BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

Department

of

Electrical and Electronics Engineering

COURSE STRUCTURE

AND

SYLLABUS FOR 1st, 2nd, 3rd & 4th YEAR

B.TECH.

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PROGRAM OUTCOMES (PO'S)

Program Outcomes		Engineering Graduates will be able to
PO1	Engineering knowledge	Apply the knowledge of mathematics, science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis	Identify, formulate, review research literature, and analyze complex engineering problem s reaching substantiated conclusions using first principles of m athem atics, natural sciences, and engineering sciences.
PO3	Design/development of solutions	Design solutions for com plex engineering problem s and design system components or processes that m eet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of com plex 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 com plex 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 im pact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics	Apply ethical principles 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 com prehend 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, as a 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 life-long learning in the broadest context of technological change

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PROGRAM SPECIFIC OUTCOMES (PSO'S)

PSO1	The Electrical and Electronics Engineering graduates are capable of applying the Knowledge of mathematics and sciences in modern power industry.
PSO2	Analyze and design efficient systems to generate, transmit, distribute and utilize electrical energy to meet social needs using power electronic systems.
PSO3	Electrical Engineers are capable to apply principles of management and economics for providing better services to the society with the technical advancements in renewable and sustainable energy integration.

PROGRAM EDUCATIONAL OBJECTIVES (PEO'S)

PEO1	Have a strong foundation in the principles of Basic Sciences, Mathematics and Engineering to solve real world problems encountered in modern electrical engineering and pursue higher studies/placement/research.
PEO2	Have an integration of knowledge of various courses to design an innovative and cost effective product in the broader interests of the organization & society.
PEO3	Have an ability to lead and work in their profession with multidisciplinary approach, cooperative attitude, effective communication and interpersonal skills by participating in team oriented and open ended activities.
PEO4	Have an ability to enhance in career development, adapt to changing professional and societal needs by engage in lifelong learning.

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
First Year B.Tech (SEMESTER – I)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA001	Mathematics – I (Linear algebra and differential equations)	3	1	0	4	50	50	100	3
18PH001	Physics – I Waves and Modern Physics	4	1	0	5	50	50	100	4
18CE001	Environmental Studies	3	0	0	3	50	50	100	2
18EL001	Communicative English	3	0	0	3	50	50	100	2
18MEL01	Engineering Graphics	1	0	4	5	50	50	100	3
18PH L01	Physics Lab	0	0	3	3	50	50	100	1
18ELL01	English Communication skills Lab	0	0	3	3	50	50	100	1
18MEL02	Workshop Practice Lab	0	0	3	3	50	50	100	1
	Induction program								
	TOTAL	**14**	**2**	**13**	**32**	**400**	**400**	**800**	**17**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective From the Academic Year2018-2019 (R18 Regulations)

First Year B.Tech(SEMESTER – II)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA002	Mathematics – II (Numerical methods& Advanced Calculus)	3	1	0	4	50	50	100	3
18CY001	Chemistry	4	0	0	4	50	50	100	3
18PH003	Physics – II (Semiconductor Physics and Nano Materials)	4	0	0	4	50	50	100	3
18EE204	Circuit Theory	4	0	0	4	50	50	100	3
18CS001	Programming for Problem Solving	3	0	0	3	50	50	100	2
18CY L01	Chemistry Lab	0	0	3	3	50	50	100	1
18EE L22	Circuit Theory Lab	0	0	3	3	50	50	100	1
18CS L01	Programming for Problem Solving Lab	0	0	3	3	50	50	100	1
	NCC/NSS								
	TOTAL	**18**	**1**	**9**	**28**	**400**	**400**	**800**	**17**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective From the Academic Year2018-2019 (R18 Regulations)

Second Year B.Tech(SEMESTER – III)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18MA003	Mathematics – III (Probability and Statistics)	3	1	0	4	50	50	100	3
18EE302	Network Analysis	4	1	0	5	50	50	100	4
18EE303	Analog Electronics	4	0	0	4	50	50	100	3
18EE304	Electrical Machines-I (DC Machines and Transformers)	4	1	0	5	50	50	100	4
18CE003	Engineering Mechanics	4	1	0	5	50	50	100	4
18EL002	Technical English	3	0	0	3	50	50	100	2
18EEL31	Analog Electronics Lab	0	0	3	3	50	50	100	1
18EEL32	Measurement and Instrumentation Lab	2	0	3	5	50	50	100	2
	TOTAL	**24**	**4**	**6**	**34**	**400**	**400**	**800**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
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Effective From the Academic Year2018-2019 (R18 Regulations)
Second Year B.Tech (SEMESTER – IV)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE401	Electro Magnetic Fields	4	0	0	4	50	50	100	3
18EE402	Digital Electronics	4	1	0	5	50	50	100	4
18EE403	Electrical Machines-II (Induction motors and Synchronous machines)	4	1	0	5	50	50	100	4
18EE404	Signals & Systems	4	0	0	4	50	50	100	3
18CE002	Biology for Engineers	3	0	0	3	50	50	100	2
18EE406	Power Systems- I	4	0	0	4	50	50	100	3
18EEL41	Digital Electronics Lab	0	0	3	3	50	50	100	1
18EEL42	Electrical Machines Lab-I	0	0	3	3	50	50	100	1
18ITL01	Data Structures and Algorithms Lab	2	0	3	5	50	50	100	2
	TOTAL	**25**	**2**	**9**	**36**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective From the Academic Year2018-2019 (R18 Regulations)
Third Year B.Tech(SEMESTER – V)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE501	Power System – II	4	1	0	5	50	50	100	4
18EE502	Control Systems	4	1	0	5	50	50	100	4
18EE503	Power Electronics	4	1	0	5	50	50	100	4
18EE504	Microprocessors & Microcontrollers	4	0	0	4	50	50	100	3
18HS002	Indian Traditional Knowledge	3	0	0	3	50	50	100	0
18EE506	Professional Ethics and Human values	4	0	0	4	50	50	100	3
18EEL51	Electrical Machines Lab-II	0	0	3	3	50	50	100	1
18EEL52	Microprocessors & Microcontrollers Lab	0	0	3	3	50	50	100	1
18ELL02	Soft Skills Lab	0	0	3	3	50	50	100	1
18EEMO	MOOC								2
	TOTAL	**23**	**3**	**9**	**35**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective From the Academic Year2018-2019 (R18 Regulations)

Third Year B.Tech (SEMESTER – VI)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE601	AI techniques in Electrical Engineering	4	0	0	4	50	50	100	3
18EE602	Power System Protection	4	1	0	5	50	50	100	4
18EE603	Electrical Drives	4	0	0	4	50	50	100	3
18EE604	IOT's in Electrical Engineering	4	0	0	4	50	50	100	3
18EE605	Power System Operation Control	4	1	0	4	50	50	100	4
18EED1__	Program Elective Course -I	4	0	0	4	50	50	100	3
18EEL61	Control System Lab	0	0	3	3	50	50	100	1
18EEL62	Power Electronics lab	0	0	3	3	50	50	100	1
18EEL63	Simulation Lab	0	0	3	3	50	50	100	1
	Internship	4 Weeks during Summer Vacation							
TOTAL		**24**	**1**	**9**	**33**	**450**	**450**	**900**	**23**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Department Elective - I

18EED11: Optimization techniques
18EED12: Electrical Energy Conservation & Auditing
18EED13: Power Distribution System
18EED14: Digital Signal Processing

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)

For

Electrical and Electronics Engineering

Effective from the Academic Year2018-2019 (R18 Regulations)

Fourth Year B.Tech (SEMESTER – VII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EE701	High Voltage Engineering	4	0	0	4	50	50	100	3
18EED2_	Program Elective Course -II	4	0	0	4	50	50	100	3
18EED3_	Program Elective Course -III	4	0	0	4	50	50	100	3
18_ _I_ _	Open Elective-I	4	0	0	4	50	50	100	3
18ME002	Industrial Management and Entrepreneurship Development	4	0	0	4	50	50	100	3
18EE706	Constitution of India	3	0	0	3	50	50	100	0
18EEP01	Project Stage -I	0	0	6	6	50	50	100	2
18EEL72	Power Systems Lab	0	0	3	3	50	50	100	1
18EEL73	Electronics Design Lab	0	0	6	6	50	50	100	2
18EEL74	Internship					100		100	2
	TOTAL	**23**	**0**	**15**	**38**	**500**	**400**	**900**	**22**

CIE: Continuous Internal Evaluation SEE: Semester End Examination

L: Lecture, T: Tutorial, P: Practical

Department Elective - II

18EED21: Electrical Machine Design
18EED22: Control Systems Design
18EED23: Switched Mode Power Supply
18EED24: Digital Protection of Power System

Department Elective - III

18EED31: HVDC & FACTS
18EED32: Electrical and Hybrid Vehicles
18EED33: Line Commutated and Active Rectifiers
18EED34: Computer Aided Power System

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SCHEME OF INSTRUCTION & EXAMINATION (Semester System)
For
Electrical and Electronics Engineering
Effective from the Academic Year2018-2019 (R18 Regulations)
Fourth Year B.Tech (SEMESTER – VIII)

Code No.	Subject	Scheme of Instruction (Periods per week)				Scheme of Examination (Maximum marks)			No. of Credits
		L	T	P	Total	CIE	SEE	Total Marks	
18EED4_	Department Elective -IV	4	0	0	4	50	50	100	3
18_ _I_ _	Institutional Elective -II	4	0	0	4	50	50	100	3
18EED5_	Department Elective -V	4	0	0	4	50	50	100	3
18EEP02	Project Stage -II	0	0	20	20	75	75	150	10
	TOTAL	**12**	**0**	**20**	**32**	**225**	**225**	**450**	**19**

CIE: Continuous Internal Evaluation SEE: Semester End Examination
L: Lecture, T: Tutorial, P: Practical

Department Elective -IV
18EED41: Power Quality
18EED42: Smart Grid Technology and Applications
18EED43: Machine Modeling and Analysis
18EED44: Advanced Electric Drives

Department Elective -V
18EED51: Energy Storage Systems
18EED52: Industrial Electrical Systems
18EED53: Digital Control Systems
18EED54: Wavelet Transforms

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Institutional Elective-I

18CEI01: Air Pollution & Control
18CEI02: Sustainable Water and Sanitation
18CSI01: Java Programming
18CSI02: Database Management Systems
18ECI01: Consumer Electronics
18ECI02: Embedded Systems
18EII01: Principles & Applications of MEMS
18EII02: Power System Instrumentation
18ITI01: Data Analytics
18ITI02: Cyber Security
18MEI01: Fluid Power and Control Systems
18MEI02: Project Management
18MAI01: Linear Algebra
18PHI01: Nano-Materials and Technology
18PHI02: Fiber Optic Communication
18HUI01: System Thinking
18ELI01: English for Competitive Examinations
18ELI02: Professional Communication

Institutional Elective-II

18CEI03: Disaster Management
18CEI04: Remote sensing & GIS
18CSI03: Python Programming
18CSI04: Computer Networks
18ECI03: Artificial Neural Network
18ECI04: Internet of Things (IoT)
18EII03: Robotics and Automation
18EII04: Advanced Computer Control Systems
18ITI03: Mobile Application Developments
18ITI04: Web Technology
18MEI03: Non-Conventional Energy Sources
18MEI04: Automobile Engineering
18MAI02: Graph Theory
18PHI03: Advanced Materials
18PHI04: Optical Electronics
18HUI02: Organizational Psychology
18HUI03: Telugu Modern Literature
18ELI03: English through Media

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LINEAR ALGEBRA AND ODE

I B.Tech –I Semester (Code: 18MA001)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives:

CO1: To learn about solving a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors.

CO2: Identify the type of a given differential equation and select and apply the appropriate. Analytical technique for finding the solution of first order and higher order ordinary differential equations.

CO3: Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.

CO4:To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique.

Course Outcomes: Students will be able to

CLO1:Apply elementary row operations to find the rank of a matrix, to solve a system of linear equations and to find the inverse of a matrix.

CLO2:Find the Eigen values and Eigen vectors of the given square matrix and also compute the higher powers of the given matrix.

CLO3: Solve separable, linear, exact differential equations with and without initial conditions.

CLO4:Distinguish between linear and non-linear differential equation.

CLO5: Write the piecewise continuous functions in terms of unit step functions and hence find its
Laplace transforms.

CLO6:Solve linear differential equation with constant coefficients and unit step input functions using Laplace transforms technique.

UNIT - I

Linear Algebra: Rank of a Matrix; Elementary transformations of a matrix; Gauss-Jordan method of finding the inverse; Consistency of linear System of equations: Rouches theorem, System of linear Non-homogeneous equations, System of linear homogeneous equations; vectors; Eigen values; properties of Eigen values(without proofs); Cayley-Hamilton theorem (without proof).

[Sections: 2.7.1; 2.7.2; 2.7.6; 2.10.1; 2.10.2; 2.10.3; 2.12.1; 2.13.1; 2.14; 2.15.]

UNIT - II

Differential Equations of first order: Definitions; Formation of a Differential equation; Solution of a Differential equation; Equations of the first order and first degree; variables separable; Linear Equations; Bernoulli's equation; Exact Differential equations; Equations reducible to Exact equations: I.F found by inspection, I.F of a Homogeneous equation, In the equation M dx+ N dy=0.

Applications of a first order Differential equations: Newton's law of cooling; Rate of decay of Radio-active materials.

[Sections: 11.1; 11.3; 11.4; 11.5; 11.6; 11.9; 11.10; 11.11; 11.12.1; 11.12.2; 11.12.4; 12.6; 12.8]

UNIT – III

Linear Differential Equations: Definitions; Theorem; Operator D; Rules for finding the complementary function; Inverse operator; Rules for finding the Particular Integral; Working procedure to solve the equation; Method of Variation of Parameters; Applications of Linear Differential Equations: Oscillatory Electrical Circuits.

[Sections: 13.1; 13.2.1; 13.3; 13.4; 13.5; 13.6; 13.7;13.8.1;14.1;14.5]

UNIT – IV

Laplace Transforms: Definition; conditions for the existence; Transforms of elementary functions; properties of Laplace Transforms; Transforms of derivatives; Transforms of integrals; Multiplication by t^n; Division by t; Inverse transforms- Method of partial fractions; Other methods of finding inverse transforms; Convolution theorem(without proof); Application to differential equations: Solution of ODE with constant coefficients using Laplace transforms.

[Sections:21.2.1; 21.2.2; 21.3; 21.4; 21.7; 21.8; 21.9; 21.10; 21.12; 21.13; 21.14; 21.15.1]

TEXT BOOK:

1.B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1.Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.

2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

NPTEL Course Links:

1. https://nptel.ac.in/courses/122/104/122104018/

CO, PO and PSO Mapping:

LINEAR ALGEBRA AND ODE (18MA001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To learn about solving a system of linear homogeneous and non-homogeneous equations, finding the inverse of a given square matrix and also its Eigen values and Eigen vectors.	**3**	**2**	**-**	**1**	-	-	-	-	-	-	-	-	-	**1**	-
CO2	Identify the type of a given differential equation and select and apply the appropriate analytical technique for finding the solution of first order and higher order ordinary Differential equations.	**3**	**1**	-	**1**	-	-	-	-	-	-	-	-	-	**1**	-
CO3	Create and analyze mathematical models using first and second order differential equations to solve application problems that arises in engineering.	**3**	**3**	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO4	To learn about solving linear Differential equations with constant coefficients with the given initial conditions using Laplace transform technique	**3**	**3**	-	**2**	-	-	-	-	-	-	-	-	-	**3**	-

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WAVES AND MODERN PHYSICS

(ENGINEERING PHYSICS-1)
I B.TECH – I SEMESTER (CODE-18PH001)
(Common for ECE,EEE, EIE)

Lectures	**4**	Tutorial	**0**	Practical	**0**	Credits	**3**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

COURSE OBJECTIVES

CO1: To familiarize the students in getting knowledge about modern optics and their Engineering applications.
CO2: To make aware of the students to obtain circuit knowledge regarding electrical, Electronics and Magnetism.
CO 3: To make the students to understand the quantum theory and solving the various Physical problems using quantum mechanics.
CO 4: To get the knowledge of various methods of analytical techniques for material testing.

COURSE OUTCOMES: Student will be able to

CLO1: Learn about principle and working of different types of lasers and their applications.
CLO2: Know about principle, types of optical fibers of their importance in communication.
CLO3: Analyze the electromagnetic principles in electrical and electronic circuits and Maxwell's equations.
CLO4: Study about quantum mechanics and its applications.
CLO5: Read about properties and applications of ultrasonic's in various fields.
CLO6 : Know about radio isotopes and their applications.

UNIT-I (ADVANCED OPTICS)

Lasers: Interaction of radiation with matter. Einstein co-efficients, Properties of laser, Population inversion, LASER principle, pumping schemes-Three level and four level laser, ypes of lasers: solid-state lasers (Ruby), gas lasers (He-Ne), Semiconductor lasers; applications of lasers in industry and medicine.

Fibre Optics: Importance of optical fibre, Structure and principle of optical fibre, acceptance angle and numerical aperture, Types of optical fibers based on modes and refractive index, V-number, losses associated with optical fibers, ,fibre optical communication, advantages of optical fiber.

UNIT-II (ELECTRO-MAGNETIC INDUCTION AND MAXWELL'S EQUATIONS)

Maxwell's equations in vacuum and conducting medium. Velocity of electromagnetic wave in vacuum. Electromagnetic oscillations in LC circuit, LCR series resonance in A.C circuit and resonant frequency, Quality factor. Concept of skin effect, Energy in an electromagnetic field; Flow of energy and Poynting vector. Principle of circulating charge and cyclotron, Hall Effect.

UNIT-III (MODERN PHYSICS)

Dual nature of light, Debroglie concept of matter waves, Davission- Germer experiment, Heisenberg uncertainty principle and applications (non existence of electron in nucleus and finite width of spectral lines), one dimensional time independent and dependent Schrodinger wave equation, physical significance of wave function, application of Schrödinger wave equation to particle in a one dimensional potential box, concept of quantum tunneling and construction and working of Scanning Tunneling Electron Microscope.

UNIT-IV (ANALYTICAL TECHNIQUES)

Ultrosonics: Properties of ultrasonic's, Production of ultrasonic waves by magneto striction andpiezo-electric method, Determination of velocity of ultrasonic wave in liquids by Ultrasonic interferometer. Medical applications, Ultrasonic Imaging technique (Doppler Ultrasound Imaging advantages and limitations), industrial applications, NDT : Pulse echo technique, Time of flight diffraction technique.

Nuclear Techniques: Radio isotopes and its applications (medical and Industrial), GM counter, Scintillation counter.

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TEXT BOOK:

1. M.V.Avadhanulu, P.G.Kshirsagar, "Engineering physics", S.Chand & Company Pvt. Ltd.

2. PalaniSwamy, "Engineering physics", Scitech publication

REFERENCE BOOKS:

1. Dr.P.srinivasaRao, Dr.K.Muralidhar, "Basic engineering physics" Himalaya Publication

2. Dr.P.SrinivasaRao, Dr.K.Muralidhar, "Applied physics" Himalaya publication

CO, PO and PSO Mapping:

Physics – I Waves and Modern Physics(18PH001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Learn about principle and working of different types of LASERS and their applications.	3	_	3	3	3	3	2	–	–	–	–	2	–	2	–
CO2	Know about the principle, types of optical fibers and their importance in communication	3	_	3	3	3	3	2	–	–	–	–	2	–	–	1
CO3	Analyze electromagnetic principles in electrical and electronic circuits and Maxwell's equations	3	3	2	2	2	3	–	–	–	–	–	3	–	–	–
CO4	Study about quantum mechanics and its applications	3	3	–	2	2	2	–	–	–	–	–	3	–	2	–
CO5	Read about properties and applications of ultrasonic's in various fields	3	–	3	3	3	3	–	–	–	–	–	2	–	–	–
CO6	Know about radio isotopes and their applications	–	–	3	3	3	2	2	–	–	–	–	2	2	–	–

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ENVIRONMENTAL STUDIES

I B.Tech – I/II Semester (Code: 14CE001)

Lectures	4	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives: To learn

CO1: To develop an awareness, knowledge, and appreciation for the natural environment.

CO2: To understand different types of ecosystems exist in nature.

CO3: To know our biodiversity.

CO4: To understand different types of pollutants present in Environment.

CO5: To know the global environmental problems.

Course Outcomes: Students will be able to

CLO 1: Develop an appreciation for the local and natural history of the area.

CLO 2: Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.

CLO 3: Know how to manage the harmful pollutants.

CLO 4: Gain the knowledge of Environment.

CLO 5: Create awareness among the youth on environmental concerns important in the long-term interest of the society

UNIT – I

Introduction: Definition, Scope and Importance, Need for public awareness. Ecosystems: Definition, Structure and Functions of Ecosystems, types - Forest, Grassland, Desert, Aquatic (Marine, pond and estuaries). 6 periods

Biodiversity: Definition and levels of Biodiversity; Values of Biodiversity - Consumptive, Productive, Social, Aesthetic, Ethical and Optional; Threats and Conservation of Biodiversity; Hot Spots of Biodiversity, Bio-geographical Classification of India, India as a mega diversity nation. Chipko movement case study

UNIT – II

Natural resources: Land: Land as a resource, Causes and effects of land degradation - Soil erosion, Desertification. **Forest**: Use of forests, Causes and effects of deforestation, Afforestation, Mining - benefits and problems. **Water**: Uses, floods and drought, Dams - benefits and problems.

Energy: Importance of energy, Environmental Impacts of Renewable and Non-renewable energy resources. Silent Valley Project and Narmada Bachao Andolan case studies8 periods

Sustainability: Definition, Concept and Equitable use of resources for sustainable development; Rain water harvesting and Watershed management. Fieldwork on Rain water harvesting and Watershed management.

UNIT – III

Pollution: Definition; Causes, effects and control of air, water and nuclear pollution; Chernobyl Nuclear Disaster case study; Solid Waste: urban, Industrial and hazardous wastes; Integrated waste management - 3R approach, composting and vermin composting.

Environmental acts: Water and air (Prevention and Control of pollution) acts, Environmental protection act, Forest Conservation act.

UNIT – IV

Environmental issues: Green house effect & Global warming, Ozone layer depletion, Acid rains, Green Revolution, Population Growth and environmental quality, Environmental Impact Assessment. Environmental Standards (ISO 14000, etc.)

Case Studies: Bhopal Tragedy, Mathura Refinery and TajMahal, and Ralegan Siddhi (Anna Hazare).

Field work: Visit to a local area to document environmental assets – Pond/Forest/Grassland. Visit to a local polluted site- Urban and industry/ Rural and Agriculture.

TEXT BOOKS:

1. Benny Joseph, “Environmental Studies”, Tata McGraw-Hill Publishing Company Limited, New Delhi.
2. JP Sharma, “Comprehensive environmental studies”, Laxmi Publications.
3. ErachBharucha, “Text Book of environmental Studies”

REFERENCE BOOKS:

1. R.Rajagopalan, “Environmental studies”, Oxford University Press.
2. Anjaneyulu Y, “Introduction to Environmental Science”, B S Publications
3. Jr. G. Tyler Miller, “Environmental Science”, 11th Edition – Thomson Series.

CO, PO and PSO Mapping:

ENVIRONMENTAL STUDIES (14CE001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop an appreciation for the local and natural history of the area.	-	-	-	1	-	2	3	-	-	1	-	2	-	-	-
CO2	Hope for the better future of environment in India which is based on many positive factors like Biodiversity, successive use of renewable energy resources and other resources, increasing number of people's movements focusing on environment.	-	-	-	-	2	2	3	-	-	1	-	2	-	-	1
CO3	Know how to manage the harmful pollutants.	-	-	-	-	-	-	3	-	-	1	1	2	1	-	-
CO4	Gain the knowledge of Environment.	-	-	-	1	-	2	3	-	-	1	-	2	1	-	-
CO5	Create awareness among the youth on environmental concerns important in the long-term interest of the society	-	-	-	-	-	2	3	2	-	1	-	2	-	-	1

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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COMMUNICATIVE ENGLISH

I B.Tech – I/II Semester (Code: 18EL001)

Lectures	4	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Course Objectives : The course aims

CO1:To enhance the vocabulary competency of the students
CO2:To enable the students to demonstrate proficiency in the use of written English, including proper spelling, grammar, and punctuation
CO3:To introduce corrective measures to eliminate grammatical errors in speaking and writing
CO4:To enhance theoretical and conceptual understanding of the elements of grammar.
CO5:ToUnderstand and apply the conventions of academic writing in English
CO6:To enhance the learners' ability of communicating accurately and fluently

Course Outcomes : By the end of the course the student would be able to

CLO1:Build academic vocabulary to enrich their writing skills
CLO2: Make use of contextual clues to infer meanings of unfamiliar words from context
CLO3: Produce accurate grammatical sentences
CLO4: Skim for main idea(s) & scan for details
CLO5: Distinguish main ideas from specific details
CLO6: Identify author's purpose and tone
CLO7: Make inferences and predictions based on comprehension of a text
CLO8: Discuss and respond to content of the text in writing
CLO9: Produce coherent and unified paragraphs with adequate support and detail

UNIT-I

1.1 **Vocabulary Development**: Word formation-Formation of Nouns, Verbs & Adjectives from Root words-Suffixes and Prefixes
1.2 **Essential Grammar:** Prepositions, Conjunctions, Articles
1.3 **Basic Writing Skills**: Punctuation in writing
1.4 **Writing Practices**: Mind Mapping, Paragraph writing (structure-Descriptive, Narrative, Expository & Persuasive)

UNIT-II

2.1 **Vocabulary Development**: Synonyms and Antonyms
2.2 **Essential Grammar**: Concord, Modal Verbs, Common Errors
2.3 **Basic Writing Skills**: Using Phrases and clauses
2.4 **Writing Practices**: Hint Development, Essay Writing

UNIT III

3.1 **Vocabulary Development**: One word Substitutes
3.2 **Essential Grammar**: Tenses, Voices
3.3 **Basic Writing Skills**: Sentence structures (Simple, Complex, Compound)
3.4 **Writing Practices**: Note Making

UNIT IV

4.1 **Vocabulary Development**: Words often confused
4.2 **Essential Grammar**: Reported speech, Common Errors
4.3 **Basic Writing Skills**: Coherence in Writing: Jumbled Sentences
4.4 **Writing Practices**: Paraphrasing &Summarising

TEXT BOOKS/REFERENCE BOOKS:

1. Sanjay Kumar &PushpaLatha, "Communication Skills", Oxford University Press:2011.
2. Michael Swan, "Practical English Usage", Oxford University Press:1995.
3. F.T.Wood, "Remedial English Grammar", Macmillan:2007.
4. Liz Hamplyons& Ben Heasley, "Study Writing", Cambridge University Press:2006.

CO, PO and PSO Mapping:

Communicative English (18EL001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	To Enhance the Vocabulary Competence of the Students	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
CO 2	To enable the students to demonstrate proficiency in the use of written English including proper spelling ,grammar and punctuation	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
CO 3	To introduce corrective measures to eliminate grammatical errors in speaking and writing	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	**1**
CO 4	To Understand and apply the conventions of academic writings in English	-	-	-	-	-	-	-	-	**2**	**3**	**2**	-	-	**2**	1
CO 5	To Enhance the Learners' ability of communicating accurately and fluently	-	-	-	-	-	-	-	-	**3**	**3**	**2**	-	-	**2**	1

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ENGINEERING GRAPHICS

I B.Tech – I Semester (Code: 18MEL01)

Lectures	1	Tutorial	0	Practical	4	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives: To learn

CO1: clear picture about the importance of engineering graphics in the field of engineering
CO2: the drawing skills and impart students to follow Bureau of Indian Standards
CO3: To give an idea about Geometric constructions, Engineering curves, orthographic projections and pictorial projections
CO4: imagination skills about orientation of points, lines, surfaces and solids
CO5: basic drafting skills of AutoCAD

Course Outcomes: Students will be able to

CLO-1: draw projections of points and projections of lines using Auto CAD
CLO-2: plot projections of surfaces like circle, square and rhombus
CLO-3: plot the Projections of solids like Prisms and pyramids
CLO-4: convert the of Orthographic views into isometric views of simple objects
CLO-5: generate the of pictorial views into orthographic views of simple castings

UNIT – I

INTRODUCTION: Introduction to Drawing instruments and their uses, geometrical construction procedures

INTRODUCTION TO AUTOCAD:

Basics of sheet selection, Draw tools, Modify tools, dimensioning

METHOD OF PROJECTIONS: Principles of projection - First angle and third angle projection of points. Projection of straight lines. Traces of lines.

UNIT II

PROJECTIONS OF PLANES: Projections of plane figures: circle, square, rhombus, rectangle, triangle, pentagon and hexagon.

UNIT – III

PROJECTIONS OF SOLIDS: Projections of Cubes, Prisms, Pyramids, Cylinders and Cones Inclined to one plane. .

UNIT –IV

ISOMETRIC PROJECTIONS: Isometric Projection and conversion of Orthographic views into isometric views. (Treatment is limited to simple objects only).

ORTHOGRAPHIC PROJECTIONS: Conversion of pictorial views into Orthographic views. (Treatment is limited to simple castings).

TEXT BOOK:

1. Dhananjay M. Kulkarni, "Engineering Drawing with AutoCAD" PHI publication
2. N.D. Bhatt & V.M. Panchal, "Engineering Drawing", Charotar Publishing House.

REFERENCE BOOKS:

1. Dhananjay AJolhe, "Engineering Drawing" Tata McGraw hill publishers
2. Prof.K.L.Narayana& Prof. R.K.Kannaiah, "Engineering Drawing"

CO, PO and PSO Mapping:

Engineering Graphics(18MEL01)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Draw projections of points and projections of lines using Auto CAD	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO2	Plot projections of surfaces like circle, square and rhombus	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Plot the Projections of solids like Prisms and pyramids	3	-	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Convert the of Orthographic views into isometric views of simple objects	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-
CO5	Generate the of pictorial views into orthographic views of simple castings	3	2	-	-	-	-	-	-	-	-	-	-	-	2	-

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PHYSICS
LABORATORY
I B.Tech– I Semester (Code:
18PHL01)
(COMMON TO ALL
BRANCHES)

Lectures	**0**	Tutorial	0	Practical	**3**	Credits	**1**
Continuous Internal Assessment			**50**	Semester End Examination (3hours)			**50**

LIST OF EXPERIMENTS

1. Determination of acceleration due to gravity at a place using compound pendulum.
2. Study the variation of intensity of magnetic field along the axis of a circular coil using
3. Stewart-Gee's apparatus.
4. Determination of thickness of thin wire using air wedge interference bands.
5. Determination of radius of curvature of a Plano convex lens by using Newton's rings.
.6. Determination of wavelengths of mercury spectrum using grating normal incidence method.
7. Determination of dispersive power of a given material of prism using prism minimum deviation method.
8. Draw the resonant characteristic curves of L.C.R. series circuit and calculate the resonant frequency.
9. Draw the characteristic curves of a photocell and calculate the maximum velocity of electron.
10. Verify the laws of transverse vibration of stretched string using sonometer.
11. Determine the rigidity modulus of the given material of the wire using Torsional Pendulum.
12. Draw the load characteristic curves of a solar cell.
13. Determination of Hall coefficient of a semiconductor.
14. Determination of voltage and frequency of an A.C. signal using C.R.O.
15. Determination of Forbidden energy gap of Si &Ge.
16. Determination of wavelength of laser source using Diode laser.

