	M	S
CO5	S	S	S	S	S	S	M	M	S	M	M	S
CO6	S	S	S	S	S	S	M	M	S	M	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Robotics Lab	8	2	

List of Experiments

1. Study of different types of robots based on configuration and application.
2. Study of different type of links and joints used in robots.
3. Study of components of robots with drive system and end effectors.
4. Determination of maximum and minimum position of links.
5. Verification of transformation (Position and orientation) with respect to gripper and world coordinate system.
6. Estimation of accuracy, repeatability and resolution.
7. Robot programming exercises.
8. Point-to-point and continuous path programming.

Course Outcomes:

CO:1. model the different types of robots using EDA tool

CO:2. Different type of links and joints used in robots

CO:3. Calculate work volume for different robots

CO:4. Programming of ROBOTs

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Hardware Networking	8	3	50

Course Objective

- To introduce the basic concept of power electronics.
- Identify the major components that make up the system unit.
- Understand the concept of data communication.
- Discuss the advantages and disadvantages of different network topologies. Compare different network classifications based on different category.
- Know the use of different network devices.
- Identify the protocols used in TCP /IP and compare with OSI model. Understand IP address concepts and TCP/IP suite.

Unit 1:

Introduction about Computer -Basics of computer - Organization of computer- Software and hardware- Input/output devices.

Unit 2:

Basic networking concepts- Network topologies: LAN, WAN, MAN, PAN, CAN. - Networking Model -The OSI model -TCP/ IP Model – Network adapters- Introducing protocols. - Cabling and troubleshooting.

Unit 3:

Introduction to various networking devices: . Routers- Switches- Modems- Hubs etc. - Wired and Wireless technology.

Unit 4:

Inside the PC: Opening the PC and identification- Study of different blocks- Assembling and disassembling.- Network basic and configuration: Setting IP addresses, Sharing files and folders- Network troubleshooting- PING test, ipconfig etc.

Unit 5:

Introduction to servers and network security - Types of servers: Files servers, Email Servers-Proxy servers etc. Basics of Internet and Intranet: Types of Internet connections: Dialup, Broadband, Leased Line, Wi-Fi, WiMax, 2G, 3G, 4G, WWW, E-mails, Search Engines, Social Networking. - Cloud application. ---Audio-video Conferencing- Voice over Internet Protocol (VOIP)- Recovery and backup- Essential security measures

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Course Outcome:

CO:1. Troubleshoot the Faults in PC

CO:2. Compare different network classifications based on different category.

CO:3.Understand the different layers of OSI and their functions. Compare different LAN protocols.

CO:4.Understand about the various types of servers

References:

[1] Computer Networks Andrew S.Tanenbaum Prentice-Hall of India, New Delhi 2002

[2] Data Communication and networking BehrouzA.Forouzan Tata Mc-Graw Hill, New Delhi 2006

[3] Data and Computer Communications William Stallings Prentice-Hall of India Eighth Edition 2007

[4] IBM PC and CLONES:Hardware, Troubleshooting and Maintenance Hardcover – 20 September 2002 by B.Govindarajalu

Text Books:

[1] Computer Installation and Servicing D.BalasubramanianArasanGanesan Institute of Technology 1993

[2] The complete PC upgrade and Maintenance Mark Minasi BPB Publication 1997

[3] Troubleshooting, Maintaining and Repairing PCs Stephen J Bigelow Tata MCGraw Hill Publication 2004

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	S	M	M	S	S	M	S
CO4	S	S	S	M	S	S	S	M	S	M	M	S
CO5	S	S	S	S	S	M	M	M	M	S	M	S
CO6	S	M	S	M	S	S	M	M	S	M	M	S
CO7	S	S	S	S	S	S	S	M	S	S	M	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Real time operating Systems	8	3	50

Course Objective

- The objective of the course is to introduce the principles shared by many real-time operating systems, and their use in the development of embedded multitasking application software.

Unit 1:

INTRODUCTION

Introduction to Operating System: Computer Hardware Organization, BIOS and Boot Process, Multi-threading concepts, Processes, Threads, Scheduling

Unit 2:

BASICS OF REAL-TIME CONCEPTS

Terminology: RTOS concepts and definitions, real-time design issues, examples, Hardware Considerations: logic states, CPU, memory, I/O, Architectures, RTOS building blocks, Real-Time Kernel

Unit 3:

PROCESS MANAGEMENT

Concepts, scheduling, IPC, RPC, CPU Scheduling, scheduling criteria, scheduling algorithms Threads: Multi-threading models, threading issues, thread libraries, synchronization Mutex: creating, deleting, prioritizing mutex, mutex internals

Unit 4:

INTER-PROCESS COMMUNICATION

Messages, Buffers, mailboxes, queues, semaphores, deadlock, priority inversion, PIPES Memory Management:- Process stack management, run-time buffer size, swapping, overlays, block/page management, replacement algorithms, real-time garbage collection

Unit 5:

CASE STUDIES

Case study Linux POSIX system, RTLinux / RTAI, Windows system, Vxworks, uItron Kernel Design Issues: structure, process states, data structures, inter-task communication mechanism, Linux Scheduling

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Course Outcome:

CO:1.After completing the course students will understand the fundamental concepts of real-time operating systems.

References:

[1]. W. Richard Stevens, "Advanced Programming in the UNIX® Environment", 2nd Edition, Pearson Education India, 2011.
[2]. Philips A. Laplante, "Real-Time System Design and Analysis", 3rd Edition, John Wley& Sons, 2004
[3].Doug Abbott, "Linux for Embedded and Real-Time Applications", Newnes, 2nd Edition, 2011.

Text Books:

[1]. J. J Labrosse, "MicroC/OS-II: The Real –Time Kernel", Newnes, 2002.
[2]. Jane W. S. Liu, "Real-time systems", Prentice Hall, 2000.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	S	M	M	S	S	M	S
CO4	S	S	S	M	S	S	S	M	S	M	M	S
CO5	S	S	S	S	S	M	M	M	M	S	M	S
CO6	S	M	S	M	S	S	M	M	S	M	M	S
CO7	S	S	S	S	S	S	S	M	S	S	M	S

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PROFESSIONAL ELECTIVE COURSE –VI

(Power Electronics)

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Advanced Power Electronics And Drives	8	3	45

Course Objective

- To introduce the basic concept of power electronics.
- To study the AC to DC converters & DC to AC converters.
- To study the DC motor drives and Ac motor drives.

Unit 1:
INTRODUCTION
Basic Concept of Power Electronics, Different types of Power Electronic Devices – Diodes, Transistors and SCR, MOSFET, IGBT and GTO's.

Unit 2:
AC TO DC CONVERTERS
Single Phase and three phase bridge rectifiers, half controlled and Fully Controlled Converters with R, RL, and RLE loads. Free Wheeling Diodes, Dual Converter, Sequence Control of Converters – inverter operation, Input Harmonics and Output Ripple, Smoothing Inductance.

Unit 3:
DC TO AC CONVERTERS
Basics of Inverter – Classifications – VSI - single Phase Half and Full Bridge Inverters, three phase 180^o and120^o Configurations – Basic current source inverters- Need for feedback diodes in anti parallel with switches - Voltage Control and PWM strategies – single phase multilevel Inverter.

Unit 4:
DC MOTOR DRIVES
Speed control of DC motors – Thyristor converter fed DC drives : Single, two and four quadrant operations - Chopper Drives.

Unit 5:
AC MOTOR DRIVES
Speed control of Induction motors – Stator control – stator voltage and frequency control, Rotor Control , Slip Power Recovery Schemes – Kramer and scherbius Drives - AC chopper, Inverter, cycloconverter fed induction motor drives. Introduction - Synchronous Motor drives

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Course Outcomes:

CO:1. Understand the Basic structure, working and switching characteristics of Power semiconductor devices
CO:2. Principle and working of configuration of AC-DC controlled converters
CO:3. Working of different types of DC-AC Converters
CO:4. Apply different PWM methods and control strategies
CO:5. Speed control of different types of DC converters fed DC Drives
CO:6. Speed control of AC drives using different Converter configuration
CO:7. Slip power recovery scheme

References:

[1]. M. H. Rashid, Power Electronics: Circuits, Devices and Applications, Prentice Hall of India 3rd Edition,2014.
[2].P.C.Sen, Modern Power Electronics, S Chand & Co Ltd, 2nd edition 2005.
[3].Vedam Subramaniyam, Electric Drives, Tata McGraw Hill Ltd, 1994.

