Curriculum and Syllabus

B.Tech

Electrical and Electronics Engineering

(Four Year Full Time)

Regulation 2017

(Based on OBE)

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





Department Vision and Mission

VISION

To become a leader in providing education, training and research in the field of Electrical and Electronics Engineering to the aspiring graduates to be competent in their profession and render best service to the society.

MISSION

The missions of the Electrical and Electronics Engineering department are

- DM 1: To provide affordable, quality undergraduate and graduate education in the areas of electrical engineering.
- DM 2: To provide service to the profession, the university, the community, and society
- DM 3: To conduct scholarly research at the frontiers of electrical engineering.
- DM 4: To instill our graduates the need for life-long learning
- DM 5: To promote personal and intellectual growth to reinforce a commitment to ethical and professional practices.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





Programme Educational Objective (PEO)

PEO1	Our Graduates are professionally competent and apply the concept of
	mathematics, science and engineering to solve problem in Electrical and
	Electronics Engineering and related fields.
	Our Graduates stay relevant in their chosen profession through lifelong learning
PEO2	and demonstrate social and ethical responsibility.

Graduate Attributes (GAs)

- Knowledge base for Engineering: Demonstrate competence in mathematics, natural sciences, engineering fundamentals and specialized engineering knowledge appropriate to the programme.
- 2. Analytical Skills: Identify, formulate, analyze and solve diverse engineering problems.
- 3. **Design:** Solution for complicated open–ended engineering problems and design the components with appropriate standards to meet specified needs with proper attention to public health, safety, environment and society.
- 4. **Experimental Investigation:** Technical skills to conduct investigation, interpretation of observed data and provide solution for multifaceted problems.
- 5. Modern Engineering tools usage: Acquire, select, manipulate relevant techniques, resources and advanced engineering ICT tools to operate simple to complex engineering activities.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 – 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





- 6. **Impact of engineering on society:** Provide a product / project for use by the public towards their health, welfare, safety and legal issues to serve the society effectively.
- 7. Environment and Sustainability: Design eco-friendly and sustainable products in demonstrating the technology development to meet present and future needs.
- 8. **High Ethical Standards:** Practice ethical codes and standards endorsed by professional engineers.
- 9. Leadership and team work: Perform as an individual and as a leader in diverse teams and in multi-disciplinary scenarios.
- 10. **Communication Skills:** Professional communication with the society to comprehend and formulate reports, documentation, effective delivery of presentation and responsible to clear instructions.
- 11. **Project management and Finance:** Appropriate in incorporating finance and business practices including project, risk and change management in the practice of engineering by understanding their limitations.
- 12. **Life-long learners:** Update the technical needs in a challenging world in equipping themselves to maintain their competence.





Programme Outcomes (POs)

- 1. Apply the knowledge of mathematics, science, engineering fundamentals, to the solution of complex problems in Electrical and Electronics Engineering.
- 2. Identify, formulate, research literature and analyze complex Electrical and Electronics Engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
- 3. Design solutions for complex Electrical and Electronics Engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
- 4. 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, related to Electrical and Electronics Engineering.
- 5. Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex Electrical and Electronics Engineering activities with an understanding of the limitations.
- 6. 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.
- 7. Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.





- 8. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
- 9. Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
- 10. Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
- 11. 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.
- 12. 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

Program Specific Outcomes (PSOs)

	Able to use the knowledge of power engineering in dynamic and challenging
PSO1	environment for the research
	Able to identify and apply scientific theories, ideas, methodologies and the new
PSO2	cutting edge Technologies in renewable energy engineering

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

Curriculum and Syllabus

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

CURRICULUM 2017

SEMESTER I

Code No.	Course Title	L	Т	Р	С
XMA101	Algebra, Differential Calculus and their Applications	3	1	0	4
XCP102	Computer Programming	3	0	1	4
XBW103	Mechanical and Civil Engineering Systems	3	1	1	5
XAC104	Applied Chemistry	3	1	1	5
XGS105	Study Skills	1	0	0	1
XUM106	Human Ethics, Values, Rights and Gender Equality	1	0	0	1
			3	3	20

SEMESTER II

Code No.	Course Title	L	Т	Р	С
XMA201	Calculus and Laplace Transforms	3	1	0	4
XME202	Engineering Mechanics	3	1	0	4
XBE203	Electrical and Electronics Engineering Systems	3	1	1	5
XAP204	Applied Physics	3	1	1	5
XME205	Engineering Graphics	2	0	1	3
XGS206	Speech Communication	1	0	0	1
		15	4	3	22

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

SEMESTER III

Code No.	Course Title	L	Т	Р	С
XMA301	Transforms and Partial Differential Equations	3	1	0	4
XEE302	Electric Circuit Analysis	3	1	0	4
XEE303	Object Oriented Programming	3	0	1	4
XEE304	Electrical Machines – I	3	1	1	5
XEM305	Material Science	3	0	0	3
XEP306	Entrepreneurship Development	2	0	0	2
XGS307	Interpersonal Communication (Audit Course)	0	0	0	0
XEE308	In-plant Training – I	0	0	0	1
		17	3	2	23

SEMESTER IV

Code No.	Course title	L	Т	Р	С
XOR401	Operations Research	3	0	0	3
XEE402	Transmission & Distribution of Electrical Power	3	0	0	3
XEE403	Electronic Devices and Circuits	3	0	1	4
XEE404	Electrical Machines – II	3	1	1	5
XEE405	Electromagnetic Field Theory	3	1	0	4
XUM406	Economics for Engineers	3	0	0	3
XGS407	Technical Communication	1	0	0	1
XEC408	Extracurricular activities - NCC/NSS/YRC/RRC/Sports	-	-	-	-
		19	2	2	23

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

SEMESTER V

Code No.	Course Title	L	Т	P	С
XMA501	Numerical Methods	2	1	0	3
XEE502	Power System Analysis	2	1	0	3
XEE503	Power Electronics	3	0	1	4
XEE504	Control System Engineering	3	1	1	5
XEE***	Electives – 1	2	1	0	3
XUM506	Total Quality Management	3	0	0	3
XGS507	Business Communication	1	0	0	1
XEE508	In-plant Training – II	0	0	0	1
		16	4	2	23

SEMESTER VI

Code No.	Course Title	L	Т	Р	С
	·				
*** OE1	Open Elective – I	3	0	0	3
XEE602	Protection and Switchgear	3	0	0	3
XEE603	Design of Electrical Apparatus	3	1	0	4
XEE604	Digital Logic Circuits	3	1	1	5
XEE605	Power System Operation and Control	3	0	1	4
XEE***	Elective – 2	3	0	0	3
XUM607	Environmental Studies (Audit Course)	0	0	0	0
XGS608	Academic Writing	0	0	0	0
XEE***	Minor Course - I	1	0	0	1
		19	2	2	23

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

SEMESTER VII

Code No.	Course Title	L	Т	Р	С
***OE2	Open Elective – II	3	0	0	3
XEE702	Microprocessor and Microcontrollers	3	0	1	4
XEE703	Measurement and Instrumentation	3	1	1	5
XEE ***	Elective – 3	3	1	0	3
XEE ***	Elective – 4	3	0	0	3
XUM 706	Cyber Security (Audit Course)	0	0	0	0
XEE707	Project Phase – I	0	0	2	2
XGS708	Career Development Skills (Audit Course)	0	0	0	0
XEE709	In-plant Training – III	0	0	0	2
XEE***	Minor Course - II	1	0	0	1
		16	1	4	23

SEMESTER VIII

Code No.	Course Title	L	Т	Р	C
	-			-	-
*** OE3	Open Elective – III	3	0	0	3
XEE ***	Elective – 5	3	0	0	3
XEE ***	Elective – 6	3	0	0	3
XEE ***	Project Phase – II	0	0	12	12
XEE***	Minor Course - III	1	0	0	1
		10	0	12	22

OVER ALL CREDITS = 179 CREDITS

Note:

- ▶ In plant Training II is for a period of 21 days at the time of summer vacation.
- ▶ In plant Training III is for a period of 45 days at the time of summer vacation.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ELECTIVE GROUP - 1:

Code No.	Course Title	L	Т	Р	С
E11	Linear Integrated Circuits	2	1	0	3
E12	Signals and Systems	2	1	0	3
E13	Control and Maintenance of Electrical Machines	2	1	0	3
E14	Digital Signal Processing	2	1	0	3

ELECTIVE GROUP - 2:

Code No.	Course Title	L	Т	Р	С
E21	Solid State Drives	3	0	0	3
E22	Power Plant Engineering	3	0	0	3
E23	Power Electronics for Renewable Energy Systems	3	0	0	3
E24	Wind Energy Conversion Systems	3	0	0	3

ELECTIVE GROUP - 3:

Code No.	Course Title	L	Т	Р	С
E31	Bio-Medical Instrumentation	3	0	0	3
E32	Electrical Energy Utilization and Conservation	3	0	0	3
E33	Pollution performance Analysis of Electrical Systems		0	0	3
E34	Energy Efficient Buildings	3	0	0	3

ELECTIVE GROUP - 4:

Code No.	Course Title	L	Т	Р	С
E41	Special Electrical Machines	3	0	0	3
E42	Energy Management and Auditing	3	0	0	3
E43	Electrical Safety	3	0	0	3
E44	Sustainable Energy Utilization	3	0	0	3

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ELECTIVE GROUP - 5:

Code No.	Course Title	L	Т	Р	С
E51	Electric Vehicles and Power Management	3	0	0	3
E52	Advanced Control System Engineering	3	0	0	3
E53	Smart Grids	3	0	0	3
E54	Fundamentals of Nano Science	3	0	0	3

ELECTIVE GROUP - 6:

Code No.	Course Title	L	Т	Р	С
E61	High Voltage Engineering	3	0	0	3
E62	2 Disaster Management		0	0	3
E63	63 Electrical Power Quality		0	0	3
E64	Solar and Energy Storage System	3	0	0	3

OPEN ELECTIVES:

Code No.	Course Title	L	Т	Р	С
OE1	Industrial Automation	3	0	0	3
OE2	Energy Management and Auditing	3	0	0	3
OE3	Renewable Energy Technology	3	0	0	3

MINOR (ONE CREDIT) COURSES:

Code No.	Course Title	L	Т	Р	С
OC1	Electrical Safety	1	0	0	1
OC2	Microgrid	1	0	0	1
OC3	Distributed Generation		0	0	1
OC4	Energy Auditing		0	0	1
OC5	OC5 Personality Development		0	0	1
OC6	Industrial Lectures	1	0	0	1

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ALGEBRA, DIFFERENTIAL CALCULUS AND APPLICATIONS

Cours	e Outcomes(XMA 101):	Domain	Level
CO1	<i>Explain</i> the Properties of Eigen values and Eigen vectors of the matrices, To <i>Use</i> orthogonal and similarity transformation and to <i>Change</i> the quadratic form to Canonical form	Cognitive	Understanding Understanding Understanding
CO2	<i>Define</i> and <i>Compute</i> the radius and circle of curvature in Cartesian and polar coordinates and to <i>Explain</i> evolutes and envelopes.	Cognitive	Remembering Understanding Understanding
CO3	<i>Explain</i> the convergence of series of positive terms, alternating series, and power series using tests of convergence	Cognitive	Understanding
CO4	<i>Compute</i> total and partial derivatives, Taylor series expansions of functions and the extremum of functions and their applications.	Cognitive	Understanding
CO5	<i>Solve</i> the linear equations of second and higher order with constant and variable coefficients and simultaneous first order differential equations and to <i>Apply</i> Method of variation of parameters to <i>Solve</i> the differential equation.	Cognitive	Applying Applying Applying

SUBCODE	SUBCODE SUB NAME		Т	P	С	
XMA 101 ALGEBRA, DIFFERENTIAL CALCULUS AND		3	1	0	4	
THEIR APPLICATIONS						
C:P:A = 3:0:0		L	Т	P	Η	
		3	2	0	5	
UNIT I MATR	ICES				15	
Eigen values and - Cayley-Hamilto Orthogonal matrix Reduction of quad	Eigenvectors of a real matrix –Properties of Eigen values n theorem (excluding proof) - Similarity transformation x - Orthogonal transformation of a symmetric matrix to ratic form to Canonical form by Orthogonal transformation	and (Co o dia on.	Eigen oncept igona	1 vec t only 1 for	tors y) – m –	
UNIT IIGEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS						
Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involutes and evolutes – Envelopes – Properties of envelopes and evolutes.						





think • innovate • transform

15

UNIT IIIINFINITE SERIES

Sequences – Convergence of series – General properties – Series of positive terms – Tests of convergence (Comparison test, Integral test, Comparison of ratios and D'Alembert's ratio test – Statement of theorems and problems only) – Alternating series – Series of positive and negative terms – Absolute and conditional convergence – Power Series – Convergence of exponential, logarithmic and Binomial Series (Simple problems only)

UNIT IV FUNCTIONS OF SEVERAL VARIABLES

Functions of two variables – Partial derivatives – Total differentiation – Taylor's expansion – Maxima and Minima – Constrained maxima and minima – Lagrange's Multiplier method – Jacobian Determinants.

UNIT VORDINARY DIFFERENTIAL EQUATIONS AND APPLICATIONS

15

15

Linear equations of second and higher order with constant and variable coefficients (Euler's and Legendre's equations) – Simultaneous first order linear equations with constant coefficients – Method of variation of parameters - Applications to electrical circuit problems.