Any three experiments are virtual

TEXT BOOK:

1. P.Srinivasarao & K.Muralidhar, "Engineering physics laboratory manual", Himalaya publications.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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ENGLISH COMMUNICATION SKILLS LABORATORY

I B.Tech – I/II Semester (Code: 18ELL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

UNIT-I

1.1 Listening Skills; Importance – Purpose- Process- Types
1.2 Barriers to Listening
1.3 Strategies for Effective Listening

UNIT-II

2.1 Phonetics; Introduction to Consonant, Vowel and Diphthong sounds
2.2 Stress
2.3 Rhythm
2.4 Intonation

UNIT-III

3.1 Formal and Informal Situations
3.2 Expressions used in different situations
3.3 Introducing Yourself & Others-Greeting & Parting-Congratulating-Giving Suggestions & Advices-Expressing Opinions-Inviting People-Requesting-Seeking Permission-Giving Information- Giving Directions- Sympathizing- Convincing People- Complaining & Apologizing-Thanking Others- Shopping- Travelling- Conversational Gambits

UNIT-IV

4.1 JAM Session
4.2 Debates
4.3 Extempore

TEXT BOOKS/REFERENCE BOOKS:

1. Sanjay Kumar &PushpaLatha, "Communication Skills", Oxford University Press:2011.
2. J.D. O' Connor, "Better English Pronunciation", Cambridge University Press:1984
3. Jack C Richards, "New Interchange" (4rth Edition), Cambridge University Press:2015
4. Grant Taylor, "English Conversation Practice", McGraw Hill:2001

SOFTWARE:

1. Buzzers for conversations, New Interchange series
2. English in Mind series, Telephoning in English
3. Speech Solutions, A Course in Listening and Speaking

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WORKSHOP PRACTICE

I B.Tech – I & II Semester (Code: 18MEL02)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives:

1. To impart student knowledge on various hand tools for usage in engineering applications.
2. Be able to use analytical skills for the production of components.
3. Design and model different prototypes using carpentry, sheet metal and welding.
4. Make electrical connections for daily applications.
5. To make student aware of safety rules in working environments.

Course Outcomes: After completion of this course student should be able to:

1. Make half lap joint, Dovetail joint and Mortise &Tenon joint
2. Produce Lap joint, Tee joint and Butt joint using Gas welding
3. Prepare trapezoidal tray, Funnel and T-joint using sheet metal tools
4. Make connections for controlling one lamp by a single switch, controlling two lamps by a single switch and stair case wiring.

Syllabus:

1. Carpentry
   a. Half Lap joint
   b. Dovetail joint
   c. Mortise &Tenon joint
2. Welding using electric arc welding process/gas welding
   a. Lap joint
   b. Tee joint
   c. Butt joint
3. Sheet metal operations with hand tools
   a. Trapezoidal tray
   b. Funnel
   c. T-joint
4. House wiring
   a. To control one lamp by a single switch
   b. To control two lamps by a single switch
   c. Stair-case wiring

TEXT BOOKS:

1. P.Kannaiah and K.L.Narayana, “Workshop Manual”, SciTech Publishers, 2009.
2. K. Venkata Reddy, “Workshop Practice Manual”, BS Publications, 2008.

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NUMERICAL METHODS AND ADVANCED CALCULUS

I B.Tech –II Semester (Code: 18MA002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: None

Course Objectives:

CO1: To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of equations, Interpolation and Approximation techniques.

CO2: To learn about evaluation of double and triple integrals and their applications.

CO3: To learn some basic properties of scalar and vector point functions and their applications to line, surface and volume integrals.

Course Outcomes: Students will be able to

CLO-1: Solve non-linear equations in one variable and system of linear equations using iteration methods.

CLO-2: Choose appropriate interpolation formulae based on the given data.

CLO-3: Compute the value of a definite integral using numerical integration techniques.

CLO-4: Predict the numerical solution of the derivative at a point from the given initial value problem using appropriate numerical method.

CLO-4: Evaluate the double and triple integrals using change of variables.

CLO-5: Transform line integrals to surface and surface to volume integrals and evaluate them.

UNIT - I

Numerical Solution of Equations: Introduction; Solution of algebraic and transcendental equations: Bisection method, Method of false position, Newton-Raphson method; Useful deductions from the Newton-Raphson formula; Solution of linear simultaneous equations; Direct methods of solution: Gauss elimination method, Gauss-Jordan method, Factorization method; Iterative methods of solution: Jacobi's iterative method, Gauss-Seidel iterative method.

[Sections: 28.1; 28.2; 28.3; 28.5; 28.6; 28.7.1;28.7.2]. [12 Hours]

UNIT - II

Finite differences and Interpolation: Finite differences: Forward differences, Backward differences; Newton's interpolation formulae: Newton's forward interpolation formula, Newton's backward interpolation formula; Interpolation with unequal intervals; Lagrange's interpolation formula; Divided differences; Newton's divided difference formula; Numerical integration; Trapezoidal rule; Simpson's one-third rule; Simpson's three-eighth rule; Numerical solution of ODE's: Introduction; Picard's method; Euler's method; Runge-Kutta method.

[Sections:29.1; 29.1-1; 29.1.2; 29.6; 29.9; 29.10; 29.11; 29.12; 30.4; 30.6; 30.7; 30.8; 32.1; 32.2; 32.4; 32.7]. [12 Hours]

UNIT – III

Multiple Integrals: Double integrals; Change of order of integration; Double integrals in polar coordinates; Area enclosed by plane curves; Triple integrals; Volumes of solids: Volume as Triple integrals, Change of variables.

[Sections: 7.1; 7.2; 7.3; 7.4; 7.5; 7.6.2; 7.7.2]. [12 Hours]

UNIT – IV

Vector calculus and its Applications: Scalar and vector point functions; Del applied to scalar point functions-Gradient: Definition, Directional derivative; Del applied to vector point functions: Divergence, Curl; Line integral; Surfaces: Surface integral, Flux across a surface; Green's theorem in the plane (without proof); Stokes theorem (without proof); Gauss divergence theorem(without proof).

[Sections: 8.4; 8.5.1; 8.5.3; 8.6; 8.11; 8.12; 8.13; 8.14; 8.16] [12 Hours]

TEXT BOOK:

1. B.S.Grewal, "Higher Engineering Mathematics", 44thedition, Khanna publishers, 2017.

REFERENCE BOOKS:

1. Erwin Kreyszig, "Advanced Engineering Mathematics", 9th edition, John Wiley & Sons.
2. N.P.Bali and M.Goyal, "A Text book of Engineering Mathematics" Laxmi Publications, 2010.

NPTEL Course Links:

1. NPTEL :: Mathematics - NOC:Numerical methods
2. NPTEL :: Mathematics - NOC:Integral and Vector Calculus

CO, PO and PSO Mapping:

NUMERICAL METHODS AND ADVANCED CALCULUS (18MA002)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	To learn about some advanced numerical techniques e.g. solving a nonlinear equation, linear system of equations.	**3**	**1**	-	**1**	-	-	-	-	-	-	-	-	-	**2**	-
CO2	To learn about some Interpolation and Approximation techniques.	**3**	**2**	-	**2**	-	-	-	-	-	-	-	-	-	**2**	-
CO3	To learn about evaluation of double and triple integrals and their applications.	**3**	**3**	-	**2**	-	-	-	-	-	-	-	-	-	**1**	-
CO4	To learn some basic properties of scalar and vector point functions and their applications to line, surface and volume integrals.	**3**	**3**	-	**2**	-	-	-	-	-	-	-	-	-	**1**	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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ENGINEERING CHEMISTRY-1

(Common to all branches)

I B.Tech – I/II Semester (Code: 18CY001)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

PREREQUISITES: None

COURSE OBJECTIVES: The student should be conversant:

CO1: With the principles of water characterization and treatment of water for industrial purposes and methods of producing water for potable purposes.

CO2: To understand the thermodynamic concepts, energy changes, concept of corrosion & its control.

CO3: With the conventional energy sources, solid, liquid and gaseous Fuels & knowledge of knocking and anti-knocking characteristics.

CO4: With aim to gain good knowledge of organic reactions, plastics, conducting polymers & biodegradable polymers.

COURSE OUTCOME: After studying this course, students will be able to

CLO-1: Develop innovative methods to produce soft water for industrial use and potable water at cheaper cost.

CLO-2: Apply their knowledge in converting various energies of different systems and protection of different metals from corrosion.

CLO-3: Have the capacity of applying energy sources efficiently and economically for various needs.

CLO-4: Design economically and new methods of organic synthesis and substitute metals with conducting polymers and also produce cheaper biodegradable polymers to reduce environmental pollution.

UNIT -I

Water Chemistry

Introduction: water quality parameters

Characteristics: Alkalinity, Hardness - Estimation & simple numerical problems,

Boiler Troubles - Sludges, Scales, Caustic embrittlement, boiler corrosion, Priming and foaming;

Internal conditioning- phosphate, calgon and carbonate methods.

External conditioning - Ion exchange process & Zeolite proess WHO Guidelines, Potable water, Sedimentation, Coagulation, Filtration. Disinfection methods: Chlorination, ozonization and UV treatment. Salinity – Treatment of Brackish water by Reverse Osmosis and Electrodialysis.

UNIT- II

Thermodynamic functions: energy, entropy and free energy. Estimations of entropy and free energies. Free energy and emf. Cell potentials, the Nernst equation and applications.

Corrosion: Types of corrosion - Chemical or dry corrosion, Electrochemical or wet corrosion; Galvanic, stress, pitting and differential aeration corrosion; Factors effecting corrosion.

Corrosion control – Cathodic protection, and electro plating (Au)& electoless Ni plating.

UNIT- III

Fuels: Classification of fuels; Calorific value of fuels (lower, higher)

Solid fuels: Determination of calorific value (Bomb Calorimeter) & related problems, Coal ranking,

Liquid Fuels: Petroleum refining and fractions, composition and uses. Knocking and anti-knocking Agents, Octane number and Cetane number; Bio fuels- Biodiesel, general methods of preparation and advantages

Gaseous fuels: CNG and LPG, Flue gas analysis – Orsat apparatus.

UNIT- IV

Organic reactions and synthesis of a drug molecule

Introduction to reactions involving substitution (SN^1, SN^2), addition (Markownikoff's and anti-Markwnikoff's rules) , elimination (E_1& E_2), Synthesis of a commonly used drug molecule.(Aspirin and Paracetamol)

Polymers: Conducting polymers: Classification, Intrinsic and Extrinsic conducting polymers and their applications**.** Plastics: Thermo plasts and thermosetting plastics, Bskelite and PVC. Bio degradable polymers: types, examples-Polyhydroxybuterate (PHB), Polyhydroxybuterate-co-β-hydroxyvalerate (PHBV), applications.

TEXT BOOKS:

1. P.C. Jain and Monica Jain, "Engineering Chemistry" DhanpatRai Pub, Co., New Delhi 17th edition (2017).
2. SeshiChawla, "Engineering Chemistry"DhanpatRai Pub, Co LTD, New Delhi 13 th edition, 2013.

REFERENCES:

1 Essential Of Physical Chemistry by ArunBahl, B.S. Bahl, G.D.Tuli, by ArunBahl, B.S. Bahl, G.D.Tuli, Published by S Chand Publishers, 12th Edition, 2012.

2 Text Book of Engineering Chemistry by C.P. Murthy, C.V. Agarwal, A. Naidu B.S. Publications, Hyderabad (2006).

3 Engineering Chemistry by K. Maheswaramma, Pearson publishers 2015.

CO, PO and PSO Mapping:

ENGINEERING CHEMISTRY-1(18CY001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop innovative methods to produce soft water for industrial use and able to solve the industrial problems	3	3	1	-	-	2	3	-	-	-	-	3	1	-	-
CO2	the students will be familiar with applications of polymers in domestic and engineering areas & the most recent surface characterization techniques	3	3	2	-	-	2	2	-	-	-	-	3	-	-	-
CO3	Have the capacity of classifying fuels, their calorific value determination and applying energy sources efficiently and economically for various needs.	3	3	-	-	-	2	3	-	-	-	-	3	-	-	-
CO4	Explain features, classification, applications of newer class materials like smart materials, refrocteries, abbrasives, lubriants and composite materials etc.	3	3	2	-	-	2	1	-	-	-	-	2	-	-	1

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SEMICONDUCTOR PHYSICS AND NANO MATERIALS

I B.Tech II-semester: CODE: 18PH003

(Common for CSE, IT,EEE,&EIE)

Lectures	3	Tutorials	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination			50

Course Objectives:

CO1: This unit aim to build the foundation and inspires interest of freshmen into electrical and electronics and to focus on fundamental concepts and basic principles regarding electrical conduction.

CO2: This unit provides various properties of semiconductor materials and their importance in various device fabrications.

CO3: This unit aim to educate the student on various opto-electronic devices and their applications.

CO4: This unit provide information about the principles of processing, manufacturing and characterization of nano materials, nanostructures and their applications.

COURSE OUTCOMES:

The students were able to

CLO1: understand concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.

CLO2: know the concept of Fermi level and various semiconductor junctions.

CLO3: familiar with working principles of various opto-electronic devices and their applications.

CLO4: understand importance of nano-materials and their characteristic properties.

UNIT –I

ELECTRONIC MATERILAS: Somerfield free electron theory, Fermi level and energy, density of states, Failure of free electron theory (Qualitative), Energy bands in solids, E-K diagrams, Direct and Indirect band gaps. Types of Electronic materials: Metals, Semi-conductors and Insulators, Occupation Probability, effective mass, Concept of hole.

UNIT – II

SEMICONDUCTORS: Introduction to semiconductors, intrinsic and extrinsic semiconductors, carrier concentrations, Fermi level and temperature dependence, Continuity equation, Diffusion and drift, P-N junction (V-I characteristics), Metal – Semiconductor junction (Ohmic and Schottky), Semiconductor materials of interest for opto- electronic devices.

UNIT-III

OPTO-ELECTRONIC DEVICES AND DISPLAY DEVICES: Photo voltaic effect, principle and working of LED, Applications of Photo diode, Solar cell, PIN & APD Diode, Liquid crystal display, Opto electric effect: Faraday Effect and Kerr effect.

UNIT-IV

NANO-MATERIALS: Introduction to nano technology, quantum confinement, surface to volume ratio, properties of nano materials, synthesis of nano-materials: CVD, sol-gel methods, laser ablation.Carbon nano tubes: types, properties, applications. Characterization of nano materials: XRD, SEM, applications of nano materials.

TEXT BOOKS:

1. A text book of engineering physics by Avadhanulu and Kshirsagar S.Chand& Co. (2013)
2. Applied physics by Dr.*P.Srinivasa Rao*. Dr.K.*Muralidhar*
3. Introduction to solid state state physics, Charles Kittel, 8th edition
4. Solid state physics, S.O. Pillai

REFERENCE BOOKS:

1. Text book on Nanoscience and Nanotechnology (2013): B.S. Murty, P. Shankar, Baldev Raj, B.B. Rath and J. Murday, Springer Science & Business Media.
2. Basic Engineering Physics, Dr.*P.SrinivasaRao*. Dr.K.*Muralidhar*. Himalaya Publications, 2016

CO, PO and PSO Mapping:

SEMICONDUCTOR PHYSICS AND NANO MATERIALS (18PH003)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	The students able to understand the concepts of band structure of solids, concept of hole and effective mass of electron in semiconductors.	3	3	-	2	-	-	-	-	-	-	-	3	-	2	-
CO2	Students were able to know the concept of fermi level and various semiconductors junctions	3	3	-	2	-	-	-	-	-	-	-	3	-	-	1
CO3	Students were able to familiar with working principles of various optoelectronic devises and their applications	3	-	3	3	2	2	3	-	-	-	-	3	-	-	-
CO4	The students able to understand the importance of nano materials and their characteristic properties	3	3	2	2	2	-	-	-	-	-	-	3	-	2	-

CIRCUIT THEORY

I B.Tech – II Semester (Code: 18EE204)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics, Basic Physics

Course Objectives: To make the students

CO1: Understand basic Laws in circuits, circuit elements and sources and their characteristics.

CO2: Understand fundamental concepts of alternating current and voltages, power triangle and power factor.

CO3: Analyze circuits with network topology.

CO4: Analyze circuits with different DC and AC sources.

CO5: Gain knowledge about statement and application of various theorems.

CO6: Understand concept of resonance in series and parallel circuits.

Course Outcomes: Students will be able to

CLO1: Gain knowledge about basic Laws, circuit elements and sources and their characteristics.

CLO2: Draw phasor diagrams, phase relations in elements and power triangle.

CLO3: Analyze circuits with network topology.

CLO4: Solve problems involving with different AC and DC sources in electrical circuits.

CLO5: Synthesis the circuits with various theorems.

CLO6: Demonstrate the series and parallel resonance circuits.

UNIT – I

CIRCUIT ELEMENTS AND SOURCES: Basic definition of the unit of Charge, Voltage, Current, Power and Energy, Circuit concept, various circuit elements, Ideal, Practical and dependent sources and their V-I characteristics, Source transformation, Voltage and Current division, series / parallel combination of elements, Star-Delta transformation, Energy stored in Inductors and Capacitors, Kirchhoff's laws, Instantaneous, Peak, Average and RMS values of various waveforms, Crest factor, Form factor; Concept of phase and phase difference in sinusoidal waveforms, Phase relation in pure resistor, Inductor and capacitor, Impedance diagram, phasor diagram, series and parallel circuits, compound Circuits, Computation of active, reactive and complex powers, power triangle, power factor.

UNIT – II

NETWORK TOPOLOGY: Concepts of a Network Graph, Terminology used in Network Graph, Relation between Twigs and Links, Formation of incidence matrix, tie-set matrix, fundamental tie-set matrix, cut-set matrix, fundamental cut-set matrix and Relation between matrices, Kirchhoff's voltage law in Topological form, Kirchhoff's current law in Topological form, Relation between branch voltage, Twig voltage matrix and node voltage matrix, Relation between branch voltage matrix and loop current matrix, Network equilibrium equations, principle of duality and construction of a dual network.

UNIT – III

CIRCUIT ANALYSIS AND NETWORK THEOREMS: Mesh, Super mesh, Node and Super node Analysis, Analysis with dependent current and voltage sources, Superposition theorem, Thevenin's and Norton's theorems, Reciprocity, Compensation, Maximum power transfer theorems, Tellegen's and Millman's theorems to both independent and dependent current and voltage sources.

UNIT – IV

RESONANCE: Series resonance, Impedance and phase angle, voltages and currents, bandwidth and Q factor and its effect on bandwidth, magnification, parallel resonance, resonant frequency, variation of impedance with frequency , Q factor, magnification, reactance curves in parallel resonance, Locus diagrams for series and parallel circuits.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 8th Edition,TMH, 2012.
2. M E Vanvalkenburg, "Network Analysis", 3rd Edition, PHI, 2006.
3. C L Wadhwa, "Network analysis and synthesis", New Age International, 2nd Edition, 2006.

REFERENCE BOOKS:

1. C K Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 5th Edition, 2016.
2. Abhijit chakrabarti, "Circuit theory analysis and synthesis" Dhanapatrai &co (p) Ltd, 2018.
3. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 4th Edition, TMH, 2010.
4. J A Edminister, "Electric circuits", Schaum outline series.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Network Analysis, https://nptel.ac.in/courses/108/105/108105159
2. NPTEL :: Electrical Engineering - NOC:Basic Electric Circuits, https://nptel.ac.in/courses/108/104/108104139/
3. NPTEL :: Electrical Engineering - NOC:Basic Electrical Circuits, https://nptel.ac.in/courses/108/106/108106172/

CO, PO and PSO Mapping:

CIRCUIT THEORY (18EE204)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand basic Laws in circuits, circuit elements and sources and their characteristics	3	-	-	1	1	-	-	-	-	-	-	-	2	2	-
CO2	Understand fundamental concepts of alternating current and voltages, power triangle and power factor	3	-	1	1		-	-	-	-	-	-	-	2	2	-
CO3	Analyse circuits with network topology.	3	-	1	3	2	-	-	-	-	-	-	-	3	3	-
CO4	Analyse circuits with different DC and AC sources.	3	2	-	3	-	-	-	-	-	-	-	-	3	3	-
CO5	Gain knowledge about statement and application of various theorems.	3	2	-	2	1	-	-	-	-	-	-	-	2	2	-
CO6	Understand concept of resonance in series and parallel circuits	3	2	1	3	1	-	-	-	-	-	-	-	2	2	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

PROBLEM SOLVING USING PROGRAMMING

(Common for all branches except Civil Engineering)

I B.Tech – II Semester (Code: 18CS001)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: BASIC MATHEMATICS

Course Objectives: Students will be able to

1. Understand basic concepts of C Programming such as: C-tokens, Operators, Input/output, and Arithmetic rules.
2. Develop problem-solving skills to translate 'English' described problems into programs written using C language.
3. Use Conditional Branching, Looping, and Functions.
4. Apply pointers for parameter passing, referencing and differencing and linking data structures.
5. Manipulate variables and types to change the problem state, including numeric, character, array and pointer types, as well as the use of structures and unions, File.

Course Outcomes:

After the course the students are expected to be able to

1. Choose the right data representation formats based on the requirements of the problem.
2. Analyse a given problem and develop an algorithm to solve the problem.
3. Use the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
4. Write the program on a computer, edit, compile, debug, correct, recompile and run it.
5. Identify tasks in which the numerical techniques learned are applicable and apply them to write programs, and hence use computers effectively to solve the task.

UNIT- I

Overview of C, Constants, Variables and Data Types, Operators and Expressions, Managing I/O Operations. Decision Making and Branching.

Programming Exercises for Unit I:C-expressions for algebraic expressions, evaluation of arithmetic and Boolean expressions. Syntactic and logical errors in a given program, output of a given program, values of variables at the end of execution of a program fragment, Programs using Scientific and Engineering formulae. Finding the largest of the three given numbers. Computation of discount amount on different types of products with different discount percentages. Finding the class of an input character, finding the type of triangle formed with the given sides, computation of income-tax, finding given year is leap year or not, and conversion of lower case character to its upper case.

UNIT -II

Decision Making and Looping, Arrays, Character Arrays and Strings.

Programming Exercises for Unit II: To print the sum of the digits of a given number and to display the image of a given number. To find whether a given number is prime, printing Fibonacci sequence and to find prime factors of a given number. To print graphic patterns of symbols and numbers. To find the length of a string, compare strings, reverse a string, copy a string and to find whether the given string is palindrome or not with and without using String Handling Functions. Transpose of a matrix and sorting of names using arrays.

UNIT- III

User-defined Functions, Structures and Unions, Pointers

Programming Exercises for Unit - III: Functions - Recursive functions to find factorial & GCD (Greatest Common Divisor), string operations using pointers and pointer arithmetic. Swapping two variable values. Sorting a list of student records on register number using array of pointers

UNIT -IV

File Management in C, Dynamic Memory Allocation, Preprocessor

Programming Exercises for Unit - IV: Operations on complex numbers, and to read an input file of marks and generate a result file, sorting a list of names using command line arguments. Copy the contents of one file to another file. Allocating memory to variables dynamically.

TEXT BOOK:

1. E.Balaguruswamy, “Programming in ANSI C, Fifth Edition,.

REFERENCE BOOKS:

1. Kernighan BW and Dennis Ritchie M, “C programming language”, 2nded, Prentice Hall, .
2. Yashavant P. Kanetkar, “Let us C”, BPB Publications, .
3. Herbert Schildt, “C: The Complete Reference”, 4th edition, Tata Mcgraw-Hill, .
4. Ashok N.Kamthane, “Programming in C”, PEARSON 2nd Edition, .

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Problem Solving through Programming in C
2. NPTEL :: Computer Science and Engineering - NOC:Introduction to programming in C

CO, PO and PSO Mapping:

PROBLEM SOLVING USING PROGRAMMING (18CS001)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand basic concepts of C programming.	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3
CO2	Understanding the controls and flow of C programming language	2	3	2	2	-	-	-	-	-	-	-	-	2	1	2
CO3	To handle the complex and heterogeneous data using C language	2	2	1	2	-	-	-	-	-	-	-	-	2	2	2
CO4	To develop useful and powerful user defined functions in C language	2	1	2	2	-	-	-	-	-	-	-	-	2	1	2
CO5	Develop problem solving skills and to translate real world problems into C language programs	3	2	2	3	-	-	-	-	-	-	-	-	3	2	3

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

ENGINEERING CHEMISTRY LABORATORY
(Common to all branches)
I B.Tech – I/II Semester (Code: 18CYL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

LIST OF EXPERIMENTS

1. **Introduction to Chemistry Lab** (the teachers are expected to teach fundamentals likeCalibration of Volumetric Apparatus, Primary, Secondary Solutions, Normality, Molarity, Molality etc. and error, accuracy, precision, theory of indicators, use of volumetric titrations).

2. **Volumetric Analysis:**
   a. Estimation of Washing Soda.
   b. Estimation of Active Chlorine Content in Bleaching Powder
   c. Estimation of Mohr's salt by permanganometry.
   d. Estimation of given salt by using Ion-exchange resin using Dowex-50.
3. **Analysis of Water:**
   a. Determination of Alkalinity of Tap water.
   b. Determination of Total Hardness of ground water sample by EDTA method
   c. Determination of Salinity of water sample
4. **Estimation of properties of oil**:
   a. Estimation of Acid Value
   b. Estimation of Saponification value
5. **Preparations:**
   a. Preparation of Soap
   b. Preparation of Urea-formaldehyde resin
   c. Preparation of Phenyl benzoate
6. **Demonstration Experiments (Any two of the following):**
   a. Determination of $p^H$of given sample.
   b. Determination of conductivity of given sample by conduct meter.
   c. Potentiometric Determination of Iron.

TEXT BOOKS (for Chemistry 1 and 2):

1. Practical Engineering Chemistry by K.Mukkanti, Etal, B.S. Publications, Hyderabad, 2009.
2. Inorganic quantitative analysis, Vogel, 5^{th} edition, Longman group Ltd. London, 1979.

REFERENCE BOOKS:

1. Text Book of engineering chemistry by R.n. Goyal and HarrmendraGoel.
2. A text book on experiments and calculations- Engineering Chemistry. S.S. Dara.
3. Instrumental methods of chemical analysis, Chatwal, Anand, Himalaya Publications.

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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CIRCUIT THEORY LAB

I B.Tech – II Semester (Code: 18EEL22)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Pre-requisites: Circuit theory, Mathematics

Course Objectives: To make the students

CO1: Understand and verify basic Kirchhoff's laws in circuits.

CO2: Understand and verify fundamental theorems of circuit theory.

CO3: Able to determine the parameters of a given choke coil.

CO4: Understand the locus diagrams of series RL, RC circuits.

CO5: Understand and verify fundamental theorems of circuit theory using software.

Course Outcomes: Students will be able to

CLO1: Gain knowledge about basic Kirchhoff's laws in circuits.

CLO2: Verify fundamental theorems of circuit theory.

.CLO3: Analyze the parameters of a given choke coil.

CLO4: To draw the locus diagrams of series RL,RC circuits.

CLO5: Verify fundamental theorems of circuit theory using software.

LIST OF EXPERIMENTS

1. Verification of KCL and KVL
2. Verification of Superposition theorem
3. Verification of Thevenin's theorem
4. Verification of Norton's theorem
5. Verification of Reciprocity theorem
6. Verification of Maximum Power Transfer theorem
7. Parameters of Choke coil
8. Measurement of low and medium resistance using volt ampere method
9. Locus diagram of RL series circuit
10. Locus diagram of RC series circuit
11. Steady state analysis of RL, RC and RLC series circuits using software
12. Verification of Superposition theorem using software
13. Verification of Thevenin's and Norton's theorem using software
14. Verification of Maximum Power Transfer theorem DC and AC circuits using software
15. Locus diagram of RL and RC series circuit using software

Note: Minimum 10 experiments should be carriedout.

CO PO and PSO mapping:

Circuit Theory Lab (18EEL22)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Gain knowledge about basic Kirchhoff's laws in circuits.	3	2	-	-	-	-	-	-	-	-	-	1	2	-	-
CO2	Verify fundamental theorems of circuit theory.	2	3	-	-	-	-	-	-	-	-	-	-	3	-	-
CO3	Analyze the parameters of a given choke coil.	2	2	2	-	-	-	-	-	-	-	-	-	3	-	-
CO4	To draw the locus diagrams of series RL, RC circuits.	3	3	1	-	-	-	-	-	-	-	-	2	2	-	-
CO5	Verify fundamental theorems of circuit theory using software.	2	2	1	-	-	-	-	-	-	-	-	1	2	-	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

PROBLEM SOLVING USING PROGRAMMING LAB

I B.Tech – II Semester (Code: 18CSL01)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

1. A program for electricity bill taking different categories of users, different slabs in each category. (Using nested if-else statement).

Domestic Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 200	0.50 per unit	
201 – 400	100 plus	0.65 per unit
401 – 600	230 plus	0.80 per unit
601 and above	390 plus	1.00 per unit
Commercial Customer:		
Consumption Units	**Rate of Charges(Rs.)**	
0 – 100	0.50 per unit	
101 – 200	50 plus	0.6 per unit
201 – 300	100 plus	0.70 per unit
301 and above	200 plus	1.00 per unit

2. Write a C program to evaluate the following (using loops):
   a) $1 + x^2/2! + x^4 / 4! + \ldots$up to ten terms
   b) $x + x^3/3! + x^5/5! + \ldots$ up to ten terms
3. Write a C program to check whether the given numberis
   a) Prime ornot.
   b) Perfect or Abundant or Deficient.
4. Write a C program to display statistical parameters (using one – dimensional array).
   a) Mean
   b) Mode
   c) Median
   d) Variance.
5. WriteaCprogramtoreadalistofnumbersandperformthefollowingoperations
   a) Print the list.
   b) Delete duplicates from the list.
   c) Reverse the list.
6. Write a C program to read a list of numbers and search for a given number using Binary search algorithm and if found display its index otherwise display the

message “Element not found in the List”.

7. Write a C program to read two matrices and compute their sum and product.
8. Write a C program to read list of student names and perform the following operations
a) To print the list of names.
b) To sort them in ascending order.
c) To print the list after sorting.
9. Write a C program that consists of recursive functions to

a) Find factorial of a given number

b) Solve towers of Hanoi with three towers (A, B & C) and three disks initially on tower A.

10. A Bookshop maintains the inventory of books that are being sold at the shop. The list includes details such as author, title, price, publisher and stock position. Whenever a customer wants a book the sales person inputs the title and the author, and the system searches the list and displays whether it is available or not. If it is not, an appropriate message is displayed, if it is, then the system displays the book details and request for the number of copies required ,if the requested copies are available the total cost of the requested copies is displayed otherwise the message “required copies not in stock” is displayed. Write a program for the above in structures with suitable functions.

11. Write a C program to read a data file of students’ records with fields(Regno, Name, M1,M2,M3,M4,M5) and write the successful students data (percentage > 40%) to a data file.

12. Write a C program to read a file as command line argument and count the given word frequency in a file

PROBABILITY AND STATISTICS

Common to All Branches

II B.Tech-III Semester (Code: 18MA003)

Lectures	3	Tutorial	1	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives:

CO1: To provide principles of statistical methods and probability concepts that serves the foundations for the applications of methods in engineering.

CO2:To educate the student on the applications of various t-tests to various problems in the field of engineering.

CO3: To educate the student on the application of completely randomized designs (CRD) and randomized block designs (RBD) to different realistic problems in the field of engineering.

CO4: To motivate the student on the applications of single and multiple regression analysis to the regression model arising in the field of engineering.

Course Outcomes:

Upon the successful completion of the course, the student will be able to:

1. Apply various probability distributions to solve the complex problems that will arise in engineering applications.
2. Understand the terms sample, population and the analysis related to two groups of populations.
3. Understand how to state the null and alternative hypothesis for a one-way ANOVA, create an ANOVA summary table for the one-way ANOVA and understand what conclusion can be drawn when the null hypothesis for a one-way ANOVA is rejected.

Use multivariate techniques appropriately, undertake multivariate hypothesis tests and draw appropriate conclusions

UNIT – I

Continuous Random Variables, Normal Distribution, Normal Approximation to the Binomial Distribution, Uniform Distribution, Gamma Distribution and its applications, Beta Distribution and its applications, Joint Distributions (Discrete),Joint Distributions (Continuous).Populations and Samples, Law of large numbers, Central limit theorem and its applications, The sampling distribution of the mean (σ unknown),The sampling distribution of the variance.

(Sections 5.1, 5.2, 5.3, 5.5,5.7, 5.8, 5.10, 6.1, 6.2, 6.3, 6.4 of Text Book [1])

UNIT – II

Point estimation, Interval estimation, Tests of Hypotheses, Null Hypothesis and Tests of hypotheses, Hypothesis concerning one mean, Comparisons-Two independent Large samples, Comparisons-Two independent small samples, Paired sample t test.