Text Books:

[1]. Dr P S Bimbhra "Power Electronics", Khanna Publishers, New Delhi, Edition 2012.
[2]. Dubey G.K. and Kasara .BadaRao., Power Electronic and Drives, Narosa Publications, 1986.
[3].G.K.Dubey, Doradia, S.R. Joshi and R.M.Sinha, Thyristorised, Power Controllers, New Age International Publishers, New Delhi, 1996.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	M	S
CO2	S	M	S	M	S	S	M	M	S	S	M	S
CO3	S	S	S	S	S	S	M	M	S	S	M	S
CO4	S	S	S	M	S	S	S	M	S	M	M	S
CO5	S	S	S	S	S	M	M	M	M	S	M	S
CO6	S	M	S	M	S	S	M	M	S	M	M	S
CO7	S	S	S	S	S	S	S	M	S	S	M	S

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Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Electric Vehicles And Hybrid Vehicles	8	3	45

Course Objective

- Understand the different possible ways of energy storage.
- Understand the different strategies related to energy storage systems

Unit 1:
INTRODUCTION

Conventional Vehicles: Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance. Introduction to Hybrid Electric Vehicles: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies

Unit 2:
ELECTRIC DRIVE

Hybrid Electric Drive-trains: Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis

Unit 3:
ELECTRIC TRAINS

Electric Drive-trains: Basic concept of electric traction, introduction to various electric drive train topologies, power flow control in electric drive-train topologies, fuel efficiency analysis. Electric Propulsion unit: Introduction to electric components used in hybrid and electric vehicles, Configuration and control of DC Motor drives, Configuration and control of Induction Motor drives, configuration and control of Permanent Magnet Motor drives, Configuration and control of Switch Reluctance Motor drives, drive system efficiency.

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Unit 4:
ENERGY STORAGE

Energy Storage: Introduction to Energy Storage Requirements in Hybrid and Electric Vehicles, Battery basedenergy storage and its analysis, Fuel Cell based energy storage and its analysis, Super Capacitor based energy storage and its analysis, Flywheel based energy storage and its analysis, Hybridization of different energy storage devices. Sizing the drive system: Matching the electric machine and the internal combustion engine (ICE), Sizing the propulsion motor, sizing the power electronics, selecting the energy storage technology, Communications, supporting subsystems

Unit 5:
ENERGY MANAGEMENT STRATEGIES

Energy Management Strategies: Introduction to energy management strategies used in hybrid and electric vehicles, classification of different energy management strategies, comparison of different energy management strategies, implementation issues of energy management strategies. Case Studies: Design of a Hybrid Electric Vehicle (HEV), Design of a Battery Electric Vehicle (BEV)

Course Outcomes:

CO:1. Basic concepts of hybrid and electric vehicles.

CO:2. Basic concepts of hybrid traction, types of hybrid drive-train topologies, Power flow control in hybrid drive-train topologies.

CO:3. Analysis of fuel efficiency.

CO:4. Study the configuration and control of Permanent Magnet Motor drives ,Switch Reluctance Motor drives .

CO:5. Matching the electric machine and the internal combustion engine (ICE).

CO:6. Classification of different energy management strategies.

References:

[1]. M. Ehsani, Y. Gao, S. E. Gay and A. Emadi, "Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design", CRC Press, 2005.

[2].T. Denton, "Electric and Hybrid Vehicles", 2nd Edition, 2020, Taylor and Francis Publisher.

[3]. Iqbal Husain, "Electric and Hybrid Vehicles Design Fundamentals" 2021 Edition Taylor & Francis Publisher.

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Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/
2. Electrical for you https://www.electrical4u.com/

Text Books:

[1]. C. Mi, M. A. Masrur and D. W. Gao, "Hybrid Electric Vehicles: Principles and Applications with Practical Perspectives", John Wiley & Sons, 2nd Edition, 2017.

[2].S. Onori, L. Serrao and G. Rizzoni, "Hybrid Electric Vehicles: Energy Management Strategies", Springer, 2015.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
S	S	S	S	S	S	S	S	S	S	S	S	S
S	M	S	M	S	S	S	M	S	S	S	S	S
S	S	S	S	M	S	M	S	S	S	M	M	S
S	S	S	S	S	S	M	S	S	M	S	S	S
S	S	S	M	M	S	S	S	S	S	S	S	S
S	S	S	S	S	S	S	S	S	S	S	S	S

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Course Code	Course Name	Semester	Credit	
BEEF188TE	Advanced Power Electronics And Drives Lab	8	2	

List of Experiments

Using Matlab, PSIM Software's

1. Single phase half and full converter with R, RL and RLE load.
2. IGBT based single phase PWM inverter.
3. Three phase AC voltage regulator.
4. Resonant DC to DC converter.
5. Microcontroller based speed control of VSI three phase Induction motor drive.
6. Simulation of Single Phase Full Converter with different loads.
7. Simulation of Single Phase Semi Converter with different loads.
8. Simulation of BUCK Converter.
9. Simulation of BOOST Converter.
10. Simulation of BUCK-BOOST Converter.

Course Outcomes:

CO:1. Analyse Single phase full converter with R, RL and RLE load

CO:2. Analyze Three phase AC voltage regulator and Resonant DC to DC converter

CO:3. Obtain speed control of Microcontroller based VSI fed three phase Induction motor drive

CO:4. Simulation of Single Phase Full Converter with different loads ,SinglePhase Semi Converter with different loads

CO:5. Simulation of Buck, Boost, Buck-Boost Converter.

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF188TE	Power Quality	8	3	

Course Objective

- To introduce the power quality problem
- To educate on production of voltages sags, over voltages and harmonics and methods of control.
- To study overvoltage problems
- To study the sources and effect of harmonics in power system
- To impart knowledge on various methods of power quality monitoring

Unit 1:

INTRODUCTION

Definitions-Power quality, Voltage quality-Power quality issues: Short duration voltage variations, Long duration voltage variations, Transients, Waveform distortion, Voltage imbalance, Voltage fluctuation, Power frequency variations-Sources and Effects of power quality problems-Power quality terms- Power quality and Electro Magnetic Compatibility (EMC),IEEE and IEC Standards.

Unit 2:

SHORT AND LONG INTERRUPTIONS

Introduction-Origin of short interruptions: Voltage magnitude events due to re- closing, Voltage during the interruption-Monitoring of short interruptions- Influence on induction motors, Synchronous motors, Adjustable speed drives, Electronic equipments-Single phase tripping: Voltage during fault and post fault period, Current during fault period-Prediction of short Interruptions.

LONG INTERRUPTIONS: Definition-Failure, Outage, Interruption-Origin of interruptions-Causes of long interruptions – Principles of regulating the voltage-Voltage regulating devices, Applications: Utility side, End-User side-Reliability evaluation-Cost of interruptions.

Unit 3:

VOLTAGE SAG AND TRANSIENTS

VOLTAGE SAG: Introduction-Definition-Magnitude, Duration-Causes of Voltage Sag-Load influence on voltage sags on Adjustable speed drives, Power electronics loads, Sensitive loads- Stochastic assessment of voltage sags – Overview of mitigation methods.

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TRANSIENTS: Definition-power system transient model-Principles of over voltage protection –Types and causes of transients- Devices for over voltage protection- Capacitors witch in transients- Lightning transients-Transients from load switching.