LECTURE	TUTORIAL	TOTAL
45	30	75

TEXT BOOKS

- 1) Grewal, B.S. Higher Engineering Mathematics, 40th Edition, Khanna Publication, Delhi, 2007.
- 2) Kreyszig, E, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Son(Asia) Ltd, Singapore, 2001.

REFERENCE BOOKS

- 1. Bali N.P and Narayana lyengar, Engineering Mathematics, Laxmi Publications (P) Ltd, New Delhi, 2003.
- 2. Veerarajan T, Engineering Mathematics Fourth Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2005.
- 3. Kandasamy P., Thilagavathy K, and Gunavathy K, Engineering Mathematics Volume I, II and III, S. Chand & Co, New Delhi, 2005.
- 4. Venkataraman M. K, Engineering Mathematics, Volume I and II Revised enlarge Fourth Edition, The National Publishing Company, Chennai, 2004.

E REFERENCE BOOKS

www.nptel.ac.in

Advanced Engineering Mathematics Prof. Pratima Panigrahi

Department of Mathematics Indian Institute of Technology, Kharagpur.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

COs versus GAs mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

0 -No relation 1 - Low relation 2 - Medium relation 3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

COMPUTER PROIGRAMMING

Cours	se Outcomes(XCP102):	Domain	Level
CO1	Define programming fundamentals and Solve simple programs using I/O statements.	Cognitive Psychomotor	Remember Guided Response
CO2	Define syntax and write simple programs using control structures and arrays	Cognitive Psychomotor	Remember Guided Response
CO3	Explain and write simple programs using functions and pointers	Cognitive Psychomotor	Understand Guided Response
CO4	Explain and write simple programs using structures and unions	Cognitive Psychomotor	Understand Guided Response
CO5	Explain and write simple programs using files and Build simple projects	Cognitive Psychomotor	Understand Guided Response

SUBCODE	SUB NAME	L	Т	Р	С			
XCP102	COMPUTER PROGRAMMING	3	0	1	4			
C:P:A = 3:1:0		L	Т	Р	Η			
		3	0	2	5			
UNIT I PROGRAMMING FUNDAMENTALS AND INPUT /OUTPUT STATEMENTS 9+6								

Theory

Program – Flowchart – Pseudo code – Software – Introduction to C language – Character set – Tokens: Identifiers, Keywords, Constants, and Operators – sample program structure -Header files – Data Types - Output statements – Input statements.

Practical

- 1. Program to display a simple picture using dots.
- 2. Program for addition of two numbers
- 3. Program to swap two numbers
- 4. Program to solve any mathematical formula.

UNIT II CONTROL STRUCTURE AND ARRAYS	9+6
Fheory	

Control Structures – Conditional Control statements: Branching, Looping - Unconditional control structures: switch, break, continue, goto statements – Arrays: One Dimensional Array – Declaration – Initialization – Accessing Array Elements – Searching – Sorting – Two Dimensional arrays - Declaration – Initialization – Matrix Operations – Multi Dimensional Arrays - Declaration – Initialization. Storage classes: auto – extern – static. Strings: Basic operations on strings.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

Practical

- 1. Program to find greatest of 3 numbers using Branching Statements
- 2. Program to display divisible numbers between n1 and n2 using Looping Statement
- 3. Program to remove duplicate element in an array.
- 4. Program to perform string operations.

······································	
UNIT III FUNCTIONS AND POINTERS	9+6
Theory	
Functions: Built in functions - User Defined Functions - Parameter passing meth	10ds -
Passing arrays to functions - Recursion - Programs using arrays and functions. Poir	iters -
Pointer declaration - Address operator - Pointer expressions & pointer arithmetic - Po	ointers
and function - Call by value - Call by Reference - Pointer to arrays - Pointers and struct	ures -
Pointers on pointer.	
Practical	
1. Program to find factorial of a given number using four function types.	
2. Programs using Recursion	
3. Programs using Pointers	
UNIT IV STRUCTURES AND UNIONS	9+6
Theory	
Structures and Unions - Giving values to members - Initializing structure - Function	is and
structures - Passing structure to elements to functions - Passing entire function to funct	ions -
Arrays of structure - Structure within a structure and Union.	
Practical	
1. Program to read and display student mark sheet Structures with variables	
2. Program to read and display student marks of a class using Structures with arrays	s.
3. Program to create linked list using Structures with pointers.	
UNIT V FILES	9+6

UNIT V FILES Theory

File management in C - File operation functions in C - Defining and opening a file - Closing a file - The getw and putw functions - The fprintf & fscanf functions - fseek function – Files and Structures.

Practical

- 1. Program for copying contents of one file to another file.
- 2. Program using files using structure with pointer.

LECTURE	TUTORIAL	TOTAL
45	30	75

TEXT BOOKS

- 1. Byron Gottfried, "Programming with C", III Edition, (Indian Adapted Edition), TMH publications, 2010.
- 2. Yeshwant Kanethker, "Let us C", BPB Publications, 2008.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

REFERENCE BOOKS

- 1. Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Education Inc. (2005).
- **2.** Behrouz A. Forouzan and Richard. F. Gilberg, "A Structured Programming Approach Using C", II Edition, Brooks–Cole Thomson Learning Publications, 2001.
- 3. Johnsonbaugh R. and Kalin M., "Applications Programming in ANSI C", III Edition, Pearson Education India, 2003.
- 4. https://iitbombayx.in/courses/IITBombayX/BMWCS101.1x/2015_T1/courseware

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3	2			2							2
CO2	3	2			2							2
CO3	3	2	1	2	2							2
CO4	3	2	1	2	2							2
CO5	3	2	1		2			1			2	2

Mapping of COs with GAs:

	GA	GA1	GA1	GA1								
	1	2	3	4	5	6	7	8	9	0	1	2
Origina 1	15	10	3	4	10			1			2	10
Scaled to 0,1,2,3 scale	3	2	1	1	2			1			1	2

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

MECHANICAL AND CIVIL ENGINEERING SYSTEMS

Cours	se Outcomes(XBW103):	Domain	Level
CO1	Define and visualize the working principles of the various	Cognitive	Knowledge
	boilers, turbines and engines	Psychomotor	Perception
CO2	Differentiate and auscultate the measurements by using	Cognitive	Comprehension
	various metrology instruments	Psychomotor	Guided response
CO3	Categories and illustrate the various metal forming,	Cognitive	Synthesis
	joining and cutting processes	Psychomotor	Mechanism
CO4	<i>Characterize and determine</i> the quality of the good Building materials; and measure linear and angular dimensions	Cognitive Psychomotor	Knowledge Guided response
CO5	Summarize and palpate the components of a substructures	Cognitive	Evaluation
	and super structures.	Psychomotor	Guided response

SUBCODE	SUB NAME	L	Т	Р	С
XBW103	MECHANICAL AND CIVIL ENGINEERING	3	1	1	5
	SYSTEMS				
C:P:A = 3:1:0		L	Т	Р	Η
		3	2	2	7
UNIT I Basics	s of Thermal and Energy Systems		•	9+6+6	5

Introduction to Mechanical Engineering – Streams – Thermal, Design, and Manufacturing Conventional and non conventional sources of energy – Heat energy – Modes of heat transfer – Working principles of Boilers and Turbines – Classification of IC Engines – 4 stroke and 2 stroke engines – Petrol and diesel engines – Performance and heat balance – Working principles of hydel, steam and nuclear power plants.

Practical:

Petrol engine performance – BHP

Diesel engine performance – BHP

Demonstration of refrigeration and air conditioning unitsUNIT Fundamentals of Machine Elements and Measurements9+6+6

Engineering materials – Machine elements – fasteners and support systems – Belt drives – Types – Velocity ratio and Length of belt – Gear drives – Types – Velocity ratio. Principle of measurements – Accuracy – Precision – Errors – Measuring instruments – Scale – Vernier Caliper – Micrometer – Slip gauges – Spirit level.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

9+6+6

Practical:

Measurements using Vernier Caliper, Micrometer, Slip gauges and Spirit level.

Demonstration of transmission system in machines and suspension system in automobiles.

TINIT	III Flows on 4	a of Mounto due		
UNII	III Element	s of Manufactu	ring	
			8	

Manufacturing processes – Classification – Principles of metal forming – forging, moulding, and casting – Principles of metal joining – welding, soldering and brazing. Machining – turning, drilling, milling and grinding – Machining time and material removal rate.

Practical:

Exposure to workshop tools

Fitting exercises: Square and triangle

Simple turning and drilling

Demonstration of welding and mould preparation

UNIT IV Surveying and Construction Materials

9+6+6

9+6+6

Surveying: Definition – Survey Instruments – Classification of Survey – Linear and Angular Measurements – Measurement of area – Illustrative Examples. Construction Materials: Bricks – Stones – Timber – Steel – Cement – Sand – Aggregates – Concrete

Practical: Surveying

UNIT Components and of Construction of Civil Structures

Substructure: Bearing capacity - Types of Foundation – Application – Requirement of good foundations. Superstructure: Brick masonry – Types of bond – Flooring – Beams – Columns – Lintels – Roofing – Doors and windows fittings – Introduction to bridges and dams – Building drawing

Practical: Building drawing, Carpentry, Plumbing.

	LECTURE	T & P	TOTAL
	45	30+30	105
TEXT BOOKS			

1. Dr. P.K. Srividhya, P. Pandiyaraj, S. Balamurugan, "Basic Civil and Mechanical Engineering", PMU Publications, Vallam, 2013.

- 2. Dr. B.C.Punmia, Ashok Kumar Jain, "Basic Civil Engineering", Laxmi Publications, New Delhi, 2003.
- 3. Dr. B.C.Punmia, "Surveying Volume I", Laxmi Publications, New Delhi, 2005

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

REFERENCE BOOKS

- 1. Venugopal K., Basic Mechanical Engineering, Anuradha Publications, Kumbakonam, 2007.
- 2. Shanmugam G. and Palanichamy M. S., "Basic Civil and Mechanical Engineering", Tata Mc Graw Hill Publishing Co., New Delhi, 3rd Edition, 2009.

Mapping of CO's with GA's:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	2	-	-	2	-	-	-	-	-	-	-	-
CO2	2			2		1	-	-	-	-	-	-
CO3		2			2	-	-	-	-	-	-	-
CO4		3		1		-	-	-	-	-	-	-
CO5	1	1			3	-	-	-	-	-	-	-
Total	5	6	-	5	5	1	-	-	-	-	-	-
Scale	2	3		2	2	1						

Scale : 1 - Low Relation

2 - Medium Relation

3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





APPLIED CHEMISTRY

Cours	se Outcomes(XAC104):	Domain	Level
CO1	<i>Identify</i> and <i>describe</i> the various water quality parameters and methods to purify water in contest with boilers and domestics usage.	Cognitive Psychomotor	Applying Keywords
CO2	<i>Explain</i> the fundamental principles of electrochemical reactions, its applications in redox reactions and calculate the different electrochemical processes.	Cognitive Psychomotor	Evaluating Keywords
CO3	<i>Interpret</i> thetypes of corrosion, <i>use and measure</i> its control by various methods including protective techniques.	Cognitive Affective Psychomotor	Understanding Receiving Mechanism
CO4	<i>Describe</i> , <i>Illustrate</i> and <i>Discuss</i> the generation of energy in batteries, nuclear reactors, solar cells, fuel cells and anaerobic digestion.	Cognitive Cognitive Affective	Remembering Understanding Responding
CO5	<i>Apply</i> and <i>measure</i> the different types of spectral techniques for quantitative chemical analysis and <i>list</i> nanomaterials for various engineering processes.	Cognitive Cognitive Psychomotor	Applying Evaluating Mechanism

COURSE CODE	COURSE NAME	L	Т	P	С
XAC104	APPLIED CHEMISTRY	3	1	1	5
C:P:A = 2.8:0.8 :0.4					
		L	Т	Р	Η
		3	2	2	7
Theory Part			•		.
UNIT IWATER TECHNOLOGY				7+	8 +9
Sources and types of water – water types and estimation of hardness (pro feed water – requirements – disadva external treatment – demineralization water treatment - Effluent treatment pr	quality parameters – BIS and ISO s blems) - alkalinity: types and estima intages of using hard water in boile n process – desalination using rever rocesses in industries	pecifi tion (p ers – i rse os	catio prob nter mos	ons- l lems) nal ti is –	hardness:) – boiler reatment, domestic

UNIT II ELECTROCHEMISTRY

Basic concepts of conductance – Kohlraush's law and conductometric titrations –electrode potentials– Nernst equation: derivation and problems - reversible and irreversible cells – electrolytic and electrochemical cells– emf and its measurements - types of electrodes-reference electrodes - primary and secondary - glass electrode - determination of pH using quinhydrone and glass electrodes - electrochemical series and its applications - Galvanic cells and concentration cells - potentiometric titrations - redox titrations.

UNIT III CORROSION AND PROTECTIVE COATINGS

Corrosion- causes- types-chemical, electrochemical corrosion (galvanic, differential aeration), corrosion in electronic devices, corrosion control - material selection and design aspects - electrochemical protection – sacrificial anode method and impressed current cathodic method. **Protective coatings**: paints- constituents and functions - electroplating of copper and gold, Electroless plating - Distinction between electroplating and electroless plating,

advantages of electroless plating, electroless plating of nickel and copper on PCB.