(Sections 7.1,7.2, 7.4, 7.5, 7.6, 8.2, 8.3, 8.4 of Text Book [1])

UNIT-III

The estimation of variances, Hypotheses concerning one variance, Hypotheses concerning two variances, Estimation of proportions, Hypotheses concerning one proportion, Hypotheses concerning several proportions, Procedure for Analysis of Variance (ANOVA) for

comparing the means of k (>2) groups- one way classification(Completely randomized designs), Procedure for Analysis of Variance (ANOVA) for comparing the means of k (>2) groups- two way classification(Randomized block designs). (Sections 9.1, 9.2, 9.3, 10.1, 10.2, 10.3, 12.2, 12.3 of Text Book [1])

UNIT -IV

Multivariate Analysis: The concept of bi variate relationship, scatter diagram, Pearson's correlation and correlation matrix. Simple linear regression model and assumptions, Least Squares Estimation of the parameters of the model, Testing the significance of the model. Regression versus Correlation, Multiple linear regression model with k explanatory variables and assumptions of the model. Least Square Estimation of regression coefficients. Concept of the coefficient of determination R^2. Test for significance of the regression model and individual regression coefficients. Applications of multiple regression analysis. (1^{st} and 2^{nd} Chapters of Text Book [2]).

TEXT BOOKS:

1. Miller & Freund's "Probability and Statistics for Engineers", Richard A. Johnson, 8^{th} Edition, PHI.
2. Introduction to Linear Regression Analysis, Douglas C. Montgomery, E.A. Peck and G.G. Vining, 3^{rd}edition, Wiley.

REFERENCE BOOKS:

1. R.E Walpole, R.H. Myers & S.L. Myers 'Probability & Statistics for Engineers and Scientists', 6^{th} Edition, PHI.
2. Fundamentals of Mathematical Statistics, S.C.Gupta and V.K.Kapoor, 11^{th} Edition, Sultan Chand & Sons.
3. MurrayR Spiegel, John J.Schiller, R. Alu Srinivasa, 'Probability & Statistics', Schaum's outline series.
4. K.V.S.Sarma ,' Statistics Made Simple – Do it yourself on PC', Prentice Hall India, Second Edition, 2015.

CO, PO and PSO Mapping:

PROBABILITY AND STATISTICS (18MA003)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	Understand probabilities and able to solve using an appropriate sample space & Compute various operations like expectations from probability density/distribution functions (pdfs)	3	2	-	2	-	-	-	-	-	-	-	-	-	2	-
CO 2	Perform Likelihood ratio tests from pdfs for statistical engineering problems & Mean and covariance functions for simple random variables.	2	2	-	1	-	-	-	-	-	-	-	-	-	1	-
CO 3	Understand Auto-correlation and cross correlation properties between two random variables & the concept of random process, differentiate between stochastic and ergodic processes	2	2	-	2	-	-	-	-	-	-	-	-	-	2	-
CO 4	Understand the concept of power spectral density and power density spectrum of a random process & Apply the principles of a random process in system concepts.	2	1	-	2	-	-	-	-	-	-	-	-	-	2	-

NETWORK ANALYSIS

II B.Tech – III Semester (Code: 18EE302)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Mathematics

Course Objectives: To make the students

CO1: Infer and evaluate transient response, Steady state response for single phase systems.

CO2: Analyze the circuits using Laplace Transforms.

CO3: Understand the concepts of three-phase systems and its analysis.

CO4: Evaluate two-port network parameters and network functions.

CO5: Analyze coupled circuits and its behavior.

CO6: Construct passive filters using constant K and M derived methods.

Course Outcomes: Students will be able to

CLO1: Analyze transient response, Steady state response for single phase systems.

CLO2: Explain the circuits using Laplace Transforms.

CLO3: Analyze three-phase circuits in the sinusoidal steady-state.

CLO4: Evaluate two-port network parameters, network functions.

CLO5: Analyze coupled circuits and its behavior.

CLO6: Design passive filters using constant K and M derived methods.

UNIT – I

Solution of First and Second order networks: Solution of first and second order differential equations for Series and parallel R-L, R-C, RLC circuits, initial and final conditions in network elements, forced and free response, time constants, steady state and transient state response for DC and AC excitations.

Electrical Circuit Analysis Using Laplace Transforms: Review of Laplace Transform, Analysis of electrical circuits using Laplace Transform for standard inputs, convolution integral, inverse Laplace transform, Frequency response (magnitude and phase plots).

UNIT – II

Poly Phase Systems: Advantages of 3-phase systems, generation of 3-phase voltages, phase sequence, star & delta connections, interconnection of 3-phase sources and loads, voltage,

current & power in star & delta connected systems, analysis of 3-phase balanced circuit, measurement of 3-phase power, 2 wattmeter method. Analysis of 3-phase unbalanced systems, star / delta transformation method, application of KVL and Mill man's method.

UNIT-III

Two Port Network and Network Functions: Two Port Networks, terminal pairs, relationship of two port variables, impedance parameters, admittance parameters, transmission parameters and hybrid parameters, interrelation of two port network, interconnections of two port networks, image parameters, Two-Port bridged – T, Ladder and Lattice networks. transformed network with initial conditions. Transfer function representation. Poles and Zeros - Network functions for the one port and two port - Poles and Zeros of network functions - Restrictions on pole and zero locations for driving point functions and transfer functions - Time domain behavior from the pole zero plot..

UNIT-IV

Coupled Circuits: Defining self and mutual inductance, coefficient of coupling, dot convention, Development of circuit equations in time domain and frequency domain, solution of coupled circuits, series and parallel connections of two coupled coils, tuned circuit analysis (single and double tuned)

Filters: Low pass, high pass, band pass & band reject filters - frequency response, constant K – and M derived – filters.

TEXT BOOKS:

1. William H. Hayt, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuit Analysis", 8th Edition,TMH, 2013.
2. M.E.Vanvalkenburg, "Network Analysis", 3rd Edition, PHI, 2006.
3. A Sudhakar and Shyam Mohan SP, "Circuits and Networks: Analysis and Synthesis", 5th Edition, TMH, 2017.

REFERENCE BOOKS:

1. C. K. Alexander and M. N. O. Sadiku, "Electric Circuits", McGraw Hill Education, 5th Edition, 2016.
2. Abhijit Chakrabarti, "Circuit theory analysis and synthesis" Dhanapatrai & co(p) Ltd, 2018.
3. C. L Wadhwa, "Network analysis and synthesis", New Age International, 2nd Edition, 2006.
4. J. A Edminister, "Electric circuits", Schaum outline series,.

CO, PO and PSO Mapping:

NETWORK ANALYSIS (18EE302)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze transient response, Steady state response for single phase systems.	3	-	-	2	-	-	-	-	-	-	-	-	3	-	-
CO2	Explain the circuits using Laplace Transforms.	3	-	2	2	-	-	-	-	-	-	-	-	3	-	-
CO3	Analyze three-phase circuits in the sinusoidal steady-state.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO4	Evaluate two-port network parameters, network functions.	3	3	2	2	-	-	-	-	-	-	-	-	2	1	-
CO5	Analyze coupled circuits and its behavior.	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO6	Design passive filters using constant K and M derived methods.	3	3	3	2	-	-	-	-	-	-	-	-	2	-	-

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ANALOG ELECTRONICS

II B.Tech – III Semester (Code: 18EE303)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics

Course Objectives: To make the students

CO1: Understand formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.

CO2: To empower understand the design and working of BJT / FET amplifiers.

CO3: Analyze different feedback and oscillating circuits.

CO4: To give the idea about basics of Differential, Multi-stage and operational amplifiers**.**

CO5: Gain knowledge about Linear and Nonlinear applications of Op-amp.

Course Outcomes: Students will be able to

CLO1: Understand formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.

CLO2: Understand the design and working of BJT / FET amplifiers.

CLO3: Analyze different feedback and oscillating circuits

CLO4: To give the idea about basics of Differential, Multi-stage and operational amplifiers.

CLO5: Gain knowledge about Linear and Nonlinear applications of Op-amp.

UNIT – I

Diode circuits: Open-circuited P-N Junction, Current Components in a p-n diode, I-V characteristics, temperature Dependence of the I-V characteristic, Zener Diode.
Rectifiers: Half wave, full wave and Bridge Rectifiers without filter and with inductor filter capacitor filter, L section &Π- section filters.
Clippers, Clampers: Positive and negative clippers - Positive and negative clampers.

UNIT – II

BJT circuits: NPN & PNP junction transistors, Transistor current components, CB Configuration, CE Configurations, CC configuration, BJT as a switch, BJT as an amplifier, BJT biasing circuits, Small signal equivalent circuits.
FET circuits: JFET, Pinch-off Voltage , volt-ampere characteristics, MOSFET structure and I-V characteristics, MOSFET as a switch, MOSFET as an amplifier, FET small signal model, CS / CD / CG configurations at low frequencies.

UNIT – III

Feedback Amplifiers: Feedback concept, Transfer Gain with Feedback, Negative feedback amplifiers and their characteristics.

Oscillators: Barkhausen criterion for sinusoidal oscillators, RC phase shift oscillator using BJT, General Form of Oscillator, Wien Bridge, Hartley, Colpitt's oscillators using BJT. **Differential, Multi-stage and operational amplifiers:** Differential amplifier, multi-stage amplifiers, internal structure of an operational amplifier, deal op-amp, non-idealities in an op- amp (Output offset voltage, input bias current, input offset current, slew rate, gain bandwidth product)

UNIT – IV

Linear applications of Op-amp: Idealized analysis of op-amp circuits. Inverting and non-inverting amplifier, instrumentation amplifier, integrator, differentiator, Voltage to current and current to voltage conversion.

Nonlinear applications of Op-amp: Basic comparator , Zero-crossing detector , Schmitt Trigger, Square-wave and triangular-wave generators, Absolute value output circuit, Peak detector , Sample and hold circuit, Precision rectifier.

TEXT BOOKS:

1. Jacob Millman and Christos C Halkias, Integrated Electronics Analog and Digital Circuits and Systems, 2nd Edition,TMH, 2002.
2. Robert L Boylested and Louis Nashelsky , Electronic Devices and Circuit Theory, 8th Edition, PHI, 2003.
3. Rama Kant A. Gayakwad, Op-Amps and Linear Integrated Circuits, 4th Edition, PHI/ Pearson Education, 2003.

REFERENCE BOOKS:

1. Theodore F Bogart Jr., Jeffrey S Beasley and Guillermo Rico, Electronic Devices and Circuits, 6th Edition, Pearson Education, 2004.
2. David A Bell, Electronic Devices and Circuits, 4th Edition, PHI, 2003.
3. D.Roy and Choudhury, ShailB.Jain, Linear Integrated Circuits, 2nd Edition, New Age International, 2003.

CO, PO and PSO Mapping:

Analog Electronics (18EE303)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand formation of PN junction Diode and applications of diode like Rectifiers, clippers and clampers.	3	-	2	-	2	-	-	-	-	-	-	-	3	1	2
CO2	To empower understand the design and working of BJT / FET amplifiers	3	-	2	-	-	-	-	-	-	-	-	-	3	1	2
CO3	Analyze different feedback and oscillating circuits.	3	-		-	2	-	-	-	-	-	-	-	3	2	2
CO4	To give the idea about basics of Differential, Multi-stage and operational amplifiers	3	2	-	-	2	-	-	-	-	-	-	-	2	1	2
CO5	Gain knowledge about Linear and Nonlinear applications of Op-amp	3	2	-	-	2	-	-	-	-	-	-	-	2	1	2

ELECTRICAL MACHINES – I
(DC MACHINES AND TRANSFORMERS)

II B.Tech – III Semester (Code: 18EE304)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment	:	50	Semester End Examination (3 Hours)	:	50		

Prerequisites: Basic Physics, Basic Mathematics
Course objectives: To make the students

CO1: Understand the concept of magnetic circuits and electromagnetic force and torque.
CO2: Know the construction of dc generators and its characteristics.
CO3: Understand the speed control techniques and testing methods of dc motor.
CO4: Know the construction and operation of single and three phase Transformers.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain the concepts of magnetic circuits.
CLO2: Describe the operation of dc generators and its characteristics.
CLO3: Analyze the speed control techniques and testing methods of dc motors.
CLO4: Analyze construction and operation of single and three phase Transformers.

UNIT-I

Magnetic Fields and Magnetic circuits: Review of magnetic circuits-MMF, flux, reluctance, inductance; review of Ampere law and Biot- Savarts law. Visualization of magnetic fields produced by a bar magnet and a current carrying coil-through air and through a combination of iron and air.
Electromagnetic force and torque: B-H curve of magnetic materials; energy stored in magnetic circuit; Field energy and mechanical force-mechanical energy-Multiple excited magnetic field systems-Forces /Torques in systems with permanent magnets. Examples of galvanometer coil-relay contact-lifting magnet-rotating element with eccentricity or saliency.

UNIT-II

DC Generators: Basic construction of a DC machine-Principle and operation of DC Generator-Types of windings- Types of field excitations-EMF equation-Armature reaction- commutation-Characteristics of all types of DC Generators-Applications of DC Generators- Parallel operation of DC Generators.

UNIT-III

DC Motors: Principle and operation of DC motor-Torque equation of DC motor-characteristics of all types of DC motors-starters and their design-speed control-Losses-Swinburne's test, load testing and back-to-back testing of DC machines.

UNIT-IV

Single phase Transformers: Principle, Construction and operation of single-phase transformer, equivalent circuit, phasor diagrams. Voltage Regulation, losses and efficiency. Testing's-OC and SC test, back-to back test, Separation of hysteresis and eddy current losses. **Three phase transformers:** Construction, types of connection and their comparative features. Parallel operation. Auto- transformers. Magnetizing current, effect of non-linear B- H curve of magnetic core material. Scott connection, tap changing transformers. Cooling of transformers.

Text Books:

1. P.S.Bhimbra, "Electric Machinery ", ,Khanna Publications, 7th edition, 2011.
2. I.J.Nagrath&D.P.Kotari, "Electric Machines", Tata Mc Graw-Hill Publication, 3rd edition, 2004.

References:

1. A.E. Fitzgerald and C.Kingsley,"ElectricMachimery", New York, McGraw Hill Education, 2013.
2. A.E.Clayton and N.N. Hancock, "Performance and design of DC Machimes", CBS Publishers, 2004.
3. M.G.Say,"Performance and design of AC machines", CBS Publishers, 2002.
4. Clayton & Hancock, "Performance and design of DC Machines", BPB Publishers.

CO, PO and PSO Mapping:

Electrical Machines – I (18EE304)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the concepts of magnetic circuits.	3	-	2	1	-	-	-	-	-	-	-	-	3	-	-
CO2	Describe the operation of dc generators and its characteristics.	3	-	2	1	-	-	-	-	-	-	-	-	3	2	-
CO3	Analyze the speed control techniques and testing methods of dc motors.	3	-	2	1	-	-	-	-	-	-	-	-	3	-	2
CO4	Analyze construction and operation of single and three phase Transformers.	3	2	2	1	-	-	-	-	-	-	-	-	3	-	-

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ENGINEERING MECHANICS

II B.Tech – III Semester (Code: 18CE003)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics

Course Objectives: To learn

CO1: The concepts Force systems, free body diagrams, resultant of forces and equations of equilibrium, Supports and support reaction sand calculation of Centroid
CO2: The Concept of moment of inertia of plane figures, Laws and applications of friction
CO3: The Analysis of the truss and determination of axial forces by Method of Joints
CO4: Motion of a body and their relationships and application of D Alembert's principle in rectilinear and curvilinear motions
CO5: About Mass moment of inertia of material bodies, Plane motion of a body about a fixed axis

Course Outcomes: Students will be able to

CLO-1: Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations
CLO-2: Locate Centroid of composite figures and determine moment of plane figures
CLO -3: Analyze the systems with friction
CLO-4: Determine the axial forces in the members of determinate truss. Calculation of acceleration, velocity and displacement and forces
CLO-5:Determine moment of inertia of material bodies, Calculation of angular displacement, velocity and angular acceleration of rotational bodies.

UNIT – I

Concurrent Forces in a Plane: Principles of statics – composition and resolution of forces – equilibrium of concurrent forces in a plane –Method of moments.
Parallel Forces in a Plane: Two parallel forces – general case of parallel forces in a plane – center of parallel forces – Centroids of composite plane figures and curves.

UNIT – II

Moments of Inertia of Plane Figures: Moment of inertia of a plane figure with respect to an axis in its plane – Moment of Inertia with respect to an axis perpendicular to the plane of the figure – Parallel axis theorem.
Friction: Characteristics of friction – problems involving dry friction, ladder friction and wedge friction..

UNIT – III

Rectilinear Translation: Kinematics of rectilinear motion – principles of dynamics –

Differential equations of rectilinear motion D'Alemberts principle .

Curvilinear Translation: Kinematics of curvilinear motion – Differential equations of curvilinear motion – D'Alembert's principle.

UNIT – IV

Moments of Inertia of Material Bodies: Moment of inertia of rigid body – Moment of inertia of a lamina – Moments of inertia of three – dimensional bodies.

Rotation of a Rigid Body about a Fixed Axis: Kinematics of rotation – Equation of motion for a rigid body rotating about a fixed axis – D'Alembert's principle.

TEXT BOOKS:

1. S. Timoshenko and D. H. Young, "Engineering mechanics" Mc Graw-Hill International edition (For concepts and symbolic problems)
2. R. C. Hibbeler and Ashok Gupta, "Engineering mechanics statics and dynamics", Pearson (For numerical problems using S.I. system ofunits)

REFERENCE BOOKS

1. Beer and Johnston, "Vector mechanics for engineers statics and dynamics" Tata Mc Graw-Hill publishing company, NewDelhi
2. A. K. Tayal, "Engineering mechanics statics and dynamics" Umesh publication, Delhi (For numerical problems using S.I. system of units)

NPTEL COURSE LINKS:

1. NPTEL :: Mechanical Engineering - NOC:Engineering Mechanics
2. NPTEL :: Basic courses-Sem 1 and 2 - Engineering Mechanics

CO, PO and PSO Mapping:

ENGINEERING MECHANICS (18CE003)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Construct free body diagrams and use appropriate equilibrium equations, Calculate unknown forces in a plane by resolution of force and equilibrium equations	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Locate Centroid of composite figures and determine moment of plane figures	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Analyze the systems with friction	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO4	Calculation of acceleration, velocity and displacement and forces	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-
CO5	Determine moment of inertia of material bodies, Calculation of angular displacement, velocity and angular acceleration of rotational bodies.	3	2	-	-	-	-	-	-	-	-	-	-	-	-	-

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TECHNICAL ENGLISH

II B.Tech – III Semester (Code: 18EL002)

Lectures	3	Tutorial	0	Practical	0	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: The course aims

CO1: At enhancing the vocabulary competency of the students
CO2: To introduce corrective measures to eliminate grammatical errors in speaking and writing
CO3: To learn writing as a process, including various invention heuristics (such as Brainstorming),4 gathering evidence, considering audience, drafting, revising, editing, and proofreading
CO4: Use grammatical, stylistic, and mechanical formats and conventions appropriate for a variety of purposes

Course Outcomes: By the end of the course the student would be able to

CLO1: Build academic vocabulary to enrich their writing skills
CLO2: Make use of contextual clues to infer meanings of unfamiliar words from context
CLO3: Produce accurate grammatical sentences
CLO4: Participate actively in writing activities (individually and in collaboration) that model effective technical communication in the workplace.
CLO4: Understand how to apply technical information and knowledge in practical documents for a variety of purposes.
CLO5: Practice the unique qualities of professional writing style that includes sentence conciseness, readability, clarity, accuracy, honesty, avoiding wordiness or ambiguity, previewing, using direct order organization, objectivity, unbiased analyzing, summarizing, coherence and transitional devices.
CLO6: Use grammatical, stylistic, and mechanical formats and conventions appropriate to various audiences and disciplines
CLO7: Collect, analyze, document, and report clearly, concisely, logically, and ethically; understand the standards for legitimate interpretations of data within technical communities.

UNIT-I

1.1 Vocabulary Development: Familiarizing Idioms & Phrases
1.2 Grammar for Academic Writing: Making Requests
1.3 Language Development: Using Transition & Link words
1.4 Technical Writing: Letter Writing & Email Writing

UNIT-II

2.1 Vocabulary Development: Analogous words
2.2 Grammar for Academic Writing: Tenses: Simple Past /Present Perfect, The Future: Predicting & Proposing
2.3 Language Development: Cloze tests
2.4 Technical Writing: Technical Reports

UNIT-III

3.1 Vocabulary Development: Abbreviations& Acronyms
3.2 Grammar for Academic Writing: Describing(People/Things/Circumstances) : Adjectival & Adverbial groups
3.3 Language Development: Transco ding (Channel conversion from chart to text)
3.4 Technical Writing: Circular, Memos, Minutes of Meeting

UNIT-IV

4.1 Vocabulary Development: Corporate vocabulary
4.2 Grammar for Academic Writing: Inversions & Emphasis
4.3 Language Development: Reading Comprehension
4.4 Technical Writing: Resume Preparation

REFERENCE BOOKS:

1. Communication Skills, Sanjay Kumar & Pushpa Latha. Oxford University Press:2011.
2. Technical Communication Principles and Practice. Oxford University Press:2014.
3. Advanced Language Practice, Michael Vince. Mac Milan Publishers:2003.
4. Objective English (Third Edition), Edgar Thorpe &Showick. Pearson Education: 2009.
5. English Grammar: A University Course (Second Edition), Angela Downing & Philip Locke, Rout ledge Taylor & Francis Group: 2016

CO, PO and PSO Mapping:

Technical English(18EL002)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO 1	To enable the students to Self-Promote themselves effectively.	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-
CO 2	To make them to be interactive and to overcome the communicative inhibitions.	-	-	-	-	-	-	-	-	3	3	2	-	-	-	-
CO 3	To empower the students to master the Presentation Skills.	-	-	-	-	-	-	-	2	3	3	2	-	-	-	-
CO 4	To train the students to face the interviews confidently	-	-	-	-	-	-	-	2	3	3	2	-	-	-	-

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ANALOG ELECTRONICS LAB

II B.Tech – III Semester (Code: 18EEL31)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic of Electronic Devices and Circuits.

Course Objectives: To make the students

CO1: Able to get basic knowledge of the characteristics of diodes, clippers, rectifiers.
CO2: To get basic knowledge of transistor biasing and characteristics of BJT.
CO3: Able to get basic knowledge on characteristics of JFET and MOSFET
CO4: Able to learn characteristics of Multistage and Feedback amplifiers
CO5: To familiarize on LC and RC oscillators
CO6: Able to learn various Applications using OP-amp.

Course Outcomes: Students will be able

CLO1: Analyse the different applications of Diodes.
CLO2: Analyse BJT as an amplifier
CLO3: Apply JFET and MOSFET in different switching operations
CLO4: Design different types of multistage and feedback amplifiers
CLO5: Design different types of Oscillator circuits.
CLO6: Able to generate different basic waveforms using OP-amp.

LIST OF EXPERIMENTS:

1. Characteristics of PN Junction and Zener diode
2. Half wave rectifier with and without filter
3. Full wave rectifier with and without filter
4. Non-linear wave shaping – clippers
5. Characteristics of Transistor in Common Emitter configuration
6. Verification of Transistor Self Bias Circuit
7. Characteristics of Junction Field Effect Transistor
8. Characteristics of MOSFET
9. Two stage RC coupled Amplifier.
10. Design of voltage shunt feedback amplifier.
11. Design of RC phase shift oscillator.
12. Design of LC oscillator

13. Waveform generation using OP-AMP
14. Instrumentation amplifier using IC 741
15. Schmitt trigger using OP-AMP

Note: Minimum 10 experiments should be conducted.

CO, PO and PSO Mapping:

Analog Electronics Lab (18EEL301)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Able to get basic knowledge of the characteristics of diodes, clippers, rectifiers.	2	2	2	-	-	-	-	-	2	-	-	2	2	2	-
CO2	To get basic knowledge of transistor biasing and characteristics of BJT.	3	3	2	-	-	-	-	-	2	-	-	2	2	2	-
CO3	**Able to get basic knowledge on characteristics of JFET and MOSFET**	2	2	2	-	-	-	-	-	2	-	-	2	2	2	-
CO4	Able to learn characteristics of Multistage and Feedback amplifiers	3	2	2	-	-	-	-	-	2	-	-	2	2	2	-
CO5	To familiarize on LC and RC oscillators	3	3	3	-	-	-	-	-	2	-	-	2	2	2	-
CO6	**Able to learn various Applications using OP-amp.**	3	3	3	-	-	-	-	-	2	-	-	2	2	2	-

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MEASUREMENT AND INSTRUMENTATION LAB

II B.Tech – III Semester (Code: 18EEL32)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Assessment	:	50		Semester End Examination (3 Hours)	:	50	

Prerequisites: Mathematics, Basic Electrical Engineering.

Course Objectives: To make the students

CO1: To know the procedures for measuring values and errors of circuit elements of different ranges by various bridges.

CO2. To perform experiments to measure three phase power.

CO3. To design experiments for calibration of energy meter.

CO4. To know the industrial practices of Measuring earth resistance, dielectric strength of transformer oil & Testing of underground cables.

CO5. To understand the concept of transducers and digital meters.

Course Outcomes: Students will be able to

CLO1: Examine various methods to measure resistance, inductance and capacitance.

CLO2. Examine methods to measure 3-Φ active power and reactive power.

CLO3. Analyse the performance of various meters and to calibrate and test single phase energy meter.

CLO4. Execute testing of earth resistance and dielectric strength of oil.

CLO5. Analyse the concpet of transducers and DSO.

Lectures/Demonstrations:

1. **Concepts relating to measurements:** True value, Absolute error, Accuracy, Precision, Resolution, Drift, Hysteresis, Dead band, Sensitivity.
2. **Instruments:** Classification of Instruments – Construction and principle of Permanent magnet moving coil – Moving iron – Extension range – Energy meter.
3. **Bridges:** Measurement of R, L & C by using DC Bridges – AC Bridges. Transducers.
4. **Digital Instruments:** Principle of operation of Digital Meters
5. **Oscilloscope:** Basic operation – deflection mechanism – time base circuits – vertical amplifier- applications of CRO - DSO.

Lab experiments

1. Calibration and testing of Single phase energy meter by direct loading.
2. Energy meter calibration by phantom loading.
3. Measurement of Low resistance using Kelvin's double bridge.
4. Measurement of medium resistance using Wheatstone Bridge.
5. Measurement of **C** using a bridge technique as well as LCR meter.

6. Measurement of **L** using a bridge technique as well as LCR meter.
7. Measurement of Frequency using Wein's Bridge.
8. Measurement of frequency using CRO.
9. Measurement of three phase active and reactive power in three phase circuits.
10. Displacement measurement using LVDT.
11. Determination of parameters of B-H curve using Hysteresis loop tracer kit.
12. Measurement of earth resistance by earth tester & fall of potential method.
13. Measurement of dielectric strength of transformer oil by oil testing kit.
14. Measurement of high resistance and insulation resistance using Megger.
15. Usage of DSO to capture transients like a step change in R-L-C circuit.

Note: Minimum 10 experiments should be carried.

CO PO and PSO mapping:

MEASUREMENT AND INSTRUMENTATION LAB (18EEL32)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Examine various methods to measure resistance, inductance and capacitance Analyse the performance of various meters and to calibrate and test single phase energy meter.	3	3	2	2	1	1	-	-	1	-	-	-	3	3	2
CO2	Examine methods to measure 3-Φ active power and reactive power.	3	3	2	2	-	1	-	-	1	-	-	-	3	3	2
CO3	Analyse the performance of various me and test single phase energy meter.	3	3	2	2	2	1	-	-	1	-	-	-	3	3	2
CO4	Execute testing of earth resistance and dielectric strength of oil.	2	2	-	2	2	1	-	-	1	-	-	-	3	2	2
CO5	Analyse the concpet of transducers and DSO.	3	2	-	2	2	1	-	-	1	-	-	-	3	2	2

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ELECTROMAGNETIC FIELDS

II B.Tech – IV Semester (Code: 18EE401)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: To make the students

CO1: To acquire knowledge in Electromagnetic field theory

CO2: To provide a solid foundation in Electrostatics such as Dipole, Capacitance

CO 3: To attain familiarity in Boundary conditions and Magnetic field.

CO 4: To understand the relation between field theory and circuit theory.

CO 5: To identify the electromagnetic wave propagation in medium

Course Outcomes: Students will be able to

CLO1: Describe the fundamentals in Electromagnetic field theory

CLO2: Explain basics in Electrostatics such as Dipole, Capacitance

CLO3: Distinguish electric and magnetic properties of material media and Familiarity in Boundary conditions and Magnetic field

CLO4: Analyze three-dimensional vector differential and integral concepts to solve real life electromagnetic field problems

CLO5: Describe the electromagnetic wave propagation in medium

UNIT – I

Electrostatics I: Introduction to Rectangular, Cylindrical and Spherical Coordinate systems. The experimental law of coulomb, Electric field intensity, Field due to a continuous volume charge distribution, Field of a line charge, sheet of charge. Electric Flux Density, Gauss's law , Applications of Gauss law, Divergence, Maxwell's First equation (Electrostatics), Energy expended in moving a point charge in an electric field, Definition of potential and potential difference. The potential field of a point charge, system of charges, potential gradient.

UNIT – II

Electrostatics II: Electric field intensity due to dipole and Energy density in electrostatic field. The nature of dielectric materials, boundary conditions for perfect dielectric materials. Capacitance. Several capacitance examples. Capacitance of a two-wire line. Derivations of Poisson's and Lap lace's equations, Examples of the solution of Laplace's equation. Current and current density, continuity of current, conductor properties and boundary conditions

UNIT – III

Steady Magnetic Field: Biot- Savart Law, Ampere's Circuital Law, Magnetic Flux and Magnetic Flux Density, The scalar and vector magnetic potentials. Magnetic Forces and Materials: Force on a moving charge, Force on a differential current element, Force between differential current elements, Force and torque on a closed circuit, The nature of magnetic materials, Magnetization and Permeability. Magnetic boundary conditions. Potential energy in magnetic fields.

UNIT – IV

Time Varying Fields and Maxwell's Equations: Faraday's law, Displacement current, Maxwell's equations in point form, integral form.

Concept of Uniform Plane Wave: Wave propagation in free space, dielectrics. Poynting theorem and wave power. Propagation in good conductors: skin effect. Reflection of uniform plane waves at normal incidence.

TEXT BOOKS:

1. W H Hayt, J A Buck , "Engineering Electromagnetics", 7th Edition TMH, 2006.
2. Mathew NO Sadiku, "Elements of Electromagnetics", Oxford University Press, 2003.
3. G S N Raju, "Electromagnetic Field Theory and transmission lines", 1st Edition, Pearson Education India, 2005.

REFERENCE BOOKS:

1. Joseph A Edminister, "Theory and Problems of Electromagnetics", 2nd Edition, Schaum's Outline Series, Mc-Graw Hill International, 1993
2. EC Jordan and KG Balmain, "Electromagnetic Waves and Radiating Systems", PHI 2003.

NPTEL COURSE LINKS:

1. Electrical Engineering - NOC:Electromagnetic theory - NPTEL **https://nptel.ac.in/courses/108/104/108104087/**
2. Electrical Engineering - Electromagnetic Fields - NPTEL **https://nptel.ac.in/courses/108/106/108106073/**

CO, PO and PSO Mapping:

ELECTROMAGNETIC FIELDS (18EE401)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Describe the fundamentals in Electromagnetic field theory	**3**	**3**	**3**	-	-	-	-	-	-	-	-	-	**3**	2	-
CO2	Explain basics in Electrostatics such as Dipole, Capacitance	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	2	-
CO3	Distinguish electric and magnetic properties of material media and Familiarity in Boundary conditions and Magnetic field	**3**	**3**	**2**	-	-	-	-	-	-	-	-	-	**3**	2	-
CO4	Analyze three dimensional vector differential and integral concepts to solve real life electromagnetic field problems	**2**	**2**	**1**	-	-	-	-	-	-	-	-	-	**3**	2	-
CO5	Describe the electromagnetic wave propagation in medium	**3**	**3**	**3**	-	-	-	-	-	-	-	-	-	**3**	2	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

(Autonomous)

DIGITAL ELECTRONICS
II B.Tech – IV Semester (Code: 18EE402)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course Objectives: In this course students are able to

CO1: Have a thorough understanding of the fundamental concepts and techniques used in digital electronics, and Number conversions;

CO2: Understand Boolean Algebra and able to minimize boolean expressions by applying boolean algebra, K-Map method and Tabulation Method with "don't care" conditions.

CO3: to analyze and design various combinational logic circuits.

CO4: Use basic flip-flops SR, JK, D and T; analyze and design synchronous sequential circuits.

CO5: Have a understanding of the fundamental concepts about various terms and circuits of A/D and D/A converters

CO6: Understand Registers and Counters and Memories and design Programmable Logic Devices.