Unit 4:

WAVEFORM DISTORTION

Introduction - Definition and terms - Harmonics, Harmonics indices, Inter harmonics, Notching - voltage Vs Current distortion - Harmonics Vs Transients - Sources and effects of harmonic distortion - System response characteristics - Principles of controlling harmonics - Standards and limitation

Unit 5:

POWER QUALITY SOLUTIONS

Introduction-Power quality monitoring: Need for power quality monitoring, Evolution of power quality Monitoring, Deregulation effect on power quality monitoring-Brief introduction to power quality measurement equipments and power conditioning equipments- Planning, Conducting and Analyzing power quality survey-Mitigation and control techniques- Active Filters for Harmonic Reduction

Course Outcome:

CO:1. Explain various power quality problems

CO:2. Discuss the root cause of power quality problems

CO:3. Explain the impact of PQ issues on various electrical components

CO:4. Discuss the need for PQ monitoring and measurement

CO:5. Compute the harmonics distortion in the given electrical drive

References:

[1]. Sankaran.C,"PowerQuality", CRCPress, Washington, D.C., 2002.

[2].Math H.J. Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, NewYork, 2000.

[3].Arrillaga.J, Watson.N.RandChen.S,"PowerSystemQualityAssessment", JohnWiley.

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Text Books:

[1]. Roger C.Dugan, MarkF.Mc Granaghan and H.Wayne Beaty, “Electrical Power Systems Quality", McGraw-Hill, NewYork, Edition, 2002.

[2].Barry W.Kennedy, “Power QualityPrimer”, McGraw-Hill, NewYork, 2000.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	S	S	M	M	S	M	S	S
CO2	S	S	M	M	S	S	S	M	S	M	M	S
CO3	S	S	S	S	S	M	M	M	S	M	M	S
CO4	S	S	M	M	S	S	S	M	S	M	S	S
CO5	S	S	S	S	S	S	M	M	M	M	M	S

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SYLLABUS

OPEN ELECTIVE - I

(Mechatronics)

Course Code	Course Name	Semester	Credit	Hours
BEEF185OE	Applied Machines and fluid mechanics	5	3	45

Course Objective

- To understand the stresses developed in bars, compounds bars, beams, shafts, cylinders and spheres.
- The applications of the conservation laws to flow through pipes and hydraulic machines are studied.
- To understand the importance of various types of flow in pumps and turbines.

Unit 1:

GEO METRICAL PROPERTIES OF SECTIONS

Centroid, Centroidal axis Moments of inertia – Polar moment of inertia – Principal moments of inertia– Graphical treatment – Center of Gravity of solids by integration. Combined stresses-Principle stresses and planes - Graphical treatment – Stresses in thin cylinders and shells.

Unit 2:

ANALYSIS OF STATICALLY DETERMINATION PLANE STRESSES

Method of joints – Method of sections – Tension coefficient method – Graphical method. BEAMS AND BENDING: Beams and support conditions - Types of support - Shear force and bending moment – There dynamics for simply support beams. Cantilevers and over hanging beams with concentrated and or distributed loads - Theory of simple bending stress distribution crosssection due to B.M.Shear-Leaf springs.

Unit 3:

TORSION OF CIRCULAR SHAFTS

Theory of Torsion – Torsion of circular and hollow circular shaft and Shear due to torsion closed open coiled helical springs - Strain Energy due to axial force, bending moment flexural and torsional shear- Resilience stresses due to impact and suddenly applied loads.

Unit 4:

PROPERTIES OF FLUIDS

Properties of fluids – types of fluid flow – Euler‟s and Bernoulli‟s equation, limitations, pressure and flow measuring devices – mano meters – Orifice meter –venture meter and Pitottube. Reciprocating and centrifugal pumps – principles and operation – work done – efficiency – characteristics – specific speed – selection of pumps.

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Unit 5:

CLASSIFICATION OF TURBINES

Hydraulic turbines – Classification – Working principles of Pelton wheel, Francis and Kalpan turbines – Workdone – Efficiency – Velocity triangles – Specific speed – Characteristics curves –Selection of turbines.

Course Outcome:

CO:1. Upon completion of this course, the students can able to apply mathematical knowledge to calculate the deformation behavior of simple structures and different types of loads.

CO:2. The students can be to apply mathematical knowledge to predict the properties and characteristics of a fluid

CO:3. Can critically analyze the performance of pumps and turbines

References:

[1]. James M.Gere & Stephen, P.Timoshenko, "Mechanics of Materials", CBS Publishers and Distributors, Delhi.

[2].Gere and Timoshenko,"Mechanics of Materials", 4th edition, A Math CAD Based ebook.

[3].Egor P Popov, "Introduction to Mechanics of solids", Engle wood clitts, New Jersey, Prentice – Hall.

Text Books:

[1].S.Ramamrutham & R.Narayan, "Strength of Materials", 20th edition 2022, Dhanpat Rai Publishers, New Delhi.

[2].Dr.R.K.Bansal, "Fluid mechanics and machinery", Laxmi Publication pvt. Ltd, Bangalore, 9th Edition 2010

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	M	S	S	M	S	M	S	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	S	M	S	S	S	S	M	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185OE	Thermodynamics	5	3	45

Course Objective

- To familiarize the students to understand the fundamentals of thermodynamics.
- To perform thermal analysis on their behavior and performance.
- To integrate the concepts, laws and methodologies in thermodynamics into analysis of cyclic processes.
- To apply the thermodynamic concepts into various thermal applications like IC engines, Steam boilers and Turbines, Compressors and Refrigeration and Air conditioning systems.
- To understand the mechanisms of heat transfer under steady and transient conditions.
- To understand the concepts of heat transfer through extended surfaces.

Unit 1:
SYSTEM AND LAWS OF THERMODYNAMICS

Closed and open systems – equilibrium – first law – second law – reversibility – entrophy – processes–heat and work transfers – entrophy change – Carnot‟s cycle.

Unit 2:
POWER CYCLES AND INTERNAL COMBUSTIONS ENGINES

Carnot‟s cycle – otto cycle – diesel cycle – dual cycle – brayton cycle – air standard efficiency two stroke and four stroke engines – SI and CI engines – gas turbine operation.

Unit 3:
STEAM BOILERS AND TURBINES

Steam properties – use of steam tables and charts – steam power cycle – boilers and accessories–boiler testing – layout of thermal power stations –steam turbines – impulse and reaction turbine – compounding of turbines – simple velocity diagrams.

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Unit 4:
AIR COMPRESSORS, REFRIGERATION AND AIR CONDITIONING

Reciprocating and rotary compressors – staging compressor work – vapour compression refrigeration cycle – applications – air conditioning system layout – selection.

Unit 5:
HEAT TRANSFER

Conduction – plane wall, cylinder, sphere, composite walls – critical insulation thickness –simplefins– convection – free convection and forced convection flow over flat plates and flow through pipes – empirical relations – radiation – Black body – grey body radiation exchanges – cooling of machines.

Course Outcome:

CO:1. Apply the Thermodynamic Principles to Mechanical Engineering Application

CO:2. Apply mathematical fundamentals to study the properties of steam, gas and gas mixtures.

CO:3. Apply the different gas power cycles and use of them in Internal Combustion Engines.

CO:4. Apply the different gas power cycles and use of them Steam boilers and Turbines, Compressors and Refrigeration and Air conditioning systems

References:

[1]. Ballancy P.L,"Applied Thermodynamics",Edition 5, Khanna Publishers, 1984.
[2].A.S. Sorao, K.S. Rai "Applied Thermodynamics: In MKS and SI System of Units", Satya Prakasm,1988.

Text Books:

[1]. Nag P.K,"Engineering Thermodynamics", Tata Mc Graw - Hill, 6th Edition 2017.
[2].Kothadaraman and Domkundwar, "Thermodynamics and Thermal Engineering", Dhanput Rai & co(p) ltd,2008.
[3].Sachdeva R.C, "Fundamentals of Engineering Heat and Mass Transfer", 5th Edition New Age International,2017.
[4].T.Roy Choudhury, "Basic Engineering Thermodynamics",Tata Mc Graw-Hill Publishing Co.Ltd.2000.