UNIT IV ENERGY STORAGE DEVICES AND NUCLEAR ENERGY12 + 7Energy storage devices - Batteries: Types - primary (dry cell, alkaline cells) and secondary
(lead acid, Ni-Cd and Lithium ion batteries) - Supercapacitors - Fuel cells-Hydrogen-Oxygen fuel
cell- Solar cells .Solar cells - Fuel cells-Hydrogen-Oxygen fuel

Nuclear energy: nuclear fission and fusion –chain reaction and its characteristics – nuclear energy and calculations (problems) – atom bomb –Nuclear reactor- light water nuclear power plant – breeder reactor- Weapon of mass destruction- nuclear, radiological, chemical and biological weapons. Disarmament - National and International Cooperation- Chemical Weapon Convention (CWC), Peaceful Uses of Chemistry. Bio fuels: biomethanation- anaerobic digestion process, biomass: sources and harness of energy.

UNIT V SPECTROSCOPY AND NANOCHEMISTRY

Electromagnetic spectrum - Lambert law and Beer-Lambert's law (derivation and problems) – molecular spectroscopy -UV- visible spectroscopy: electronic transitions - chromophores and auxochromes – instrumentation (block diagram) - applications – IR spectroscopy: principle – fundamental modes of vibrations – calculations of vibrational frequency – IR spectrophotometer instrumentation (block diagram) – applications of IR spectroscopy.

Nanochemistry - Basics - distinction between molecules, nanoparticles and bulk materials; sizedependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis ; properties and applications of nano materials-Buckminister fullerenes, CNT^{*}S(Single walled carbon nano tubes and Multi-walled carbon tubes)-Graphene- advantages and applications.



8+5 +15

10 .

9 +6 +3

9 + 4 + 3





think • innovate • transform

30 hrs

TEXT BOOKS

1. Jain and Jain , "A Text book of Engineering Chemistry", Dhanapatrai Publications, New Delhi, 2011.

- 2. Gadag and NityanandaShetty, "Engineering Chemistry", I.K International publishing House Pvt. Ltd, 2010.
- 3. P. Atkins, J.D. Paula, "Physical Chemistry", Oxford University Press, 2009.
- 4. S. S. Dara, S. S. Umare, "A Text Book of Engineering Chemistry", S. Chand Publishing, 2011
- 5. C.P. Poole and F.J. Owens, "Introduction to Nanotechnology", , Wiley, New Delhi ,2007.

REFERENCE BOOKS

- 1. Puri B R Sharma L R and Madan S Pathania, "Principles of Physical Chemistry", Vishal publishing Co., Edition 2004
- 2. Kuriocose, J C and Rajaram, J, "Engineering Chemistry", Volume I/II, Tata McGraw-Hill Publishing Co. Ltd. New Delhi, 2000

E Resources - MOOCs:

- 1. http://www.mooc-list.com/course/chemistry-minor-saylororg
- 2. https://www.canvas.net/courses/exploring-chemistry
- 3. http://freevideolectures.com/Course/2263/Engineering-Chemistry-I
- 4. http://freevideolectures.com/Course/3001/Chemistry-I
- 5. http://freevideolectures.com/Course/3167/Chemistry-II
- 6. http://ocw.mit.edu/courses/chemistry/

Laboratory Part

- 1. Determination of total hardness, temporary and permanent hardness of water by EDTA method.
- 2. Determination of alkalinity of water sample.
- 3. Determination of chloride content of water sample by Argentometric method.
- 4. Conductometric titration of a strong acid with a strong base.
- 5. Determination of strength of hydrochloric acid by pH metric method.
- 6. Conductometric precipitation titration using barium chloride and sodiumsulphate.
- 7. Determination of strength of iron by potentiometric method using dichromate.
- 8. Potentiometric acid-base titration using quinhydrone electrode.
- 9. Corrosion inhibition efficiency by weight loss method.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

Email: headeee@pmu.edu 10. Estimation of iron by colorimetric method.





REFERENCE BOOKS

- 1. Mendham, Denney R.C,. Barnes J.D and Thomas N.J.K., "Vogel's Textbook of Quantitative Chemical Analysis", 6th Edition, Pearson Education, 2004.
- 2. Garland, C. W.; Nibler, J. W.; Shoemaker, D. P. "Experiments in Physical Chemistry", 8th Ed.; McGraw-Hill: New York, 2003.
- 3. Sirajunnisa.A., Sundaranayagi.S.,Krishna.,Rajangam.R.,Gomathi.S., "Applied Chemistry Lab Manual", Department of Chemistry, PMU Press, Thanjavur, 2016.

E Resources - MOOCs:

1.http://freevideolectures.com/Course/2380/Chemistry-Laboratory-Techniques 2. http://freevideolectures.com/Course/2941/Chemistry-1A-General-Chemistry-Fall-2011 3.http://ocw.mit.edu/courses/chemistry/5-301-chemistry-laboratory-techniques

LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
45	30	30	105

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	3	3	3			1	2	1	1	1		2
CO2	2	1	0			1		1	1			1
CO3	3	3	3	2	2	1	2		1	1		1
CO4	3	3	2	2	2	1	2		1	1		1
CO5	2	2	1	1	1	1	1	1	1			1
Total	13	12	9	5	5	5	7	3	5	3		6
Scaled to 0,1,2,3 scale	3	3	2	1	1	1	2	1	1	1		2

Mapping of CO's with GA's:

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





STUDY SKILLS

Cours	se Outcomes(XGS105):	Domain	Level
CO1	Identify different strategies of reading and writing skills.	Cognitive	Applying
CO2	Make use of library skills in their learning process.	Cognitive	Applying
CO3	Apply different techniques to various types of material such as a novel, newspaper, poem, drama and other reading papers.	Cognitive	Applying
CO4	Ability to use visual aids to support verbal matters into languagediscourse.	Cognitive	Understanding
CO5	Prepares to face the written exam with confidenceand without any fear or tension.	Cognitive Psychomotor	Understanding Guided Response

				L	Т	Р	С
XGS 105		5		1	0	1	1
			STUDY SKILLS				
С	Р	Α		L	Т	Р	Η
1	1	0		1	0	2	3
UN	ITI	Iı	ntroduction to study skills; Learning Skills and Strategies of Lear	ning	; Cog	gnitive	5
		S	tudy skills and physical study skills, Library skills (How to	o use	e Lił	orary),	
		fa	amiliarization of library facilities by the librarian; familiariz	atior	n of	basic	
		c	ataloguing techniques, how to ransack the library etc.				
UN	UNITII Reference Skills, how to use the library facilities for research and to write						
		a	ssignments; how to find out reference books, articles, journal	ls an	d ot	her e-	
		le	earning materials; how to use a dictionary and thesaurus.				
UN	ITII	R	leading related study skills, Process of reading, various types of re	eadin	g ma	terials	5
		a	nd varied reading techniques; familiarization to materials writ	tten	by v	arious	
		a	uthors; features of scientific writing and familiarization to scien	tific	writi	ng by	
		re	enowned authors; note making skills				
UN	ITIV	V	Vriting related study skills; process of writing, characterist	ics c	of w	riting,	5
		d	iscourse analysis, use of visual aids, and note making and note tak	ing s	kills		
UN	ITV	E	exam preparation skills; anxiety reduction skills; familiarizatio	n wi	ith v	arious	5
		ty	ypes of exam/evaluation techniques etc.				

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

LANGUAGE LAB (Practical)	
Sounds of English Language; vowels, consonants, diphthongs, word stress, sentence stress,	5
intonation patterns, connected speech etc	
Vocabulary building – grammar, synonyms and antonyms, word roots, one-word	5
substitutes, prefixes and suffixes, idioms and phrases.	
Reading comprehension – reading for facts, meanings from context, scanning, skimming,	10
inferring meaning, and critical reading. Active listening, listening for comprehension etc.	
L=15 hrs P -25 hrs Library – 5 Total:45	5 Hrs
TEXT BOOKS	
Appropriate Chapters/Units from the following textbooks	
1. V.R. Narayanaswamy ,Strengthen Your Writing by (Orient Longman), 2000	
2. Ghosh, R N; Inthira, S R [Author], A Course in written English: New Delhi, 1978	
3. Jaya Sasikumar, Champa Tickoo, Writing With A Purpose, Published by Oxford	
University Press, 2000	
4. Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, 1979	
5. Paul Gunashekar M.L. Tickoo, Reading for Meaning, Published by S. Chand & Com	pany
Ltd. Sultan Chand & Company, 2000	
6. Bernard Hartley (Author), Peter Viney (Author) Streamline English: Departures (Oxf	ord
English) Paperback ,1990.	
7. Bernard Hartley (Author), Peter Viney (Author), Streamline English: Destinations, b	у,
Oxford : Oxford University Press, 1992.	
8. Bernard Hartley (Author), Peter Viney (Author), Streamline English Directions,	
(Oxford University Press 1982).	
REFERENCE BOOKS	
1. Jaya Sasikumar, Champa Tickoo, Writing With A Purpose, Oxford University	
Press Paper Back Language – English.	
Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, 1979.	
2. Reading for Meaning, Paul Gunashekar M.L. Tickoo, Published by S. Chand & Com	pany
Ltd. Sultan Chand & Company, 2000	
3. Susan Fawcett (Author)Evergreen: A Guide to Writing with Readings Paperba	ack –
January 4, 2013.	

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India





 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu

Mapping of COs with GAs:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
C01										2		
CO2										2		
CO3				2						1		
CO4												1
CO5										1	2	

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu



PERIYAR MANIAMMAI UNIVERSITY (Under Sec. 3 of UGC Act. 1956) • NAAC Accredited

think • innovate • transform

HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY

Cours	e Outcomes(XUM 106):	Domain	Level
CO1	Relate and Interpret the human ethics and human	Cognitive	Remember
	relationships	Cognitive	Understanding
CO2	Explain and Apply gender issues, equality and violence	Cognitive	Understanding
	against women	Cognitive	Applying
CO3	<i>Classify</i> and <i>Develop</i> the identify of human rights and their	Cognitive	Analyzing
	violations	Affective	Receiving
CO4	Classify and Dissect necessity of human rights and report	Cognitive	Understanding
	on violations.	Cognitive	Analyzing
CO5	<i>List</i> and respond to family values, universal brotherhood,	Cognitive	Remembering
	fight against corruption by common man and good	Affective	Respond
	governance.		

SUBCODE	SUB NAME	L	Т	Р	C
XUM 106	HUMAN ETHICS, VALUES , RIGHTS AND GENDER EQUALITY	2	0	0	1
C:P:A = 1.8:0:0.2		L	Т	Р	Η
		1+2 *	0	0	3
		*SS			
UNIT I HUN	MAN ETHICS AND VALUES				7

UNIT I HUMAN ETHICS AND VALUES [7] Human Ethics and values - Understanding of oneself and others- motives and needs- Social service, Social Justice, Dignity and worth, Harmony in human relationship: Family and Society, Integrity and Competence, Caring and Sharing, Honesty and Courage, Valuing Time, Co-operation, Commitment, Sympathy and Empathy, Self respect, Self-Confidence and Personality- Living in harmony at various levels.

UNIT II GENDER EQUALITY

Gender Equality - Gender Vs Sex -, Concepts, definition, Gender equity, equality, empowerment. Status of Women in India Social, Economical, Education, Health,

9

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660



transform

9

9

Phule to Women Empowerment.

UNIT III WOMEN ISSUES AND CHALLENGES

Women Issues and Challenges- Female Infanticide, Female feticide, Violence against women, Domestic violence, Sexual Harassment, Trafficking, Access to education, Marriage. Remedial Measures – Acts related to women: Political Right, Property Rights, Right to Education, Medical Termination of Pregnancy Act, and Dowry Prohibition Act.

UNIT IV HUMAN RIGHTS

Human Rights Movement in India - The preamble to the Constitution of India, Human Rights and Duties, Universal Declaration of Human Rights (UDHR), Civil, Political, Economical, Social and Cultural Rights, Rights against torture, Discrimination and forced Labour, Rights of Children. National Human Rights Commission and other statutory Commissions, Creation of Human Rights Literacy and Awareness. - Intellectual Property Rights (IPR). National Policy on occupational safety, occupational health and working environment.

UNIT V GOOD GOVERNANCE AND ADDRESSING SOCIAL ISSUES 11 Good Governance - Democracy, People's Participation, Open and Transparence governance, Corruption, Impact of corruption on society, on how and whom to make corruption complaints, fight against corruption and related issues and character building, Fairness in criminal justice administration, Government system of Redressal. Issues and intervention in situations of family violence, substance abuse and corruption. Creation of People friendly environment and universal brotherhood.

LECTURE	SELF STUDY	TOTAL
15	30	45

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





REFERENCE BOOKS

 Aftab A, (Ed.), Human Rights in India: Issues and Challenges, (New Delhi: Raj Publications, 2012).
 Bajwa, G.S. and Bajwa, D.K. Human Rights in India: Implementation and Violations (New Delhi: D.K. Publications, 1996).
 Chatrath, K. J. S., (ed.), Education for Human Rights and Democracy (Shimala: Indian Institute of Advanced Studies, 1998).
 Jagadeesan. P. Marriage and Social legislations in Tamil Nadu, Chennai: Elachiapen Publications, 1990).
 Kaushal, Rachna, Women and Human Rights in India (New Delhi: Kaveri Books, 2000)
 Mani. V. S., Human Rights in India: An Overview (New Delhi: Institute for the World Congress on Human Rights, 1998).