Learning Outcomes: After the completion of this course the students are expected to be able to:

CLO1: Describe fundamental concepts and techniques used in digital electronics, and able to perform Number conversions, Complements; able to describe various Boolean algebraic rules and laws.

CLO2: Simplify Boolean function using Boolean algebraic rules and laws, K-Map and Tabulation Method.

CLO3: Analyze and design of various Combinational logic circuits.

CLO4: Analyze functionalities of Latches and Flip-Flops; able to Analyze and design of Sequential logic circuits.

CLO5: learn about various terms of A/D and D/A converters

CLO6: Analyze and design of Registers, Counters, types of memories and PLD's.

UNIT-I

Fundamentals of Digital Systems and Logic families: Digital signals, digital Circuits, A N D , OR, NOT, NAND, NOR a n d Exclusive-OR operations, Boolean algebra, examples of IC gates, number systems-binary, signed binary, Octal, hexa decimal number, binary arithmetic, one's and two's complements arithmetic, codes: Excess-3 and gray code, error detecting and correcting codes, characteristics of digital ICs, digital logic families, TTL, Schottky TTL and CMOS logic, interfacing CMOS and TTL, Tri-state logic.

UNIT-II

Combinational Digital Circuits: Standard representation for logic functions, K-map representation, simplification of logic functions using K-map, don't care conditions, Adders, Subtractors, BCD arithmetic, carry look ahead adder, serial adder, Multiplexer, De-Multiplexer, digital comparator, parity checker/ generator, code converters, priority encoders, decoders/drivers for display devices, Q-M method of function realization.

UNIT-III

Sequential circuits and systems : A1-bitmemory,thecircuit properties of Bi stable latch, the clocked SR flip flop, J-K, T and D- type flip flops, applications of flip flops, shift registers, applications of shift registers, ring counter, sequence generator, ripple (Asynchronous) counters, synchronous counters, counters design using flip flops, applications of counters.

UNIT-IV

A/D and D/A Converters: Digital to analog converters: weighted resistor/converter, R-2R Ladder D/A converter, specifications for D/A converters, sample and Hold Circuit, analog to digital converters: quantization and encoding, parallel comparator A/D converter, successive approximation A/D converter, counting A/D converter, dual slope A/D converter, A/D converter using voltage of frequency and voltage to time conversion, specifications of A/D converters.

Semi-conductor memories and Programmable logic devices: Memory organization and operation, expanding memory size, classification and characteristics of memories, r ead only memory (ROM), read and write memory (RAM), ROM as a PLD, Programmable logic array, Programmable array logic.

TEXT BOOKS:

1. R.P. Jain, "Modern Digital Electronics", Mc Graw Hill India, 4th edition, 2012.
2. M. Morris Mano, "Digital logic and Computer design", Pearson India, 6th edition, 2018.
3. A.Kumar, "Fundamentals of Digital Circuits", Prentice Hall India, 2016.

REFERENCE BOOKS:

1. Anil K. Maini, "Digital Electronics: Principles and Integrated Circuits", Wiley, 2007.
2. S.S. Bhatti Rahul Malhotra, "A Textbook of Digital Electronics", I K International Publishing House, 2011.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Digital Electronic Circuits, https://nptel.ac.in/courses/108/105/108105132/
2. NPTEL :: Electrical Engineering - NOC:Digital Circuits, https://nptel.ac.in/courses/108/105/108105113/

CO, PO and PSO Mapping:

Digital Electronics (18EE402)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Describe fundamental concepts and techniques used in digital electronics, and able to perform Number conversions, Complements; able to describe various Boolean algebraic rules and laws.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CO2	Simplify Boolean function using Boolean algebraic rules and laws, K-Map and Tabulation Method.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CO3	Analyze and design of various Combinational logic circuits.	3	2	3	-	-	-	-	-	-	-	-	-	3	1	-
CO4	Analyze functionalities of Latches and Flip-Flops; able to Analyze and design of Sequential logic circuits.	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CO5	Learn about various terms of A/D and D/A converters	3	3	2	-	-	-	-	-	-	-	-	-	3	1	-
CO6	Analyze and design of Registers, Counters, types of memories and PLD's.	3	2	3	-	-	-	-	-	-	-	-	-	3	1	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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ELECTRICAL MACHINES – II
(INDUCTION MOTORS AND SYNCHRONOUS MACHINES)

II B.Tech – IV Semester (Code: 18EE403)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

CO1: Understand the construction, operation and performance of three phase induction machines.

CO2: Gain knowledge about construction, operation and application of single phase induction machines.

CO3: Understand the construction, operation and performance of Alternators

CO4: Gain knowledge about construction, operation and performance of synchronous motors.

Course outcomes: At the end of this course, students will be able to

CLO1: Demonstrate construction, operation and performance of three phase induction machines.

CLO2: Explain construction, operation and application of single phase induction machines.

CLO3: Analyze operation and performance of Alternators

CLO4: Analyze operation and performance of synchronous motors.

UNIT-I

Induction machines: Construction-Types (squirrel cage and slip ring)-rotating magnetic field in two phase & three phase systems-Torque equation-torque slip characteristics- equivalent circuit-phasor diagram-losses and efficiency- circle diagrams-starting methods and speed control-Induction generator.

UNIT-II

Single- phase Induction motors: Constructional features-double revolving field theory-equivalent circuit-determination of parameters-split phase-capacitor start and run-shaded pole motors-characteristics and their applications.

UNIT-III

Synchronous generators: Construction-EMF equation with winding factors-equivalent circuit and phasor diagram-armature reaction-synchronous impedance-voltage regulation- methods of determining regulation –EMF and ZPF methods-salient pole machine-two reaction theory-power angle characteristics-parallel operation of alternators-synchronization of alternators.

UNIT-IV

Synchronous motors: Theory of operation-starting methods-phasor diagrams-variation of current and power factor with excitation-Power circles-V and inverted V curves-hunting and its prevention-synchronous condenser and its applications.

TEXT BOOKS:

1. P.S.Bimbhra," Electrical Machinery", Khanna Publishers,2011.
2. I.J.Nagrath and D.P.Kothari,"Electric Machines", McGraw Hill Education,2010.

REFERENCES BOOKS:

1. A.E. Fitzgerald and C.Kingsley, "Electric Machinery", McGraw Hill Education, 2013.
2. M.G.Say, "Performance and design of AC machines", CBS Publishers, 2002.
3. A.S.Langsdorf, "Alternating current machines", McGraw Hill Education,1984.
4. P.C.Sen,"Principles of Electric Machines and Power Electronics", John Wiley & Sons, 2007.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Electrical Machines II, https://nptel.ac.in/courses/108/106/108106072/
2. NPTEL :: Electrical Engineering - NOC:Electrical Machines - II, https://nptel.ac.in/courses/108/105/108105131/

CO, PO and PSO Mapping:

Electrical Machines – II (18EE403)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the construction of three phase rotating machines.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO2	Analyze the rotating magnetic field in two phase and three phase systems.	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO3	To know the performance of three phase induction motors.	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO4	Understand the starting methods of single phase induction motors	3	3	2	3	-	-	-	-	-	-	-	-	3	2	-
CO5	Understand the winding factors of synchronous machines.	3	3	2	2	-	-	-	-	-	-	-	-	3	2	-
CO6	To know the parallel operation of Alternators	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-
CO7	Understand the phenomenon of hunting and its consequences.	3	3	3	2	-	-	-	-	-	-	-	-	3	2	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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SIGNALS AND SYSTEMS

II B.Tech – IV Semester (Code: 18EE404)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Physics, Basic Mathematics

Course objectives: To make the students

CO1: Understand the concepts of continuous time and discrete time systems.
CO2: Gain knowledge about LTI systems
CO3: Analyze systems in frequency domain.
CO4: Understand sampling theorem and its implications.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain the concepts of continuous time and discrete time systems.
CLO2: Analyze the behavior of continuous and discrete time LTI systems.
CLO3: Analyze systems in frequency domain.
CLO4: Demonstrate sampling theorem and its implications.

UNIT-I

INTRODUCTION TO SIGNALS AND SYSTEMS: Signals and systems as seen in everyday life, and in various branches of engineering and science. Signal properties: periodicity, absolute integrability, determinism and stochastic character. Some special signals of importance: the unit step, the unit impulse, the sinusoid, the complex exponential, some special time-limited signals; continuous and discrete time signals, continuous and discrete amplitude signals. System properties: linearity: additivity and homogeneity, shift-invariance, causality, stability, realizability. Examples.

UNIT-II

BEHAVIOR OF CONTINUOUS AND DISCRETE-TIME LTI SYSTEMS: Impulse response and step response, convolution, input-output behavior with a periodic convergent inputs, cascade interconnections. Characterization of causality and stability of LTI systems. System representation through differential equations and difference equations .State-space Representation of systems. State-Space Analysis, Multi-input, multi-output representation. State Transition Matrix and its Role. Periodic inputs to an LTI system, the notion of a frequency response and its relation to the impulse response.

UNIT-III

FOURIER AND Z - TRANSFORMS: Fourier series representation of periodic signals, Waveform Symmetries, Calculation of Fourier Coefficients. Fourier Transform, convolution/multiplication and their effect in the frequency domain, magnitude and phase response, Fourier domain duality. The Discrete- Time Fourier Transform (DTFT) and the Discrete Fourier Transform (DFT). Parseval's Theorem. The z-Transform for discrete time signals and systems, system functions, poles and zeros of systems and sequences, z-domain analysis.

UNIT-IV

SAMPLING AND RECONSTRUCTION: The Sampling Theorem and its implications. Spectra of sampled signals. Reconstruction: ideal interpolator, zero-order hold, first-order hold. Aliasing and its effects. Relation between continuous and discrete time systems. Introduction to the applications of signal and system theory: modulation for communication, filtering, feedback control systems.

TEXT BOOKS:

1. A. V. Oppenheim, A. S. Willsky and S. H. Nawab, "Signals and Systems", Prentice Hall India, 2007.
2. J. G. Proakis and D. G. Manolakis, "Digital Signal Processing: Principles, Algorithms, and Applications", Pearson, 2007.
3. H. P. Hsu, "Signals and Systems" , Schaum's series, McGraw Hill Education, 3rd Edition 2013.

REFERENCE BOOKS:

1. S. Haykin and B. V. Veen, " Signals and Systems", John Wiley and Sons, 2nd Edition, 2007.
2. A. V. Oppenheim and R. W. Schafer, "Discrete-Time Signal Processing", Prentice Hall, 3rd Edition, 2014.
3. M. J. Robert "Fundamentals of Signals and Systems", McGraw Hill Education, 2007.
4. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Signals and Systems, https://nptel.ac.in/courses/108/106/108106163/
2. NPTEL :: Electronics & Communication Engineering - Signals and Systems, https://nptel.ac.in/courses/117/101/117101055/

CO, PO and PSO Mapping:

SIGNALS AND SYSTEMS (18EE404)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the concepts of continuous time and discrete time systems.	3	3	2	2	1	-	-	-	-	-	-	-	3	2	-
CO2	Analyze the behavior of continuous and discrete time LTI systems.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CO3	Analyze systems in frequency domain.	3	3	1	2	-	-	-	-	-	-	-	-	3	2	-
CO4	Demonstrate sampling theorem and its implications.	3	3	2	-	1	-	-	-	-	-	-	-	3	2	-

BAPATLA ENGINEERING COLLEGE :: BAPATLA

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BIOLOGY FOR ENGINEERS

II B.Tech-IV Semester (18CE002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To learn

CO1: To describe the bio molecules present in living organisms
CO2: to give awareness about the sterilization methods
CO3: it explains the importance of plants in the ecosystem
CO4: it gives an idea about the classifications of organisms
CO5: It explores the harmful and beneficial role of bacteria

Course Outcomes: Students will be able to

CLO1: Explain the Morphology and chemical composition of the cell and function of each organelle present in the cell with the help of microscope.
CLO2: Explain the process of human physiological system and its cell functioning.
CLO3: Explain the importance of microbiology and immunological science to know the reactions of our body.
CLO4: Discuss the biological science related to the different disciplinary areas.
CLO5: Explain the importance of genetics and how bioscience is related to other technical areas.

UNIT-I

Introduction to biology: Classification of microorganisms- Two kingdom, Three kingdom & Five kingdom; Prokaryotic cell structure (Bacteria); Eukaryotic cell structure (Plant & Animal cells); Differences between Prokaryotes and Eukaryotes.

UNIT-II

Bacterial Growth Phases; Nutrition in Bacteria; Types of media; Bacteria - Binary Fission, Endosporm Formation; Plant & Animal cell Division - Mitosis & Meiosis.

UNIT-III

Structure of DNA (Watson & Crick model); Types of DNA & Function of DNA; Structure of RNA & types of RNA; Differences between DNA & RNA. Types of proteins & structure of proteins.

UNIT-IV

Sterilization methods - Physical methods : Heat, Filtration, radiation; Chemical methods: Phenolics, alcohols, aldehydes, halogens, heavy metals, sterilizing gases, dyes. Economic importance of bacteria (Harmful & Beneficial aspects); Plants in Primary Health care - Tulasi, piper longum, Myrobalan, Aloe vera, Turmeric.

REFERENCE BOOKS:

1. Prof. K.yadagiri., Dr. M. Manikya Lakshmi, "Botany" paper-I,II,III,IV (Telugu Akademi Coordinating Committee)
2. Presscott, "Microbiology"
3. Pelczar, "Microbiology"
4. Ananthanarayana, "Microbiology"

CO, PO and PSO Mapping:

BIOLOGY FOR ENGINEERS (18EE404)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the Morphology and chemical composition of the cell and function of each organelle present in the cell with the help of microscope.	2	1	-	-	-	-	-	-	-	-	-	-	-	-	-
CO2	Explain the process of human physiological system and its cell functioning.	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-
CO3	Explain the importance of microbiology and immunological science to know the reactions of our body.	-	1	2	2	1	-	-	-	-	-	-	-	-	-	-
CO4	Discuss the biological science related to the different disciplinary areas.	-	1	2	-	2	-	-	-	-	-	-	-	-	-	-
CO5	Explain the importance of genetics and how bioscience is related to other technical areas.	-	1	2	-	-	-	-	-	-	-	-	-	-	-	-

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POWER SYSTEM – I
(GENERATION and TRANSMISSION)

II B.Tech-IV Semester (18EE406)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Understand the economical aspects and choice of power stations and units
CO2: Understand the significance of conventional and non-conventional energy resources and their operation
CO3: Calculate transmission line parameters.
CO4: Discuss the theory and mechanical design of transmission lines and introduce various types of insulators and their testing.

Course Outcomes: Students will be able to
CLO1: Explain the economical aspects and choice of power stations and units
CLO2: Analyze the significance of conventional and non-conventional energy resources and their operation.
CLO3: Analyze the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of conductor materials.
CLO4: Classify the types of insulators, testing of insulators and calculation of string efficiency.

Course Syllabus:

UNIT – I

Economical Aspects: Economics of generation - factors affecting cost of generation - Definitions: load factor – diversity factor – plant use factor - reduction of cost by inter connected stations. Power factor considerations – causes of low power factor – methods of improving power factor – phase advancing and generation of reactive KVAR – most economical power factor for constant KW load and constant KVA type loads. Tariff: Characteristics of Tariff – types of Tariff.

Choice of power stations and units: Types of power stations – choice of generation - size of generator units – load duration curve – effect of variable load on plant operation and design.

UNIT-II

Thermal Power: Block Diagram of Thermal Power Station (TPS), Brief Description of Thermal Power system Components
Hydro Power: Selection of Site, Classification, Layout, Description of Main Components.
Nuclear Power: Nuclear Fission and Chain Reaction-Principle of Operation of Nuclear Reactor.- Description of Main Components.

Solar Power Generation: Role and Potential of Solar Energy Options, Principles of Solar Radiation, Solar Energy Collectors, Different Methods of Energy Storage – PV Cell- V-I Characteristics.
Wind Power Generation: Role and potential of Wind Energy Options, Horizontal and Vertical Axis Wind Mills- Performance Characteristics-Pitch & Yaw Controls – Economic Aspects.

UNIT-III

Transmission Line Parameters: Calculation of inductance for single phase and three phase, single and double circuit lines, concept of GMR & GMD, symmetrical and asymmetrical conductor configuration with and without transposition. Calculation of capacitance for 2 wire and 3 wire systems, effect of ground on capacitance, capacitance calculations for symmetrical and asymmetrical single and three phase, single and double circuit lines.

Modeling of Transmission Lines: Classification of Transmission Lines - Short, medium and long line and their model - representations - Nominal-T, Nominal-Pie and A, B, C, D Constants. Mathematical Solutions to estimate regulation and efficiency of all types of lines- Long Transmission Line-Rigorous Solution, evaluation of A,B,C,D Constants, Interpretation of the Long Line Equations – Representation of Long lines – Equivalent T and Equivalent – π, Numerical Problems. – Surge Impedance and surge Impedance loading - wavelengths and Velocity of propagation – Ferranti effect, Charging current, Need of Shunt Compensation.

UNIT-IV:

Insulators, Corona: Types of Insulators- String efficiency and Methods for improvement– Voltage Distribution, Calculation of string efficiency- Capacitance grading and Static shielding. Corona - Description of the phenomenon, factors affecting corona, critical voltages and power loss, Radio Interference.
Mechanical Design of Lines: Sag and Tension Calculations with equal and unequal heights of towers, Effect of Wind and Ice on weight of Conductor - Stringing chart and sag template and its applications.

TEXT BOOKS:

1. Electric Power Generation Distribution and Utilization by C.L Wadhwa, New Age International (P) Ltd., 2005.
2. Non-Conventional Energy Sources by G.D. Rai, Khanna Publishers, 2000.
3. Electrical power systems, C.L.Wadhwa, New Age International (P) Limited, 6th Edition, 2010, Reprint 2014.

REFERENCE BOOKS:

1. Renewable Energy Resources – John Twidell and Tony Weir, Second Edition, Taylor and Francis Group, 2006.
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., PHI, 2003.
3. Principles of Power Systems by V.K Mehta and Rohit Mehta S.CHAND & COMPANY LTD., New Delhi 2004.
4. Wind Electrical Systems by S. N. Bhadra, D. Kastha& S. Banerjee – Oxford University Press, 2013.
5. Power System Engineering, D. P. Kothari and I. J. Nagrath, Mc Graw Hill Education

(India) Pvt. Ltd., 2nd Edition, 2008, 23rd Reprint 2015.

NPTEL Course Links:

1. **NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/**
2. **NPTEL :: Electrical Engineering - NOC:Power System Engineering, https://nptel.ac.in/courses/108/105/108105104/**
3. **NPTEL :: Introduction to power system analysis, https://nptel.ac.in/courses/108/105/108105067/**

CO, PO and PSO Mapping:

Power systems- I(18EE 406)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain the economic aspects and choice of power stations and units	2	2	1	1	-	-	-	-	-	-	-	-	2	1	1
CO2	Analyze the significance of conventional and non-conventional energy resources and their operation.	3	3	3	-	-	-	-	-	-	-	-	-	3	2	-
CO3	Analyze the performance of short, medium and long transmission lines and identify the transmission system which requires minimum volume of Conductor materials.	3	3	3	-	-	-	2	-	-	-	-	-	3	2	-
CO4	Classify the types of insulators, testing of insulators and calculation of string efficiency	2	2	2	-	-	-	2	-	-	-	-	-	3	2	2

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DIGITAL ELECTRONICS LAB

II B.Tech – IV Semester (Code: 18EEL41)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

LIST OF EXPERIMENTS

1. Realization of Logic Gates using Discrete Components
2. Realization of Logic Gates using Universal Building Blocks.
3. Design of Combinational Logic Circuits like half-adder, Full adder, Half-subtractor and Full-subtractor
4. Design of Code converters.
5. Design of combinational circuit for BCD to decimal conversion to drive 7-segment display driver.
6. Design of 4X1 Multiplexer and 1x4 Demultiplexer.
7. Four-bit parity generator and comparator circuits.
8. Realization of RS-JK & D flip-flop using logic gates.
9. Design of Shift Registers.
10. Design of Ring Counter and Johnson Counter using Flip Flops
11. Design of Asynchronous counter, Mod counter, Up counter, Down counter and Up/Down counter using Flip Flops
12. Design of Synchronous Counter, Mod Counter, Up counter, Down counter and Up/Down counter using Flip Flops.
13. Design of Sequence Generators.
14. Design and testing of mono stable and Astable Multivibrators using 555 timers.
15. Design a 4-bit R-2R ladder type of digital to analog converter.

Note: Minimum 10 experiments should be conducted.

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ELECTRICAL MACHINES LAB - I

II B.Tech – IV Semester (Code: 18EEL42)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: To develop experimental setups for studying the performance and operation of DC Generators and DC motors

CO2: To perform Direct and Indirect tests of various DC motors.

CO3: Acquire hands on experience of conducting various tests on Transformers and obtaining their Performance indices using standard analytical as well as graphical methods.

CO4: To develop experimental setups for studying the performance and operation of Transformers.

Course Outcomes: Students will be able to

CLO1: Analyze the performance characteristics of DC Generators.

CLO2: Asses the performance of the given DC motors

CLO3: Understand and explain the principle of operation and performance of transformer.

CLO4: Calculate load of transformer for a given application and then select the suitable specification of electrical machine

LIST OF EXPERIMENTS

1. Open circuit characteristics of separately excited / self-excited D.C shunt generator
2. Load test on D.C Shunt Generator
3. Load test on D.C series generator
4. Load test on D.C Compound Generator
5. Brake test on D.C Shunt Motor
6. Speed control of DC Shunt motor
7. Swinburne's Test on a D.C Shunt Machine.
8. Retardation test on D.C. Machine.
9. Field test on two identical DC series machine

10. Hopkinson's test on Two Identical D.C Machines
11. OC & SC tests on single - phase transformer
12. Load test on single - phase transformer
13. Scott Connection of Transformers
14. Parallel Operation of Two Single - Phase Transformers
15. Sumpner's test on Two single-phase Transformers
16. Separation of losses in single – phase transformer

Note: Minimum 10 experiments should be carried out.

CO PO and PSO mapping:

ELECTRICAL MACHINES-I LAB (18EEL42)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze the performance characteristics of DC Generators.	2	2	1	1	-	-	-	-	-	-	-	-	1	3	-
CO2	Asses the performance of the given DC motors	2	3	1	1	-	-	-	-	-	-	-	-	1	2	-
CO3	Understand and explain the principle of operation of transformers	1	2	2	1	-	-	-	-	-	-	-	-	2	2	-
CO4	Know the performance of Transformers	2	1	2	1	-	-	-	-	-	-	-		1	2	-

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DATA STRUCTURES AND ALGORITHMS LAB

II B.Tech – IV Semester (Code: 18ITL01)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

LIST OF EXPERIMENTS:

1. Write a program to perform the following operations on Array List.

   a) Creation b) Insertion c) Deletion d) Search e) Display.

2. Write a program to implement the following

   a) stack using array b) queue using array

3. Write a program to implement the following using stack.

   a) infix to postfix conversion b) postfix evaluation

4. Write a program to implement circular queue and perform the following

   a) enqueue b) dequeue

5. Write a program to perform the following operations on Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

6. Write a program to perform the following operations on Circular Single Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

7. Write a program to perform the following operations on Doubly Linked List.

   a) Creation b) Insertion c) Deletion d) Search e) Display

8. Write a program to implement the following sorting techniques

   a) Quick Sort b) Merge Sort c) Shell Sort

9. Write a program to demonstrate Binary Expression tree.

10. Write a program to create Binary tree and display their traversals.

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Programming, Data Structures and Algorithms
2. NPTEL :: Computer Science and Engineering - Data Structures And Algorithms

POWER SYSTEM – II

III B.Tech-V Semester (18EE501)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Circuit Theory, Network Analysis

Course Objectives: To make the students

CO1: Analyze copper efficiencies of various supply systems and substation practice

CO2: Describe types of underground cables and explains the representation of power system components

CO3: Understand the symmetrical components and networks and analysis of Unsymmetrical faults.

CO4: Understand travelling waves and transmission lines over voltages.

Course outcomes: At the end of this course, students will be able to

CLO1: Explain all types of DC and AC distribution systems, classification of substations.

CLO2: Analyze performance of underground cables and solve all power system problems using per unit system.

CLO3: Analyze all the power system networks with symmetrical and asymmetrical fault analysis

CLO4: Classify the types of insulators, testing of insulators and calculation of string efficiency.

UNIT – I

Distribution: Comparison of copper efficiencies between DC, AC Single phase, 3-phase, 3-wire & 4-wire systems, calculation of voltage regulation in case of non-uniform and uniformly distributed loads on feeders, feeders fed at one end and both ends, ring feeders without and with interconnections, choice of voltage and frequency, Kelvin's law for most economical cross section and most economical current density and its limitations.

Substation Practice: Classification of substations, indoor and outdoor substations, bus-bar arrangements – single bus-bar, sectionalized single bus-bar, main and transfer bus-bar system, sectionalized double bus-bar system, ring mains, group switching,

UNIT – II

Underground Cables: Types of cables, laying of cables, insulation resistance, electric stress and capacitance of single core cable, use of inter sheath, capacitance grading, capacitance of three core belted type cable, stress in a three-core cable, sheath effects,

currents in bonded sheaths, electrical equivalent of sheath circuit, thermal characteristics of cables.

Representation of power system Components: Modeling of power system components for system studies: transmission lines, two-winding transformers with nominal & off-nominal ratio tap settings, three-winding transformers, phase shifting transformers. One line diagram, Impedance and Reactance diagrams, advantages of Per Unit Computations, per unit quantities, changing the base, selection of base, per-unit impedances of three winding transformers.

UNIT-III

Symmetrical Faults: Transients in RL series circuit, short-circuit currents and reactance's of synchronous machines, internal voltages of loaded machines under transient conditions, selection of circuit breakers. Formation of Bus Impedance matrix by using Z-Bus building algorithm. Analysis of symmetrical faults using bus impedance matrix

Symmetrical components and Networks: Introduction – operator 'a', resolution of three unbalanced phasor into symmetrical components, power in terms of symmetrical components. Unsymmetrical series impedance - sequence impedances and sequence networks of unloaded generators, circuit elements. Positive, negative and zero sequence networks.

Unsymmetrical Faults: Single line to ground, line to line and double line to ground faults on an unloaded alternator and on power systems.

UNIT-IV

Travelling waves on Transmission lines and over voltages: Wave equation, Surge impedance and wave velocity, Reflection and Refraction of waves, Typical cases of line terminations, forked line, successive Reflection, Bewley Lattice diagram, Attenuation and Distortion, Arcing grounds, Capacitance switching and Current chopping.

Over Voltages: Lightning Phenomenon, over voltages due to lightning, Switching Over voltages, protection of systems against surges and Surge Arresters.

TEXT BOOKS:

1. Pradip Kumar Sadhu, Soumya Das, "Elements of Power Systems", CRC Press, 1st Edition, 2015.
2. John J. Grainer, W D Stevenson Jr, "Power System Analysis", McGraw Hill Education, 1st edition, 2017
3. D P Kothari, I J Nagrath, "Power System Engineering", McGraw-Hill Education, 3rd Edition, 2019

REFERENCE BOOKS:

1. S. Ramar, S. Kuruseelan, "Power System Analysis", PHI Learning Pvt. Ltd., 2013
2. S.N.Singh., "Electrical Power Generation, Transmission and Distribution", PHI, 2nd Edition, 2008.
3. C.L. Wadhwa, "Electrical Power Systems", New age International (P) Limited, 7th edition,2016.

NPTEL COURSE Links:

1. Electrical Engineering - Power System Analysis - NPTEL https://nptel.ac.in/courses/108/105/108105067/
2. **NPTEL :: Electrical Engineering - Power System Generation, Transmission and Distribution (Encapsulated from earlier Video), https://nptel.ac.in/courses/108/102/108102047/**
3. Electrical Engineering - NOC:Power System ... - NPTEL https://nptel.ac.in/courses/108/105/108105104/
4. Electrical Engineering - NOC:Electrical Distribution ... - NPTEL, https://nptel.ac.in/courses/108/107/108107112/

CO, PO and PSO Mapping:

	POWER SYSTEM – II (18EE501)	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain all types of DC and AC distribution systems, classification of substations.	3	3	-	2	-	-	-	-	-	-	-	3	3	2	2
CO2	Analyze performance of underground cables and solve all power system problems using per unit system.	3	3	-	1	-	-	-	-	-	-	2	-	3		2
CO3	Analyze all the power system networks with symmetrical and asymmetrical fault analysis	3	3	-	3	-	-	2	-	-	-	-	-	3	2	2
CO4	Classify the types of insulators, testing of insulators and calculation of string efficiency.	3	3	-	2	-	-	1	-	-	-	-	-	3	1	-

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CONTROL SYSTEMS

III B.Tech-V Semester (Code: 18EE502)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Physics, Network Theory

Course Objectives: To make the students

CO1: To make the students interpret different physical systems, construct mathematical models and reduce a block diagram of multiple subsystems to a signal block.
CO2: To make the students employ time domain analysis to predict and diagnose transient performance parameters of the system for standard input functions.
CO3: To make the students analyze the system stability using complex domain.
CO4: To make the students formulate different types of analysis in time and frequency domain.
CO5: To make the students Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
CO6: To make the students assess controllability and observability of control systems.

Course Outcomes: Students will be able

CLO1: Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system and reduce a block diagram of multiple subsystems to a signal block
CLO2: Describe time domain analysis and predict the performance parameters of the system for standard input functions.
CLO3: Compute stability of the system in complex domain.
CLO4: Analyze stability of the system in time and frequency domain.
CLO5: Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system.
CLO6: Assess controllability and observability of control systems.

Course Syllabus:

UNIT – I

Introduction: Basic concept of control system. Types of feedback control systems and its effect on overall gain – Liner time invariant, time variant systems and nonlinear control systems

Modeling of LTI Systems: Mathematical models and Transfer functions of Physical systems. Block diagram representation of control systems – signal flow graph.

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UNIT – II

Time Domain Analysis: Standard test signals – step, ramp, parabolic and impulse response function –Time response of first order and second order systems to standard test signals - steady state response – error Constants.
Stability Analysis in the Complex Plane: Absolute, relative, conditional, bounded input – bounded output, zero input stability, conditions for stability, Routh –Hurwitz criterion.

UNIT – III

Root Locus Technique: Introduction - Construction of Root Locus, Introduction to Controller Design using Root-loci method of feedback controller design,
Frequency Domain Analysis: Introduction – correlation between time and frequency responses – Polar plots – Bode plots – Nyquist plots.

UNIT – IV

Design of controllers and compensator: Effect of adding poles and zeros on overshoot, rise time, band width. Introduction to Application of Proportional, Integral and Derivative Controllers, Lead and Lag compensation in designs.
State space analysis: Concepts of state variables and state models – diagonalization – solution of state equations – Concepts of controllability and Observability

TEXT BOOKS:

1. I. J. Nagrath and M. Gopal, "Control Systems Engineering", New Age International Pvt Ltd, 6th Edition 2018.
2. Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Pvt. Ltd., 5th Edition, 2015.
3. Control Systems Engineering by SK Bhattacharya, Pearson Education India,3rd Edition, 2013.

REFERENCE BOOKS:

1. A. Anand Kumar, "Control Systems", Prentice Hall India Learning Private Limited, 2nd Edition, 2014.
2. A. NagoorKani, "Control Systems", RBA publications, 1st Edition, 2014.
3. Joseph Distefano, Allen Stubberud, Ivan Williams & Sanjoy Mandal, "Control Systems (Schaum's Outline Series)", McGraw Hill Education, 3rd Edition, 2017.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Control,engineering https://nptel.ac.in/courses/108/106/108106098/

2. NPTEL :: Electrical Engineering - Control Engineering https://nptel.ac.in/courses/108/102/108102043/
3. NPTEL :: Electrical Engineering - Control Engineering https://nptel.ac.in/courses/108/102/108102044/
4. NPTEL :: Engineering Design - NOC:Control systems https://nptel.ac.in/courses/107/106/107106081/

CO, PO and PSO Mapping:

Control Systems (18EE502)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the concepts of classification of control systems, develop of mathematical models from schematics of physical system and reduce a block diagram of multiple subsystems to a signal block	**3**	**2**	-	**2**	2	1	-	-	1	-	1	**2**	-	-	-
CO2	Describe time domain analysis and predict the performance parameters of the system for standard input functions.	**2**	**3**	2	**2**	1	2	1	1	1	1	1	**2**	-	2	-
CO3	Compute stability of the system in complex domain.	**2**	2	**1**	**2**	**2**	**1**	**1**	-	-	1	-	**1**	-	-	2
CO4	stability of the system in time and frequency domain.	**3**	**3**	2	**2**	2	1	1	-	1	-	1	**2**	-	**2**	-
CO5	Identify the needs of different types of controllers and compensator to ascertain the required dynamic response from the system	**2**	**3**	2	**2**	1	1	1	1	-	1	1	**1**	-	-	-
CO6	Assess controllability and observability of control systems.															