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	M	S	S	S	S	S	M	S	S	M	S
CO2	S	S	S	S	S	S	S	S	S	S	S	S
CO3	S	S	S	M	M	M	S	S	S	M	S	S
CO4	S	S	S	S	S	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	
BEEF188TE	Applied Mechanics and Fluid Machineries Lab	5	2	

List of Experiments

1. Tension test on steel rod
2. Compression test on wood
3. Double shear test on metal
4. Torsion test on mild steel rod
5. Impact test on metal specimen (Izod and Charpy)
6. Hardness test on metals (Rockwell and Brinell Hardness Tests)
7. Deflection test on metal beam
8. Compression test on helical spring
9. Deflection test on carriage spring
10. Study of Pressure Measuring Devices
11. Verification of Bernoulli's Theorem
12. Venturimeter
13. Orifice meter
14. Impacts of jets
15. Pumps
16. Turbines

Course Outcome:

CO:1. The students will have the required knowledge in the area of testing of materials and components of structural elements experimentally.

CO:2. Understand the broad principles of fluid statics, kinematics and dynamics

CO:3. Understand definitions of the basic terms used in fluid mechanics, classifications of fluid flow

CO:4. Be able to apply the continuity, momentum and energy principles

CO:5. Be able to apply their knowledge of fluid mechanics in addressing problems in open channels

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF185OE	Electrical Materials	5	3	45

Course Objective

- To understand the concept of emission and thermal conductivity.
- To understand the theories of polarization.
- To understand magnetic material and their properties.
- To understand about LED's and lasers.
- To understand the concepts of special material.

Unit 1:
INTRODUCTION

Review of "structure of atom"- conductivity of metals Electrons mobility – Energy levels of amolecule – fermi – Dirac distribution – Emission – Superconductivity – Thermal conductivity of metals–Thermo electric effects of metals.

Unit 2:
DIELECTRIC PROPERTIES

Dielectric properties – (static fields) – polarization – Mechanisms of polarization polarisability – Dielectric properties – (Alternating fields) - Frequency dependence of polarisability – Dielectric losses–dielectric properties of polymeric systems – Ferro and piezo electricity.

Unit 3:
MAGNETIC PROPERTIES OF MATERIALS

Magnetic properties of materials – classification – dia, para, ferro magnetism – magnetic resonance– Measurement of electro magnetic properties

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Unit 4:
LIQUIDS AND OPTICS

Conduction in liquids – classification – electrolysis – lonic velocities – chemical cells and concentration cells – corrosion cells – corrosion by electric currents optical properties of solids – photo emission – electro luminescence – panels – photo emitters LED‟s – lasers – smart sensor materials- Material for fabrication of integrated circuits.

Unit 5:
SPECIAL MATERIALS

Metallic glasses as transformer core material – nano phase material – shape memory alloys –advanced ceramic materials – polymers – biomaterials – non - linear materials and their applications.

Course Outcome:

CO:1. To understand the various principles of emission

CO:2. To understand about dielectric and magnetic material

CO:3. To analyze the electro chemical properties, concentration cells etc.

CO:4. To evaluate various properties of special material

References:

[1]. A.J.Dekker , “Electrical Engineering Materials”, Prentice Hall,1961.
[2]. B.M.Tareev , “Materials for Electrical Engineering”,Higher school pub co.
[3].C.S. Indulkar , “An introduction to electrical Engineering materials”, S.Chand & co,1998.
[4].Raghavan V, “Materials science and Engineering”, Prentice Hall of India, New Delhi, 1993.

Text Books:

[1]. Arumugam.M, “Material science”, Anuradha Technical book Publishers, Kumbakonam,1997.
[2].Electrical Engineering Materials – Author(s): Amaresh Choudhury Santosh Kumar Mallick Tapas Chhualsingh,, Publication date:27-Sep-2018
[3].Materials Science for Electrical and Electronic Engineers, Publisher: Ian Jones, 2007,Authors:Jones, Ian P

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	M	S

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SYLLABUS

Open Elective II - (Management)

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Total Quality Management	6	3	45

Course Objective

- To study principles and practices of total quality management.
- To study tools and techniques of total quality management.
- To learn contemporary systems standards for total quality management.
- To facilitate the understanding of Quality Management principles and process.

Unit 1:
INTRODUCTION

Definition of Quality, Dimensions of Quality, Quality Planning, Quality costs – Analysis Techniques for Quality Costs, Basic concepts of Total Quality Management, Historical Review, Principles of TQM, Leadership – Concepts, Role of Senior Management, Quality Council, Quality Statements, Strategic Planning, Deming Philosophy, Barriers to TQM Implementation

Unit 2:
TQM PRINCIPLES

Customer satisfaction - Customer Perception of Quality, Customer Complaints, Service Quality,Customer Retention, Employee Involvement- Motivation, Empowerment, Teams, Recognition and Reward, Performance Appraisal, Benefits, Continuous Process Improvement - Juran Trilogy, PDSA Cycle, 5S, Kaizen, Supplier Partnership, Partnering, sourcing, Supplier Selection, Supplier Rating, Relationship Development, Performance Measures, Basic Concepts, Strategy, Performance Measure

Unit 3:
STATISTICAL PROCESSCONTROL (SPC)

The seven tools of quality, Statistical Fundamentals – Measures of central Tendency and Dispersion, Population and Sample, Normal Curve, Control Charts for variables and attributes, Process capability, Concept of six sigma, New seven Management tools.

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Unit 4:
TQM TOOLS

Benchmarking – Reasons to Benchmark, Benchmarking Process, Quality Function Deployment (QFD)- House of Quality, QFD Process, Benefits, Taguchi Quality Loss Function, Total Productive Maintenance (TPM) - Concept, Improvement Needs, FMEA- Stages of FMEA.

Unit 5:
QUALITY SYSTEMS

Need for ISO 9000 and Other Quality Systems, ISO 9000:2000 Quality System - Elements, Implementation of Quality System, Documentation, Quality Auditing, QS 9000, ISO 14000 –Concept, Requirements and Benefits.

Course Outcome:

CO:1. The different meanings of the quality concept and its influence. Describe, distinguish and use the several techniques and quality management tools.

CO:2. Distinguish the normalization, homologation and certification activities.

CO:3. Identify the elements that are part of the quality measuring process in the industry

CO:4. Predict the errors in the measuring process, distinguishing its nature and the root causes.

CO:5. Justify whether or not a measuring process fulfils the established Quality requirements.

CO:6. The regulation and the phases of a quality system certification process.

References:

[1]. James R.Evans & William M.Lidsay, "The Management and Control of Quality", (5th Edn), South-Western (Thomson Learning), Cengage Learning 2012.

[2]. Janakiraman. B and Gopal .R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006.

[3]. Feigenbaum.A.V."Total Quality Management", Mc Graw-Hill, 1991.

[4].NarayanaV.and Sreenivasan N.S., "Quality Management-Concepts and Tasks", New Age International, 1996.

[5]. Ramasamy, S., Total Quality Management, 2017, McGraw Hill Education.

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Text Books:

[1]. Dale H.Besterfiled, "Total Quality Management", Pearson Education Asia, 5th Edition, Indian reprint Sixth Impression, 2019.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Industrial Management	6	3	45

Course Objectives:

- The main objective of this course is to make the students understand industrial management practices
- To impart the core understanding of industrial production, planning and control, Industrial efficiency and productivity, Industrial discipline and relations

Unit 1:

INTRODUCTION TO INDUSTRIAL MANAGEMENT

Industrial Management–Concept Meaning and Definitions Scope Industrial Management Application of Industrial Management Objectives of Industrial Management Significance of Industrial Management. Difference between Industrial Management& Production Management Recent trends in Industrial Management

Unit 2:

MATERIAL MANAGEMENT AND PURCHASE MANAGEMENT

Concept and Meaning of Material Management Integrated Approach to Material Management Objectives of Material Management Functions of Material Management Concept and Meaning of Purchase Management Functions of Purchase Department Methods of Purchasing Steps in Purchasing Procedure

Unit 3:

INDUSTRIAL DISCIPLINE AND GRIEVANCE PROCEDURE

Concept and Meaning of Industrial Discipline Symptoms of Poor Industrial Discipline Steps in Disciplinary Procedure Concept and Meaning Grievance Procedure Need of Grievance Procedure
Method of Redressing Grievances Principle of Handling Grievances Model Grievance Procedure/Machinery in India

Unit 4:

TRADE UNIONISM AND COLLECTIVE BARGAINING

Concept and Meaning of a Trade Union Features of Trade Union Functions/Objectives of Trade Union Weaknesses/Defects of Indian Trade Union Measures to Remove Weaknesses/Defect of Indian Trade Union Concept and Meaning of Collective Bargaining Features of Collective Bargaining Advantages/Importance of Collective Bargaining

Unit 5:

INDUSTRIAL DEMOCRACYAND WORKERS PARTICIPATION IN MANAGEMENT

Concept and Meaning of Industrial Democracy Features of Industrial Democracy Advantages/Benefits of Industrial Democracy Concept and Meaning of Workers Participation in Management Need of Workers Participation in Management Methods/Techniques of Workers Participation in Management

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Course Outcomes:

CO:1. The students, ongoing through the course, will able to take decision regarding production, planning and control and deciding plant location and layout.