- 7. Singh, B. P. Sehgal, (ed) Human Rights in India: Problems and Perspectives (New Delhi: Deep and Deep, 1999).
- 8. Veeramani, K. (ed) Periyar on Women Right, (Chennai: Emerald Publishers, 1996)
- 9. Veeramani, K. (ed) Periyar Feminism, (Periyar Maniammai University, Vallam, Thanjavur: 2010).
- 11.Planning Commission report on Occupational Health and Safety http://planningcommission.nic.in/aboutus/committee/wrkgrp12/wg_occup_safety.p
- 11. Central Vigilance Commission (Gov. of India) website: http://cvc.nic.in/welcome.html.

COs versus GAs mapping

	GA6	GA7	GA8	GA9	GA10
CO1	2	1	3		
CO2	2		3		
CO3	2		3	2	2
CO4	2		3	2	2
CO5	2	1	3	0	1
Total	10	2	15	4	5

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660 Email: headeee@pmuledu Scaled total





0 -No relation 1 - Low relation 2 - Medium relation 3 - High Relation

2

CALCULUS AND LAPLACE TRANSFORMS

Cours	se Outcomes(XMA 201):	Domain	Level
C01	<i>Use</i> standard results to <i>estimate</i> the Laplace transforms of derivatives and integrals and to <i>solve</i> differential equations	Cognitive	Creating
CO2	Apply multiple integral concepts to determine area		Applying
02	volume and to understand the order of integration.	Cognitive	Apprying
CO3	Define the gradient, divergent curl of vectors. Compute directional derivative, unit vector normal to the surface.	a	Applying
	<i>Apply</i> corresponding theorems to find the line, surface and	Cognitive	
	Volume integrals.		
CO4	Construct and examine the analytic functions, and their		Creating
	complex Conjugate and to Explain the concept of	Cognitive	Applying
	conformal mapping and its Construction bilinear	Cognitive	11 2 6
	transformation.		
CO5	Compute the poles, singularities and residues of functions	Cognitive	Creating
	and to solve the problems using contour integration.		Applying

SUBCODE	SUB NAME	L	Т	Р	C
XMA 201	CALCULUS AND LAPLACE TRANSFORMS	3	1	0	4
C:P:A = 3:0:0		L	Т	Р	Η
		3	2	0	5

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

UNITT LAPLACE TRANSFORMS





think • innovate • transform

Transforms of elementary functions – properties – derivatives and integrals of transforms-Transforms of derivatives and integrals - Transforms of unit step function and impulse function - Transform of periodic functions – Convolution Theorem – Inverse transforms – Solutions of differential and integral equations.

UNIT IIMULTIPLE INTEGRALS

15

Double integration – Cartesian and polar coordinates – change of order of integration - area as a double integral – change of variables between Cartesian and polar coordinates - triple integration-– Simple applications (Finding area & volume of a certain region).

UNIT IIIVECTOR CALCULUS				15			
Gradient, divergence and curl - directional derivative – normal and tangent to a given surface							
Volume Integral – Green's theorem in a plane	Gauss divers	ence theorem a	and Stok	ce's			
theorem (excluding proof).							
UNIT IV ANALYTIC FUNCTIONS				15			
Function of a complex variable - analytic function	tion – necessa	ry and sufficier	nt condit	tion			
(excluding proof) – Cauchy Riemann equations – properties of analytic functions - harmonic							
conjugate - construction of an analytic function – C coshz, $z + \frac{k^2}{z}$ - Bilinear transformation.	Conformal map	ping: w= z + c, e	$z, \frac{1}{z}, s$	inz,			
~							
UNIT VCOMPLEX INTEGRATION				15			
Statement and application of Cauchy's integral the	eorem and inte	gral formula - I	aylor's	and			
Laurent's expansion - Residues – Cauchy's Residue Theorem - Contour integration over unit							
circle.							
	LECTURE	TUTORIAL	ТОТА	L			
	45	30	75				
TEXT BOOKS							
1. Grewal, B.S. Higher Engineering Mathema	tics, 41 st Editi	on, Khanna Pub	lication,				
Delhi, 2011.							
2. Kreyszig, E, Advanced Engineering Mather	natics, Eighth 1	Edition, John Wi	iley and				
Son(Asia) Ltd, Singapore, 2001.							
REFERENCE BOOKS							

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660



- Email: headeee@ppued.P and Narayana Iyengar, Engineering Mathematics, Laxmi Publications (P) Ltd, New Delhi, 2003.
 - Veerarajan T, Engineering Mathematics Fourth Edition, Tata McGraw Hill Publishing Company Ltd, New Delhi, 2005.
 - 3. Kandasamy P., Thilagavathy K, and Gunavathy K, Engineering Mathematics Volume I, II and III, S. Chand & Co, New Delhi, 2005.
 - 4. Venkataraman M. K, Engineering Mathematics, Volume I and II Revised enlarge Fourth Edition, The National Publishing Company, Chennai, 2004.

E REFERENCES

www.nptel.ac.in

1. Advanced Engineering Mathematics Prof. Jitendra Kumar Department of Mathematics Indian Institute of Technology, Kharagpur

COs versus GAs mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3											1
CO 2	3											1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	3	3	6

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ENGINEERING MECHANICS

Cours	se Outcon	nes(XEM 2	Domain	Level			
CO1	<i>Identify</i> support systems.	and choos conditions	se various types of le that act on structural a	Cognitive	Understanding		
CO2	<i>Apply</i> permechanic problem.	ertinent mat cs principle	thematical, physical and es to the system to	engineering predict the	redict the Cognitive A		
CO3	Display a and mom	<i>and Apply</i> knowledge on the concepts of centroid ment of inertia of various sections and solids.				Applying	
CO4	Analyze diagrams the solut	and Mod and accuration.	<i>del</i> the problem using the equilibrium equations	Cognitive Psychomotor	Analyzing Model		
CO5	Develop and dyn analysis kinemati	concepts amics with and solving cs and mom	of friction, rigid body an emphasis on the m simple dynamic problen nentum.	Cognitive	Creating		
Semester SEMESTER II							
Subje	Subject Name ENGINEERING MECHANICS						
Subje	ct Code	XEM 202					
L –T – 3- 1 –	-P -C - 0- 4		C: P: A 2.6: 02: 0.2	P: A L -T -P- H 02: 0.2 3- 2 - 0 -5			
Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

ail headeeecommu edu

UNIT IBASICS AND STATICS OF PARTICLES

Introduction - Units and Dimensions - Laws of Mechanics - Coplanar and Non coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Equivalent systems of forces - Principle of transmissibility - single equivalent force.

UNIT IIEQUILIBRIUM OF RIGID BODIES

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium – Equilibrium of Rigid bodies in two dimensions - Equilibrium of rigid bodies in three dimensions.

UNITIIIPROPERTIES OF SURFACES AND SOLIDS 15 Determination of Areas and Volumes - First moment of area and the centroid - second and product moments of plane area - Parallel axis theorem and Perpendicular axis theorem -Polar moment of inertia – Mass moment of inertia - relation to area moment of inertia. UNIT IVDYNAMICS OF PARTICLES 15 Displacement, Velocity and Acceleration - their relationships - Relative motion -Curvilinear motion - Newton's Law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies. UNIT VELEMENTS OF RIGID BODY DYNAMICS AND FRICTION 15 Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion - Moment of Momentum Equations - Rotation of rigid Body - Work energy equation. Frictional Force - Laws of Coulomb friction - Simple Contact friction - Rolling Resistance - Belt Friction. L=45 hrs T -30 hrs TEXT BOOKS 1. D.S.Kumar "A text book of Engineering Mechanics" Publishers S.K.Kataria and Sons , 2012

2. R.S.Khurmi "A Textbook of Engineering Mechanics", S. Chand Publishers, 2011

3. Engineering Mechanics: Statics (14th Edition) by Russell C. Hibbeler, Best Sellers, 2015

NSTITUTE OF SC

MANIAM

think • innovate • transform

15

15

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660



ansform

- Email: he 4. Engineering Mechanics: Dynamics (14th Edition) by Russell C. Hibbeler, Best Sellers, 2015
 - 5. Velusami.M.A. "Engineering Mechanics with Vector Approach": S.Chand Publishers, 2012
 - 6. J. L. Meriam, L. G. Kraige "Engineering Mechanics: Dynamics", Sixth Edition 2012

REFERENCES

- 1. Beer F.P and Johnson E.R., "Vector Mechanics for Engineers Statics and Dynamics", Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001.
- 2. K.V.Natarajan, "Engineering Mechanics", Dhanalakshmi Publishers, Chennai, 2006.
- 3. Chandramouli, Engineering Mechanics, PHI Learning Pvt Ltd, 2011
- 4. Jayakumar and Kumar, Engineering Mechanics, PHI Learning Pvt Ltd, 2013

Mapping of CO's with GA 's:

	GA1	GA2	GA3	GA 4	GA5	GA6	GA7	GA 8	GA9	GA10	GA11	GA12
CO1	2	3	1	3								
CO2		3		2								
CO3									2			
CO4	3	3										1
CO5	3	3										

0-No relation 1 - Low, 2 - Medium, 3 - High

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ELECTRICAL AND ELECTRONICS ENGINEERING SYSTEMS

Cours	se Outcomes(XBE 203):	Domain	Level
CO1	Describe AC and DC circuits and measuringdevices.	Cognitive	Remembering
	Construct and test AC, DC circuits and measuring	Psychomotor	Mechanism
	devices.	-	set
CO2	Explain different types of Electrical machines	Cognitive	Understanding
CO3	Describe semiconductor devices and show the input	Cognitive	Remembering
	output characteristics of basic semiconductor devices.	Psychomotor	Set
CO4	Explain logic gates and their applications and construct	Cognitive	Understanding
	and verify the logic gates and construct simple adders and	Psychomotor	COR,Set
	subtractors using logic gates.		
CO5	Describe microprocessors in detail	Cognitive	Remembering

SUB CODE	SUB NAME	L	Т	Р	С	
XBE 203	ELECTDICAL AND ELECTDONICS ENCIMEEDINC	3	1	1	5	
C:P:A	ELECTRICAL AND ELECTRONICS ENGINEERING SVSTFMS	L	Т	Р	Н	
3:1:0	51512/05	3	2	2	7	
UNIT I FUNDAMENTAL OF DC AND AC CIRCUITS, MEASUREMENTS 10 + 9 +						

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





Fundamentals of DC– Ohm's Law – Kirchoff's Laws - Sources - Voltage and Current relations – Star/Delta Transformation - Fundamentals of AC – Average Value, RMS Value, Form Factor - AC power and Power Factor, Phasor Representation of sinusoidal quantities - Simple Series, Parallel, Series Parallel Circuit - Operating Principles of Moving coil and Moving Iron Instruments (Ammeter, Voltmeter) and Dynamometer type meters (Watt meter and Energy meter).

UNIT II ELECTRICAL MACHINES

8 + 9

Construction, Principle of Operation, Basic Equations, Types and Application of DC Generators, DC motors - Basics of Single Phase Induction Motor and Three Phase Induction Motor - Construction, Principle of Operation of Single Phase Transformer, Three phase transformers, Auto transformer.

UNIT III SEMICONDUCTOR DEVICES

Classification of Semiconductors, Construction, Operation and Characteristics: PN Junction Diode – Zener Diode, PNP, NPN Transistors, Field Effect Transistors and Silicon Controlled Rectifier – Applications.

UNIT IV DIGITAL ELECTRONICS

Basic of Concepts of Number Systems, Logic Gates, Boolean Algebra, Adders, Subractors, multiplexer, demultiplexer, encoder, decoder, Flipflops, Up/Down counters, Shift Registers.

UNIT V MICROPROCESSORS

Architecture, 8085, 8086 - Interfacing Basics: Data transfer concepts - Simple Programming concepts.

- 1. Study of Electrical Symbols, Tools and Safety Precautions, Signal Generators, Power Supplies and Voltage Regulators.
- 2. Study of Active and Passive Elements Resistors, Inductors and Capacitors, Bread Board and Printed Circuit Board.
- 3. Verification of AC Voltage, Current and Power in Series connection and Parallel connection.
- 4. Fluorescent lamp connection with choke.
- 5. Staircase Wiring.
- 6. Calibration of Ammeter, Voltmeter, Wattmeter, Energy meter, Multimeter and Lux meter.
- 7. Testing of DC Voltage and Current in series and parallel resistors which are connected in breadboard by using Voltmeter, Ammeter and Multimeter.
- 8. Measuring input signal magnitude and frequency by using Cathode Ray Oscilloscope.
- 9. Forward and Reverse bias characteristics of PN junction diode and Zener diode.
- 10. Input and Output Characteristics of NPN transistor.
- 11. Verification of Truth Tables of Logic Gates.
- 12. Construction and verification of simple adders and subtractors.

Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours

9 + 6 + 5

9 + 3

9 + 3 + 5

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660





TEXT BOO	This in the interview of the interview o							
1.	Mittle, V. N., 2007. Basic Electrical and Electronics Engineering. 1 st ed. New Delhi: Tata McGraw-Hill.							
2.	Malvino, A. P., 2006. Electronics Principles. 7 th ed. New Delhi: Tata McGraw-Hill.							
3.	Rajakamal, 2007. Digital System-Principle & Design. 2 nd ed. Pearson education.							
4.	Moris Mano, 1999. Digital Design. Prentice Hall of India.							
5.	Ramesh, S. Gaonkar, 2013. Microprocessor Architecture, Programming and its Applications with the 8085. 6 th ed. India: Penram International Publications.							
REFEREN	REFERENCE BOOKS:							
1.	Corton, H., 2004. Electrical Technology. CBS Publishers & Distributors.							
2.	Syed, A. Nasar, 1988. Electrical Circuits. Schaum Outline Series, McGraw-Hill.							
3.	Jacob Millman and Christos, C. Halkias, 2010. Electronics Devices and Circuits. 3 rd ed. New Delhi: McGraw-Hill.							
4.	Millman, J. and Halkias, C. C., 2011. Integrated Electronics: Analog and Digital Circuits and Systems. 2 nd ed. New Delhi: McGraw-Hill.							
5.	Mohammed Rafiquzzaman, 1992. Microprocessors - Theory and Applications: Intel and Motorola. Prentice Hall International.							