POWER ELECTRONICS

III B.Tech – V Semester (Code: 18EE503)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Electric Engineering, Semiconductor Physics and Nano Materials

Course Objectives: To make the students
CO1: Understand the Power Electronics devices its protection.
CO2: Analyze AC to DC Conversion circuits.
CO3: Analyze the operation of DC-DC choppers and AC Voltage controllers.
CO4: Analyze the operation of inverters PWM techniques.

Course outcomes: At the end of this course, students will be able to
CLO1: Understand the transistor, thyristor devices its protection.
CLO2: Design and analyze AC to DC Conversion circuits.
CLO3: Design and analyze the operation of DC-DC choppers and AC Voltage controllers.
CLO4: Design and analyze the operation of inverters PWM techniques.

UNIT-I

Introduction to Power Electronics devices and protection: Thyristor family devices, principle of operation, Snubber designs, selection and protection, Firing circuits, Commutation, MOSFET, IGBT operation, principles and ratings.

UNIT-II

AC to DC conversion: Uncontrolled, semi-controlled, fully controlled and dual converters in single-phase and three phase configurations operation with R, R-L, back emf load, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters and effect of source inductance.

UNIT-III

Inverters: Basics of dc to ac conversion, inverter circuit configurations and principle of operation, VSI and CSI, single and three-phase configurations, Single, Multiple, Square wave and sinusoidal PWM control methods and harmonic control.

UNIT-IV

DC-DC Converters and AC-AC Converters: Introduction to dc-dc conversion, various topologies, buck, boost, buck-boost converters. Introduction to ac to ac conversion, single-phase and three-phase ac voltage controller circuit configuration with R load Analysis. Cyclo-converters: single-phase, three-phase to single-phase circuit configuration.

TEXT BOOKS:

1. M. H. Rashid, Pearson, "Power electronics: circuits, devices, and applications", education India, 4th edition, 2017.
2. M.D.Singh and Khanchandani, "Power Electronics", TMH, 2nd Edition, 2017.
3. N. Mohan and T. M. Undeland, "Power Electronics: Converters, Applications and Design", John Wiley & Sons, 3rd Edition, 2007.

REFERENCE BOOKS:

1. R.W.Erickson and D.Maksimovic, "Fundamentals of Power Electronics", Springer Science & Business Media, 2009.
2. L. Umanand, "Power Electronics: Essentials and Applications", Wiley India, 2009.
3. P.S. Bhimbra, "Power Electronics", Khanna publications, International Edition, 2012.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Electronics
2. NPTEL :: Electrical Engineering - NOC:Power Electronics

CO, PO and PSO Mapping:

POWER ELECTRONICS (18EE503)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the transistor, thyristor devices its protection.	2	-	3	2	2	2	-	-		2	-	3	-	-	-
CO2	Design and analyze AC to DC Conversion circuits.	3	-	2	3	3	2	2	-	-	-	-	2	-	2	-
CO3	Design and analyze the operation of DC-DC choppers and AC Voltage controllers.	3	-	3	3	3	2	2	-	-	-	-	2	-	-	3
CO4	Design and analyze the operation of inverters PWM techniques.	3	3	3	3	3	2	-	-	-	-	-	3	-	-	-

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MICROPROCESSORS & MICROCONTROLLERS

III B.Tech – V Semester (Code: 18EE504)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Digital Electronics

Course Objectives: To make the students

CO1: Understand the Architecture of 8085 and 8086microprocessor.

CO2: Learn the detail aspects of I/O and Memory Interfacing circuits.

CO3: Study the Architecture of 8051microcontroller.

CO4: Study about 8051 micro controller interfacing with various applications.

Course Outcomes: At the end of this course students will be able to

CLO1: Write programs in 8086 microprocessor using assembly language Programing.

CLO2: Design various applications by interfacing programmable I/O devices.

CLO3: Describe the architecture of 8051 microcontroller and write assembly language programs.

CLO4: Develop various applications using 8051 microcontrollers.

UNIT – I

8086 Microprocessor: Introduction to 8085 Microprocessor and its Architecture, 8086 Microprocessor Family, 8086 Internal Architecture, Pins and Signals, Instruction set and Assembler directives. Introduction to Programming: 8086Assembly Language Programming, Implementing standard Program Structures, Strings, Procedures and Macros.

UNIT – II

Interfacing Devices & Applications: 8255 Programmable Peripheral Interface, keyboard interfacing and 7-segment display interfacing, 8279 Programmable Keyboard Display Interface 8253 Programmable Interval Timer, 8259 Programmable Interrupt Controller, Direct Memory Access (DMA) and 8257DMA Controller, 8251 and serial I/O and Data Communication.

UNIT – III

8051 Microcontroller: Architecture of 8051, Special Function Registers, I/O Ports, Memory Organization, Addressing modes, Instruction set, Assembly Language Programming, Assembly Code for Arithmetic and Logic Operations.

UNIT – IV

Microcontroller Interfacing & Applications: Programming 8051 Timers, Timer programming, Serial Port Program_ming, Interrupts Programming, LCD and Keyboard Interfacing, ADC, DAC and Sensor Interfacing, External Memory Interface, Stepper Motor and Waveform generation.

TEXT BOOKS:

1. Ramesh Goankar, "Microprocessor Architecture, Programming, and Applications with the 8085",Penram International Publishing, 6th Edition, 2013.
2. D. V. Hall, "Microprocessors & Interfacing", McGraw Hill Higher Education, 3rd Edition, 2017.
3. M. A.Mazidi, J. G. Mazidi and R. D. McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", 2nd Edition, Pearson Education, 2011.

REFERENCE BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088Family - Architecture, Programming and Design", 2nd Edition, Prentice Hallof India, 2007.
2. K. J. Ayala, "8051 Microcontroller", Delmar Cengage Learning, 3rd Edition, 2007.
3. K. M. Bhurchandi and A K Ray, "Advanced Microprocessors and Peripherals", McGraw Hill, 3rd edition, 2017.

NPTEL COUIRSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Microprocessors And Microcontrollers
2. NPTEL :: Electronics & Communication Engineering - Microcontrollers and Applications
3. NPTEL :: Computer Science and Engineering - Microprocessors and Microcontrollers

CO, PO and PSO Mapping:

Microprocessors and Microcontrollers — (18EE504)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3	PSO4
CO1	Write programs in 8086 microprocessor using assembly language Programming.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-	-
CO2	Design various applications by interfacing programmable I/O devices.	2	2	3	-	2	-	-	-	2	-	-	2	-	2	-	-
CO3	Describe the architecture of 8051 microcontroller and write assembly language programs.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-	-
CO4	Develop various applications using 8051 microcontrollers.	2	2	3	-	2	-	-	-	2	-	-	2	-	2	-	1

INDIAN TRADITIONAL KNOWLEDGE

B.Tech – V Semester (Code: 18HU002)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre Requisites: NIL

Course Outline: This Course is to facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

Course Objectives:

1. The course aims at imparting basic principles of thought process, reasoning and inferencing. Sustainability is at the core of Indian traditional knowledge systems connecting society and nature.

2. Holistic life style of Yogic-science and wisdom capsules in Sanskrit literature are also important in modern society with rapid technological advancements and societal disruptions.

3. The course focuses on introduction to Indian knowledge system, Indian perspective of modern scientific world-view and basic principles of yoga and holistic healthcare system.

Course Outcomes: After completion of the course, students will be able to:

1. Understand the concept of Indian Traditional knowledge and its importance
2. Compare the Indian traditional knowledge Systems with Other Global systems. .
3. Understand the concept of yoga and its correlations to science.
4. Study various case studies related to traditional knowledge.

UNIT I

Basic Structure of Indian Knowledge System (i) वेद, (ii) उपवेद (आयुर्वेद, धनुर्वेद, गन्धर्वेद, स्थापत्य आदि) (iii) वेदांग (शिक्षा, कल्प, निरुत, व्याकरण, ज्योतिष छंद), (iv) उपाइग (धर्म शास्त्र, मीमांसा, पुराण, तर्कशास्त्र)

UNIT II

Modern Science and Indian Knowledge System 8 Periods

Introduction to traditional knowledge: Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and

social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge Vs indigenous knowledge, traditional knowledge Vs western knowledge , traditional knowledge Vs formal knowledge

UNIT III

Yoga and Holistic Health care 8 Periods

Science of Yoga , Yoga as a tool for healthy Life style , 8 limbs of Yoga (Yama , Niyama , Aasana , Pranayama , Pratyahara , Dharana , Dhyana , Samadhi).

UNIT IV

Case Studies 8 periods

Traditional knowledge in different sectors: Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment.

TEXT BOOKS:

1. V. Sivaramakrishna (Ed.), Cultural Heritage of India-Course material, Bharatiya Vidya Bhavan, Mumbai, 5th Edition, 2014.
2. Swami jitatmanand, Modern Physics and Vedant, Bharatiya Vidya Bhavan
3. Fritzof Capra, Tao of Physics.
4. Fritzof Capra, The wave of life.
5. V N Jha(Eng. Trans.), Tarkasangraha of Annam Bhatta, International Chinmay Foundation, Velliarnad, Amaku, am.
6. Yoga Sutra of Patanjali, Ramakrishna Mission, Kolkatta.
7. G N Jha, (ENG. Trans.), Ed. R N Jha, Yoga-darshanam with Vyasa Bhashya, Vidyanidhi Prakasam, Delhi, 2016.
8. R N Jha, Science of consciousness Psychotherapy and yoga practices, Vidyanidhiprakasham, Delhi, 2016.
9. P R Sharma (English translation), Shodashang Hridayam.

REFERENCE BOOKS :

1. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
2. Traditional Knowledge System in India by Amit Jha Atlantic publishers, 2002.

PROFFSSIONAL ETHICS AND HUMAN VALUES

III B.Tech – V Semester (Code: 18EE506)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives (COs): To make the student

CO1: Understand the importance of ethics and human values in life and society, moral awareness.
CO2: Apply ethics to engineering profession, understood moral development, and importance of ethical theories.
CO3: Understand the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.
CO4: Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.

Course Learning Outcomes (CLOs):

Course outcomes: At the end of this course, students will be able to
CLO1: Understand objectives of ethics and human values that ought to guide the engineering profession.
CLO2: Apply work ethics in the profession and in society and Resolves the moral issues in the profession and moral development.
CLO3: Understand the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.
CLO4: Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas

UNIT – 1

Morals, values and Ethics: Integrity – Work ethic – Service learning – Civic virtue – Respect for others – Living peacefully – Caring – Sharing – Honesty – Courage – Valuing time – Cooperation – Commitment – Empathy – Self-confidence – Character – Spirituality – Introduction to Yoga and meditation for professional excellence and stress management.

UNIT -II

Senses of Engineering Ethics: Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan"s theory – Consensus and Controversy – Models of professional roles – Theories about right action – Self-interest – Customs and Religion – Uses of Ethical Theories.

UNIT – III

Engineering as Social Experimentation: Engineering as Experimentation, Engineers as Responsible Experimenters, Codes of Ethics, Safety, Responsibility and Rights: Safety and Risk– Assessment of Safety and Risk, Risk Benefit Analysis and Reducing Risk. Collegiality and Loyalty, Respect For Authority, Collective Bargaining Confidentiality, Conflicts Of Interest, Occupational Crime, Professional Rights Employee Rights,

UNIT – IV

Global Issues: Multinational Corporations, Environmental Ethics, Computer Ethics, Engineers as Managers, Consulting Engineering, Engineering as Expert Witnesses and Advisors. Intellectual Property Rights (IPR) – Discrimination.

TEXT BOOKS:

1. Mike Martin and Roland Schinzinger, Introduction to Engineering Ethics, Mc Graw Hill, 2nd Edition, 2010.
2. M. Govindarajan, S. Natarajan, V. S. Senthil kumar, “Professional Ethics and Human Values”, PHI Learning Pvt Ltd., 2013.
3. Charles E Harris, Michael S Pritchard and Michael J Robins, “Engineering Ethics”, 6th edition, 2017.

REFERENCE BOOKS:

1. Charles D Fleddermann, “Engineering Ethics”, Pearson Prentice Hall, 2008.
2. John R Boatright, “Ethics and The Conduct of Business”, Pearson, 8th Edition, 2016.
3. Edmund G Seebauer And Robert L Barry, “Fundamentals of Ethics for Scientists and Engineers”, Oxford University Press, 2000

NPTEL VIDEO LINKS:

1.https://nptel.ac.in/courses/109/106/109106117/
2.https://nptel.ac.in/courses/110/105/110105097/

CO, PO and PSO Mapping:

Professional Ethics and Human Values (18EE506)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand objectives of ethics and human values that ought to guide the engineering profession.	-	1		1	-	-	-	-	-	-	-	3	-	-	-
CO2	Apply work ethics in the profession and in society and Resolves the moral issues in the profession and moral development	-	1	2	3	2	1	2	-	-	-	-	3	-	-	2
CO3	Understand the Engineers as responsible experimenters, assessment of safety and risk, employee rights and professional rights.	-	1	-	3	-	-	3	-	-	-	-	2	-	-	3
CO4	Shape themselves into valuable professionals, follow ethics and are able to solve their ethical dilemmas.	-	2	2	3	2	2	3	-	-	-	-	3	-	-	-

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ELECTRICAL MACHINES LAB – II

III B.Tech – V Semester (Code: 18EEL51)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objective: To make the students

CO1: To develop experimental setups for studying the performance and operation of squirrel cage and slip ring induction motors.

CO2: To perform Direct and Indirect tests of various induction motors.

CO3: Acquire hands on experience of conducting various tests on alternators and obtaining their performance indices using standard analytical as well as graphical methods.

CO4: To develop experimental setups for studying the performance and operation of synchronous Motors.

Course Outcomes: After completion of this lab course, the student is able to

CLO1. Analyze the performance characteristics of Induction motors.

CLO2. Asses the performance of the given Induction motors.

CLO3. Know the performance of synchronous generators.

CLO4. Know the performance of synchronous motors.

List of Experiments:

1. Load test on Squirrel-Cage Induction motor.
2. Load test on Slip-Ring Induction motor.
3. No-load and Blocked rotor test on 3-phase induction motor.
4. Separation of losses of 3-phase Induction motor.
5. Brake test on single - phase induction motor.
6. Determination of Equivalent circuit of single - phase induction motor.
7. Real Power flow Control of 3-Phase Induction Generator.
8. Regulation of alternator by EMF &MMF method.
9. Regulation of alternator by ZPF method.
10. Synchronization of alternator with infinite bus with P & Q control.
11. Load test on Alternator.
12. Measurement of X_d and X_q of a three phase alternator.
13. V and inverted V curves of synchronous motor.
14. Synchronous Motor performance with constant excitation.
15. Load test on Universal Motor.

Note: Minimum 10 experiments should be conducted.

CO, PO and PSO Mapping:

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MICROPROCESSORS & MICROCONTROLLERS LABORATORY

III B.Tech-V Semester (Code: 18EEL52)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Understand the working of TASM to write assembly language programs for 8086 microprocessors.

CO2: Understand the operation of 8086 development board.

CO3: Understand the operation of 8051 development board.

CO4: Understand the working of different programmable i/o devices

Course Outcomes: At the end of this course, students will showcase the ability to

CLO1: Write basic programs in assembly language for 8086 microprocessors using TASM

CLO2: Write complex programs in assembly language for 8086 microprocessors using TASM.

CLO3: Interface programmable i/o devices using 8086 development board to develop various applications.

CLO4: Interface programmable i/o devices using 8051 development board to develop various applications.

Program execution with Assembler

1. Programs on 16-bit arithmetic and logical operations for 8086 microprocessors. (using various addressing modes)
2. Programs on conditional and unconditional branching instructions for 8086 microprocessors
3. Programs to implement procedures for 8086 microprocessors.
4. Programs to sort given data using 8086 microprocessors.
5. Programs to implement string manipulations using 8086 microprocessors.
6. Programs to implement interrupt handling using 8086 microprocessors.

Program execution with 8086 Development boards

7. Study of Programmable peripheral interface 8255.
8. Study of Programmable interval timer 8254.
9. Study of Programmable Keyboard Display Interface 8279
10. Elevator Simulator interfacing with 8086 microprocessors.
11. Traffic light controller interfacing with 8086 microprocessors.
12. Stepper motor control using 8086 microprocessors.

Program execution with 8051 Development boards

13. Programming arithmetic, logical and bit manipulation instructions using 8051 microcontrollers.
14. Program and verify timer/counter in 8051 microcontrollers.
15. Program and verify interrupt handling in 8051 microcontrollers.
16. UART operation in 8051 microcontrollers.
17. Interfacing DAC and ADC to 805l microcontroller.
18. Interfacing stepper motor using 8051 microcontrollers.

Note: Minimum 10 experiments should be conducted

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CO, PO and PSO Mapping:

Microprocessors and Microcontrollers Laboratory (18EEL52)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Write basic programs in assembly language for 8086 microprocessors using TASM	2	1	3	-	3	-	-	-	2	-	-	-	2	-	-
CO2	Writecomplex programs in assembly language for 8086 microprocessors using TASM	2	2	3	-	3	-	-	-	2	-	-	-	2	-	-
CO3	Interface programmable i/o devices using 8086 development board to develop various applications	2	2	3	-	3	-	-	-	2	-	-	-	2	2	-
CO4	Interface programmable i/o devices using 8051 development board to develop various applications	2	2	3	-	3	-	-	-	2	-	-	-	2	2	-

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AI TECHNIQUES IN ELECTRICAL ENGINEERING

III B.Tech-VI Semester

(18EE604)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives (COs): To make the students

CO1 Understand the concepts of artificial neural networks
CO2 Understand the concepts of Fuzzy Logic.
CO3 Understand the concepts of genetic algorithms
CO4 Analyze the applications of AI techniques to Electrical Engineering

Course Outcomes (CLOs): After completion of this course, students will be able to

CLO1 Realize the concepts of ANN Algorithms.
CLO2 Realize the concepts of Fuzzy Logic.
CLO3 Realize the concepts of Genetic Algorithm.
CLO4 Apply soft computing (AI) techniques to real-world problems.

UNIT – I

Artificial Neural Networks: Introduction, Models of Neuron Network-Architectures – Knowledge representation, Artificial Intelligence and Neural networks–Learning process-Error correction learning, Hebbian learning–Competitive learning-Boltzman learning, supervised learning-Unsupervised learning–Reinforcement learning-Learning tasks.

ANN Paradigms: Multi-layer perceptron using Back propagation Algorithm (BPA), Self – Organizing Map (SOM), Radial Basis Function Network-Functional Link Network (FLN), Hopfield Network

UNIT – II

. **Fuzzy Logic:** Introduction –Fuzzy versus crisp, Fuzzy sets-Membership function –Basic Fuzzy set operations, Properties of Fuzzy sets –Fuzzy cartesion Product, Operations on Fuzzy relations –Fuzzy logic –Fuzzy Quantifiers, Fuzzy Inference-Fuzzy Rule based system, Defuzzification methods.

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UNIT – III

Meta Heuristic techniques: Introduction Description of meta heuristics, Principle of population-based meta heuristics Principle of population-based meta heuristics, Genetic algorithm, Differential evolution, Evolutionary programming, Backtracking search optimization algorithm, Particle swarm optimization, Ant colony optimization, Artificial bee colony, Firefly algorithm, Teaching–learning-based optimization

UNIT – IV

Applications of AI Techniques: ANN applications to Load forecasting and frequency control in Single area system, Fuzzy logic application to PSS and Speed control of DC and AC Motors, Meta Heuristic applications to Economic load dispatch.

TEXT BOOKS:

1. S.Rajasekaran and G.A.V.Pai, "Neural Networks, Fuzzy Logic & Genetic Algorithms", PHI, New Delhi, 2003.
2. Chaturvedi**,** Devendra K, "Soft Computing Techniques and its Applications in Electrical Engineering", Springer, 2008. J
3. ordan Radosavljevic, "Metaheuristic Optimization in Power Engineering", IET, 2018.

REFERENCE BOOKS:

1. Hassoun, "Fundamentals of Artificial Neural Networks", MIT Press, 2010.
2. Kosko, "Neural Networks and Fuzzy Systems", Pearson Education, 2007.
3. Samir Roy, Udit Chakraborty, "Introduction to Soft Computing: Neuro-Fuzzy and Genetic Algorithms", Pearson Education India, 1st edition, 2013.

NPTEL COURSE LINKS:

1. NPTEL :: Computer Science and Engineering - NOC:Introduction to Soft Computing
2. NPTEL :: Electronics & Communication Engineering - Neural Networks and Applications
3. NPTEL :: Electrical Engineering - NOC:Fuzzy Sets, Logic and Systems & Applications
4. NPTEL :: Mechanical Engineering - NOC:Traditional and Non-Traditional Optimization Tools

CO, PO and PSO Mapping:

AI Techniques in Electrical Engineering (18EE601)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Realize the concepts of ANN Algorithms.	2	2	3	-	2	-	-	-	2	-	-	2	-	-	-
CO2	Realize the concepts of Fuzzy Logic.	2	2	3	-	2	-	-	-	2	-	-	2	-	1	-
CO3	Realize the concepts of Genetic Algorithm.	2	-	3	-	2	-	-	-	2	-	-	2	2	-	-
CO4	Apply soft computing (AI) techniques to real-world problems.	1	-	-	1	-	2	1	-	-	1	-	-	1	-	-

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POWER SYSTEM PROTECTION

III B.Tech-VI Semester (Code: 18EE602)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power systems, Basics of circuit theory.

Course Objectives: To make the students

CO1: Develop adequate knowledge of requirement of protective relaying and about all types of protective relays.

CO2: Provide the knowledge of static relays and numerical relays.

CO3: Understand Protection of alternators, transformers and transmission lines.

CO4: Capable of understanding about microprocessor relays and computer based relays. CO5: Develop basic knowledge of switch gear and principles of operations of various types of circuit breakers.

CO6: Analyze ratings and specifications of circuit breakers.

Course Outcomes: After completion of this course, students will be able to

CLO1: Explain requirement of protective relaying and classification of relays.

CLO2: Understand basic components of static relays, types of comparators, types of over current relays and types of numerical relays.

CLO3: Describe differential protection for generators, transformers and transmission lines and feeders.

CLO4: Explain microprocessor and computer-based relays.

CLO5: Identify and differentiate various types of circuit breakers. CLO6: Analyze ratings and specifications of circuit breakers.

UNIT – I

Protective Relays: Introduction, basic requirement of protective relaying, zones of protection, primary and backup protection, classification of relays, attracted armature, balanced beam, induction disc, thermal relays, Buchholz's relay, Over current, under voltage, directional and non-directional relays. Distance relays, impedance, reactance, mho and off set mho relays. Differential relays, circulating current and opposite voltage differential scheme. Negative sequence relays.

UNIT – II

Static Relays: Introduction, basic component of static relays. Comparators, amplitude and phase comparators. Over current relays, instantaneous over current relay, inverse time over

current relays, differential relays. Introduction to numerical relays, Introduction to Microprocessor and PC based Relaying.

UNIT – III

Protection of alternators, transformers and transmission lines: Differential protection for generators, transformers and transmission lines, field suppression of alternator, over current and distance protection for feeders, carrier protection.

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UNIT – IV

Switchgear: Elementary principles of arc phenomenon, arc quenching, interruption of capacitive currents and low current chopping, resistance switching, recovery and restriking voltages. Principles of operations of various types of circuit breakers, air break, oil filled, air blast, vacuum and SF6 circuit breakers. Rating and specifications of circuit breaker.

TEXT BOOKS:

1. Badri Ram, D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc-Graw Hill, 2nd Edition, 2017.
2. Y.G. Paithankar & S.R.Bhide, "Fundamentals of Power System Protection", PHI, 2nd Edition, 2013.
3. Bhuvanesh Oza, Nirmal-Kumar Nair, Rashesh Mehta and Vijay Makwana, "Power system protection & switchgear" Mc-Graw Hill, 1st Edition, 2017.

REFERENCE BOOKS:

1. T.S. Madhava Rao, "Power system protection Static relays", Tata Mc-Graw Hill, 2nd Edition, 2017
2. Sunil S Rao, "Switchgear Protection and Power Systems (Theory, Practice & Solved Problems)", Khanna Publishers, 14th Edition, 2019.
3. Ravindranath B and M Chander, "Power system protection and switchgear" ,New Age International,2nd Edition, 2018.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power System Protection
2. NPTEL :: Electrical Engineering - NOC:Power System Protection

CO, PO and PSO Mapping:

Power System Protection (18EE602)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain requirement of protective relaying and classification of relays.	3	2	-	2	-	-	-	-	-	-	-	2	-	2	-
CO2	Understand basic components of static relays, types of comparators, types of over current relays and types of numerical relays.	3	3	-	2	-	-	-	-	2	-	-	3	-	-	-
CO3	Describe differential protection for generators, transformers and transmission lines and feeders.	3		3	3	2	2	3	-	-	-	-	2	-	-	-
CO4	Explain microprocessor and computer-based relays.	3	3	-	3	-	3	-	-	-	2	-	2	-	3	-
CO5	Identify and differentiate various types of circuit breakers.	2	3	3	2	2	3	-	-	-	-	2	-	-	-	3
CO6	Analyze ratings and specifications of circuit breakers.	3	2	2	3	3	3	2	-	-	-	-	-	-	3	-

ELECTRICAL DRIVES

III B.Tech-VI Semester (Code: 18EE603)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electrical machines –I(18EE304), Electrical machines-II(18EE403) & Power Electronics
(18EE503).

Course Objectives:

To make the

students

CO1: Describe the structure of Electric Drive systems and their role in various applications such as flexible production systems, energy conservation, renewable energy, transportation etc., making Electric drives an enabling technology
CO2: Describe the operation of dc motor drives to satisfy four-quadrant operation to meet Mechanical load requirements.
CO3: Describe the operation of induction machines in an energy efficient manner using Power electronics.
CO4: Learn the basic operation of stepper motors and switched-reluctance motor drives.

Course Outcomes:
After completion of this course, the student will be able to

CLO1: Understand different types of drives and applications in various industries & To know the characteristics of various motors and loads.
CLO2: Gain the knowledge about operation of d.c motor speed control using converters and choppers
CLO3: Acquire the knowledge of different speed control methods in induction motors using thyristors based control schemes.
CLO4: Learn the basic operation of stepper motors and switched-reluctance motor drives.

UNIT – I

Introduction: Electric drives - advantages of electric drive - Type of electric drives - components of electric drives - Status of dc and ac drives. **Dynamics of Electric Drives:** Speed torque conventions and multi quadrant operation - Equivalent values of drive parameters. **Control of Electric Drives:** Modes of operation - Speed control and drive classification -

closed-loop control of drives.

UNIT – II

DC motor Drives: DC motors and their performance – Starting - methods of braking - speed control -Methods of armature voltage control - Transformer and uncontrolled rectifier control.
Controlled Rectifier fed DC Drives: Single phase fully and half controlled rectifier control of separately excited dc motor - Three phase fully and half controlled rectifier control of separately excited dc motor - Dual converter control of separately excited dc motor - comparison of conventional.
Chopper fed DC Drives: Control of separately excited dc motors - Chopper control of series motor.

UNIT – III

Induction motor drives: Three phase induction motors - Operation with unbalanced source voltages and single phasing - Operation with unbalanced rotor impedances – Starting – braking - transient analysis - Speed control - pole amplitude modulation - stator voltage control - Variable frequency control from voltage and current sources - Eddy current drives - rotor resistance control - slip power recovery - Variable speed constant frequency generation.

UNIT – IV

Synchronous motor drives: Synchronous motors - Operation and fixed frequency supply - Synchronous variable speed drives - braking of synchronous motor. Switched reluctance motor drives - brush less dc motors - stepper motors – variable reluctance motor. Vector controls- Space vector modulation.

TEXT BOOKS:

1. G.K. Dubey, “Fundamentals of Electric drives’’, Narosa, ,2nd Edition,2010.

REFERENCE BOOKS:

1. G.K. Dubey, “Power Semiconductor controlled drives”, PH,.2nd Edition 2010.
2. S.B. Dewan, G.R. Selmon & Straughen, “Power semiconductor drives” John Wiley, 2009.
3. GK Dubey SR Doradla, ‘Thyristorised power controllers’ New Age,2nd edition,2012.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - NOC:Fundamentals of Electric Drives
2. NPTEL :: Electrical Engineering - Industrial Drives - Power Electronics

CO, PO and PSO Mapping:

ELECTRIC DRIVES (Code: 18EE603)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand different types of drives and applications in various industries & To know the characteristics of various motors and loads.	-	2	3	2	-		2	-	-	-	2	-	2	2	-
CO2	Gain the knowledge about operation of d.c motor speed control using converters and choppers	-	2	-	2	-	2	-	-	-	-	-	2	2	1	-
CO3	Acquire the knowledge of different speed control methods in induction motors using thyristors based control schemes.	-	2	3	2	-	2	-	-	-	-	2	2	2	1	-
CO4	Learn the basic operation of stepper motors and switched-reluctance motor drives.	-	-	2		2	-	3	-	-	-	-	-	-	1	1

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APPLICATION OF IOT IN ELECTRICAL ENGINEERING

III B.Tech-VI Semester (Code: 18EE604)

Lectures	3	Tutorial	0	Practical	3	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objective: The objective of this course is to impart necessary and practical knowledge of components of Internet of Things and develop skills required to build real-life IOT based projects.

CO1.Understand the concepts of Internet of Things

CO2.Analyze basic protocols in wireless sensor network

CO3.Design IOT applications in different domain and be able to analyze their performance

CO4. Implement basic IOT applications.

Learning Outcomes

After the completion of this course, the students will be able to:

CLO1.Understand internet of Things and its hardware and software components

CLO2.Acquire Knowledge on Interface I/O devices, sensors & communication modules

CLO3.Able to design remotely monitor data and control devices

CLO4.Able to develop real life IOT based projects.

UNIT – I

Introduction to IOT: Architectural Overview, Design principles and needed capabilities, IOT Applications, Sensing, Actuation, Basics of Networking, M2M and IOT Technology Fundamentals- Devices and gateways, Data management, Business processes in IOT, Everything as a Service(XaaS), Role of Cloud in IOT, Security aspects in IOT.

UNIT – II

Elements of IoT: Hardware Components- Computing (Arduino, Raspberry Pi), Communication, Sensing, Actuation, I/O interfaces. Software Components- Programming API's (using Python/Node.js/Arduino) for Communication Protocols-MQTT, ZigBee, Bluetooth, CoAP, UDP, TCP.

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UNIT–III

IoT Application Development: Solution framework for IoT applications- Implementation of Device integration, Data acquisition and integration, Device data storage- Unstructured data storage on cloud/local server, Authentication, authorization of devices.

UNIT – IV

IoT Case Studies: IOT case studies and mini projects based on Industrial automation, Transportation, Agriculture, Healthcare, Home Automation

TEXT BOOK:

1. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, " Internet of Things: Technologies and Applications for a New Age of Intelligence ", 2nd Edition, Academic Press, 2018.
2. Pethuru Raj and Anupama C. Raman, " The Internet of Things: Enabling Technologies, Platforms, and Use Cases ", Auerbach Publications, 1st edition , 2017.
3. Raj Kamal, " Internet of Things: Architecture and Design ", McGraw Hill Education; 1st edition, 2017.

REFERENCE BOOKS:

1. Jeeva Jose, " Internet of Things " , Khanna Publishing, 1st edition ,2018.
2. Vijay Madisetti and Arshdeep Bahga , " Internet of Things (A Hands-on-Approach) ", Orient Blackswan Private Limited , 1st edition , 2015.
3. Olivier Hersent, David Boswarthick, Omar Elloumi, " The Internet of Things: key applications and Protocols " , Wiley, 1st edition , 2015.
4. Michael Miller , " The Internet of Things: How Smart TVs, Smart Cars, Smart Homes, and Smart Cities are Changing the World " , Que Publishing, 1st edition , 2015.