CO:2.The students will aware and able to measure industrial productivity and efficiency as well as students will able to maintain industrial discipline and improve the industrial relations

References:

[1] PunekarS.D.-"LabourWelfare",Trade,,UnionismandIndustrialRelations"-Himalaya Publication House-2003.

[2] M.E.TukaramRao –Industrial Management.

[3] Singh,Chhabra,Taneja–Personnel Management & Industrial Relations.

[4] MemoriaC.B.–Personnel Management.

[5] Aswaththappa K. – Human Resource Management Text and Cases – Mcgraw Hill Education(I) Ltd.

[6] Dipak Bhattacharya –Human Resource Management, Excel Books NewDelhi.

[7] JainJ.–Industrial Manageent–KitabMahal,Allahabad.

Text Books:

[1] KhannaO.P.–Industrial Engineering and Management.

[2] AhujaK.K.–Industrial Management –Khanna Publishers,Delhi.

[3] LundyJ.L.– Effective Industrial Management–Eurasia Publications

[4] Shrivastava R. M. - Management Policy & Strategic Management – Himalaya Publication House -1999

[5] S. N. Chary-Production and Operation Management 3rd Edition

[6] K. Aswathappa, K. ShidharaBhat – Production and Operation ManagementHimalaya Publication House.

[7] B.S.Goel-Production and Operation Management

[8] Kumarand Mittal-Production and Operation Management

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MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Entrepreneurship Development	6	3	45

Course Objectives:

- Understanding the types, characteristics of entrepreneurship and its role in economic development.
- Appreciating of the theories of achievement motivation and the principles of entrepreneurship development program to enterprise.
- Understanding the appropriate form of business ownership in setting up an enterprise.
- Understanding the fundamental concepts of finance and accounting to enterprise.
- Recognizing sickness in industry, selecting the appropriate corrective measures, and identifying the growth strategies in enterprise

Unit 1:
ENTREPRENEURSHIP

Entrepreneur – Characteristics – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur – Role of Entrepreneurship in Economic Development – Factors Affecting Entrepreneurial Growth – Economic, Non Economic, Government Actions.

Unit 2:
MOTIVATION

Entrepreneurial Motivation: Theories and Factors, Achievement Motivation –Entrepreneurial Competencies – Entrepreneurship Development Programs – Need, Objectives – Business Game, Thematic Apperception Test, Self Rating, Stress management.

Unit 3:
BUSINESS

Small Enterprises – Definition, Characteristics, Project Identification and selection – Project Formulation: Significance, content, formulation of project report – Project Appraisal: Concept and method – Ownership Structures: Selection & Pattern.

Unit 4:
FINANCING AND ACCOUNTING

Finance: Need, Sources, Capital Structure, Term Loans – Accounting: Need, Objectives, Process, Journal, Ledger, Trial Balance, Final Accounts – Working Capital Management: Significance, Assessment, Factors, Sources, Management.

Unit 5:
SUPPORT TO ENTREPRENEURS

Sickness in small Business: Concept, Signals, Symptoms, Magnitude, Causes and Consequences, Corrective Measures – Government Policy for Small Scale Enterprises – Growth Strategies in Small Scale Enterprise – Institutional Support to Entrepreneurs: Need and Support – Taxation Benefits to Small Scale Industry: Need, Depreciation, Rehabilitation, Investment

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Course Outcomes:

CO:1. Explain the types, characteristics of entrepreneurship and its role in economic development.
CO:2. Apply the theories of achievement motivation and the principles of entrepreneurship development program.
CO:3. Select the appropriate form of business ownership in setting up an enterprise.
CO:4. Apply the fundamental concepts of finance and accounting to enterprise.
CO:5. Identify sickness in industry, select the appropriate corrective measures, and identify the growth strategies in enterprise.

References:

[1]. Charantimath, P. M., Entrepreneurship Development and Small Business Enterprises, Pearson, 2006.
[2]. Hisrich R D and Peters M P, "Entrepreneurship" 5th Edition Tata McGraw-Hill, 2002.
[3]. Mathew J Manimala," Entrepreneurship theory at cross roads: paradigms and praxis" Dream tech, 2nd edition 2006.
[4]. Rabindra N. Kanungo, "Entrepreneurship and innovation", Sage Publications, New Delhi, 1998.
[5]. Singh, A. K., Entrepreneurship Development and Management, University Science Press, 2009.

Text Books:

[1]. S.S.Khanka, "Entrepreneurial Development" S.Chand& Co. Ltd. Ram Nagar New Delhi,1999.
[2]. Kurahko&Hodgetts, " Entrepreneurship – Theory, process and practices", Thomson learning 6th edition.

MAPPING CO – PO

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CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Human Resource and Management	6	3	45

Course Objective

- To familiarize the students with methods and techniques of HRM
- To understand and appreciate the importance of the human resources vis-a-vis other resources of the organization
- To equip them with the application of the HRM tools in real world business situations.

Unit 1:

HUMAN RESOURCES MANAGEMENT

Context and Concept of People Management in a Systems Perspective - Organization and Functions of the HR and Personnel Department - HR Structure and Strategy; Role of Government and Personnel Environment including MNCs.

Unit 2:

RECRUITMENT AND SELECTION

Human Resource Information System [HRIS] - Manpower Planning - Selection – Induction & Orientation - Performance and Potential Appraisal - Coaching and Mentoring - HRM issues and practices in the context of Outsourcing as a strategy.

Unit 3:

HUMAN RESOURCES DEVELOPMENT

Training and Development Methods - Design & Evaluation of T&D Programmes - Career Development - Promotions and Transfers - Personnel Empowerment including Delegation - Retirement and Other Separation Processes

Unit 4:

FINANCIAL COMPENSATION

Productivity and Morale - Principal Compensation Issues & Management - Job Evaluation - Productivity, Employee Morale and Motivation - Stress Management - Quality of Work Life.

Unit 5:

BUILDING RELATIONSHIPS

Facilitating Legislative Framework - Trade Unions - Managing Conflicts - Disciplinary Process - Collective Bargaining - Workers Participation in Management - Concept, Mechanisms and Experiences.

Course Outcome:

CO:1.The different meanings of the Human Resources concept and its influence.

CO:2.Describe, distinguish and use the several techniques and Human Resources management tools.

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References:

[1] Aswathappa, Human Resource Mangement, Tata Mcgraw Hill, Newdelhi, 2010
[2] Human Resource Management, Cengage Learning, Newdelhi, 2007 Pravindurai,
[3] Garry Dessler&Varkkey, Human Resource Management, Pearson, New Delhi, 2009 Alan Price,

Text Books:

[1] Human Resource Mangement, Pearson, New Delhi,2010 Snell, Bohlander&Vohra,
[2] Venkataratnam C. S. &Srivatsava B. K.,Personnel Management And Human Resources, Tata Mc-Graw Hill, Newdelhi,,
[3] Human Resources Management, Cengage, Newdelhi, 2010 10 MBA – II Semester Paper – IX

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Finance for Non Finance Managers	6	3	45

Course Objective

- To provide knowledge on the importance of finance.
- To provide knowledge on working capital.
- To provide knowledge on cash and inventory management

Unit 1:
INTRODUCTION
Why Good Financial Information Is Critical to You-The Structure and Interrelationship of Financial Statements-The Balance Sheet: Basic Summary of Value and Ownership- The Income Statement: The Flow of Progress.