E-REFERI	E-REFERENCES:									
1	NTPEL, Basic Electrical Technology (Web Course), Prof. N. K. De,									
1.	Prof. T. K. Bhattacharya and Prof. G. D. Roy, IIT Kharagpur.									
2	http://freevideolectures.com/Course/2335/Basic-Electrical-Technology#,									
۷.	Prof. L. Umanand, IISc Bangalore.									
3.	http://nptel.ac.in/Onlinecourses/Nagendra/, Dr. Nagendra Krishnapura , IIT Madras.									
4	http://www.nptelvideos.in/2012/11/basic-electrical-technology.html, Dr. L. Umanand,									
4.	IISC Bangalore.									

COs versus GAs mapping

CO/GA	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	3	2	2	2	1	-	-	-	1	-	-	1
CO2	3	2	-	2	1	-	-	-	-	-	-	1
CO3	3	-	-	-	1	-	-	-	1	-	-	1
	3	2	2	2	1	-	-	-	1	-	-	1



0 -No relation 1 - Low relation 2 - Medium relation 3 - High Relation

APPLIED PHYSICS

Cours	se Outcomes(XAP204):	Domain	Level
CO1	<i>Identify</i> the basics of mechanics, <i>explain</i> the principles of	Cognitive	Applying
	elasticity, viscosity and <i>determine</i> its significance in	Psychomotor	Mechanism
	engineering systems and technological advances.		
CO2	Describe the production, propagation, perception	Cognitive	Analyze
	& analysis of acoustical wave and locate basic acoustical	Affective	Receiving
	problem encountered in constructed buildings.		
CO3	Understand the fundamental phenomena in optics by	Cognitive	Understanding
	measurement and describe the working principle and	Psychomotor	Mechanism
	<i>application</i> of various lasers and fibre optics.	Affective	Receiving
CO4	Analyse different crystal structures, discuss and use	Cognitive	Analyze
	physics principles of latest technology by visualizing.	Psychomotor	Mechanism
		Affective	Receiving
CO5	Develop Knowledge on engineering materials, its	Cognitive	Applying
	properties and <i>application</i> .		

COURSE CODE	COURSE NAME	L	Т	Р	С
XAP204	APPLIED PHYSICS	3	1	1	5
C:P:A = 2.8:0.8:0.4					

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India





Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu

UNIT I MECHANICS AND PROPERTIES OF MATTER

9+6+12

Mechanics: Force - Newton's laws of motion - work and energy - impulse and momentum - torque - law of conservation of energy and momentum - Friction.

Elasticity: Stress - Strain - Hooke's law - Stress strain diagram - Classification of elastic modulus - Moment, couple and torque - Torsion pendulum - Applications of torsion pendulum - Bending of beams - Experimental determination of Young's modulus: Uniform bending and non-uniform bending - I shape girders.**Viscosity:** Coefficient of viscosity - Laminar flow - streamline flow - turbulent flow - Reynold's number - Poiseuille's method.

UNIT II ACOUSTICS, ULTRASONICS AND SHOCK WAVES	9+6				
Acoustics: Classification of sound - Characteristics of musical sound - Loudness - Weber					
Fechner law - Decibel - Absorption coefficient - Reverberation - Reverberation time - Sabin's					
formula (growth and decay) - Factors affecting acoustics of buildings (reverberati	on time,				
loudness, focussing, echo, echelon effect - resonance and noise) an	d their				
remedies.Ultrasonics: Production: Magnetostriction and Piezoelectric methods	- NDT:				
Ultrasonic flaw detector. Shock waves: Definition of Mach number - Description of	a shock				
wave - Characteristics - Methods of creating shock waves.					

UNIT III OPTICS, LASERS AND FIBRE OPTICS	9+6+12				
Optics: Dispersion - Optical instrument: Spectrometer - Determination of refractive index and					
dispersive power of a prism - Interference of light in thin films: air wedge - Diffraction	: grating.				
LASER: Introduction - Population inversion -Pumping - Laser action - Nd-YAG las	ser - CO_2				
laser - Semiconductor Laser (homojunction) - Applications					
Fibre Optics: Principle and propagation of light in optical fibre - Numerical aper	rture and				
acceptance angle - Types of optical fibre - Fibre optic communication system					
UNIT IV SOLID STATE PHYSICS	9+6+6				
Crystal Physics : Lattice - Unit cell - Lattice planes - Bravais lattice - Miller Sketching a plane in a cubic lattice - Calculation of number of atoms per unit cell radius - Coordination number - Packing density for SC, BCC, FCC and HCP structures Semiconductors : Semiconductor properties - Types of semiconductor - Intrinsic - Ext type and N-type semiconductor - PN junction diode - Biasing - Junction diode characte	indices - - Atomic rinsic: P- ristics.				
UNIT V NOVEL ENGINEERING MATERIALS AND BIOMETRICS	9+6				
Novel Engineering Materials: Introduction - Metallic glasses: Melt spinning te	echnique,				

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660



Email: headeee@pmu.edu properties, applications - Shape Memory Alloys: Transformation temperature, working of SMA, characteristics - Biomaterials: Properties, interaction of biomaterials with tissues, applications - Nano phase materials: Production, properties and applications. **Biometrics:** Introduction - definition - instrumentation - devices -advantages

TEXT BOOKS

- 1. Avadhanulu M. N. and Kshirsagar P. G., "A Text Book of Engineering Physics", 7th Enlarged Revised Edition., S. Chand & Company Ltd., New Delhi, 2005.
- 2. Senthil Kumar G., " Engineering Physics", 2nd Enlarged Revised Edition, VRB Publishers, Chennai, 2003.
- 3. Mani P., "Engineering Physics", Dhanam Publications, Chennai, 2005.
- 4. Prabu P. and Gayathri P., " Applied Physics", PMU Press, Thanjavur, 2013

REFERENCE BOOKS

- 1. Gaur R.K. and Gupta S. L., "Engineering Physics", Dhanpat Rai Publishers, New Delhi, 2001.
- 2. Pillai S.O., "Solid State Physics", 5th Edition, New Age International Publication, New Delhi,2003.

ER	ESOURCES					
NPT	EL, Engineering Physics, Prof. M. K. Srivastava, Department of Physics, IIT, Roorkee.					
	LABORATORY					
1.	Torsional Pendulum - determination of moment of inertia and rigidity modulus of the given material of the wire.					
2.	Uniform Bending - Determination of the Young's Modulus of the material of the beam.					
3.	Non-Uniform Bending - Determination of the Young's Modulus of the material of the beam.					
4.	Poiseuille's flow - Determination of coefficient of viscosity of the given liquid.					
5.	Spectrometer - Determination of dispersive power of the give prism.					
6.	Spectrometer - Determination of wavelength of various colours in Hg source using grating.					
7.	Air wedge - Determination of thickness of a given thin wire.					

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660



Email: headeee@pmu.edu 8. Laser - Determination of wavelength of given laser source and size of the given micro particle using Laser grating.

9. Post office Box - Determination of band gap of a given semiconductor.

10. PN Junction Diode - Determination of V-I characteristics of the given diode.

REFERENCE BOOKS

- 1. Srinivasan M. & others, "A text book of Practical Physics", Sultan Chand & Sons, 2001.
- 2. Shukla R.K., "Practical Physics", New Age International Publication, New Delhi, 2011.
- 3. Umayal Sundari AR., "Applied Physics Laboratory Manual", PMU Press, Thanjavur, 2012.

LECTURE	TUTORIAL	PRACTICAL	TOTAL HOURS
45	30	30	105

Mapping of CO's with GA's:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	3	2	2	2	1	-	-	-	1	-	-	1
CO2	3		1		1	-	-	-		-	-	1
CO3	3	2	2	2	1	-	-	-	1	-	-	1
CO4	3	2	2	2	1	-	-	-	1	-	-	1
CO5	3		2			-	-	-		-	-	1
Total	15	6	9	6	4				3			5
Scaled to 0,1,2,3 scale	3	2	2	2	1				1			1

1 - Low, 2 - Medium, 3 - High

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ENGINEERING GRAPHICS

Cours	se Outcomes(XME205):	Domain	Level
CO1	Apply the national and international standards, construct	Cognitive	Applying
	and <i>practice</i> various curves	Psychomotor	G.Response
		Affective	Receiving
CO2	Interpret, construct and practice orthographic	Cognitive	Understanding
	projections of points, st. lines and planes.	Psychomotor	Mechanism
		Affective	Receiving
CO3	Construct Sketch and Practice projection of solids in	Cognitive	Applying
	various positions and true shape of sectioned solids.	Psychomotor	CoR
		Affective	Receiving
CO4	Interpret, Sketch and Practice the development of	Cognitive	Understanding
	lateral surfaces of simple and truncated solids,	Psychomotor	CoR
	intersection of solids.	Affective	Receiving
CO5	Construct, sketch and practice isometric and perspective	Cognitive	Applying
	views of simple and truncated solids.		CoR
			Receiving





think • innovate • transform

Subject Name	ENGINEERING GRAPHICS	L	Т	Р	С			
Subject Code	XME205	XME205 2 1 0 3						
Prerequisite	Nil	L T P H						
C:P:A	2	2	0	4				
UNIT I INTRODUCTION, FREE HAND SKETCHING OF ENGG OBJECTS 6+6 AND CONSTRUCTION OF PLANE CURVE								
Importance of graphics in specifications and conventi	n engineering applications – use of o ons as per SP 46-2003.	draftir	ng instr	ument	s – BIS			
Pictorial representation of	engineering objects – representation of	three	dimensi	ional c	bjects in			
two dimensional media – n	eed for multiple views - developing visu	ualiza	tion ski	lls thro	ough free			
hand sketching of three dimensional objects.								
Polygons & curves used in engineering practice – methods of construction – construction of								
ellipse, parabola and hype	ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves –							

UNITIIPROJECTION OF POINTS, LINES AND PLANE SURFACES

6+6

General principles of orthographic projection – first angle projection – layout of views – projections of points, straight lines located in the first quadrant – determination of true lengths of lines and their inclinations to the planes of projection – traces – projection of polygonal surfaces and circular lamina inclined to both the planes of projection.

UNITIIIPROJECTION OF SOLIDS AND SECTIONS OF SOLIDS

construction – drawing of tangents to the above curves.

6+6

Projection of simple solids like prism, pyramid, cylinder and cone when the axis is inclined to one plane of projection – change of position & auxiliary projection methods – sectioning of above solids in simple vertical positions by cutting plane inclined to one reference plane and perpendicular to the other and above solids in inclined position with cutting planes parallel to one reference plane – true shapes of sections.

UNIT IVDEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS 6+6

Need for development of surfaces – development of lateral surfaces of simple and truncated solids – prisms, pyramids, cylinders and cones – development of lateral surfaces of the above solids with square and circular cutouts perpendicular to their axes – intersection of solids and

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@nmu.edu
 Wah: www.pmu.edu



curves	of int	ersection –prism with cylinder,	cylinder & cylinder, cone	& cylinder with normal
intersec	ction c	of axes and with no offset.		think • Innovate • trans
UNIT	VISO	METRIC AND PERSPECTIV	VE PROJECTIONS	6+6
Princip	les of	isometric projection - isometri	ric scale – isometric proje	ctions of simple solids,
truncate	ed pri	sms, pyramids, cylinders and	cones - principles of pe	rspective projections -
projecti	ion of	prisms, pyramids and cylinders	s by visual ray and vanishing	g point methods.
		LECTURE: 30	TUTORIAL: 30	TOTAL :60
TEVT	BUU	KS I I I I I I I I I I I I I I I I I I I		
1.	Bhat	t,N.D, "Engineering Drawing",	, Charotar Publishing House	, 46 th Edition-2003.
2.	Nata	arajan,K.V, "A Textbook of Eng	gineering Graphics", Dhana	lakshmi Publishers,
	Chei	nnai, 2006 . Dr. P.K. Srividhya,	, P. Pandiyaraj, "Engineerin	g Graphics", PMU
	Publ	ications, Vallam, 2013		

REFERENCE BOOKS

- 1. Luzadder and Duff, "Fundamentals of Engineering Drawing" Prentice Hall of India PvtLtd, XI Edition 2001.
- 2. Venugopal,K. and Prabhu Raja, V., "Engineering Graphics", New Age International(P) Ltd., 2008.
- 3. Gopalakrishnan.K.R,. "Engineering Drawing I & II", Subhas Publications, 1998.
- 4. Shah, M.B and Rana, B.C., "Engineering Drawing", Pearson Education, 2005.