List of Experiments

Basic Level (any 7)

1. Familiarization with Arduino/Raspberry Pi and perform necessary software installation.
2. To interface LED/Buzzer with Arduino/Raspberry Pi and write a program to turn ON LEDfor 1 sec after every 2 seconds.
3. To interface Push button/Digital sensor (IR/LDR) with Arduino/Raspberry Pi and write a program to turn ON LED when push button is pressed or at sensor detection.
4. To interface DHT11 sensor with Arduino/Raspberry Pi and write a program to print temperature and humidity readings.
5. To interface motor using relay with Arduino/Raspberry Pi and write a program to turn ON motor when push button is pressed.
6. To interface OLED with Arduino/Raspberry Pi and write a program to print temperature and humidity readings on it.

7. To interface Bluetooth with Arduino/Raspberry Pi and write a program to send sensor data to smartphone using Bluetooth.

8. To interface Bluetooth with Arduino/Raspberry Pi and write a program to turn LED ON/OFF when '1'/'0' is received from smartphone using Bluetooth.
9. Write a program on Arduino/Raspberry Pi to upload/retrieve temperature and humidity data to thingspeak cloud.
10. To install MySQL database on Raspberry Pi and perform basic SQL queries.
11. Write a program on Arduino/Raspberry Pi to publish temperature data to MQTT broker.
12. Write a program on Arduino/Raspberry Pi to subscribe to MQTT broker for temperature data and print it.
13. Write a program to create TCP server on Arduino/Raspberry Pi and respond with humidity data to TCP client when requested.
14. Write a program to create UDP server on Arduino/Raspberry Pi and respond with humidity data to UDP client when requested.

Advanced Level (any 3)

1. Design of smart socket and operating through phone application using Arduino
2. Design of smart water tank and reading continuous water level using Arduino
3. Making of DIY weather station and handling temperature and humidity values on cloud platform
4. Building of smart parking meter and design of its mobile application
5. DIY heart beat monitoring system by interfacing pulse sensor to Arduino
6. Design of soil moisture monitoring system using Arduino

Note: Minimum 10 experiments should be conducted

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CO, PO and PSO Mapping:

IOT Applications in Electrical Engineering-18EE604		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand internet of Things and its hardware and software components	-	-	-	-	3	-	-	-	-	-	-	2	2	1	-
CO2	Acquire Knowledge on Interface I/O devices, sensors & communication modules	2	1		-	3	-	-	-	-	2	-	2	-	2	1
CO3	Design remotely monitor data and control devices	2	-	1	2	2	-		-	-	3	-	1	-	2	-
CO4	Develop real life IOT based projects	3		2	2	3	-	1	-	-	2	3	3	-	2	-

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POWER SYSTEM OPERATION CONTROL AND STABLITY

III B.Tech-VI Semester (Code: 18EE605)

Lectures	4	Tutorial	1	Practical	0	Credits	4
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Power system-1, Power System-2

Course Objectives: To make the students

CO1: Understand economic load dispatch under various operational constraints and techniques to solve the problem.

CO2: Modeling of turbines and generators and know the importance of quality of power, P-f, Q-V control loops, AGC

CO3: To deal with the numerical methods studied in applied mathematics courses to get the Solutions of load flow problem and comparison of different methods.

CO4: Discuss the concept of reactive power and voltage control in detail.

CO5: Understand Power system stability and voltage stability in operation of power system.

Course Outcomes: Students will be able

CLO1: Explain the importance of economic operation of power systems

CLO2: Develop the mathematical models of turbines and governors and know the importance of single area and AGC

CLO3: Develop proper mathematical models for analysis of load flow study

CLO4: Explain the importance and control of reactive power and voltage

CLO5: Explain the stability issues concerned with power system operation

UNIT – I

Economic operation of power systems: Economic dispatch in thermal power station: Heat rate curves, cost curves, incremental fuel and Production costs, economic distribution of load between units without consideration to line losses; Transmission line losses as a function of plant generation, calculation of loss coefficients, Optimum generation allocation between thermal plants; Capability diagram of a synchronous generator.

UNIT – II

Quality of power: Importance of keeping voltage and frequency constant in a power system **The two main control loops- (P-δ) and (Q – V) loops:** Load frequency control (LFC) single area case, the P- **δ** loop: Schematic of load frequency and AVR of a synchronous generator, mathematical modelling of generator, loads, prime mover and speed governor for LFC & corresponding block diagram representation, LFC block diagram of an isolated power system, steady state analysis, dynamic response. The automatic generation control (AGC) scheme – AGC in a single area system, block diagram representation of AGC for an isolated power system

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UNIT – III

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution Algorithms, solution techniques using Gauss Seidal, Newton Raphson Load Flow Methods.

Reactive power control: The role of excitation system- exciter, generator and sensor models, simplified AVR block diagram,

Voltage control of distribution systems: Tap changing, booster transformers, synchronous phase modifiers, induction regulators and static capacitors.

Transmission line compensation: Series compensation, shunt compensation, static VAR Compensators – thyristor controlled reactors (TCR), thyristor switched capacitors (TSC), and STATCOM,.

UNIT – IV

Power system stability: Introduction – steady state stability, Transient stability, Review of machine swing equation - Equal area criterion of stability – applications. Step by step solution of the swing curve – factors affecting steady state and transient stabilities.

Voltage stability: Introduction, comparison of angle & voltage stability, reactive power flow and voltage collapse, Mathematical formulation of voltage stability problem.

TEXT BOOKS:

1. Power system analysis by H.Saadat , McGraw Hill -2nd Edition 2004
2. Modern power system analysis by D.P.Kothari & I.J.Nagrath McGraw Hill-4th Edition, 2011.
3. Power System Analysis operation and control by Abhijit Chakrabarti & Sunita Halder, PHI Learning Pvt. Ltd, 3rd Edition 2010

REFERENCE BOOKS:

1. Economic Operation of Power System - L. K. Kirchmeyer, Wiley India Pvt Ltd 2009.
2. Power System Analysis by T.K.Nagsarkar M.S.Sukhija, OXFORD university press, 2nd edition 2014.
3. Generation Distribution and utilization of Electrical Energy by CL Wadhwa, New Age Int. Pub, Revised 2/E 3rd Edition 2015.
4. Electrical Energy Systems by John Weedy, Willey Eastern, 5th Edition 2012.
5. Power System Stability and Control by Prabha Kundur, McGraw Hill Education; 1st edition 2006.

NPTEL COURSE LINKS:

1. NPTEL :: Electrical Engineering - Power Systems Operation and Control
2. NPTEL :: Electrical Engineering - Power Systems Operation and Control
3. NPTEL :: Electrical Engineering - Power Systems Analysis

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Power System Operation Control and Stablity (18EE605)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Know the importance of economic operation of power systems	3	2	2	-	-	-	-	-	3	-	-	2	3	2	2
CO2	Develop the mathematical models of turbines and governors and know the importance of single area and AGC	3	3	2	2	-	-	-	-	-	-	-	-	-	3	-
CO3	Know the importance of voltage control of distribution systems	3	-	3	-	-	-	-	-	-	-	2	-	-	2	-
CO4	Control the voltage and reactive power in practical case also.	3	2	3	-	-	-	-	-	-	-	-	-	3	-	-
CO5	Explain the stability issues concerned with power system operation	3	-	3	3	-	-	-	-	-	-	-	-	-	3	-

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OPTIMIZATION TECHNIQUES

III B.Tech-VI Semester (18EED11)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives (COs): To make the students

CO1 Understand the Concepts to solve linear programming problems arise in real life situations involving several parameters using various methods and their advantages

CO2 Discuss the applications of linear programming namely transportation, assignment and travelling salesman problem which arise in different situations in all engineering branches

CO3 Explain the non-linearity in optimization problems, direct search techniques and iterative methods

CO4 Discuss the applications of optimization techniques in the problem Dynamic programming in optimization and solve certain integer linear programming problems

Course Learning Outcomes (CLOs): After completion of this course, students will be able to

CLO1 Develop the mathematical model of an optimization problem and identify particular case of activities among the several alternatives and solve a given linear programming problem using suitable method

CLO2 Obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem and infer their practical relevance

CLO3 Analyze the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques

CLO4 Describe the characteristics of Dynamic programming in optimization and solve certain integer linear programming problems

UNIT-I

Linear Programming Problems (LPP): Mathematical models and basic concepts of linear programming problem; Solution of linear programming problems - Graphical method, Analytical method, Simplex method, Artificial variable technique (Big-M and Two-phase methods), Duality principle and dual simplex method.

UNIT-II

Special type of LPPs: Mathematical model of transportation problem, Methods of finding initial basic feasible solution to find the optimal solution of transportation problem, Exceptional cases in transportation problem, Degenerate solution of transportation problem, Assignment problem as a special case of transportation problem, Hungarian algorithm to solve an assignment problem, Special cases in assignment problem. The travelling salesman problem, Formulation of travelling salesman problem as an assignment problem.

UNIT-III

Non-linear Programming Problems (NLPP): Classical method of optimization using Hessian matrix, Iterative methods - Random search methods, Steepest decent method and Conjugate gradient method; Direct methods - Lagrange‘s method, Kuhn-Tucker conditions, Penalty function approach.

UNIT – IV

Dynamic Programming:

Principle of optimality – recursive relations – solution of LPP – simple examples.
Integer Linear Programming: Gomory’s cutting plane method – Branch and bound algorithm – Knapsack problem – linear 0–1 problem.

TEXT BOOKS:

1. Kantiswarp,P.K.Gupta, Man Mohan, ―Operations Research‖, S. Chand & Sons, New Delhi. 16/e., 2013. (Unit I,II)
2. S.S. Rao, ―Optimization Techniques‖, New Age International, New Delhi, 3/e., 2013.
3. K.V.Mittal : Optimization Methods, Wiley Eastern Ltd. 2005

REFERENCE BOOKS:

1. Hamdy. A. Taha, Operations Research, Prentice Hall of India Ltd, New Delhi, 7/e., 2002.
2. J.C. Pant, ―Introduction to Optimization‖, Jain Brothers, New Delhi, 7/e., 2012.

CO, PO and PSO Mapping:

Optimization Techniques (18EED11)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Develop the mathematical model of an optimization problem and identify particular case of activities among the several alternatives and solve a given linear programming problem using suitable method.	3	3	1	1	2	-	-	-	-	-	-	-	-	-	-
CO2	Obtain solution for a special type linear programming problem namely transportation, assignment & travelling salesman problem and infer their practical relevance	3	3	1	1	2	-	-	-	-	-	-	-	-	1	-
CO3	Analyze the characteristics of non-linearity in optimization and solve certain NLPP using searching and iterative techniques	3	3	1	1	2	-	-	-	-	-	-	-	-	-	-
CO4	Describe the characteristics of Dynamic programming in optimization and solve certain integer linear programming problems	3	3	1	1	2	-	-	-	-	1	-	-	-	-	-

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ELECTRICAL ENERGY CONSERVATION & AUDITING

III-B.Tech VI-Semester (Code: 18EED12)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course objectives: To make the students

CO1: Understand the concept of energy conservation, energy management.

CO2: Know the energy efficient motors and its characteristics.

CO3: Understand the power factor improvement, lighting and different measuring instruments.

CO4: Know the economic aspects of energy management.

Course outcomes: At the end of this course, students will be able to

CLO1: Examine the principles of Energy audit and its process in thermal power station &analyze the different aspects of energy management.

CLO2: Describe the characteristics of energy efficient motors.

CLO3: Illustrate the power factor improvement, good lighting system practice and the types of energy instruments

CLO4: Analyze the economic aspects of Energy Management.

UNIT-I

Basic Principles of Energy Audit: Energy audit - definitions, concept , types of audit, energy index, cost index , pie charts, Sankey diagrams, load profiles, Energy conservation schemes - Energy saving potential, energy audit of thermal power station, building energy audit.

Energy Management: Principles of energy management, organizing energy management program, initiating, planning, controlling, promoting, monitoring, reporting, Energy manger, Qualities and functions, language, Questionnaire - check list for top management.

UNIT-II

Energy Efficient Motors: Energy efficient motors, factors affecting efficiency, loss distribution, constructional details. Characteristics - Variable speed, variable duty cycle systems, Voltage variation -Voltage unbalance - Over motoring - Motor energy audit.

UNIT-III

Power Factor Improvement, Lighting & Energy Instruments: Power Factor Improvement, Lighting: Power factor – Methods of improvement, location of capacitors, Pf with nonlinear loads, effect of harmonics on power factor. Power factor motor controllers - Good lighting system design and practice, lighting control, lighting energy audit. Energy Instruments: Watt meter, data loggers, thermocouples, pyrometers, lux meters, tong testers, application of PLC's.

UNIT-IV

Economic Aspects and Analysis: Economics Analysis - Depreciation Methods, time value of money, rate of return, present worth method , replacement analysis, life cycle costing analysis - Energy efficient motors, Calculation of simple payback method, net present worth method - Power factor correction, lighting - Applications of life cycle costing analysis, return on investment.

TEXT BOOKS:

1. W.R. Murphy and G. Mckay, "Energy Management", Butter worth Publications.
2. John. C. Andreas, "Energy Efficient Electric Motors", Marcel Dekker Inc Ltd, 2nd Edition, 1995.

REFERENCES:

1. Paul O' Callaghan, "Energy Management", Mc-Graw Hill Book Company, 1st Edition, 1998.
2. W.C.Turner, "Energy Management Hand Book", A John Wiley and Sons.
3. S. C. Tripathy, "Utilization of Electrical Energy", Tata McGraw Hill, 1993.
4. Guide books for National Certification Examination for Energy Manager / EnergyAuditors Book-1, General Aspects (available online).
5. L.C. Witte, P.S. Schmidt and D.R.Brown, "Industrial Energy Management and Utilization", Hemisphere Publication, Washington, 1998

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CO PO and PSO mapping:

ELECTRICAL ENERGY CONSERVATION AND AUDITING (18EED12)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the concept of energy conservation, energy management.	3	-	-	-	-	-	-	3	2	-	1	3	-	-	1
CO2	Kno w the energy efficient motors and its characteristics.	3	-	-	-	-	2	-	-	-	-	3	-	-	1	2
CO3	To understand the power factor improvement, lighting and different measuring instruments.	3	-	4	-	-	2	3	-	-	-	-	4		2	1
CO4	Kno w the economic aspects of energy management.	3	-	-	-	-	-	-	2	3	-	1	3		-	1

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POWER DISTRIBUTION SYSTEMS

III B.Tech-V1 Semester (Code: 18EED13)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Analyze distribution system planning models and study different load characteristics

CO2: Classify different types of distribution transformers and sub-transmission systems

CO3: Analyze primary and secondary distribution systems

CO4: Calculate voltage drop and power loss for non three phase primary lines

Course outcomes: At the end of this course, students will be able to

CLO1: Able to understand various factors affecting distribution system and also about distribution system planning.

CLO2: To make clear about the Distribution Transformers, voltage regulation and Efficiency calculations. To make clear about the design considerations of sub-transmission lines.

CLO3: Able to design the substation and feeders. Able to understand the design considerations of primary and secondary distribution systems. Apply various protective devices and its coordination techniques to distribution system.

CLO4: Evaluate voltage drop & line loss calculations and design of capacitors &voltage regulating equipment and to understand the effect of compensation on power factor improvement.

UNIT – I

Distribution systems planning and automation: Planning and forecast techniques - Present and future role of computers in distribution system planning –automation - Methods of improvement - Load characteristics – Definitions load growth – tariffs - Diversified demand method.

UNIT – II

Distribution transformers: Types - Regulation and Efficiency- distribution factors – KW KVA Method of determining regulation. Design of sub transmission lines and distribution substations: Introduction – sub transmission systems - distribution substation – Substation bus schemes - description and comparison of switching schemes – substation location and rating - Application of network flow techniques in rural distribution networks to determine optimum location of sub-station.

UNIT – III

Design considerations on primary systems: Introduction , types of feeders,- voltage levels Radial type feeders , feeders with uniformly distributed load and non-uniformly distributed loads. Design considerations of secondary systems: Introduction , secondary voltage levels,- Secondary banking , existing systems improvement. Distribution system Protection: Basic definitions, over current protection devices, fuses, automatic circuit reclosures, automatic line sectionalizers, objectives of distribution system protection ,coordination of protective devices, Fuse to Fuse co-ordination, Fuse to circuit breaker coordination, Reclosure to circuit breaker co-ordination.

UNIT-IV

Voltage drop and power loss calculations: Three phase primary lines, non 3 phase primary lines, 4 wire multi grounded primary lines , copper loss , Distribution feeder costs , loss reduction and voltage improvement in rural distribution networks. Applications of Capacitors to distribution systems: Effect of series and shunt capacitors, Power factor correction , economic justification for capacitors , a computerized method to determine the economic power factor , Procedure to determine the best and optimum capacitor location Distribution System Voltage Regulation: Basic definitions , Quality of service , voltage control , line drop compensation.

TEXT BOOKS:

1. Elements of Power Systems by Pradip Kumar Sadhu, Soumya Das, CRC Press, 1st edition, 2015.
2. Power system analysis by John J. Grainer W D Stevenson Jr Fourth Edition MH International student edition, 2017
3. Power System Engineering by D P Kothari, I J Nagrath, ,McGraw-Hill Education, 3rd edition, 2019

REFERENCE BOOKS:

1. Power System Analysis by S. Ramar, S. Kuruseelan, PHI Learning Pvt. Ltd., 2013
2. Electrical Power Generation, Transmission and Distribution by S.N.Singh., 2nd Edition ,PHI,2008
3. Electrical power systems by C.L. Wadhwa, New age International (P)Limited 7th edition,2016.

CO PO and PSO mapping:

Power Distribution Systems (18EED13)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Able to understand various factors affecting distribution system and also about distribution system planning.	3	2	-	2	-	-	-	-	-	-	-	-	3	2	-
CO2	To make clear about the Distribution Transformers, voltage regulation and Efficiency calculations. To make clear about the design considerations of sub-transmission lines.	3	2	-	2	1	2	-	-	-	-	-	-	3	3	-
CO3	Able to design the substation and feeders. Able to understand the design considerations of primary and secondary distribution systems. Apply various protective devices and its coordination techniques to distribution system.	3	3	-	-	2	2	-	-	-	-	-	-	3	2	-
CO4	Evaluate voltage drop & line loss calculations and design of capacitors &voltage regulating equipment and to understand the effect of compensation on power factor improvement.	3	2	-	2	-	-	-	-	-	-	-	-	3		

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DIGITAL SIGNAL PROCESSING

III B.Tech-V1 Semester (Code: 18EED14)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objective:
The primary objective of this course is to provide a thorough understanding and working knowledge of design, implementation and analysis DSP systems.

Course Outcomes
On successful completion of the course, the student will:
CO1.To acquire knowledge in LTI signals and systems and the concept of Z-transform.
CO2.To implement DFT and IDFT using different algorithms.
CO3.Able to design Digital IIR filters from Analog filters using various techniques .
CO4.Able to design Digital FIR filters using window techniques

Learning Outcomes
After the completion of this course, the students will be able to:
CLO1. Explain the LTI signals and systems and concept of Z-transform.
CLO2. Implement DFT and IDFT using DIT-FFT and DIF-FFT algorithms.
CLO3. Design the Butter worth and Chebyshev digital IIR filters and their realization.
CLO4. Implement the appropriate type of design method for FIR filters and their realization.

UNIT – I

Discrete Signals and Systems: Introduction to digital signal processing, advantages and applications, discrete time signals, LTI system, stability and causality. Frequency domain representation of discrete time signals and systems.
Z-Transforms: Introduction to Z-transform, Z-transform theorems and properties, Inverse Z transform, causality and stability, solution of difference equations.
MATLAB programming to generate discrete time sequence , plot the frequency response of system and to find partial fraction of H(Z).

UNIT – II

Discrete Fourier Transform (DFT): Introduction, Properties of DFT, Linear convolution using DFT, computations for evaluating DFT and IDFT.
Fast Fourier Transform (FFT): Introduction, advantages of FFT, Decimation in time FFT algorithms - Decimation in frequency FFT algorithm, IDFT using FFT algorithm.
MATLAB programming to compute the DFT of sequence x(n) and comparison of circular and linear convolution of two sequences.

UNIT – III

IIR Filter Design Techniques: Introduction, Properties of IIR filters, Design of analog proto type of digital filters, Digital Butterworth and Chebyshev filters using bilinear transformation, Impulse invariance transformation methods.

Realization of IIR Filters: Direct form, Canonic form, Cascade form, Parallel form and Lattice- Ladder form of realizations
MATLAB programming on design of Butterworth and Chebyshev filters

UNIT – IV

FIR Filter Design Techniques: Introduction to characteristics of linear phase FIR filters, Frequency response. Comparison of IIR and FIR filters. Designing of FIR filters using windowing techniques.
Realization of FIR Filters: Transversal structure, cascade realization, Linear phase realization, Lattice structure.
MATLAB programming to design digital FIR filters using windowing method

TEXT BOOK:

1.John G. Proakis, Dimitris G Manolakis, digital Signal Processing: Principles, Algorithms andApplications, Pearson Education / PHI,4th Edition, 2014
2.Alan V Oppenheim and Ronald W Schafer, Digital Signal Processing, Pearson Education PHI, 2015.
3.P. Ramesh Babu, Digital Signal Processing, SciTech Publications (India) Pvt Ltd, 7th Edition, 2017

REFERENCE BOOKS:

1. Lonnie C Ludeman, Fundamentals of Digital Signal Processing, John Wiley & Sons, 2017.
2. S K Mitra, Digital Signal Processing: A Computer Based Approach, 4th Edition, TMH, 2013
3. Johnny R. Johnson, Introduction to Digital Signal Processing, PHI, 2015.

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CO PO PSO Mapping:

Digital Signal Processing (18EED13)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Explain the LTI signals and systems and concept of Z transform.	3	3	2	3	2	-	-	-	-	-	-	-	3	2	-
CO2	Implement DFT and IDFT using DIT-FFT and DIF-FFT algorithms.	3	3	-	-	2	-	-	-	-	-	-	-	3	2	-
CO3	Design the Butter worth and Chebyshev digital IIR filters and their realization.	3	3	-	-	2	-	-	-	-	-	-	-	3	-	-
CO4	Implement the appropriate type o design method for FIR filters and their realization.	3	2	-	-	2	-	-	-	-	-	-	-	3	2	-

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CONTROL SYSTEM LAB

B.Tech – VI Semester (Code: 18EEL601)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Network Theory

Course Objectives: To make the students

CO1: Able to analyze characteristics of various types of systems.
CO2: To familiarize with the modelling of dynamical systems.
CO3: Able to design Lag, Lead, Lead-Lag compensators theoretically & experimentally.
CO4: To familiarize to observe the effect of P, PI, PD and PID controllers on system.
CO5: Able to find the closed loop stability of the system with different approaches.

Course Outcomes: Students will be able

CLO1: Analyze characteristics of various types of systems.
CLO2: Derive a Mathematical model for Various Systems with various methods.
CLO3: Design and verify Lag, Lead, Lead-Lag compensators experimentally.
CLO4: Analyze the effect of P, PI, PD and PID controllers on a control system.
CLO5: Analyze and interpret stability of the system through Frequency Response Method.

LIST OF EXPERIMENTS:

1. Characteristics of magnetic amplifier.
2. Characteristics of A.C servo motor
3. Characteristics of synchros.
4. Effect of feedback on D.C servomotor.
5. Transfer function of D.C motor
6. Transfer function of D.C generator.
7. Time response of second order systems
8. Simulation of transfer functions using operational amplifier
9. Stepper motor control.
10. D.C. position control System.
11. Lag and lead compensation – Magnitude and phase plot
12. Temperature controller using PID
13. Effect of P, PD, PID controller on a second order system
14. P, PI, PD, PID control using Op-Amps.
15. Frequency response of first and second order systems.

Note: Minimum 10 experiments should be conducted.

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CO PO and PSO mapping:

Control Systems Lab (18EEL601)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Analyse characteristics of various types of systems.	3	3	-	2	-	-	-	-	2	-	-	2	2	3	-
CO2	Derive a Mathematical model for Various Systems with various methods.	3	2	2	1	-	-	-	-	2	-	-	2	2	3	-
CO3	Design and verify Lag, Lead, Lead- Lag compensators experimentally.	2	2	3	2	-	-	-	-	2	-	-	2	2	3	-
CO4	Analyse the effect of P, PI, PD and PID controllers on a control system.	3	3	-	2	-	-	-	-	2	-	-	2	2	3	-
CO5	Analyse and interpret stability of the system through Frequency Response Method.	3	3	-	2	-	-	-	-	2	-	-	2	2	3	-

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POWER ELECTRONICS LAB

III B.Tech-VI Semester(18EEL62)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Electric Engineering**,** Semiconductor Physics and Nano Materials.

Course Objectives: To make the students

CO1: To Understand the Turning ON and OFF of Transistor and Power Electronics Devices.

CO2: To Analyze AC to DC Conversion circuits on R, RL, Back emf Loads.

CO3: To Analyze the operation of inverters PWM techniques on R, Motor Loads.

CO4: To Analyze the operation of DC-DC choppers and AC Voltage controllers on R Load.

Course Outcomes: Students will be able to

CLO1: Understand the ON and OFF of Transistor & Power Electronics Devices and its Protection.

CLO2: Design and analyze AC to DC Conversion circuits on R, RL, Back emf Loads.

CLO3: Design and analyze the operation of inverters PWM techniques on R, Motor Loads.

CLO4: Design and analyze operation of DC-DCchoppers and AC Voltage controllers on R Load.

LIST OF EXPERIMENTS:

A- Essential Experiments

1. Static characteristics of SCR, TRIAC.
2. Characteristics of MOSFET & IGBT.
3. Gate triggering methods for SCR (R, RC, UJT).
4. 1- phase Half & Full controlled rectifier with R, RL & RLE load.
5. Voltage commutated DC chopper with R load.
6. 1-phase modified series inverter with R load.
7. 1-phase parallel inverter with R & RL loads.

B- List of Optional Experiments:

(i) Chose one Experiment

8. 1-phase Cyclo-converter (Center tapped or Bridge) with R load.
9. 1- phase IGBT based inverter with R, RL loads.
10. 1-phase Dual converter with R, RL & RLE loads (Circulating and Non-circulating modes).

(ii) Chose one Experiment

11. 3-phase Half & Full controlled Rectifier with R, RL and RLE loads.
12. 3-phase IGBT based inverter with R, RL loads.
13. Buck Boost Converter with R load.

(iii) Chose one Experiment

14. DSP based speed control of BLDC motor.
15. DSP based speed control of 3-phae Induction motor.
16. Study of 1-phase full wave Mc-Murray Bedford Inverter with R, RLE load.

Note: Minimum 10 experiments should be conducted.

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CO PO and PSO Mapping:

POWER ELECTRONICS LAB (Code: 18EEL62)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the ON and OFF of Transistor & Power Electronics Devices and its Protection.	3	2	3	2	2	2	3		2	2	3	3	2		3
CO2	Design and analyze AC to DC Conversion circuits on R, RL, Back emf Loads.	3	2	2	3	2	2	2	3		3	3	2	2	2	
CO3	Design and analyze the operation of inverters PWM techniques on R Motor Loads.	3	2	3	3	2	2	2		2	3	3	2	2		3
CO4	Design and analyze operation of DC-DCchoppers and AC Voltage controllers on R Load.	3	3	3	3	2	2	3		2	3	3	3	2	3	

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SIMULATION LAB

III B.Tech-VI Semester (18EEL63)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Analyse various power electronic circuits and AGC using MATLAB/P-SIM

CO2: Determine the bus impedance and admittance matrices using MATLAB.

CO3: Apply numerical methods for solving load flow problems and verify using MATLAB/MI-POWER

CO4: Analyze various faults occurring in power system and simulate the faults using MIPOWER/MATLAB

Outcomes: Students will be able to

CLO1: Analyse various power electronic circuits and AGC using MATLAB/P-SIM

CLO2: Derive a Mathematical model for impedance and admittance matrices..

CLO3: Execute numerical methods for solving load flow problems and verify using MATLAB/PSIM.

CLO4: Design and verify various faults occurring in power system and simulate the faults using MIPOWER

LIST OF EXPERIMENTS:

MATLAB/PSIM:

1. Simulation of Boost and Buck converters.
2. Simulation of Three phase three level PWM converter.
3. Simulation of single area load frequency control with and without PI controller and without PI controller.
4. Study of Economic load dispatch.
5. Formation of Y_{BUS} and Z_{BUS}.

LABVIEW:

1. Simple Amplitude Measurement
2. Building Arrays Using For Loop and While Loop
3. Generation of Random Signal
4. Waveform Minimum & Maximum Value Display
5. Matrix Fundamentals

MIPOWER/ETAP.

1. Study of Gauss Seidel load flow analysis.
2. Study of Newton Raphson method of load flow analysis.
3. Study of Fast decoupled
4. Study of symmetrical/ unsymmetrical fault analysis in a power system.
5. Study of Transient stability.

Note: Minimum 10 experiments should be conducted.

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CO PO and PSO mapping:

Simulation Lab (18EEL63)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyse various power electronic circuits and AGC using MATLAB/P-SIM	3	3	-	2	2	-	-	-	2	-	-	2	2	3	-
CO2	Derive a Mathematical model for impedance and admittance matrices..	3	2	2	3	-	-	-	-	2	-	-	2	2	3	2
CO3	Execute numerical methods for solving load flow problems and verify using MATLAB/PSIM.	3	2	2	2	2	-	-	-	2	-	-	2	2	3	-
CO4	Design and verify various faults occurring in power system and simulate the faults using MIPOWER	2	2	3	2	2	-	-	-	2	-	-	2	2	3	2

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HIGH VOLTAGE ENGINEERING

IV B.Tech – VII Semester (Code: 18EE701)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Pre-requisites: Physics, Circuit theory, Power systems-1

Course objectives: To make the students

CO1: Understand the breakdown phenomenon in solids, liquids and gases.

CO2: Know the concepts of partial discharges.

CO3: To know the generation of high voltages.

CO4: Understand different measuring techniques in high voltages.

CO5: To know the protective techniques against over voltages.

CO6: Understand the testing techniques of different high voltage apparatus.

CO7: Know the layout of high voltage laboratories.

Course outcomes: At the end of the course, the student will demonstrate

CLO1: Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.
CLO2: Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.
CLO3: Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.
CLO4: Knowledge of protection against over voltages.

UNIT-I

Breakdown phenomenon of Gases , Liquids and Solids: Ionization processes and de-ionization processes, Types of Discharge, Gases as insulating materials, Breakdown in Uniform gap, non-uniform gaps, Townsend's theory, Streamer mechanism, Corona discharge. Breakdown in pure and commercial liquids, Solid dielectrics and composite dielectrics, intrinsic breakdown, electromechanical breakdown and thermal breakdown, Partial discharge, applications of insulating materials.

UNIT-II

Generation of High voltages: Generation of high D. C. and A.C. voltages, generation of impulse voltages, generation of impulse currents, tripping and control of impulse generators.

UNIT-III

Measurement of high voltages and currents: Measurements of Peak voltage, impulse voltage and high direct current measurement method, cathode ray oscillographs for impulse voltage and current measurement, measurement of dielectric constant and loss factor, partial discharge measurements. Protection against over-voltages, Surge diverters, Surge modifiers.

UNIT-IV

High voltage testing techniques: Various standards for HV Testing of electrical apparatus, IS, IEC standards, Testing of insulators and bushings, testing of isolators and circuit breakers, testing of cables, power transformers and some high voltage equipment, High voltage laboratory layout, indoor and outdoor laboratories, testing facility requirements, safety precautions in H. V. Labs.

TEXTBOOKS:

1. High Voltage Engineering by M.S.Naidu and V.Kamaraju – TMH.
2. High Voltage Engineering fundamentals by Kuffel and Zungel, Elsavier Publications
3. C. L. Wadhwa, "High Voltage Engineering", New Age International Publishers, 2007.