Unit 2:
CAPITAL MANAGEMENT
Working capital Management- Working Capital Meaning - Importance of working capital management - components of working capital - Factors Influencing working capital requirements - Estimating working capital management - working capital life cycle - Role of finance manager in working capital.

Unit 3:
CASH MANAGEMENT
Importance - Factors influencing Cash Balance - Determining Optimum Cash Balance - Cash Budgeting - Controlling and Monitoring Collection and disbursements.- need for FinanceCommitteesonWorkingCapitalFinance.

Unit 4:
INVENTORYMANAGEMENT
Need for Inventories and Importance of its Management-Techniques for managing Inventory- Economic Order Quantity(EOQ)-Stock levels-Analysis of Investment in inventory-Selective Inventory Control-ABC,VED and FSN Analysis.

Unit 5:
APPLICATIONS
Break –event analysis, Business planning for the future-Importance of budgeting-cash flow analysis- Important indicators-Net present value-Depreciation-Importance of insurance.

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Course Outcome:

CO:1.Identify the elements that are part of the Capital, Cost Managements.

CO:2.Predict the errors in the Business planning

References:

[1]. Finance for the Non-Financial Manager ; Brief Case Books; Author: Gene Sicilliano,publisher:McGraw Hill ,2nd edition

Text Books:

[1]. Finance for Non-Financial Managers, Authors:JohanMarx.SamNgwenya.Gerhard Grobe,3rd edition

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
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CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Business Administration	6	3	45

Course Objective

- To provide knowledge regarding the basic concepts, principles and functions of management.
- To develop business and entrepreneurial aptitude among the students.
- To provide knowledge and requisite skills in different areas of management like human resource, finance, operations and marketing to give a holistic understanding of a business system.

Unit 1:
BUSINESS ENVIRONMENT
Business Environment: Meaning – Concept – Nature – Significance – Various environments affecting Business: Social economic political and legal, culture, competitive, demographic, technological and their impact in business.

Unit 2:
MANAGEMENT FUNCTIONS
Management functions- Planning- Types of Plans –Steps in planning – Management by Objectives (MBO) – Decision making.

Unit 3:
ORGANIZATION
Organization: Principles and process – Organization structure – Formal &Informal organization – Meaning of Delegation – Authority and Responsibility – Centralization and Decentralization.

Unit 4:
BUSINESS COMMUNICATION
Importance of Business communication-types of communication- Importance of effective communication-Barriers in communication-Resolving conflicts through communication.

Unit 5:
TEAM WORK
Team work and its function- Types of teams-Hierarchy of needs in team building-Designing a team-Resolving team conflicts- Conflict management in teams.

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SYLLABUS

Course Outcome:

CO:1. Identify the elements Business Management

CO:2. Predict the errors in the Business Communication

Text Books:

[1]. Business Administration by Arlene Douglas (Author),Publishser:Gill and Macmillian Ltd,4th Edition

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Nuclear And Particle Physics	6	3	45

Course Objective

- To provide knowledge regarding the basic concepts, principles and functions of Nuclear Physics

Unit 1:

BASIC NUCLEAR PROPERTIES

Nuclear size, mass, Charge, Spin, Binding energy- Nuclear stability – Mass parabola Nature of nuclear forces– Exchange forces – Meson theory.

Unit 2:

RADIOACTIVE DECAYS

Alpha emission – Geiger-Nuttal law – Neutrino hypothesis – Fermi theory of beta decay Selection rules– Gamma emission – Selection rules– Internal conversion – Nuclear isomerism - Basic principles of particle detectors – Ionization chamber – Proportional counter and G.M counters – Solid state detectors – Scintillation and semiconductor detectors.

.

Unit 3:

NUCLEAR MODELS

Liquid Drop Model: Basic concepts, Activation Energy-Shell Model: Basic concepts, Magic Numbers-Magnetic Moment of Nuclei-Collective Model: Explanation of Quadrupole Moments

Unit 4:

ACCELERATORS AND REACTORS

Cyclotron – Synchrocyclotron – Betaron – Synchrotron – Linear accelerators - Characteristics of fission, Energy in fission –Fission reactors – Thermal reactors – Basic fusion processes - Characteristics of fusion – Solar fusion – Controlled fusion reactors.

Unit 5:

ELEMENTARY PARTICLES

Building blocks of nucleus – Nucleons, leptons, mesons, baryons, hyperons, hadrons, strange particles - Classification of fundamental forces and elementary particles – Basic Conservation laws – Additional Conservation laws : Baryonic, leptonic, strangeness and isospin charges/quantum numbers

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SYLLABUS

Course Outcomes:

CO:1. Identify the properties of Nuclear elements.

CO:2. Knowledge of applying the various Laws

References:

[1] H. S. Hans, Nuclear Physics: Experimental and Theoretical, New Age International Publishers, New Delhi,(2011).

[2] D. C. Cheng and G. K. O'Neill, Elementary Particle Physics: An Introduction, Addison-Wesley,(1979).

[3] Nuclear Physics – M.L Pandya and R.P.S Yadav(2018).

Text Books:

[1] K. S. Krane, Introductory Nuclear Physics, John-Wiley, New York,(2008).

[2] S. B. Patel, Nuclear Physics: An Introduction, Wiley-Eastern, New Delhi,(2011).

[3] B. L. Cohen, Concepts of Nuclear Physics, Tata McGraw Hill, New Delhi, (1988).

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Open Elective III - (CSE & IT)

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Internet of Things	6	3	45

Course Objective

- Students will understand the concepts of Internet of Things and can able to build IOT applications

Unit 1:
INTRODUCTION

Introduction to IoT Defining IoT, Characteristics of IoT, IoT reference Model, Physical design of IoT, Logical design of IoT, Functional blocks of IoT, Communication models &APIs

Unit 2:
IOT & M2M

Introduction, Some Definitions, M2M Value Chains, IOT Value Chains, An emerging industrial structure for IOT, IOT & M2M Machine to Machine, Difference between Iotand M2M, Software define Network

Unit 3:
CHALLENGES IN IOT

Challenges in IOT Design challenges, Development challenges, Security challenges, Otherchallenges

Unit 4:
IoT APPLICATIONS

Domain specific applications of IOT Home automation, Industry applications,Surveillance applications, Other IOT applications

Unit 5:
DEVELOPING IOT

Developing IOTS Introduction to Python, Introduction to different IOT tools, Developing applications through IOT tools, Developing sensor based application through embedded system platform, Implementing IOT concepts with python

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Course Outcome:

CO:1. Understand the concepts of Internet of Things

CO:2. Analyze basic protocols in wireless sensor network

CO:3. Design IoT applications in different domain and be able to analyze their performance

CO:4. Implement basic IoT applications on embedded platform

References:

[1]. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice"

[2].Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1 st Edition, Apress Publications, 2014.

[3]. Olivier Hersent, David Boswarthick, Omar Elloumi , —The Internet of Things – Key applications and Protocols, Wiley, 2012.

[4]. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, —IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017.

Text Books:

[1]. Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1 st Edition, VPT, 2014

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Bio Information	6	3	45

Course Objective

- Students will understand the recent evolution in biological science.

Unit 1:

BIOLOGICAL DATA ACQUISITION

The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information.

Unit 2:

DATABASES

Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases - primary sequence databases, protein sequence and structure databases, Organism specific databases

Unit 3:

DATA PROCESSING

Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Localversus global. Distance metrics. Similarity and homology. Scoring matrices.

Unit 4:

METHODS OF ANALYSIS

Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA , and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment

Unit 5:

APPLICATIONS

Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis : Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

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Course Outcome:

CO:1. Develop models for biological data.

CO:2. Apply pattern matching techniques to bioinformatics data – protein data genomic data.