E RESOURCES

- 1. http://periyarnet/Econtent
- 2. http://nptel.ac.in/courses/112103019/

	GA1	GA2	GA3	GA4	GA5	GA12
CO1	3	2	3	1	1	1
CO2	3	2	1	1	1	1
CO3	3	2	1	1	1	1
CO4	3	2	1	1	1	1

Mapping of CO's with GA:

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu

Total

Scaled

IC	CAL AN	ND		NST	TUTEOF	SC.	
R	ING			AMMA	≤ 🚆	ENCEB	
nil N 136	Nadu, India 2 - 264660			MANIN	3 🗬	TECH	
ww	. pmu edu	2	1	14TIN		গ	
	15	10	7	5	5	5	
	3	2	2	1	1	1	



1 – Low Relation, 2 – Medium Relation, 3 – High Relation

SPEECH COMMUNICATION

Cours	se Outcomes(XGS 206):	Domain	Level
CO1	Choose and <i>identify</i> different styles to various forms of public speakingskills and presentation skills.	Cognitive	Applying
CO2	<i>Understand</i> and identify the proper tone of language required in writingand speaking.	Cognitive	Understanding
CO3	<i>Adapting</i> the speech structures and developing the speech outline.	Psychomotor	Adaptation
CO4	Ability to <i>communicate</i> and develop presentation skills.	Affective	Receiving
CO5	Calibrates the speaker to face the audience without any anxiety.	Psychomotor	COR

	SEMESTER II				
COUDSE CODE	CUD IECT NAME			Catego	ry
COURSE CODE	SUBJECT NAME	L	Т	Р	Credits

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660



CEB

EC

transform ur

E	mail: headeee gpmu edu XGS206	Web: www. pmu.edu	OCH DERITA	52	0 nde thi	nk • inne	ovate •
	C:P:A	SPEECH COMMU	JNICATION	L	Т	Р	Ηοι
	1.8:0.8:0.4			2	0	1	3

SYLLABUS

UNIT	Content	Hours						
		Allotted						
Ι	Introduction to public speaking; functions of oral communication; skills	5						
	and competencies needed for successful speech making; importance of							
	public speaking skills in everyday life and in the area of business, social,							
	political and all other places of group work							
II	Manuscript, impromptu, rememorized and extemporaneous speeches;	5						
	analyzing the audience and occasion; developing ideas; finding and using							
	supporting materials.							
III	Organization of Speech; introduction, development and conclusion;	5						
	language used in various types of speeches; Adapting the speech structures							
	to the Audience; paralinguistic features							
IV	Basic tips; how to present a paper/assignment etc; using visual aids to the	5						
	speeches; using body language to communicate.							

V	Public speaking as Speech practice (4	nd speech anx 1-6 speeches p	kiety, public s per student)	peaking and	critical listening	25			
		Lecture	Practical	Total					
	20 Hours 25 Hours 45 Hours								
TEXT	BOOKS								
1. Gordon H. Mills Technical Writing –Oxford Press, 1978									
•									

2. Barun K. Mitra, Effective Technical Communication: A guide for scientists and Engineers. Author, Publication: Oxford University press. 2007.

Mapping COs with Pos

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9
CO1		1					2		3
CO2				1			3		3
CO3							2		3
CO4							3		3
CO5								2	3
Total		1		1			10	2	15
Scaled									

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

 $^{\text{Em}}0-No$ relation

1- Low relation



TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS

Cours	se Outcomes(XMA301):	Domain	Level
CO1	<i>Explain</i> and <i>Demonstrate</i> the basic concepts in partial differential equations and to <i>solve</i> linear, nonlinear, homogeneous and nonhomogeneous partialDifferential equations	Cognitive	Understanding
CO2	<i>Demonstrate</i> the basic concept and properties of Fourier series and to <i>state</i> Parseval's identity and Diritchlet's condition.	Cognitive	Understanding
CO3	<i>Solve</i> the standard Partial Differential Equations, arising in engineeringProblems, like Wave equation and Heat flow equation by Fourier seriesmethod.	Cognitive	Applying
CO4	<i>Explain</i> and <i>Apply</i> the concept of Fourier transform and its properties	Cognitive	Understanding
	properties.		Applying
CO5	<i>State</i> and <i>Apply</i> the properties of Z transform and to <i>compute</i> Z transformand inverse Z transform.	Cognitive	Applying

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





XMA 301	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	thjnk	• inno I	ovate	• trar 4
C:P:A = 3:0.25:0		L	Т	Р	H
		3	2	0	5
UNIT I PARTIAL DI Formation of partial differ functions – Solution of sta linear equation – Linear constant coefficients.	FFERENTIAL EQUATIONS rential equations by elimination of arbitrary c indard types of first order partial differential e partial differential equations of second ar	constant quation nd high	s and s – La her or	arbit gran der v	15 rary ge's with
UNIT IIFOURIER SER	IES				15
Dirichlet's conditions – C series – Half range cosine	Seneral Fourier series – Odd and even functi series –Parseval's identity – Harmonic Analy	ons – H sis.	Ialf ra	inge	sine

UNIT IIIAPPLICATIONS OF BOUNDARY VALUE PROBLEMS	15			
Classification of second order quasi linear partial differential equations - Solutions of	one			
dimensional wave equation - One dimensional heat equation - Steady state solution of	two			
dimensional heat equation (Insulated edges excluded) - Fourier series solutions in Carte	sian			
coordinates.				
	1			
UNIT IV FOURIER TRANSFORM	15			
Fourier integral theorem (without proof) - Fourier transform pairs - Fourier Sine and Co	sine			
transforms - properties - Transforms of simple functions - Convolution theorem - Parsev	val's			
identity.				
UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS	15			
Z-transform - Elementary properties - Inverse Z - transform - Convolution theorem - In	itial			
and Final value theorems - Formation of difference equations - Solution of difference				
equations using Z-transform.				
LECTURE TUTORIAL TOT	AL			

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headee@pmu.edu Web: www. pmu.edu





- 1. Grewal, B.S., "Higher Engineering Mathematics", 40th Edition Khanna Publishers, New Delhi, (2007).
- 2. Narayanan, S., Manicavachagom Pillay, T.K. and Ramaniah, G., "Advanced Mathematics for Engineering Students", Volumes II and III, S.Viswanathan (Printers and Publishers)Pvt. Ltd. Chennai, (2002).

REFERENCE BOOKS

- 1. Churchill, R.V. and Brown, J.W., "Fourier Series and Boundary Value Problems", Fourth Edition, McGraw Hill Book Co., Singapore, (1987).
- 2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., "Engineering Mathematics Volume III", S. Chand & Company Ltd., New Delhi, (1996).
- 3. Bali N.P. and Manish Goyal, "A Text Book of Engineering Mathematics" 7th Edition Lakshmi Publications (P) Limited, New Delhi, (2007)

E REFERENCES

www.nptel.ac.in

 Advanced Engineering Mathematics, Prof. Jitendra Kumar, Department of Mathematics, Indian Institute of Technology, Kharagpur.

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

COs versus GAs mapping

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 1 - Low Relation, 2 - Medium Relation, 3Email: headeee@pmu.edu

ANNONNA CONTRACTOR

CEA

EC



think • innovate • transform

ELECTRIC CIRCUIT ANALYSIS

Cours	se Outcomes(XEE302):	Domain	Level
CO1	Able to <i>define</i> and <i>recall</i> the different fundamental	Cognitive	Remembering
	electrical component, Laws and their applications.	Cognitive	Remembering
CO2	<i>Relate</i> the concept of a phasor, and <i>apply</i> phasor analysis methods to analyze linear circuit operating under sinusoidal steady state conditions.	Cognitive Cognitive	Understanding Applying
CO3	Able to <i>Solve</i> Thevenin and Norton equivalent circuit of a DC circuit and find the maximum power output using network theorems.	Cognitive	Applying
CO4	Analyse the transient response of a first and second order circuit consisting of RLC circuit. Design the sinusoidal steady state response of aDC and AC circuit consisting of RLC components.	Cognitive Cognitive	Analyzing Creating
CO5	Create and Measure different electrical parameters in a coupled single phase and three phase circuits.	Cognitive Cognitive	Creating Evaluating

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600





inTovateP transform think

0

Р

0

4

Η

5

9 + 9

9 + 9

9+6

ai headeee@pmu.edu **SUB NAME** CODE **XEE 302** 3 1 C:P:A L Т **ELECTRIC CIRCUIT ANALYSIS** 3:0:0 3 2 UNIT-I **BASIC CIRCUIT CONCEPTS** Terminologies and circuit elements (active and passive R,L,&C), ideal sources (independent and dependent), V-I relationship of circuit elements - AC and DC voltage and current - Ohm's Law and Kirchhoff's Laws - Analysis of series and parallel circuits - network reduction: voltage and current division, source transformation, star/delta transformation SINUSOIDAL STEADY STATE ANALYSIS UNIT -II A.C. Fundamentals - Concept of phasor and complex Impedance / Admittance - Analysis of simple

series and parallel circuits - active power, reactive power, apparent power (volt-ampere), power factor and energy associated with these circuits - resonance in series and parallel circuits - Q factor, half-power frequencies and bandwidth of resonant circuits.

UNIT-III	CIRCUIT ANALYSIS & NETWEORK THEOREMS

Mesh current analysis - Node-voltage analysis - Super position theorem - Thevenin's theorem -Norton's theorem - Reciprocity theorem - Compensation theorem - Tellegen's theorem - Millman's theorem - Maximum power transfer theorem

Source free response of RL and RC circuits - forced (step) response of RL and RC circuits - source free response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RLC series circuits - forced (step) response of RLC series circuit - forced response of RLC series circuits - Laplace Transform application to the solution of RL, RC & RLC circuits - forced response circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. 9 +3 Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. 9 +3 Itecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOUSE: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hi	UNIT- IV	TRANSIENT RESPONSE ANDANALYSIS	9 +3						
free response of RLC series circuit - forced (step) response of RLC series circuit - forced response of RL, RC and RLC series circuit to sinusoidal excitation - Time constant and natural frequency of oscillation of circuits - Laplace Transform application to the solution of RL, RC & RLC circuits. UNIT-V COUPLED CIRCUITS, NETWORKS AND THREE PHASE PHASE PHASE Outpled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. 9 +3 TEXT BOOKS: Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	Source free	Source free response of RL and RC circuits - forced (step) response of RL and RC circuits - source							
of RL, RC and RLC series circuit to sinusoidal excitation - Time constant and natural frequency of oscillation of circuits - Laplace Transform application to the solution of RL, RC & RLC circuits. UNIT-V COUPLED CIRCUITS, NETWORKS AND THREE PHASE PHASE CIRCUITS - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. 9+3 Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	free respons	se of RLC series circuit - forced (step) response of RLC series circuit - force	ed response						
oscillation of circuits - Laplace Transform application to the solution of RL, RC & RLC circuits.UNIT-VCOUPLED CIRCUITS, NETWORKS AND THREE PHASE CIRCUITS9+3Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta.9+3 Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS:1.William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 20022.Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	of RL, RC a	and RLC series circuit to sinusoidal excitation - Time constant and natural fr	equency of						
UNIT- VCOUPLED CIRCUITSCIRCUITS, NETWORKSNETWORKSAND THREEPHASE PHASE9+3Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta.9+3 Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS:1.William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 20022.Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	oscillation of	of circuits - Laplace Transform application to the solution of RL, RC & RLC c	ircuits.						
CIRCUITS CIRCUITS Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	UNIT V	COUPLED CIRCUITS, NETWORKS AND THREE PHASE	0 + 3						
Coupled circuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysis of simple coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	UN11- V	CIRCUITS	9 +3						
coupled circuits. Network Topology - Two Port Network and its Parameters. Three phase circuits - Three Phase Connections - star/delta. Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.	Coupled cir	cuits - Mutual inductance - Coefficient of coupling - dot conversion - Analysi	s of simple						
Three Phase Connections - star/delta. Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. 2. D.D.Curte and V.Singhel, "Evendementale of Electric Networks", S. Chaud & Circuitante State Sta	coupled circ	cuits. Network Topology - Two Port Network and its Parameters. Three phas	e circuits -						
Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. 2. D.B. Curte and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate of Electric Networks", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Circuitante and V. Singhel, "Even demonstrate and V. Singhel", S. Chaud & Singhel, "Singhel", S. Chaud & Singhel, "Singhel, "Singhel", S. Chaud & Singhel, "Singhel,	Three Phase	e Connections - star/delta.							
TEXT BOOKS: 1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. 3. P.P.Curte and V.Singhel, "Evendementale of Electric Networks", S. Chaud & Ca. New Delhi 2001.		Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Ho	urs						
1. William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. 3. D.D.Curte and M.Singhel, "Evendementale of Electric Networks", S.Chaud & Ca. New Delhi 2001.	TEXT BOOKS:								
1. Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002 2. Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. 2. D.D.Curte and V.Singhol, "Even demonstrate of Electric Networks", S. Chaud & Ca. New Delhi 2001.	1	William H.HaytJr, Jack E.Kemmerly, and Steven M.Durbin, "Engineer	ing Circuit						
 Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001. D.D.Curte and V.Singhol. "Fundamentals of Electric Networks". S.Chaud. & Ca. New 	1.	¹ . Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002							
 ^{2.} McGraw-Hill, New Delhi 2001. ^{2.} D. D. Curte and V. Singhal. "Fundamentals of Electric Networks". S. Chaud. & Ca. New York, Networks and Networks, S. Chaud. & Ca. Netwo	2	Joseph A.Edminister, MahmoodNahvi, "Electric Circuits", Schaum's Series, Tata							
2 D.D. Cunto and V.C. shall "Evendomentals of Electric Networks" C.C	Ζ.	McGraw-Hill, New Delhi 2001.							
5. B.K.Gupta and V.Singnai, Fundamentals of Electric Networks, S.Chand & Co., New	3.	B.R.Gupta and V.Singhal, "Fundamentals of Electric Networks", S.Chand &	k Co., New						

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660 Email: headeee@pmu.edu. : 2006 Web: www.pmu.edu