REFERENCE BOOKS:

a. D. V. Razevig (Translated by Dr. M. P. Chourasia), "High Voltage Engineering Fundamentals", Khanna Publishers, 1993.
b. R. Arora and W. Mosch "High Voltage and Electrical Insulation Engineering", John Wiley & Sons, 2011.
c. Various IS standards for HV Laboratory Techniques and Testing

NPTEL COURSE LINK:

1. NPTEL :: Electrical Engineering - High Voltage Engineering

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CO PO and PSO mapping:

High Voltage Engineering (18EE701)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the basic physics related to various breakdown processes in solid, liquid and gaseous insulating materials.	3	-	-	2	-	3	-	-	-	-	-	2	2	3	-
CO2	Knowledge of generation and measurement of D. C., A.C., & Impulse voltages.	-	-	2	-	3	2	-	-	-	-	-	-	3	2	-
CO3	Knowledge of tests on H. V. equipment and on insulating materials, as per the standards.	3	-	-	-	-	-	-	-	-	-	-	-	2	2	-
CO4	Knowledge of protection against over voltages.	-	-	3	-	-	-	-	2	-	-	-	-	2	2	-

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ELECTRICAL MACHINE DESIGN

IV B.Tech – VII Semester (Code: 18EED21)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: To develop knowledge on principles of design of rotating machines

CO2: To design main dimensions & cooling systems of transformers

CO3: To develop knowledge on main dimensions of induction motor and its classification

CO4: Illustrate about design of stator and rotor of salient pole and cylindrical rotor alternators

Course Outcomes: Students will be able to

CLO1: Acquire knowledge to carry out a detailed design of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.

CLO2: Acquire knowledge to carry out a detailed design of a transformer and provide the information required for the fabrication of the same.

CLO3: Construct the design of stator and rotor of induction machines.

CLO4: Design stator and rotor of synchronous machines and study their behaviour.

UNIT-I

D.C.MACHINES: E.M.F generated from full pitch - fractional pitch with and without distributed windings - distribution factor. Design of main dimensions from output equation - Design of Armature windings - Design of field system - Design of inters pole and commentator.

UNIT-II

TRANSFORMERS: Derivation of output equation - volt per turn importance and calculation of main dimensions for three phase and single phase transformers - window dimensions - Yoke design and coil design - Design of tank with tubes. Basic design aspects of dry transformer and high frequency transformers

UNIT-III

INDUCTION MOTOR: Derivation of output equation - calculation of main dimensions – Stator design - number of slots - shape and area of slots - Rotor design for squirrel cage and slip ring types.

UNIT-IV

SYNCHRONOUS MACHINES: Derivation of output equation - Calculations of Main Dimensions for salient pole and cylindrical rotor alternators - Stator design - number of stator slots and slot dimensions - Pole design for salient pole generators - pole winding calculations. Design of rotor for cylindrical rotor alternator - Design of rotor windings.

COMPUTER AIDED DESIGN: Advantage of computer aided design - Flow chart for computer aided design.

TEXT BOOKS:

1. A.K. Sawhney , "A Course in Electrical machine Design" , Dhanpatrai & Sons, 2016
2. M.G. Say , "Performance and Design of AC Machines" PB, 2002
3. M. Ramamoothy, E. Horwood ,"Computer aided design of electrical equipment" , 1988
4. Colonel Wm. T. Mclyman Kg, "Magnetics Transformer And Inductor Design Handbook", Third Edition, Revised And Expanded, Inc. Idyllwild, California, U.S.A, 2004

REFERENCE BOOKS:

1. CEDT Manual on design and technology on low power transformers and inductors by IISC, Bangalore.
2. V.N.Mittle , "Design of Electrical Machines" , Standard Publishers Distributors, 2005
3. A.E. clayton , "Performance and Design of AC Machines" , PB 2004.

CO PO and PSO mapping:

Electrical Machine Design (18EED21)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Acquire knowledge to carry out a detailed design of a dc machine and provide the information required for the fabrication of the same along with an estimate of various performance indices.	3	2	-	2	-	-	-	-	-	-	-	-	3	2	-
CO2	Acquire knowledge to carry out a detailed design of a transformer and provide the information required for the fabrication of the same.	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO3	Construct the design of stator and rotor of induction machines.	3	3	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	To illustrate about design of stator and rotor of salient pole and cylindrical rotor alternators	3	2	-	2	-	-	-	-	-	-	-	-	3	-	-

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CONTROL SYSTEMS DESIGN

IV B.Tech – Semester-VII (Code: 18EED22)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Physics

Course Objectives: To make the students

CO1: To train students to understand the Time and frequency domain responses in terms of specifications.

CO2: To teach students to Design controllers in the time domain.

CO3: To teach students to Design controllers in the frequency domain

CO4: To guide students to assess controllability and observability of control systems

CO5: To teach students to Analysis of Nonlinear Systems.

Course Outcomes: Students will be able

CLO1: Understand various design specifications.

CLO2: To Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).

CLO3: To Design simple feedback controllers.

CLO4: Design controllers using the state-space approach.

CLO5: To assess effect of various nonlinearities

UNIT – I

Introduction: Introduction to design problem and philosophy. Introduction to time domain and frequency domain design specification and its physical relevance.

Response of System: Effect of gain on transient and steady state response. Effect of addition of pole on system performance. Effect of addition of zero on system response

UNIT – II

Design of Classical Control System in the time domain: Introduction to compensator. Design of Lag, lead lag-lead compensator in time domain. Feedback and Feed forward compensator design. Feedback compensation. Realization of compensators.

UNIT - III

Design of Classical Control System in frequency domain: Compensator design in frequency domain to improve steady state and transient response. Feedback and Feed forward compensator design using bode diagram. Design of P, PI, PD and PID controllers in time domain and frequency domain for first, second and third order systems. Control loop with auxiliary feedback – Feed forward control.

UNIT – IV

Control System Design in state space: Review of state space representation. Concept of controllability & observability, effect of pole zero cancellation on the controllability & observability of the system, pole placement design through state feedback. Ackerman's

Formula for feedback gain design. Design of Observer.Reduced orderobserver.Separation Principle.

Nonlinearities and its effect on system performance : Various types of non-linearity's. Effect of various non-linearity's on system performance. Singular points. Phase plot analysis.

TEXT BOOKS:

1. K. Ogata, Discrete-Time Control systems, Pearson Education/PHI, 2nd Edition, 1995.
2. V. I. George, C. P. Kurian, Digital Control Systems, Cengage Learning, 2012.
3. M. Gopal, Digital Control Engineering, New Age Int. Pvt. Ltd., 2014.

REFERENCE BOOKS:

1. Kuo, Digital Control Systems, Oxford University Press, 2nd Edition, 2003.
2. M. Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2006.
3. M. Sami Fadali Antonio Visioli, Digital Control Engineering Analysis and Design, Academic Press, 2013.

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CO PO and PSO mapping:

Control Systems Design (18EED22)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand various design specifications in Time and Frequency domain	3	1	-	-	-	-	-	-	1	-	-	-	3	1	-
CO2	Design controllers to satisfy the desired design specifications using simple controller structures (P, PI, PID, compensators).	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-
CO3	Design simple feedback controllers.	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-
CO4	Design controllers using the state-space approach.	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-
CO5	Recognize effect of various nonlinearities on system performance	3	1	1	-	-	-	-	-	1	-	-	-	3	1	-

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SWITCHED MODE POWER SUPPLY
IV B.Tech – VII Semester (Code: 18EED23)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power Electronics, Electronic Devices and Circuits

Course Objectives: To make the students

CO1: To design various Switched Mode Power Supply components

CO2: To analyze The Modeling and control aspects of converter.

CO3: To understand various Soft-switching DC - DC Converters

CO4: To Get Awareness on Pulse Width Modulated Rectifiers

Course Outcomes: Students will be able to

CLO1: Design various components of dc-dc converter

CLO2: Analyze different controllers for converter

CLO3: Analyze various modes of operation of Dc-Dc converter

CLO4: Analyze the Pulse Width Modulated Rectifiers **.**

UNIT – I

Design constraints of reactive elements in Power Electronic Systems: Design of inductor, transformer and capacitors for power electronic applications, Input filter design. Basic concepts and steady-state analysis of second and higher order Switched Mode power converters.

UNIT – II

Dynamic Modeling and control of second and higher order switched Mode power converters: Analysis of converter transfer functions, Design of feedback compensators, current programmed, frequency programmed and critical conduction mode control.

UNIT – III

Soft-switching DC - DC Converters: Zero-Voltage-switching converters, Zero-Current-switching converters, Multi resonant converters and Load resonant converters.

UNIT – IV

Pulse Width Modulated Rectifiers: Properties of ideal rectifier, realization of near ideal rectifier, control of the current waveform, single phase and three-phase converter systems incorporating ideal rectifiers and design examples. Nonlinear phenomena in switched mode power converters: Bifurcation and Chaos.

TEXT BOOKS:

1. Switched Mode Power Supplies, Design and Construction, H. W. Whittington, B. W. Flynn and D. E. MacPherson, Universities Press, 2009 Edition.
2. Mohan N. Undeland . T & Robbins W., Power Electronics Converters, Application and Design. John Wiley, 3rd edition, 2002
3. Umanand L., Bhat S.R., Design of magnetic components for switched Mode Power Converters. , Wiley Eastern Ltd.,1992
4. Robert. W. Erickson, D. Maksimovic .Fundamentals of Power Electronics., Springer International Edition, 2005
5. Course Material on Switched Mode Power Conversion, V. Ramanarayanan.

REFERENCE BOOKS:

1. Krein P.T .Elements of Power Electronics., Oxford University Press. Second Edition,2014
2. M. H. Rashid, Power Electronics. Prentice-Hall of India,Third Edition,2014

CO PO and PSO mapping:

	Switched Mode Power Converters **(18EED23)**	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Explain and design various Switched Mode Power Supply components.	3	2	-	-	-	-	-	-	-	-	-	3	2	1	3
CO2	Analyze The Modeling and control aspects of converter.	3	1	-	2	-	-	-	-	-	-	2	-	3	-	1
CO3	Understand various Soft- switching DC - DC Converters.	2	1	-	3	-	-	3	-	-	-	-	-	2	3	3
CO4	Get Awareness on Pulse Width Modulated Rectifiers.	3	2	-	1	-	-	2	-	-	-	-	-	3	2	

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DIGITAL PROTECTION OF POWER SYSTEM

IV B.Tech – VII Semester (Code: 18EED24)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students
CO1: Understand the advantages of digital relays over conventional relays.
CO2: Apply the suitable signal processing technique for protection.
CO3: Understand the adaptive criterion for relay decision making.
CO4: Identify the new developments in protective relaying and applications.

Course Outcomes: After completion of this course students will be able to
CLO1: Recognize the advantages of digital relays over conventional relays.
CLO2: Apply the suitable signal processing technique for protection.
CLO3: Understand the adaptive criterion for relay decision making.
CLO4: Identify the new developments in protective relaying and applications.

UNIT - I

Static and Digital Relays: Overview of Static relays, Transmission line protection, Transformer protection, Need for digital protection.
Digital Relays: Basic elements of a digital relay and their functions, signal conditioning subsystem, conversion subsystem, digital relay subsystem

UNIT -II

Signal processing techniques: Sinusoidal based algorithms, Fourier Analysis based algorithms, Least squares-based algorithm, Discrete Fourier Transforms, Wavelet Transforms, Kalman Filtering.

Digital filters: Fundamentals of Infinite Impulse Response Filters, Finite Impulse Response filters, Filters with sine and cosine windows. Travelling Wave Protection scheme, Digital Protection of Transformers.

UNIT-III

Decision making in Protective Relays: Deterministic decision making, Statistical Hypothesis testing, Decision making with multiple criterion, Adaptive decision schemes, Adaptive Differential protective scheme.

UNIT-IV

Applications: Applications of Fuzzy Logic and ANN for power system protection, Fault location algorithm, Wide Area Monitoring and Protection.

TEXT BOOKS:

1. Bhide S. R., "Digital Power System Protection", Springer, 2009.
2. Waldemar Rebizant, Janusz Szafran and Andrzej Wiszniewski, "Digital Signal Processing in Power System Protection and Control", Springer, 2011.
3. Arun G. Phadke, James S. Thorp, "Computer Relaying for power Systems", Wiley India Pvt Ltd; Second edition, 2012.

REFERENCE BOOKS:

1. A.T. Johns and S.K. Salman, "Digital Protection for Power Systems", Institution of Engineering and Technology, New Ed edition, 1995.
2. Badri Ram, D. N. Vishwakarma, "Power System Protection and Switchgear", Tata Mc-Graw Hill, 2nd Edition, 2017.
3. T.S. Madhava Rao, "Power system protection Static relays", Tata Mc-Graw Hill, 2nd Edition, 2017.

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CO PO and PSO mapping:

Digital Protection of Power System 18EED24		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Recognize the advantages of digital relays over conventional relays	3	2	2	-	-	-	-	-	-	-	-	-	3	2	2
CO2	Apply the suitable signal processing technique for protection	3	3	2	-	2	-	-	-	-	-	-	-	3	2	2
CO3	Understand the adaptive criterion for relay decision making	3	3	2	2	2	2	-	-	-	-	-	-	3	2	2
CO4	Identify the new developments in protective relaying and applications	3	3	2	2	2	2	-	-	-	-	-	-	3	2	2

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HVDC & FACTS

IV B.Tech – VII Semester (Code: 18EED31)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power Electronics, Power Systems.

Course Objectives: To make the students
CO1: Study comparison of AC and DC Transmission systems and components of HVDC.
CO2: Understand the control aspects of HVDC System and harmonics introduction. **CO3:** Understand the fundamentals of FACTS Controllers and basic types of facts controllers
CO4: Study objectives of shunt, series and combined compensators and their control structure
Course Outcomes: After completion of the course the student will be able to
CLO1: Compare HVAC and HVDC system and to describe various types of DC links HVDC converter and inverter operation.
CLO2: Describe various methods for the control of HVDC systems and to perform power flow analysis in AC/DC systems.
CLO3: Understand concept of FACTS controller for the specific application based on system requirements and types of facts controllers.
CLO4: Analyze the objectives of Shunt Controllers, Series controllers & combined controllers for various functions viz. Transient stability Enhancement, voltage instability prevention and power oscillation damping.

UNIT – I

HVDC transmission: HVDC Transmission system: Introduction, comparison of AC and DC systems, applications of DC transmission, types of DC links, Layout of HVDC Converter station and components of HVDC system. Line commutated converter and voltage source converter based systems.

UNIT – II

Control of HVDC system: Principles of control, desired features of control, converter control characteristics, power reversal, Ignition angle control, current and extinction angle control. Harmonics introduction, generation, ac filters and dc filters. Introduction to multi terminal DC systems and applications, comparison of series and parallel MTDC systems.

UNIT – III

FACTS concepts: Reactive power control in electrical power transmission, principles of conventional reactive power compensators. Introduction to FACTS, flow of power in AC parallel paths and meshed systems, basic types of FACTS controllers, definitions of FACTS controllers, brief description of FACTS controllers.

UNIT – IV

Static Shunt, Series and Combined Compensators: Shunt compensation – objectives of shunt compensation, static VAR compensators – SVC, STATCOM, SVC and STATCOM comparison. Series compensation – objectives of series compensation, thyristor switched

series capacitors (TCSC), static series synchronous compensator (SSSC), power angle characteristics. Unified power flow controller (UPFC) – Introduction, operating principle, independent real and reactive power flow controller and control structure. Interline power flow controller (IPFC) – Introduction, operating principle.

TEXT BOOKS:

1. Hingorani ,L.Gyugyi, 'Concepts and Technology of Flexible AC Transmission System', IEEE Press New York, 2000 ISBN –078033 4588.
2. Padiyar, K.R., 'HVDC transmission systems', Wiley Eastern Ltd., 2010.

REFERENCE BOOKS:

1. Song, Y.H. and Allan T. Johns, 'Flexible AC Transmission Systems (FACTS)', Institution of Electrical Engineers Press, London, 1999.
2. Mohan Mathur R. and Rajiv K.Varma , 'Thyristor – based FACTS controllers for Electrical
3. Transmission systems', IEEE press, Wiley Inter science , 2002.
4. Padiyar K.R., 'FACTS controllers for Transmission and Distribution systems' New Age International Publishers, 1st Edition, 2007.
5. Enrique Acha, Claudio R.Fuerte-Esqivel, Hugo Ambriz-Perez, Cesar Angeles-Camacho 'FACTS –Modeling and simulation in Power Networks' John Wiley & Sons, 2002.
6. Jos Arrillaga, 'High voltage Direct Current Transmission' IET Power and Energy Series 2009

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CO PO and PSO mapping:

HVDC AND FACTS (18EED31)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Study comparison of AC and DC Transmission systems and components of HVDC.	3	-	2	3	-	-	-	-	-	2	-	-	-	2	-
CO2	Understand the control aspects of HVDC System and harmonics introduction.	3	-	2	3	-	-	2	-	-	-	-	-	-	-	3
CO3	Understand the fundamentals of FACTS Controllers and basic types of facts controllers.	3		2	3	2	-	-	-	2	-	-	-	2	-	-
CO4	Study objectives of shunt, series and combined compensators and their control structure.	3	3	3	3	-	3	2	3	-	-	-	2	-	3	-

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ELECTRICAL AND HYBRID VEHICLES

IV B.Tech – VII Semester (Code: 18EED32)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Power Conversion Techniques, Electrical Machines

Course objectives: To make the students
CO1: Understand the concept of Vehicle Fundamentals.
CO2: Know the Operation of Electric and Hybrid drive-train topologies.
CO3: Understand the configuration and control of different motor drives.
CO4: Know the Operation of different types of energy storage systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain the concepts of Vehicle Fundamentals
CLO2: Describe the operation of Electric and Hybrid drive-train topologies.
CLO3: Analyze configuration and control of different motor drives.
CLO4: Analyze operation of different types of energy storage and management systems.

UNIT-I

Introduction and Vehicle Fundamentals: History of hybrid and electric vehicles, social and environmental importance of hybrid and electric vehicles, impact of modern drive-trains on energy supplies. Basics of vehicle performance, vehicle power source characterization, transmission characteristics, mathematical models to describe vehicle performance.

UNIT-II

Electric and Hybrid 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. Basic concept of hybrid traction, introduction to various hybrid drive-train topologies, power flow control in hybrid drive-train topologies, fuel efficiency analysis.

UNIT-III

Electric propulsion unit: Introduction to electric components used in 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.

UNIT-IV

Energy storage and Management: Introduction to Energy Storage Requirements in Electric Vehicles - Battery based energy storage and its analysis - Fuel Cell based energy storage and its analysis - Super Capacitor based energy storage and its analysis -Hybridization of different energy storage devices. Introduction to energy management strategies used in hybrid and electric vehicle, classification of different energy management strategies, comparison of different energy management strategies

TEXT BOOKS:

1. Mehrdad Ehsani, YimiGao, Sebastian E. Gay, Ali Emadi, Modern Electric, Hybrid Electric and Fuel Cell Vehicles: Fundamentals, Theory and Design, CRC Press,Second Edition 2005.
2. Iqbal Hussein, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003.
3. Ali Emadi, Advanced Electric Drive Vehicles, CRC Press, 2014.

REFERENCES:

1. James Larminie, John Lowry, Electric Vehicle Technology Explained, Wiley, Second Edition 2003.
2. H. Partab: Modern Electric Traction – Dhanpat Rai& Co, 2007.
3. Bimal Bose, 'Power electronics and motor drives', Elsevier, First Edition 2006.
4. Ion Boldea and S.A Nasar, 'Electric drives', CRC Press, Second Edition 2005.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/103/108103009/

https://nptel.ac.in/courses/108/106/108106182/

https://nptel.ac.in/courses/108/102/108102121/

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CO PO and PSO mapping:

Electrical And Hybrid Vehicles (18EED32)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the concept of Vehicle Fundamentals.	3	2	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	Know the Operation of Electric and Hybrid drive-train topologies.	1	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CO3	Understand the configuration and control of different motor drives.	2	2	3	3	-	-	-	-	-	-	-	-	2	2	3
CO4	Know the Operation of different types of energy storage systems	2	2	3	2	-	-	-	-	-	-	-	-	2	-	

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LINE COMMUTATED AND ACTIVE RECTIFIERS

IV B.Tech – VII Semester (Code: 18EED33)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Analog Electronics, Power Electronics.

Course Objectives: To make the students
CO1: To analyze controlled rectifier with passive filters.
CO2: To understand the operation of PWM approach and harmonic elimination.
CO3: To analyze operation of Single-phase ac-dc single-switch and bidirectional boost converter.
CO4: To study about Isolated single-phase ac-dc flyback converter.

Course Outcomes: Students will be able to
CLO1: Understand controlled rectifier with passive filters.
CLO2: Designing of PWM based inverters with harmonic elimination.
CLO3: Design Single-phase ac-dc single-switch and bidirectional boost converter.
CLO4: Design Isolated single-phase ac-dc flyback converter.

UNIT-I

Thyristor rectifiers with passive filtering: Half wave, Full wave Rectifiers with RL and RLE loads; 1-phase full-wave rectifiers with L, C and LC filter; 3-phase rectifiers with L, C and LC filter; Relationship between I/P and O/P voltages- expression for filter inductor and capacitors; input current waveshape, commutation overlap.

UNIT-II

Multi-Pulse converter: PWM techniques: single- multiple- and sinusoidal PWM techniques- selective harmonic elimination- space vector modulation; Review of transformer phase shifting, generation of 6-phase ac voltage from 3-phase ac, 6-pulse converter and 12-pulse converters with inductive loads, steady state analysis, commutation overlap, notches during commutation.

UNIT-III

Single-phase ac-dc single-switch and bidirectional boost converter: Review of dc-dc boost converter, power circuit of single-switch ac-dc converter, steady state analysis, unity power factor operation, closed-loop control structure. Review of 1-phase inverter and 3-phase inverter, power circuits of 1-phase and 3-phase ac-dc boost converter, steady state analysis, operation at leading, lagging and unity power factors. Rectification and regenerating modes. Phasor diagrams, closed-loop control structure.

UNIT-IV

Isolated single-phase ac-dc flyback converter: DC-DC flyback converter, output voltage as a function of duty ratio and transformer turns ratio. Power circuit of ac-dc flyback converter, steady state analysis, unity power factor operation, closed loop control structure.

TEXT BOOKS:

1.G. De, “Principles of Thyristorised Converters”, Oxford & IBH Publishing Co, 1988.
2.J.G. Kassakian, M. F. Schlecht and G. C. Verghese, “Principles of Power Electronics”, Addison- Wesley, 1991.
3 L. Umanand, “Power Electronics: Essentials and Applications”, Wiley India, 2009.

REFERENCE BOOKS:

1. N. Mohan and T. M. Undeland, “Power Electronics: Converters, Applications and Design”, John Wiley & Sons, 2007.
2. R. W. Erickson and D. Maksimovic, “Fundamentals of Power Electronics”, Springer Science & Business Media, 2001.

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CO PO and PSO mapping:

	Line Commutated and Active Rectifiers (Code: 18EED33)	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	To analyze controlled rectifier with passive filters.	3	2	-	2	-	-	2	-	-	-	-	2	-	3	-
CO2	To understand the operation of PWM approach and harmonic elimination	3	3	-	2	2	3	2	-	-	2	-	3	-		3
CO3	To analyze operation of Single-phase ac-dc single-switch and bidirectional boost converter.	3	-	3	3	2	2	3	-	-	2	-	3	-	3	-
CO4	To study about Isolated single-phase ac-dc flyback converter.	3	2	3	3	-			-	-	-	-	3	-	2	-

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COMPUTER AIDED POWER SYSTEM

IV B.Tech-VII Semester (Code: 18EED34)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics-I, Power System-II

Course Objectives: To make the students

CO1: To form incidence matrices and to prepare primitive impedance and admittance matrices with and without mutual coupling

CO2: To deal with the numerical methods studied in applied mathematics courses to get the solutions of load flow and comparison of different methods.

CO3: To teach the methods of mathematical formulation of complex power system and short circuit calculations.

CO4: To analyse the Contingency situations in the power system network

CO5: To understand the Transient Stability analysis of power system

Course Outcomes: Students will be able

CLO1: Acquire the knowledge of analysing power system network to get the primitive data with and without mutual coupling

CLO2: Develop proper mathematical models for analysis of a selected problem like load flow study or fault analysis.

CLO3: Identify the significance to conduct short circuit analysis of power system network for selection of protective devices

CLO4: Conduct contingency analysis.

CLO5: Identify transient stability problems in power system.

UNIT – I

Incidence & Network Matrices: Introduction to Graph Theory, Element-node incidence matrix - reduced incidence matrix or bus incidence matrix - basic loop incidence matrix - augmented loop incidence matrix - basic cut set incidence matrix - augmented cut set incidence matrix - branch path incidence matrix - concept of primitive network - primitive impedance and admittance matrices with and without mutual coupling - network performance equations - formation of network matrices using singular & nonsingular transformation.

UNIT – II

Formulation of Load Flow Problem: Introduction – nonlinear equations - Power Flow Solution Algorithms solution techniques using Gauss iterative, Gauss Seidal Power Flow Equations, Newton Raphson Load Flow Method, Fast Decoupled Load Flow Method and DC Load Flow Methods. AC-DC System Power Flow Analysis- Sequential and Simultaneous Solution Algorithms.

UNIT – III

Algorithm for formation of network matrices: Formation of bus admittance and bus impedance matrices and respective algorithms - modifications of bus impedance and admittance matrices for

changes in the networks with and without mutual coupling. Representation of three phase network elements for balanced and unbalanced systems.

Short Circuit studies: Short circuit calculations for symmetrical and unsymmetrical faults using Bus Impedance matrix.

UNIT – IV

Security Analysis: Basic Concepts, Static Security Analysis at Control Centers, Contingency Analysis, Importance of contingency analysis, Contingency Selection**.**

Formulation of Transient Stability Problem: Transient Stability Analysis of Multi-Machine Systems, Eigen Analysis of Dynamical Systems, Small Signal Stability Analysis using Classical Model. Flow chart for digital simulation of transient stability problem. Infinite bus using swing equation for the machine and incorporating excitation (IEEE, 1981) turbine and speed governor controls.

TEXT BOOKS:

1. Stagg, G.W. & El-Abiad, Computer methods in Power System Analysis, TMH,1988
2. L.P. Singh, Advanced Power System Analysis and Dynamics, New Age International Private Limited; 6th edition 2012.
3. J.D. Glover, M.Sarma and T.J. Overbye, Power System Analysis and Design, CL Engineering; 4th edition 2007
4. James Momoh, "Smart Grid: Fundamentals of design and analysis", John Wiley & sons Inc, IEEE press 2012.

REFERENCE BOOKS:

1. O.I.Elgerd, Electric Energy systems Theory, Tata McGraw-hill Publishing Company Ltd., 2nd ed., 46th reprint 2016
2. Anderson &Fouad, Power Systems Control and stability, Wiley-IEEE ***Press,*** 3rd edition 2019
3. Nagrath&Kothari, Modern power system analysis 4th edition, TMH 2011.
4. M.A. Pai,Computer Techniques in Power System Analysis, TMH 2017.
5. P. Kundur, Power System Stability & Control, 1st edition TMH 2006.

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CO PO and PSO mapping:

Computer Aided Power System (Code: 18EED34)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Acquire the knowledge of analysing power system network to get the primitive data with and without mutual coupling	3	2	2	2	-	-	-	-	3	-	-	-	3	-	3
CO2	Develop proper mathematical models for analysis of a selected problem like load flow study or fault analysis.	3	2	3	2	2	-	-	-	2	-	-	-	3	-	2
CO3	Identify the significance to conduct short circuit analysis of power system network for selection of protective devices	3	2	2	2	2	-	-	-	-	-	-	-	3	-	3
CO4	Conduct contingency analysis.	3	2	2	2	2	-	-	-	-	-	2	-	3	-	3
CO5	Identify transient stability problems in power system.	3	2	2	2	2	-	-	-	-	-	-	-	3	2	3

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INDUSTRIAL MANAGEMENT &ENTREPRENEUR SHIP

IV B.Tech-VIII Semester (Code: 18ME002)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives:

CO1: To provide students an insight into the concepts of industrial management and various forms of business organizations

CO 2: It aims to provide the students with an understanding of basics of production systems, productivity and quality.

CO 3: To enable the students to understand the inventory control concept.

CO 4: To make the students to learn various financial aspects of the business

CO 5: To know the depreciation and its methods of measuring depreciation.

CO 6: To Provide an understanding of personnel management.

CO 7: Students are exposed to know the importance of Entrepreneurship

CO 8: To impart the knowledge of marketing to the students

Learning Outcomes:

After completion of the course the student must be able to

CLO-1: Describe the roles & the responsibilities and various functions of the management. Learn various forms of business organizations and its dynamics

CLO-2: Understand concepts of productivity and know the ways of enhancing productivity. Develop knowledge about inventory control.

CLO-3: Learn how depreciation occurs and various methods of calculating depreciation. Understand various motivation theories and leadership styles.

CLO-4: Grasp complete knowledge of importance of entrepreneurship and its prerequisites.

UNIT – I

General Management: Management definition, Functions of Management and Principles of Management.

Scientific Management: Definition, Principles of Scientific Management.

Forms of Business Organization: Choice of form of organization, Salient features of Sole Proprietorship, Partnership, Joint Stock Company: Private Limited and Public Limited companies; Cooperative societies, Public sector organizations, State ownership, Public corporation, Merits and demerits of above types.

Introduction to Strategic Management: Definition and scope

UNIT – II

Human Resource Management: Functions of HR management, human resource planning, recruitment, selection, placement, training & development and performance appraisal, Motivation theories, leadership styles.

Marketing Management: Concepts of Selling and Marketing, Functions of Marketing, Marketing mix (4 Ps); Advertising and sales promotion; Product life cycle; distribution channels

UNIT – III

Materials Management: Inventory Control, Inventory costs, Basic EOQ model, Model with Price breaks, ABC analysis, FSN Analysis, VED Analysis.

Total Quality Management: Importance of quality, Difference between Inspection and Quality control, Components of total quality, Quality Function Deployment

Introduction to Supply Chain Management: Definition, scope of SCM, Drivers of SCM, Advantages, limitations

UNIT – IV

Financial Management: Functions of finance, Types of Capital-Fixed and Working Capital, Break Even Analysis.

Entrepreneurship Development: Introduction, Entrepreneurial characteristics, Functions of an Entrepreneur; Factors affecting entrepreneurship; Role of communication in entrepreneurship; Entrepreneurial development-Objectives, Need of Training for enterprises; Finance for the enterprises.

TEXT BOOKS:

1. Essentials of Management /Koontz and Heinz Weihrich/ Tata-McGraw-Hill 10th Ed.
2. Manufacturing Organization and Management / Amrine / Pearson Education
3. Management Science, A. R. Aryasri.
4. Industrial Engineering and production management by M Mahajan, Dhanapat rai Publications
5. Marketing Management, Philip Kotler.

REFERENCE BOOKS:

1. Entrepreneurship, Robert D Hisrich, Michael P Peters, Mathew Manimala and Dean A. Shepherd-McGraw Hill, India-2014 (9th Edition)–ISBN: 9789339205386

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CO PO and PSO mapping:

Industrial Management &Entrepreneur Ship (18EED32)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Describe the roles & the responsibilities and various functions of the management. Learn various forms of business organizations and its dynamics	3	2	-	-	-	1	-	-	-	-	1		1	1	2
CO2	Understand concepts of productivity and know the ways of enhancing productivity. Develop knowledge about inventory control.	-	-	-		2	-	3	-	-	-	-	-	-	-	-
CO3	Learn how depreciation occurs and various methods of calculating depreciation. Understand various motivation theories and leadership styles.	1	1	-	-	-	-	-	2	-	1	2	-	3	-	2
CO4	Grasp complete knowledge o importance of entrepreneurship and its prerequisites	-		-	3	-	-	-	-	1	-		-	1	-	-

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CONSTITUTION OF INDIA

IV B.Tech-VIII Semester (Code: 18HU001)

Lectures	3	Tutorial	0	Practical	0	Credits	0
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

UNIT-I

1. Meaning of the constitutional law and constitutionalism.
2. Historical perceptive of the constitution of India
3. Salient features and characteristics of the constitution of India.
4. Preamble, union and its territory and citizenship.

UNIT – II

5. Fundamental rights principles.
6. Directive principles of state policy.
7. Fundamental Duties.

8. The government of the union, the president, The Prime Minister, and the council of ministers, The parliament of India, The supreme court, the union judiciary

UNIT – III

9. The Machinery of Government in the states, The Governor, The Chief Minister and council of Ministers, The State legislature, High court, Judiciary in the states
10. Union territories.
11. The Federal System, Division of powers between centre and states, Legislative Administration and Financial relation.
12. Emergency Provisions, President Rule, National Emergency, Financial Emerging
13. Local self Government, Panchayat Raj, Municipalities and municipal Corporation.