CO:3. Apply micro array technology for genomic expression study. Analyze basic protocols in wireless sensor network

References:

[1]. Bioinformatics The Machine Learning Approach by Pierre Baldi and Soren Brunak.

Text Books:

[1] Introduction to Bioinformatics by Arthur K. Lesk , Oxford University Press.
[2] Algorithms on Strings, Trees and Sequences by Dan Gusfield, Cambridge University Press.
[3] Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids by Durbin, S.Eddy, A.Krogh, G.Mitchison.
[4] Bioinformatics Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press.
[5] Beginning Perl for Bioinformatics: An introduction to Perl for Biologists by James Tindall, O"Reilley Media.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEF186TOE	Web Development using Python	6	3	45

Course Objective

- Students will understand the concepts of Python and can able to build Web applications

Unit 1:

PYTHON BASICS

Entering Expressions into the Interactive Shell, The Integer, Floating-Point, and String Data Types, String Concatenation and Replication, Storing Values in Variables

Unit 2:

LISTS

The List Data Type, Working with Lists, Augmented Assignment Operators, Methods, Example Program: Magic 8 Ball with a List, List-like Types: Strings and Tuples

Unit 3:

PATTERN MATCHING WITH REGULAR EXPRESSIONS

Finding Patterns of Text Without Regular Expressions, Finding Patterns of Text with Regular Expressions, More Pattern Matching with Regular Expressions, Case-Insensitive Matching.

Unit 4:

CLASSES AND OBJECTS

Programmer-defined types, Attributes, Rectangles, Instances as return values, Objects are mutable, Time, Pure functions, Modifiers, Prototyping versus planning.

Unit 5:

WEB SCRAPING

Downloading Files from the Web with the requests Module, Saving Downloaded Files to the Hard Drive, Working with Excel Spreadsheets, Working with PDF and Word Documents**,** Working with CSV files and JSON data

Course Outcomes:

CO:1. Demonstrate proficiency in handling of loops and creation of functions

CO:2. Identify the methods to create and manipulate lists, tuples and dictionaries.

CO:3.Discover the commonly used operations involving regular expressions and file system.

CO:4.Interpret the concepts of Object-Oriented Programming as used in Python.

CO:5.Determine the need for scraping websites and working with CSV, JSON and other file form

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SYLLABUS

References:

[1] Gowrishankar S, Veena A, "Introduction to Python Programming", 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372

[2] 2. Jake VanderPlas, "Python Data Science Handbook: Essential Tools for Working with Data", 1 st Edition, O'Reilly Media, 2016. ISBN-13: 978-1491912058

[3] Charles Dierbach, "Introduction to Computer Science Using Python", 1 st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014

[4] Wesley J Chun, "Core Python Applications Programming", 3rd Edition, Pearson Education India, 2015. ISBN-13: 978-9332555365

Text Books:

[1] Al Sweigart,"Automate the Boring Stuff with Python",1 stEdition, No Starch Press, 2015.

[2] Allen B. Downey, "Think Python: How to Think Like a Computer Scientist", 2nd Edition, Green Tea Press, 2015.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Open Elective IV - (Employment Enhancement Course)

Course Code	Course Name	Semester	Credit	Hours
BEEP186OER	Solar PV systems Design Simulation and Monitoring Control and Maintenance	7	3	45

Course Objective

- To study principles of Solar Power Generation.
- To study tools and techniques of Solar Testing.
- To learn contemporary systems standards for import and export of solar energy.

Unit 1:

Introduction to solar PV installation

Basics of solar energy systems and power generation, DNI, GHI and diffused irradiance and radiation, solar energy compound such as panels, batteries, charge controllers, Inverters – Series and parallel connection of solar batteries – Handling procedure for solar panels – Energy storage control and conversion – Panel mounting and inclination and angle of tilt – Placement of solar panel mounting – sunlight and direction assessment – Tools involved in installation of system. Types of solar photo voltaic system – ON grid and OFF grid connected solar systems– Stand-alone systems

Unit 2:

Commissioning of solar systems

Charge controller – Inverters – ON grid and OFF grid system components – Testing equipments – Application equipments – Clamping accessories for installation – Identification of load to be connected – Reading and interpreting the single line diagrams –Site survey before installation – Testing of solar system components including fault finding and analysis including continuity testing and polarity checking – Fundamentals of earthing for solar systems.

Unit 3:

Testing import and export of Solar systems

Regulations and standards for solar interconnection of solar cells – Testing for import and export of solar energy – Testing and verify inverter operation and including anti- islanding functioning, over loading testing for power quality of a roof top solar systems – Testing for phase imbalance.

Course Outcomes:

CO:1. To understand the various principles of solar Generation
CO:2. To understand about testing of solar energy.
CO:3. To analyze the testing of import and export of solar energy.

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SYLLABUS

References:

[1].Tapan K. Bhattacharya, "Terrestrial Solar Photovoltaics" , , London Narosa Publishing House,1998

[2].NPTEL Course Videos: "Design of photovoltaic systems", Prof. Dr. L. Umanand, Department of Electronics System Engineering (DESE) of Indian Institute of Science, Bangalore, 2022

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/

Text Books:

[1].Chetan Singh Solanki ,"Solar Photo Voltaic- Fundamentals, Technologies and Applications", PHI Learning Pvt. Ltd, 2012.

[2]. Chetan Singh Solanki ,"Solar Photovoltaic Technology and Systems: A Manual for Technicians, Trainers and Engineers", PHI Learning Pvt. Ltd 2013.

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEP186OER	Maintenance of Power Transformer, DG Sets, Industrial Power Distribution	7	3	45

Course Objective:

- To study principles of Power Transformer.
- To study tools and techniques of Electrical Equipment Installation.

Unit 1:POWER TRANSFORMER INSTALLATION AND MAINTENANCE PROCEDURES :

Dry-Type Power Transformers and Liquid-Type Power Transformer : Installation, Transformer Inspection, Tests : Routine and Special Tests, Measurement of winding resistance; Measurement of voltage ratio and check of voltage vectorrelationship;Measurementofimpedancevoltage/short-circuitimpedanceand load loss; Measurement of no-load loss and current; Measurement of insulation resistance; Dielectric tests; Temperature-rise, insulation and HV test, dielectric absorption, switching impulse test. testing of Current Transformer and Voltage Transformer, power transformer, distribution transformer, CVT and special transformer with reference to Indian Standard (IS). Drying out procedure for transformer. PI index, Commissioning steps for transformer, Troubleshooting &Maintenance of transformer, Cleaning.

Unit 2: DG SETS INSTALLATION AND MAINTENANCE PROCEDURES :

DG set selection and installation factors, Operational features, Energy performance assessment of DG sets, Energy saving majors for DG sets, Maintenance : Maintenance of the Diesel engine, Alternator ,Lubrication Oil Coolant, Fuel, Batteries, Radiator ,Low Load Operation Long Term Storage, General Maintenance schedule, Schedule Maintenance – A,B,C,D, E and troubleshooting .

Unit 3:

CABLES ANDMAINTENANCE PROCEDURES :

Types and sizes of cables, specification, current rating and their application. Describe the specification, application, care and maintenance procedures of flame proof cables. Classify different types of joints in the flame proof cable such as straight through, long routes and repaired section, branch Y joints – for branch of a sector, T- Joint – for branching of a sector, transition joints – special joint between two different types of cable ,types of faults and the methods of findings fault. , how to use Megger and Test lamps in fault location. ,Test the industrial wiring installation using a megger.

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Unit 4:SWITCHES AND MAINTENANCE PROCEDURES:

Various types of switches such as SPST, SPDT, DPST, DPDT, Toggle switch, pushbutton switch, level actuator, limit switch, selector switch, and flame proof switch, use of a circuit breaker. , types of circuit breakers and their applications such as MCB, MCCB, ELCB, air circuit breaker (ACB), SF6, vacuum circuit breaker (VCB), flame proof switchgear specification.