	Defini, 2006. Think a innovate a transform
4.	A.Chakrabarti, "Circuit Theory (Analysis and Synthesis)", Dhanapatrai Publications, 2010.
REFEREN	CE BOOKS:
1.	R.C. Dorf, "Introduction to Electric Circuits" John Wiley & Sons Inc, New York, Second Edition, 2010
2.	Charles K.Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuit", McGraw-Hill, N.Y, 2003.
3.	Van Valkenberg M.E, "Network Analysis", PHI Publications, 3 rd Edition, New Delhi, 2006.
4.	Bell D A, "Fundamentals of Electric Circuits", Reston, USA
E-REFERE	ENCES:
1.	NPTEL :http://nptel.ac.in/courses/108102042/
2.	MOODLE : http://moodle.cecs.pdx.edu/course/view.php?id=16

COs versus PO, PSO mapping

CO/ PO/ PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	2	1	1	2	-	-	1	-	-	1	1
CO2	3	3	-	3	3	3	-	3	-	1	3	-	1	1
CO3	2	-	-	-	2	2	2	3	-	-	-	-	2	2
CO4	-	1	3	-	-	1	-	-	1	-	-	-	2	2
CO5	-	-	1	-	3	-	-	2	-	-	-	-	1	2
Total	7	4	4	5	9	7	4	8	1	2	3	5	7	8



0 -No relation 1 - Low relation 2 - Medium relation 3 - High Relation

ELECTRICAL MACHINES - I

Cours	se Outcomes(XEE304):	Domain	Level
CO1	<i>Infer</i> the fundamentals concepts of rotating machine.	Cognitive	Understanding
CO2	<i>List</i> the parts of the DC machines and <i>carry out</i> the complete discussion about armature reaction and characteristic.	Cognitive Psychomotor	Remembering COR
CO3	<i>Define</i> the principle of operation of DC motor and uses of starter <i>show</i> the speed control.	Cognitive Psychomotor	Remembering Set
CO4	<i>Illustrate</i> the transformer construction and operation, equivalent circuit and load condition. <i>List</i> the special type transformer.	Cognitive Cognitive	Understanding Understanding
CO5	<i>Recall</i> the knowledge in the testing of d.c. machines and transformer. <i>Show</i> the performance of machines like losses and efficiency.	Cognitive Psychomotor	Remembering Perception

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Phone: + 91 - 4362 - 264600





Ellian Headeee@	Sindledd Web. www. pindledd *A	(onder sec.	B OF UGC ACT	1920) • 14	AAC ACCIEUILE			
CODE	SUB NAME	think •	inhova	nte P t	ranGorn			
VEE 204		2	1	1	-			
XEE 304		3	1	I	5			
C:P:A	ELECTRICAL MACHINES I	L	Т	Р	Н			
3:1:0		3	2	2	7			
UNIT- I	BASIC CONCEPTS OF ROTATING MACHINES			8+	2+0			
Principles of	f electromechanical energy conversion - Energy in Magnetic S	System	Field	energ	gy co-			
energy - Si	ngle and multiple excited systems - M.M.F of distributed A.	Ċ. wir	dings	- Ro	tating			
magnetic fie	eld - Magnetic saturation and leakage flux - Generated voltage		U		U			
UNIT- II	DC GENERATORS			10+8	8+12			
Constructio	nal details and components of D.C machine - Principles of Op	eration	- Lap	and	Wave			
Winding -	EMF equation - Methods of excitation - Self and separate	ly exc	ited g	enerat	tors -			
Armature re	eaction and commutation - Characteristics of series, shunt and	compo	ound g	enera	tors -			
Parallel operation of DC shunt and compound generators.								
Parallel ope	ration of DC shunt and compound generators.							
Parallel ope	ration of DC shunt and compound generators. DC MOTORS			8+	6+6			
Parallel ope UNIT-III Principles of	ration of DC shunt and compound generators. DC MOTORS f operation - Types of D.C motors - Back EMF-Torque equat	tion - (Charac	8+ terist	6+6 ics of			
Parallel ope UNIT-III Principles of series, shun	ration of DC shunt and compound generators. DC MOTORS f operation - Types of D.C motors - Back EMF-Torque equat t and compound motors - Speed control of DC series and shunt	tion - (motors	Charac	8+ terist	6+6 ics of of DC			

UNIT- IV	TRANSFORMERS	10 +8+6					
Constructio	Constructional details of core and shell type transformers - Types of windings - Principle of						
operation -	EMF equation - Transformation ratio - Transformer on no-load - Parameters	referred to					
HV / LV w	indings - Equivalent circuit - Transformer on load - Regulation and Efficienc	y - Parallel					
operation of	f single phase transformers - Auto transformer - Three phase transformers.						
UNIT-V	TESTING OF DC MACHINES AND TRANSFORMERS	9+6+ 6					
Losses and	efficiency in DC machines and transformers - Condition for maximum e	efficiency -					
Testing of	DC machines - Brake test, Swinburne's test, Retardation test and Hopkins	son's test -					
Testing of t	ransformers - open circuit and short circuit tests - All day efficiency.						
1. Study o	f D.C. Motor Starters.						
2. Open C	ircuit Characteristics (OCC) and load Characteristics of D.C self-excited gener	rator.					
3. Load ch	aracteristics of D.C shunt generator						
4. Load ch	aracteristics of D.C. shunt motor.						
5. Load ch	aracteristics of D.C series motor.						
6. Speed control of D.C shunt motor.							
7. Load test on single-phase transformer.							
8. Open ci	8. Open circuit and short circuit tests on single phase transformer.						

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu



(Under Sec. 3 of L

ited

	Lecture = 45; $1 \operatorname{utorgar} = 50$; $2 \operatorname{ab} = \frac{50}{100}$; $1 \operatorname{otar} = 105 \operatorname{Hours}$
TEXT BOO	DKS:
1.	D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2.	P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3.	B.L.Theraja, "A Textbook of Electrical Technology "Vol. I&II, M/s S.Chand, Delhi,2013
REFEREN	CE BOOKS:
1.	A.E. Fitzgerald, Charles Kingsley, Stephen D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2.	J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3.	P.C. Sen, "Principles of Electrical Machines and Power Electronics" John Wiley & Sons, 1997.
4.	DeshPande M.V., "Electrical Machines" PHI Learning Pvt Ltd., New Delhi – 2011.
E-REFERI	ENCES:
1.	NTPEL, Electrical Machines (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G. D. Roy, IIT Kharagpur.
2.	http://freevideolectures.com/Course/2335/Basic-Electrical-Technology/22- 27Prof.L.Umanand, IISc Bangalore.
3.	http://nptel.ac.in/Onlinecourses/Nagendra/, Dr. Nagendra Krishnapura , IIT Madras.

45. 0

COs versus POs mapping

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	1	-	-	1	-	1
CO2	3	2	-	2	1	-	-	-	-	-	-	1	-	1
CO3	3	-	-	-	1	-	-	-	1	-	-	1	-	1
CO4	3	2	2	2	1	-	-	-	1	-	-	1	-	1
CO5	3	-	-	-	1	-	-	-	-	-	-	1	-	1

DEPA EL	DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING							ALINSTITI	UTE OF SC		ER	IYA AMN	AR IAI
Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India								-0.		E II	NIN	EDCI	$\mathbf{T}\mathbf{V}$
Phone:	+ 91 - 43	62 - 26460	J0 F	ax: + 91- 4	362 - 2646	60	0	2,00			TATAT	LIVDI	
Total	neadeee@	ppmu.eau 6	4	6 web: w	ww.pmu.e 5	au		3	19070	thir	k • jnnov	ate • tran	isform
Scaling	3	2	1	2	1			1			1		1

TUTE -

MATERIAL SCIENCE

Cours	se Outcomes(XEM305):	Domain	Level	
CO1	Recall and distinguish various crystal structures.	Cognitive Rememberin		
			Analyzing	
CO2	Know about the impacts of defects at the atomic and	Cognitive	Remembering	
	microstructure scales.		Understanding	
CO3	Describe the various Ceramic, Electrical & Electronic	Cognitive	Remembering	
	Materials.		Analyzing	
CO4	Describe the basics of mechanical properties of material	Cognitive	Understanding	
	and identify how they can be tested.		Analyzing	
CO5	<i>Recognize and Describe</i> various Magnetic Materials and Nano Materials.	Cognitive	Remembering	

······		 		
SUBCODE	MATERIAL SCIENCE	Т	Р	C
5020022		 	-	

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee @nmu.edu
 Web: www. pmu.edu

C:P:A = 3:0:0





think innovate transform

2

 -	-
•	•

	•							
UNIT - I	Crystal Structure	9 Hrs						
Atomic structure and inter-atomic bonding; Structure of crystalline solids; Lattices, unit cells;								
Crystal systems, Bravais lattices; Indexing of directions and planes, notations, Inter-planar spacings and angles, co- ordination number, packing factors.								
UNIT – II	9 Hrs							
Point defects; Di	slocations, Types of dislocations, Burgers vector and its repre	sentation; Planar						
defects, stacking	faults, twins, grain boundaries.							
UNIT - III	9 Hrs							
Ceramic Materi	als: Introduction, ceramic structures, silicate structures, proces	sing of ceramics;						
Properties, glasse	es; Composite Materials- Introduction, classification, concrete,	metal-matrix and						
ceramic -matrix	composites. Electrical & Electronic Properties of Mate	erials: Electrical						
Conductivity, El	ectronic and Ionic Conductivity, Intrinsic and Extrinsic Se	mi conductivity,						
Semiconductor D	evices, Dielectric Properties, Piezo-electricity.							
UNIT – IV	Mechanical Properties of Materials	9 Hrs						
Concepts of stres	ss and strain, Stress-Strain diagrams; Properties obtained from	the Tensile test;						
Elastic deformat	Elastic deformation, Plastic deformation. Impact Properties, Strain rate effects and Impact							
behavior. Hardne	ss of materials.	_						

UNIT - V	Magnetic Materials and Nano Materials	9 Hrs							
Magnetic Materials: Introduction, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferrites, Ferro, Para Magnetic materials. Nano Materials: Introduction – Nano material preparation, purification, sintering nano particles of Alumina and Zirconia, Silicon carbide, nanoop, nano-magnetic, nano-electronic, and other important nano materials.									
	TOTAL HO	URS: 45 Hours							
TEXT BOOKS:									

- 1. Askeland D.R.,& P. P. Fullay (2007), The Science and Engineering of Materials 7thCengage Learning Publishers.
- 2. William D. Callister, Jr (2008), Callister"s Materials Science and Engineering, (Adopted by

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web; www. pmu.edu

R. Balasubramaniam) Wiley-Eastern





think • innovate • transform

REFERENCE BOOKS :

- 1. A.S. Edelstein and R.C. Cammarata Ed.(1998), Nano Materials: Synthesis, Properties and Applications, Inst. Of Physics Publishing, UK.
- 2. Raghavan V (2007), Materials Science and Engineering A First Course, Prentice Hall, India
- 3. James F. Shackelford (1996), Introduction to Materials Science for Engineers, Prentice Hall, India

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	3	3		0			0			0		
CO2	3	0		0			0			3		
CO3	3	0		0			3			0		
CO4	3	3		3			0			0		
CO5	3	0		0			0			0		
Total	15	6		3			3			3		
Scaled	3	2		1			1			1		

CO Vs GA Mapping

ENTREPRENEURSHIP DEVELOPMENT

Cours	se Outcomes(XEP 306):	Domain	Level
CO1	Recognise and describe the personal traits of an	Affective	Receiving
	entrepreneur.	Cognitive	Understanding
CO2	Determine the new venture ideas and analyze the	Cognitive	Evaluating
	feasibility report.		Analyzing
CO3	Develop the business plan and analyze the plan as an	Cognitive	Applying
	individual or in team.		Analyzing
CO4	Describe various parameters to be taken into consideration	Cognitive	Understanding
	for launching and managing small business.		
CO5	Describe Technological management and Intellectual	Cognitive	Understanding
	Property Rights	000mm/0	

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

COURSE CODE	COURSE NAME	L	Τ	P	C			
XEP 306	ENTREPRENEURSHIP DEVELOPMENT	2	0	0	3			
C:P:A = 3:0:1								
		L	Т	P	Η			
		3	0	0	3			
UNIT- IENTREPRENEURIAL TRAITS AND FUNCTIONS								
Definition of Ent	repreneurship; competencies and traits of an entrepreneur; fa	ctor	s af	fecti	ing			
Entrepreneurship	Development; Role of Family and Society ; Achievement	nt N	Aoti	vati	on;			
Entrepreneurship as	s a career and national development;							
UNIT -II NEW PRODUCT DEVELOPMENT AND VENTURE CREATION 9								
Ideation to Conce	pt development; Sources and Criteria for Selection of Ph	rodu	ct;	mar	ket			
assessment ; Feasi	bility Report ;Project Profile; processes involved in starting a	a nev	w v	entu	ıre;			
legal formalities; O	wnership; Case Study.							
UNIT –III ENTR	EPRENEURIAL FINANCE			9)			
Financial forecasti	ng for a new venture; Finance mobilization; Business pla	ın p	repa	rati	on;			
Sources of Financi	ing, Angel Investors and Venture Capital; Government supp	ort	in	star	tup			
promotion.								
UNIT –IV LAUNO	CHING OF SMALL BUSINESS AND ITS MANGEMENT			9)			
Operations Plannin	g - Market and Channel Selection - Growth Strategies - Produ	ct La	aunc	hing	g –			
Incubation, Monito	Incubation, Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of							
Business Units.								