UNIT IV

13. Local self Government, Panchayat Raj, Municipalities and municipal Corporation
14. Miscellaneous Provisions, The comptroller and Auditor general of India, The Public Service Commission, Special Provisions relating to certain classes, Elections – Political parties.
15. Amendment of the Constitution.

REFERENCE BOOKS:

1. Constitutional Government in India - M V Pylee – Asia Publishing House
2. Indian Government and Politics – D C Dasgupta. Vikas Publishing house
3. The Oxford Hand Book of the Indian Constitution, Sujit Chowdary, Madhav Khosla Pratapabhem Mehla.
4. Constitutional question in India ; The President , Parliament and the States – Noorani A G – Oxford.
5. Indian Constitution and its features – Astoush Kumar, Anmol Publishers
6. The Constitution of India – Bakshi P M – Universal Law Publishers
7. Legelect's the constitution of India – Ramnarain Yadav, K K Legelest Publication

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PROJECT STAGE-I

IV B.Tech-VII Semester (Code: 18EEP01)

Lectures: 0periods/week	Tutorial: 0	Practical: 6	Self-Study: 0	Credits: 2
Continuous Internal Assessment : 50M		Semester End Examination (3 Hours) : 50M		

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POWER SYSTEMS LAB

IV B.Tech-VII Semester (Code: 18EEL72)

Lectures	0	Tutorial	0	Practical	3	Credits	1
Continuous Internal Evaluation			50	semester End Examination(3 hours)			50

Prerequisites: **Mathematics, PDS,RES.**

Course Objectives: To make the students
CO1: Analyze the performance of transmission line
CO2: Able to do Experiment in various protection of generator, feeder and transmission line using relays and circuit breakers
CO3: Able to conduct testing about the various electromagnetic relays
CO4: Be competent in use of static and digital relays.
CO5: Develop simulation model for RES

Course Outcomes: Students will be able to
CLO1: Analyze the performance of transmission line
CLO2: Examine various protection of generator, feeder and transmission line using relays and circuit breakers
CLO3: Execute testing about the various electromagnetic relay
CLO4: Competent in use of static and digital relays.
CLO5: Analyze simulation model for RES

LIST OF EXPERIMENTS:

1. Determination of ABCD parameters/regulation and efficiency of transmission line model.

2. Characteristics of IDMT over current relay/ over voltage electromagnetic relay.

3. Finding the sequence impedances of 3-phase synchronous machine.

4. Reactive power compensation using tap changing transformer.

5. Surge impedance loading of transmission line model.

6. Find cable fault using cable fault locator/Find hotspots using thermal image camera.

7. To study characteristics of MCB & HRC Fuse.

8. Test to find out polarity, ratio and magnetization characteristics of CT and PT.

9. Study on (i) on load Time Delay Relay (ii) off load Time Delay Relay.

10. Characteristics of over current/earth fault using numerical relay.

11. Characteristics of numerical distance relay.

12. Characteristics of numerical differential relay.

13. Identifying and Measuring the parameters of solar PV module in the field.

14. Series and parallel connection of PV Modules

15. Study of Solar / wind turbine generator power plant.

Note: Minimum 10 experiments should be conducted.

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CO PO and PSO mapping:

POWER SYSTEMS LAB (18EEL72)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze the performance of transmission line	3	3	-	2	1	-	-	-	2	-	-	2	2	3	-
CO2	Able to do Experiment in various protection of generator, feeder and transmission line using relays and circuit breakers	3	2	2	3	-	-	-	-	2	-	-	2	2	3	-
CO3	Student able to conduct testing about the various electromagnetic relay	3	2	2	2	2	-	-	-	2	-	2	2	2	3	2
CO4	Be competent in use of static and digital relays	2	2	3	2	2	-	-	-	2	-	-	2	2	3	-
CO5	Develop simulation model for RES	3	3	-	2	2	-	-	-	2	-	2	2	2	3	3

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ELECTRONICS DESIGN LAB

IV B.Tech-VII Semester (Code: 18EEL73)

Lectures	2	Tutorial	0	Practical	3	Credits	2
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Basic Knowledge of C-programming, Basic of Electronics.

Course Objectives: To make the students

CO1: Able to get a basic knowledge on ARDUINO-UNO and it's various basic applications.
CO2: To familiarize on PCB design software and design basic Analog circuits.
CO3: Able to get basic knowledge on RASPBERRY-PI and its various basic Applications.
CO4: Able to learn to build various Electrical Applications using ARDUINO-UNO and RASPBERRY-PI.

Course Outcomes: Students will be able

CLO1: Design different projects using ARDUINO-UNO.
CLO2: Design of PCB for various applications.
CLO3: Design different projects using RASPBERRY-PI.
CLO4: Design of digital voltmeter and servo motor using ARDUINO-UNO and RASPBERRY-PI.

LIST OF EXPERIMENTS:

1. Arduino UNO based relay control.
2. Design of Digital Thermometer using Arduino UNO & LM35 Temperature sensor.
3. Vibration sensor using Arduino UNO.
4. Obstacle Detector using Arduino UNO.
5. WIFI based RASPBERRY control of Electrical appliances.
6. Design and control of a Servo motor.
7. Digital Arduino Voltmeter.
8. Smart Street light intensity control system.
9. Line follower Robot.
10. Design the PCB Layout for full wave rectifier circuit.
11. Design of single sided PCB Layout for Common Emitter Amplifier (CE).
12. Design of single sided PCB Layout for Full adder circuit.
13. Design and create single sided PCB Layout for Flashing LEDs using 555 IC.
14. Raspberry Pi controlled LED.
15. Raspberry Pi controlled stepper motor.

Note: Minimum 10 experiments should be conducted.

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Co Po and PSO mapping:

Electronics Design Lab (18EEL73)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Able to get a basic knowledge on ARDUINO-UNO and it's various basic applications.	3	2	3	-	-	-	-	-	2	-	-	2	-	-	-
CO2	To familiarize on PCB design software and design basic Analog circuits.	3	2	-	2	-	-	-	-	2	-	-	2	-	-	-
CO3	Able to get basic knowledge on RASPBERRY-PI and it's various basic Applications.	3	2	3	-	-	-	-	-	2	-	-	2	-	-	-
CO4	Able to learn to build various Electrical Applications using ARDUINO-UNO and RASPBERRY-PI.	3	3	2	-	-	-	-	-	2	-	-	2	-	-	-

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POWER QUALITY

IV B.Tech – VIII Semester (Code: 18EED41)

Lectures	4	Tutorial	0		Practical	0	Credits	3	
Continuous Internal Assessment			:	50	Semester End Examination (3 Hours)			:	50

Prerequisites: Power Electronics, Electrical Power Distribution System

Course Objectives: To make the students

CO1: Classify the power quality problems

CO2: Analyze voltage sag and voltage swell problems and suggest preventive techniques

CO3: Identify the harmonic sources and the effects of harmonic distortion

CO4: Analyze the Power Quality Conditioners

Course Outcomes: Students will be able to

CLO1: Understand different types of power quality problems with their source of generation

CLO2: Understand To Design different methodologies for detection, classification and mitigation of power quality problems.

CLO3: Expected to practically design active & passive filters for harmonic elimination.

CLO4: Analyze the Power Quality Conditioners

UNIT – I

INTRODUCTION: Electric power quality phenomena - IEC and IEEE definitions - power quality disturbances - voltage fluctuations-transients-unbalance-waveform distortion-power frequency variations. Voltage variations - Voltage sags and short interruptions – flicker -longer duration variations.

UNIT – II

VOLTAGE SAGS AND INTERRUPTIONS : Sources of sagas and interruptions, Estimating voltage sag performance, fundamental principles of protection, solutions at the end-use level, Motor-starting sags, utility system fault-clearing Issues.

TRANSIENT OVER VOLTAGES: Sources of over voltages, principles of over voltage protection, devices for over voltage Protection, utility capacitor-switching transients, utility system lightning protection.

UNIT – III

FUNDAMENTALS OF HARMONICS: Harmonics – sources – definitions & standards – impacts - calculation and simulation –harmonic power flow - mitigation and control techniques – filtering – passive and active

UNIT – IV

POWER QUALITY CONDITIONERS: Power Quality conditioners – shunt and series compensators - DSTATCOM - Dynamic voltage restorer - unified power quality conditioners - case studies

TEXT BOOKS:

1. Electrical Power Systems Quality, Roger C. Dugan, Mark F.McGranaghan, Surya Santoso, H.Wayne Beaty, 2nd Edition, TMH Education Pvt. Ptd.
2. Power quality by C. Sankaran, 2nd Edition, 2002 CRC Press

REFERENCE BOOKS:

1. Electrical systems quality Assessment by J. Arrillaga, N.R. Watson,S. Chen, John Wiley & Sons, 2000
2. Understanding Power quality problems by Math H. J. Bollen IEEE Press, 2nd Edition, 1999.

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CO PO and PSO mapping:

Power Quality **(18EED41)**		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Acquire knowledge Classifications power quality problems	3	3	-	1	-	-	-	-	-	-	-	-	1	2	-
CO2	Analyze voltage sag and voltage swell problems and suggest preventive techniques	2	3	-	-	-	-	-	-	-	-	-	-	2	2	-
CO3	**Identify** the harmonic sources and the effects of harmonic distortion	3	2	-	-	-	-	-	-	-	-	-	-	3	2	-
CO4	To illustrate about design of stator and rotor of salient pole and cylindrical rotor alternators	2	3	-	1	-	-	-	-	-	-	-	-	3	-	-

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SMART GRID TECHNOLOGIES

IVB.Tech VIII-Sem ester (Code:18EED42)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Fundamentals of Power System

Course objectives: To make the students

CO1: Understand the Basic concept of Smart Grid.
CO2: Understand the Information & Communications Technology for The Smart Grid.
CO3: Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.
CO4: Know the operation of Demand Side Integration and Distribution Management Systems.

Course outcomes: At the end of this course, students will be able to
CLO1: Explain Basic concept of Smart Grid.
CLO2: Describe Suitable Communication Network And Security System For Smart Grid.
CLO3: Analyze Operation of Smart Metering and Advanced Metering infrastructure.
CLO4: Analyze Operation of Demand Side Integration and Distribution Management Systems.

UNIT-I

Smart Grid: Introduction, Ageing Assets and Lack of Circuit Capacity, Thermal Constraints, Operational Constraints, Security of Supply, National Initiatives, Early Smart Grid Initiatives, Active Distribution Networks, Virtual Power Plant, Other Initiatives and Demonstrations, Overview of The Technologies Required for The Smart Grid.

UNIT-II

Data communication: Introduction, Dedicated and shared communication channels, Switching techniques, Communication channels, Layered architecture and protocols.

Communication technologies for the Smart Grid: Introduction- Communication technologies- IEEE 802 series, Mobile communications, Multi-protocol label switching, Power line communication. Standards for information exchange-Standards for smart metering Modbus, DNP3, IEC 61850.

Information security for the Smart Grid: Encryption and decryption, authentication, Digital signatures, Cyber security standards

UNIT-III

Smart Metering and Advanced Metering infrastructure: Introduction, smart metering – evolution of electricity metering, key components of smart metering, smart meters: an overview of the hardware used – signal acquisition, signal conditioning, analogue to digital conversion, computation, input/output, and communication. Communication infrastructure and protocols for smart metering- Home area network, Neighborhood Area Network, Data Concentrator, meter data management system, Protocols for communication. Advanced Metering infrastructure (AMI), AMI protocols – Standards and initiatives.

UNIT-IV

Demand Side Integration and Distribution Management Systems: Demand Side Integration-Services Provided by DSI. Introduction Data Sources and Associated External Systems, SCADA, Customer Information System, Modeling and Analysis Tools, Distribution System Modeling, Topology Analysis, Load Forecasting, Power Flow Analysis, Fault Calculations, Applications, System Monitoring, Operation, Management, Outage Management System.

TEXT BOOKS:

1. Smart Grid, Janaka Ekanayake, Liyanage, Wu, Akihiko Yokoyama, Jenkins, Wiley Publications, 2012, Reprint 2015.
2. Smart Grid: Fundamentals of Design and Analysis, James Momoh, Wiley, IEEE Press., 2012, Reprint 2016.

REFERENCES:

1. The Smart Grid – Enabling Energy efficiency and demand response, Clark W. Gellings, P.E., CRC Press, Taylor & Francis group, First Indian Reprint. 2015.
2. Smart Grid – Applications, Communications, and Security Edited by Lars Torsten Berger, Krzysztof Iniewski, WILEY, 2012, Reprint 2015.
3. Practical Electrical Network Automation and Communication Systems, Cobus Strauss, ELSVIER, 2003.

NPTEL VIDEO LINK:

https://nptel.ac.in/courses/108/107/108107113/

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CO PO and PSO mapping:

	Smart Grid Technologies (18EED42)	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the Basic concept of Smart Grid.	3	3	2	2	-	-	-	-	-	-	-	-	2	-	-
CO2	Understand the Information & Communications Technology for The Smart Grid.	3	2	3	3	-	-	-	-	-	-	-	-	3	3	2
CO3	Acquire Knowledge about Smart Metering and Advanced Metering infrastructure.	2	2	3	2	2	-	-	-	-	-	-	-	2	-	3
CO4	Know the operation of Demand Side Integration and Distribution Management Systems	2	2	3	2	-	-	-	-	-	-	-	-	2	-	-

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MACHINE MODELLING &ANALYSIS

IVB.Tech VIII-Sem ester (Code:18EED43)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites:

Course Objectives (COs):

After completion of this course, students will be able to

CO1	Understand the concepts of 2-axis representation of an electric machine
CO2	Know the concepts of representing transfer function model of Dc machine
CO3	Acknowledge the importance of Voltage and current Equations in stator reference frame
CO4	Develop the modelingVoltage and current Equations in state – space variable form of 3ph synchronous motor

Course Learning Outcomes (CLOs):

After completion of this course, students will be able to

CLO1	comprehend the basic two-pole machine and identify the methods and assumptions in modelling of machines
CLO2	recognize the different frames for modelling of different AC machines and phase transformations
CLO3	write voltage, current and torque equations for different machines.
CLO4	Circuits model of a 3ph Synchronous motor and Voltage and current Equations in state – space variable form

UNIT-I

Basic Two-pole DC machine – primitive 2-axis machine – Voltage and Current relationship – Torque equation. Mathematical model of separately excited DC motor and DC Series motor in state variable form – Transfer function of the motor – Numerical problems.

Mathematical model of D.C. shunt motor D.C. Compound motor in state variable form – Transfer function of the motor – Numerical Problems

UNIT-II

Liner transformation – Phase transformation (a, b, c to α, β, o) – Active transformation (α .β, o to d, q). Circuit model of a 3 phase Induction motor – Linear transformation – Phase Transformation – Transformation to a Reference frame – Two axis models for induction motor. dq model based DOL starting of Induction Motors.

UNIT-III

Voltage and current Equations in stator reference frame – equation in Rotor reference frame – equations in a synchronously rotating frame – Torque equation – Equations I state – space form.

UNIT-IV

Circuits model of a 3ph Synchronous motor – Two axis representation of Syn. Motor. Voltage and current Equations in state – space variable form – Torque equation. dq model based short circuit fault analysis- emphasis on voltage, frequency and recovery time.

TEXT BOOKS:

1. Analysis of electric machinery and Drive systems- Paul C. Krause , Oleg Wasynezuk, Scott D. Sudhoff, third edition, IEEE press,2013
2. Generalized Machine theory P.S. Bimbhra, Khanna Publishers, 2002

REFERENCE BOOKS:

1. Thyristor control of Electric Drives – Vedam Subramanyam, Tata McGraw-Hill Education, 1988
2. Power System Stability and Control – Prabha Kundur, EPRI.2006

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Machine Modeling and Analysis (18EED43)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Comprehend the basic two-pole machine and identify the methods and assumptions in modelling of machines	3	3	3	3	3	2	2	-	2	2	2	3	1	-	-
CO2	Recognize the different frames for modelling of different AC machines and phase transformations	3	3	3	3	3	-	2	-	2	2	2	3	2	-	1
CO3	Write voltage, current and torque equations for different machines.	3	3	3	3	3	-	2	-	2	2	-	3	2	-	-
CO4	Circuits model of a 3ph Synchronous motor and Voltage and current Equations in state – space variable form	3	3	3	3	3	-	1	-	-	-	-	3	-	-	-

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ADVANCED ELECTRIC DRIVES

IV B.Tech – VIII Semester (Code: 18EED44)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Electrical machines, Power Electronics.

Course Objectives: To make the students
CO1: Design controllers for closed-loop operation of separately excited DC motor drives.
CO2: Develop high performance IM using principles of Scalar control and Direct Torque Control.
CO3: Develop Vector controlled Induction Motor drives and PMSM drives
CO4: Implement control schemes for BLDC and Switched Reluctance Motor drives

Course Outcomes: Students will be able to
CLO1: Understand and Design controllers for closed-loop operation of separately excited DC motor drives.
CLO2: Design and analyze IM using Scalar control and Direct Torque Control.
CLO3: Design Develop Vector Controlled Induction Motor drives and PMSM drives.
CLO4: Design and Implement, control schemes for BLDC and Switched Reluctance Motor drives.

UNIT-I

Separately Excited DC-motor Drives: Introduction, Review of DC-motor drives, Speed control of a Separately excited DC motor through state-space Model, drive with controlled rectifiers and choppers, Review of controllers, need for anti-windup feature for integral controllers, Speed control of a separately excited DC drive with inner current loop and outer speed loop, Design of current loop with pole-zero cancellation, Design of speed loop with symmetrical optimization technique.

UNIT-II

Induction Motor drives: Implementation of V/f control with slip compensation scheme, Review of dq0 model of 3-Ph IM with simulation studies, Principle of vector control of IM, Direct Vector control, Indirect vector control with feed-forward, Indirect vector control in various frames of reference, Decoupling of vector control with feed forward compensation, Direct Torque Control of IM , Control of wound rotor induction machine, introduction to five-phase induction motor drives.

UNIT-III

Permanent Magnet Drives: PM Synchronous motors: Types, Construction, operating principle, Expression for torque, Model of PMSM, Implementation of vector control for PMSM, Introduction to BLDC drives.

UNIT-IV

Switched Reluctance Motor Drives: Review of Switched Reluctance Motor, Torque expression, converters for SRM drives, Control of SRM drives with hard and soft chopping techniques.

TEXT BOOKS:

1. Modern Power Electronics & AC Drives – B.K. Bose, Pearson, First edition
2. Electric Motor Drives: Modeling, Analysis and Control – R. Krishnan – Prentice Hall
3. Vector Control of Electric Drives: Peter Vas, Oxford Publishers.

REFERENCE BOOKS:

1.Power Semiconductor Controlled Drives- Dubey G. K, Prentice Hall International Edition 1989.

2. High-power Converters and AC Drives: Bin-Wu, IEEE Press, John Wiley &Sons

3. Simulation of Power Electronic Circuits: M. B. Patil, V. Ramanarayanan, V.T. Ranganathan, Narosa Publications, 2013.

4. Permanent Magnet Synchronous and Brushless DC motor Drives- R.Krishnan, CRC Press 2009.

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CO PO and PSO mapping:

ADVANCED ELECTRIC DRIVES (Code: 18EED44)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design controllers for closed-loop operation of separately excited DC motor drives.	3	2	-	2	-	-	-	-	-	-	-	2	-	2	-
CO2	Develop high performance IM using principles of Scalar control and Direct Torque Control.	3	3	-	3	-	-	-	-	-	-	-	3	-	-	3
CO3	Develop Vector controlled Induction Motor drives and PMSM drives.	3	-	3	3	2	2	3	-	-	-	-	2	-	-	-
CO4	Implement control schemes for BLDC and Switched Reluctance Motor drives.	3	3	-	3	-	3	-	-	-	2	-	2	-	3	-

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ENERGY STORAGE SYSTEMS

IV-B.Tech VI-Sem ester (Code:18EED51)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course objectives: To make the students

CO1:To understand the various types of energy storage technologies and thermal storage system.

CO2:To learn the concepts and types of batteries.

CO3: To make the students to get understand the concepts of Hydrogen and Biogas storage.

CO4:To provide the insights on Flywheel and compressed energy storage systems.

Courseoutcomes: Attheendofthiscourse,studentswillbeableto

CLO1: Identify the energy storage technologies and thermal storage systems.

CLO2: Recognize the concepts and types of batteries.

CLO3: Diagnose the principle operations of Hydrogen and Biogas storage.

CLO4:Analyze the concepts of Flywheel and compressed energy storage systems

UNIT-I

INTRODUCTION: Necessity of energy storage – types of energy storage – comparison of energy storage technologies – Applications

THERMAL STORAGE SYSTEM: Thermal storage – Types – Modeling of thermal storage units – Simple water and rock bed storage system – pressurized water storage system

UNIT-II

ELECTRICAL ENERGY STORAGE SYSTEM: Fundamental concept of batteries – measuring of battery performance, charging and discharging of a battery, storage density, energy density, and safety issues. Types of batteries – Lead Acid, Nickel – Cadmium, Zinc Manganese dioxide and modern batteries for example (i) zinc-Air (ii) Nickel Hydride, (iii) Lithium Battery

UNIT-III

HYDROGEN AND BIOGAS STORAGE: Hydrogen storage options – compressed gas – liquid hydrogen – Metal Hydrides, chemical Storage, Biogas storage - comparisons. Safety and management of hydrogen and Biogas storage - Applications.

UNIT-IV

ALTERNATE ENERGY STORAGE TECHNOLOGIES: Flywheel, Super capacitors, Principles & Methods – Applications, Compressed air Energy storage, Concept of Hybrid Storage – Applications

TEXT BOOKS:

1. Ibrahim Dincer and Mark A. Rosen, Thermal Energy Storage Systems and Applications, John Wiley& Sons 2002
2. S.Kalaiselvam and R.Parameshwaran., "Thermal Energy Storage Technologies for Sustainability system Design, assessment and Applications",Elsevier publications (2014)
4. Energy Storage for Sustainable microgrid- David Wenzhong Gao., Elsevier publication (2015).
5. Fuel cell systems Explained, James Larminie and Andrew Dicks, Wiley publications, 2003.

REFERENCES:

1. Ibrahim, Hussein, Adrian Ilinca, and Jean Perron. "Energy storage systems—Characteristics and comparisons." Renewable and sustainable energy reviews 12, no. 5 (2008): 1221-1250.
2. Electrochemical technologies for energy storage and conversion, Ru-shiliu, Leizhang, Xueliang sun, Wiley publications, 2012

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INDUSTRIAL ELECTRICAL SYSTEMS

IV B.Tech – VIII Semester (Code: 18EED52)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CO2: Understand various components of industrial electrical systems.

CO3: Analyze and select the proper size of various electrical system components.

CO4: Solve problems involving with different AC and DC sources in electrical circuits.

Course Outcomes: Students will be able to

CLO1: Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.

CLO2: Understand various components of industrial electrical systems.

CLO3: Analyze and select the proper size of various electrical system components.

CLO4: Solve problems involving with different AC and DC sources in electrical circuits.

UNIT - I

Electrical System Components: LT system wiring components, selection of cables, wires, switches, distribution box, metering system, Tariff structure, protection components- Fuse, MCB, MCCB, ELCB, inverse current characteristics, symbols, single line diagram (SLD) of a wiring system, Contactor, Isolator, Relays, MPCB, Electric shock and Electrical safety practices.

Residential and Commercial Electrical Systems: Types of residential and commercial wiring systems, general rules and guidelines for installation, load calculation and sizing of wire, rating of main switch, distribution board and protection devices, earthing system calculations, requirements of commercial installation, deciding lighting scheme and number of lamps, earthing of commercial installation, selection and sizing of components.

UNIT - II

Illumination Systems: Understanding various terms regarding light, lumen, intensity, candle power, lamp efficiency, specific consumption, glare, space to height ratio, waste light factor, depreciation factor, various illumination schemes, Incandescent lamps and modern luminaries like

CFL, LED and their operation, energy saving in illumination systems, design of a lighting scheme for a residential and commercial premises, flood lighting.

UNIT - III

Industrial Electrical Systems I: HT connection, industrial substation, Transformer selection, Industrial loads, motors, starting of motors, single line diagram, Cable and Switchgear selection, Lightning Protection, Earthing design, Power factor correction – kVAR calculations, type of compensation, Introduction to PCC, MCC panels. Specifications of LT Breakers, MCB and other LT panel components.

UNIT – IV

Industrial Electrical Systems II: DG Systems, UPS System, Electrical Systems for the elevators, Battery banks, Sizing the DG, UPS and Battery Banks, Selection of UPS and Battery Banks.

Industrial Electrical System Automation: Study of basic PLC, Role of in automation, advantages of process automation, PLC based control system design, Panel Metering and Introduction to SCADA system for distribution automation.

TEXT BOOKS:

1. H. Joshi, “Residential, “Commercial and Industrial Electrical Systems”, McGraw Hill Education, 2007.
2. K. B. Raina, “Electrical Design, Estimating & Costing”, New age International, 2017.
3. J. B. Gupta, “A Course in Electrical Installation Estimating and Costing”, S.K. Kataria & Sons, 2013.

REFERENCE BOOKS:

1. Surjit Singh, “Electric Estimating and Costing”, Dhanpat Rai and Co., 2016.
2. S. L. Uppal and G. C. Garg, “Electrical Wiring, Estimating & Costing”, Khanna publishers, 2008.

CO PO and PSO mapping:

Industrial Electrical Systems 18EED52		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the electrical wiring systems for residential, commercial and industrial consumers, representing the systems with standard symbols and drawings, SLD.	3	2	2	-	-	2	-	-	-	-	-	-	3	2	-
CO2	Understand various components of industrial electrical systems.	3	2	2	-	-	2	-	-	-	-	-	-	3	2	-
CO3	Analyze and select the proper size of various electrical system components.	3	2	2	-	2	2	-	-	-	-	-	-	3	2	-
CO4	Solve problems involving with different AC and DC sources in electrical circuits.	3	2	2	-	2	-	-	-	-	-	-	-	3	2	-

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DIGITAL CONTROL SYSTEMS

IVB.Tech – VIII Semester (Code: 18EED53)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Prerequisites: Mathematics, Physics, Control Systems

Course Objectives: To make the students

CO1: Describe the concepts of digital control systems and assemble various components associated with it and usage of Z-transformations.

CO2: Calculate the difference equations in Discrete-Time control system and representation of discrete time control system using state space analysis

CO3: Assess controllability, observability and stability of control systems.

CO4: Create discrete time control systems by conventional methods and state feedback controllers

Course Outcomes: Students will be able to

CLO1: Understand z–transformations and their role in the mathematical analysis of different systems.

CLO2: Analyze state space models of discrete time systems.

CLO3: Evaluate stability analysis after determine the controllability and Observability of discrete time systems

CLO4: Design controller for discrete systems in conventional methods as well as state variable analysis methods.

UNIT – I

Sampling and Reconstruction: Introduction, Examples of Data Control Systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations. **The Z – Transforms:** Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms

UNIT – II

Z-Plane Analysis of Discrete-Time Control System: Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

State Space Analysis of Discrete time systems: State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State

transition matrix and it's Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

UNIT – III

Controllability and Observability: Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function.

Stability Analysis: Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stablility test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

UNIT – IV

Design of Discrete Time Control System by Conventional Methods: Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

State Feedback Controllers and Observers: Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman's formula. State Observers – Full order and Reduced order observers.

TEXT BOOKS:

1. K. Ogata, Discrete-Time Control systems, Pearson Education/PHI, 2nd Edition, 1995.
2. V. I. George, C. P. Kurian, Digital Control Systems, Cengage Learning, 2012.
3. M. Gopal, Digital Control Engineering, New Age Int. Pvt. Ltd., 2014.

REFERENCE BOOKS:

1. Kuo, Digital Control Systems, Oxford University Press, 2nd Edition, 2003.
2. M. Gopal, Digital Control and State Variable Methods, 2nd Edition, TMH, 2006.
3. M. Sami Fadali Antonio Visioli, Digital Control Engineering Analysis and Design, Academic Press, 2013.

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CO PO and PSO mapping:

Control Systems (18EE502)		**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**	**PSO3**
CO1	Understand z–transformations and their role in the mathematical analysis of different systems.	3	1	-	-	-	-	-	-	1	-	-	-	3	1	-
CO2	Analyze state space models of discrete time systems.	3	2	2	-	-	-	-	-	1	-	-	-	3	2	-
CO3	Evaluate stability analysis after determine the controllability and Observability of discrete time systems	3	2	3	-	-	-	-	-	1	-	-	-	3	2	-
CO4	Design controller for discrete systems in conventional methods as well as state variable analysis methods. .	3	2	3	-	-	-	-	-	1	-	-	-	3	3	-

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WAVELET TRANSFORMS

IV B.Tech – VIII Semester (Code: 18EED54)

Lectures	4	Tutorial	0	Practical	0	Credits	3
Continuous Internal Assessment			50	Semester End Examination (3 Hours)			50

Course Objectives: To make the students

CO1: Understand the fundamental of signal decomposition using Fourier transform, Short Time Fourier Transform and Wavelet Transform.

CO2: Analyze the signals using discrete wavelet transform.

CO3: Understand the concept of multi-resolution analysis.

CO4: Explain the wavelet reconstruction and applications of wavelet.

Course Outcomes: After completion of this course students will be able to

CLO1: Explain the signal decomposition using Fourier transform, Short Time Fourier Transform and Wavelet Transform.

CLO2: Analyze the signals using discrete wavelet transform.

CLO3: Apply multiresolution analysisto the signals for decomposition.

CLO4: Explain the wavelet reconstruction and applications of wavelet.

UNIT I

Fundamentals of signal decomposition: Stationary and non-stationary signals. brief overview of Fourier transforms, Short-time Fourier transform (STFT). Introduction to wavelets, continuous wavelet transform - definition - scaling – shifting - scale and frequency. CWT as a correlation, time frequency resolution.

UNIT II

Discrete Wavelet Transform: Introduction to the DWT and orthogonal wavelet decomposition. One Stage filtering, Approximation and Details, Filter bank analysis. Multi resolution analysis. orthogonal wavelet decomposition based on the Haar wavelet – digital filter implementation of the Haar wavelet decomposition (Mallat's algorithm).

UNIT III

Multi Resolution Analysis: Construction of a general orthonormal MRA, formal definition, implication of the dilation equation and orthogonality. Introductory concepts of biorthogonal wavelet basis and wavelet packet synthesis. Two-dimensional wavelet decomposition, regularity, vanishing moments. Multilevel Decomposition, Number of levels

UNIT IV

Wavelet reconstruction: Reconstruction filter, Reconstructing Approximations and details, Multilevel Reconstruction. Signal energy, wavelet-based energy, and power spectra.

Typical Applications: Signal denoising, fault detection and classifications.

TEXT BOOKS:

1. Rao R.M. & Bopardikar A.S., "Wavelet Transforms-Introduction to Theory and Applications", Addison-Wesley, 1998.
2. K P Soman and K. I. Ramachandran, ―Insight into Wavelets from theory to practice, Prentice Hall of India, 2005.
3. Don Hong (Author), Jianzhong Wang (Author), Robert Gardner (Author), Real Analysis with an Introduction to Wavelets and Applications, Academic Press; 1 edition, 2004.

REFERENCE BOOKS:

1. James S. Walker , "A Primer on Wavelets and Their Scientific Applications", Chapman and Hall/CRC, 2 edition, 2008.
2. C S Burrus, A Gopinath, and Haitao Guo, "Introduction to wavelets and wavelet transforms", Pearson, 1st Edition, 1997.
3. S.V. Narasimhan (Author), Nandini Basumallick (Author), S. Veena (Author), Introduction to Wavelet Transform: A Signal Processing Approach, Alpha Science; 1 edition, 2011.

CO PO and PSO mapping:

Wavelet Transforms (18EED52)		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Understand the fundamental of signal decomposition using Fourier transform, Short Time Fourier Transform and Wavelet Transform.	3	2	2	-	2	-	-	-	-	-	-	-	3	-	-
CO2	Analyze the signals using discrete wavelet transform.	3	2	2	-	2	-	-	-	-	-	-	-	3	-	-
CO3	Understand the concept of multi-resolution analysis.	3	2	2	-	2	-	-	-	-	-	-	-	3	-	-
CO4	Explain the wavelet reconstruction and applications of wavelet.	3	3	3	2	3	-	-	-	-	-	-	-	3	-	-

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