Determine fuse size, Miniature Circuit Breaker (MCB), Molded case circuit breakers (MCCB) etc. according to the load of circuits and their location. Inspect, test, rectify abnormal conditions, and commission connection of the circuit. Troubleshoot electrical installations and identify faults in the cable

Unit 5: DISTRIBUTION PANELS AND OTHER ACCESSORIES:

Installation, testing and commissioning of electrical installations in a big industry including high voltage transformers and its connected equipment in the switch yard, medium voltage distribution panels, power control centers, motor control centers, lighting arrangement, storage, pre-installation checks, installation, alignment, connecting and starting, Pre-commissioning checks, drying out, Causes of fire, precautions to avoid fire, types of fire-fighting equipment and their uses. Commissioning of fire-fighting equipment.

Course Outcomes:

CO:1.To understand the various principles of Electrical Maintenance

CO:2.To understand about testing of Electrical Equipment.

CO:3.To analyze the testing of import and export of Distribution Panels.

References:

[1].PhilipKiameh,“ElectricalEquipmentHandbook:TroubleshootingandMaintenance”,McGraw-Hill,2003.

[2].RelevantIndianStandards(ISCode)andIEEEStandardsfor-Installation,maintenanceandcommissioningof electricalequipment’s/machines.

Online Resources

1. Swayam-NPTELhttps://onlinecourses.nptel.ac.in/

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Text Books:

[1] Rao,S.,"Testing,commissioning,operationandmaintenanceofelectricalequipment",6/E.,KhannaPublishers, NewDelhi, 2008

[2] PaulGill,"Electricalpowerequipmentmaintenanceandtesting",CRCPress,2008.

[3] SinghTarlok,"Installation,commissioningandmaintenanceofElectricalequipment",S.K.Katariaand Sons,New Delhi,2010

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEP186OER	Wind Energy, System Design, Control and Maintenance	7	3	45

Course Objective

- To study principles of Solar Power Generation.
- To study tools and techniques of Solar Testing.
- To learn contemporary systems standards for import and export of solar energy.

Unit 1:

FUNDAMENTALS OF WIND TURBINES:

Power contained in wind -Thermodynamics of wind energy - Efficiency limit for wind energy conversion - Design of the wind turbine rotor: Diameter of the rotor, Choice of the number of blades, Choice of the pitch angle - The tower -The transmission system and gear box - Power speed characteristics - Torque speed characteristics- Wind turbine control systems: Pitch angle control, Stall control, Power electronic control, Yaw control, Control strategy

Unit 2:

WIND SITE ANALYSIS AND SELECTION:

Wind speed measurements -Robinson cup anemometer - Pressure tube anemometer -Hot wire anemometer - Wind speed statistics - Statistical wind speed distributions - Site and turbine selection.

Unit 3:

WIND MILL DESIGN AND APPLICATION:

Turbines - Wind mill –classification- power curve-Upwind and downwind systems - transmission rotors-pumps - generators - standalone system - grid system - batteries. Wind energy storage - wind farms - wheeling and banking - testing and certification procedures.

Unit 4:

SELF EXCITED INDUCTION GENERATORS:

Induction Generators-Basic Principle of operation-Operation in self excited mode-Initial Voltage build up –Limitations. Methods to overcome limitations – Controlled firing angle scheme with AC side capacitor-Inverter/converter system with DC side capacitor.

Unit 5:

GRID INTEGRATION OF WIND TURBINE SYSTEMS:

Grid Connected Induction Generators Operation - Single output system with Fixed speed -Double output system with variable speed - Grid connected Synchronous generators Operation- Wound field Synchronous generator- Permanent magnet Synchronous generator. Grid connected Wind Turbine systems – Features and configuration - Interface Requirements -Synchronizing with Grid - Power Flow between Two Synchronous Sources - Effect of a Wind Generator on the network

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SYLLABUS

Course Outcomes:

CO1: To understand the principle of wind generation
CO2: To understand tools and techniques in wind energy system
CO3: To understand the design and grid integration of wind turbine

References:

[1] Ahmed G. Abo-Khalil, Ali M. Eltamaly, Almoataz Y. Abdelaziz" Control and Operation of Grid-Connected Wind Energy Systems", Springer International Publishing, 2021

Text Books:

[1]. D.P.Kothari, S. Umashankar·"Wind Energy Systems and Applications" Narosa Publishing House Pvt. Limited, 2014

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEP186OER	VLSI Design Lab	7	2	

List of Experiments

1. HDL based design entry, Test bench creation and simulation of BCD counters PRBS generators, Comparators (min 4-bit) .
2. HDL based design entry, Test bench creation and simulation of Bothe multiplier / Carry select adder
3. 3.HDL based design entry, Test bench creation and simulation of4:1 Multiplexer /1: 4 Demultiplexer
4. HDL based design entry, Test bench creation and simulation of Decoder/Encoder
5. Synthesis, Placement and Routing (P&R) and post P&R simulation of the components simulated in (Expt. No. 2) above
6. Critical paths and static timing analysis results to be identified. Identify and verify possible conditions under which the blocks will fail to work correctly.
7. Hardware fusing and testing of each of the blocks simulated in (Expt. 2). Use of either chip scope feature (Xilinx) or the signal tap feature (Altera) is a must.
8. Invoke the PLL and demonstrate the use of the PLL module for clock generation in FPGAs.
9. Implement ADC & DAC interface with FPGA
10. Implement a serial communication interface with FPGA
11. Design, Simulate and Extract the layouts of Analog IC Blocks using EDA tools.

Tools To Be Used:

Xilinx / Mentor Graphics / Cadence / Altera / MAGMA / Tanner / Microwind / LTSPICE / Equivalent

Course Outcomes:

CO:1. Learn Hardware Descriptive Language (Verilog/VHDL)

CO:2. Learn the fundamental principles of VLSI circuit design in digital and analog domain

CO:3. Familiarize fusing of logical modules on FPGAs

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SYLLABUS

Course Code	Course Name	Semester	Credit	Hours
BEEP186OER	Artificial Intelligence and machine learning	7	3	45

Course Objective

- To study tools and techniques of Artificial Intelligence.
- To study principles of Neural Networks.

Unit 1:

ARTIFICIAL INTELLIGENCE

Defining Artificial Intelligence, Defining AI techniques - State Space Search and Heuristic Search Techniques - Production systems and characteristics, Hill Climbing, Breadth first and depth first search, Best first search

Unit 2:

MAPPINGS

Representations and Mappings, Approaches to knowledge representation - Representing simple facts in logic, Computable functions and predicates, Procedural vs Declarative knowledge, Logic Programming, Forward vs backward reasoning- Non-monotonic Reasoning, Logics for non-monotonic reasoning

Unit 3:

MACHINE LEARNING

Idea of Machines learning from data, Classification of problem – Regression and Classification, Supervised and Unsupervised learning - Model representation for single variable, Single variable Cost Function, Gradient Decent for Linear Regression, Multivariable model representation, Multivariable cost function, Gradient Decent in practice, Normal Equation and non-invertibility

Unit 4:

OPTIMIZATION

Classification, Hypothesis Representation, Decision Boundary, Cost function, Advanced Optimization, Multi-classification (One vs All), Problem of Overfitting, Regularization

Unit 5:

CASE STUDIES

Case Studies: Neural Networks - Support Vector Machines - Recommender Systems

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SYLLABUS

Course Outcomes:

CO1: To understand the principle of Neural Networks
CO2: To understand tools and techniques Artificial Intelligence

References:

[1].Artificial Intelligence, 2nd Edition, Rich and Knight
[2]. Machine Learning, Tom M. Mitchell

Text Books:

[1].Building Machine Learning Systems with Python, Richert& Coelho
[2].Artificial Intelligence: A Modern Approach, Stuart Russel, Peter Norvig

MAPPING CO – PO

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	S	S	S	S	M	S	S	S	S	S	S	S
CO2	S	M	S	S	S	S	S	S	S	S	S	M
CO3	S	S	M	S	S	S	M	M	M	S	S	S
CO4	S	M	M	S	M	S	S	M	S	M	,M	S
CO5	S	S	S	S	M	S	S	S	S	S	S	S