UNIT	$-\mathbf{V}$	TECHNOLOGY	MANAGEMENT,	IPR	PORTFOLIO	FOR	NEW	9
PROD	UCT V	VENTURE						

Technology management; Impact of technology on society and business; Role of Government in supporting Technology Development and IPR protection; Entrepreneurship Development Training and Other Support Services.

LECTURE	TUTORIAL	TOTAL
45	0	45

TEXT BOOKS

1. Hisrich, 2016, Entrepreneurship, Tata McGraw Hill, New Delhi.

2.S.S.Khanka, 2013, Entrepreneurial Development, S.Chand and Company Limited, New Delhi. **REFERENCE BOOKS**

1. Mathew Manimala, 2005, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis,

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Web: www. pmu.edu

Biztrantra, 2nd Edition.



2. Prasanna Chandra, 2009, Projects – Planning, Analysis, Selection, Implementation and Reviews, Tata McGraw-Hill.

- 3. P.Saravanavel, 1997, Entrepreneurial Development, Ess Pee kay Publishing House, Chennai.
- 4. Arya Kumar, 2012, Entrepreneurship: Creating and Leading an Entrepreneurial Organisation, Pearson Education India.
- 5. Donald F Kuratko, T.V Rao, 2012, Entrepreneurship: A South Asian perspective, Cengage Learning India.
- 6. Dinesh Awasthi, Raman Jaggi, V.Padmanand, Suggested Reading / Reference Material for Entrepreneurship Development Programmes (EDP/WEDP/TEDP), EDI Publication, Entrepreneurship Development Institute India, Ahmedabad. from: of Available http://www.ediindia.org/doc/EDP-TEDP.pdf

E RESOURCES

- 1. Jeff Hawkins, " Characteristics of a successful entrepreneur", ALISON Online entrepreneurship courses, "https://alison.com/learn/entrepreneurial-skills
- 2. Jeff Cornwall, "Entrepreneurship -- From Idea to Launch", Udemy online Education, https://www.udemy.com/entrepreneurship-from-idea-to-launch/

MAPPING COURSE OUTCOME WITH GRADUATE ATTRIBUTES:

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1									3	3	3	1
CO2			1	2	3	2	1	1	1	2	3	
CO3						1		2	3	3		2
CO4						1	1	2	3		3	3
CO5						1	1	3				3
			1	2	3	5	3	8	10	8	9	9
			1	1	1	2	1	2	3	2	2	2

INTERPERSONAL COMMUNICATION

Cours	se Outcomes(XGS 307):	Domain	Level
CO1	<i>Recognize</i> culture and a need for interpersonal communication.	Affective	Receiving
CO2	<i>Demonstrate</i> on the need for effective communication between two people.	Cognitive	Understanding
CO3	<i>Explain</i> on family and social relationships and need for socialization.	Cognitive	Understanding
CO4	<i>Practice</i> the IP principles as to how to reduce and repair conflict in interpersonal relationships.	Psychomotor	Guided Response
CO5	<i>Makeuse</i> to use effective and appropriate language at various interpersonal situations to avoid conflict.	Cognitive	Applying

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





				PED	think	• in	novat	te • t	ransforr				
							T	P	C				
С	Р	Α	- INTERPER	SONAL COMMUNICA	ΓΙΟΝ	U L	U T	U P	U H				
1	1	0	-			1	0	2	3				
			•										
UN	IT -]	[Universals of interper Communication; cultur interpersonal communic	sonal communications; A re in interpersonal commu cation	Axioms of inter inication and th	pers e se	onal lf in		9				
UN	IT -]	II Apprehension and assertiveness; aggressiveness and assertiveness; perception in interpersonal communication; listening in interpersonal communication.											
UN	IT -I	II	Verbal and non verbal messages; relationship and involvement; relationship maintenance and repair.										
UN	IT -I	V	Power in interpersonal relationship; conflict in interpersonal relationship; friends and relatives; primary and family relationships.										
UN	IT -V	T -V Socialization, need for socialization and benefits of socialization among students.											
				LECTURE	Interactive Session (IS)		TC	DTA	L				
				30	15			45					

TEXT BOOKS

- 1. DeVito, Joseph, The Interpersonal Communication Book, 13th Edition -, Published by Longman Pub Group, Updated in its 13th edition, 2000
- 2. Kathleen S. Verderber, Inter-Act: Interpersonal Communication Concepts, Skills and Contexts, Rudolph F. Verderber, 2000
- 3. Clifford Whitcomb, Effective Interpersonal and Task Communication Skills for Engineers, Atlantic Publishers.2010

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1										2		
CO2										2		
CO3				2						1		
CO4												1
CO5										1	2	

3-High Relation, 2-Medium Relation, 1-Low Relation, 0-No Relation

IN-PLANT TRAINING - I

Cours	se Outcomes(XEE308):	Domain	Level
CO1	<i>Relate</i> classroom theory with workplace practice	Cognitive	Understanding
CO2	<i>Comply with</i> Factory discipline, management and business practices.	Affective	Responding
CO3	Demonstrates teamwork and time management.	Affective	Valuing
CO4	<i>Describe</i> and <i>Display</i> hands-on experience on practical skills obtained during the programme.	Psychomotor	Perception Set
CO5	<i>Summarize</i> the tasks and activities done by technical documents and oral presentations.	Cognitive	Understanding

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

Web: www. pmu.edu

Fax: + 91- 4362 - 264660

Mapping	COs	with	GAs	-
---------	-----	------	-----	---

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	2											
CO2							1	3			1	
CO3									3	1	3	1
CO4		1	2	1	3							3
CO5				3						3		1
Total	2	1	2	4	3	0	1	3	3	4	4	5
Scaled	1	1	2	1	1	0	1	1	1	1	1	1

OPERATIONS RESEARCH

Cours	se Outcomes(XOR401):	Domain	Level
CO1	Explain the basic concepts of optimization and to	Cognitive	Understanding
	formulate and <i>Solve</i> Linear programming problems.		Creating
CO2	<i>Explain</i> and <i>Apply</i> the concepts of Transportation problem, Assignment Problem and Travelling Salesman	Cognitive	Understanding Applying
	problem.		1.122.1.18
CO3	Explain and Demonstrate the basic concepts of PERT-	Cognitive	Understanding
	CPM and their applications in product planning control.		Understanding
CO4	<i>Solve</i> the Minimal Spanning Tree Problem, Shortest Route Problem, Maximal Flow Problem and Minimal Cost	Cognitive	Creating
	Capacitated Flow Problem.		

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660





_		-										
Eñ	CO5	• <i>Apply</i> solutio	the on and	concepts d saddle po	of oint	Game	theory	to	Compute	the	NOF	Coghitive innovate * transform

SUBCODE	SUB NAME		L	Т	P	С					
XOR 401	OPERATIONS RESE	ARCH	3	0	0	3					
C:P:A = 3:0.25:0			L	Т	Р	Η					
			3	0	0	3					
UNIT I LINEAR MO	MODELS 9 programming problems (L. P. P.). Mathematical Formulation of L. P. P.										
Basics of OR, Linear prog	gramming problems (L.P.H	P), Mathematic	al Formulat	ion of	f L.P.I),					
Graphical method, Simplex algorithm, Duality.											
UNIT II TRANSPORTATION MODELS 9											
Transportation problem, Assignment problem, Travelling Salesman problem.											
UNIT III PROJECT SCHEDULING BY PERT-CPM 9											
PERT-CPM, product plan	nning control with PERT-C	CPM.									
UNIT IV NETWORK	MODELS					9					
Network definition, Min	imal Spanning Tree Prol	olem, Shortest	Route Pro	blem	, Max	imal					
Flow Problem, Minimal G	Cost Capacitated Flow Pro	blem.									
UNIT VGAME THEOF	RY					9					
Introduction - competitiv	ve game - finite and infin	ite game - tw	o person ze	ero su	ım ga	me -					
rectangular game - solution	on of game- saddle point, s	solution of a re	ctangular ga	ame v	with sa	ıddle					
point.											
		LECTURE	TUTORIA	AL	TOT	AL					
		45	0		4	5					

TEXTBOOKS 1.Hamdy A. Taha, "Operations Research" An Introduction, Eighth Edition, by Pearson Education, Inc.(2008).

- 2.Frederick.S Hillier and Gerald J. Lieberman, Introduction to Operations Research, sixth edition,Mc Graw Hill International Edition, Industrial Engineering Series, (2001).
- 3.Kantiswaroop,Gupta P.K and Manmohan, Operations Research, Sultan Chand & Sons, New Delhi, (2008).

REFERENCE BOOKS

1. Hadley G, Linear Programming, Narosa publishing House, (1995).

2. Hadley G, Nonlinear and Dynamic Programming, Addison-Wesley, Reading Mass, (1973).

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Email: headeee@pmu.edu 3. Gupta R. K. Linear Programming", Krishna Prakashan A



think • innovate • transform

E REFERENCES

www.nptel.ac.in

- 1. Fundamentals of Operations Research, Advanced Operation Research
- 2. Prof.G.Srinivasan, Department of Management Studies, Indian Institute of Technology, Madras.

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3	2								1	1	2
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

COs versus GAs mapping

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

Course Outcomes(XEE402): Domain Level Explain the structure of Electric power system with **CO1** Understanding Cognitive different types of transmission level. Compare its Understanding economical and technical Performance. **CO2** Explain different types of single and three phase Understanding Cognitive transmission line parameters of electrical and non electrical **Parameters** Distinguish the types of transmission line. Efficiency Cognitive **CO3** Analyzing Calculation and Stability analysis of transmission line. *Explain* the construction of different types of insulators. Cognitive Understanding **CO4** Interpret the performance of insulators and cables. Understanding CO5 Compare different bus schemes in substation and explain Cognitive Understanding

TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

Email: head



Understanding think innovate
 transform

		r			· · · · ·					
SUBCODE	SUB NAME	L	Т	P	C					
XEE 402	TRANSMISSION & DISTRIBUTION OF		0	0	3					
3:0:0	ELECTRIC POWER	L	Τ	Р	Η					
UNIT I	UNIT I INTRODUCTION									
Structure of e	electric power system: Various levels such as generation	n, tra	nsmis	sion	and					
distribution; H	IVDC and EHV AC transmission: comparison of econom	ics o	f tran	smiss	ion,					
technical perf	ormance and reliability, application of HVDC transmiss	ion s	ystem	– B	asic					
Concepts of F	ACTS Controllers-power system planning.									
UNIT II	TRANSMISSION LINE PARAMETERS				09					
Parameters of	Parameters of single and three phase transmission lines with single and double circuits:									
Resistance, in	nductance and capacitance of solid, stranded and b	undle	d co	nduct	ors:					
Symmetrical a	and unsymmetrical spacing and transposition; application	of se	elf an	d mu	tual					
GMD; skin an	d proximity effects; interference with neighbouring commu	nicati	ion cir	cuits.	•					
UNIT III MODELLING AND PERFORMANCE OF TRANSMISSION 09 LINE										
Classification of lines: Short line, medium line and long line; equivalent circuits, attenuation										
constant, phase constant, surge impedance; transmission efficiency and voltage regulation;										
real and reactive power flow in lines: Power-angle diagram; surge-impedance loading, load										
ability limits l	based on thermal loading, angle and voltage stability consi	derati	ons; s	shunt	and					
series compensation; Ferranti effect and corona loss.										

UNIT IV	INSULATORS AND CABLES	09				
Insulators: Ty string efficien Power factor capacitance,	ppes, voltage distribution in insulator string and grading, improvement of ncy. Underground cables: Constructional features of LT and HT cables, and heating of cable, criteria for the selection of cables- DC – Cables. dielectric stress and grading, thermal characteristics.					
UNIT V	GROUNDING AND DISTRIBUTION SYSTEM	09				
Substation layout with different BUS schemes - Switching substation-Mechanical design of						
transmission line - Sag and tension calculation for different weather condition. Resistance						
grounding sy	stems: Resistance of driven rods, resistance of grounding point electr	ode,				

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660 Etr



		LECTURE	TUTORIAL	TOTAL
		45	0	45
TE	XT BOOKS			
1.	C. L. Wadhwa, 'Electrical Power Systems' (H	Iardcover) New	Age Publicatio	ons, 2005.
2.	B.R.Gupta, 'Power System Analysis and Desig	gn', S.Chand, N	New Delhi, 2003	.
3.	S.N. Singh, 'Electric Power Generation, Trans	smission and D	istribution', Pre	ntice Hall
	India Pvt. Ltd, 2002.			
RF	EFERENCE BOOKS			
1.	Luces M.Fualkenberry ,Walter Coffer, 'Electr	rical Power Dis	tribution and Tra	ansmission',
1.	Luces M.Fualkenberry ,Walter Coffer, 'Electr Pearson Education, 1996.	rical Power Dis	tribution andTra	ansmission',
1. 2.	 Luces M.Fualkenberry ,Walter Coffer, 'Electr Pearson Education, 1996. Hadisaddak, 'Power System Analysis,' Tata M 	rical Power Dis IcGraw Hill Pu	tribution andTra	ansmission', any',2003
1. 2. 3.	 Luces M.Fualkenberry ,Walter Coffer, 'Electr Pearson Education, 1996. Hadisaddak, 'Power System Analysis,' Tata M Central Electricity Authority (CEA), 'Guidel 	rical Power Dis IcGraw Hill Pu lines for Trans	tribution andTra ublishing Compa mission System	ansmission', any',2003 1 Planning',
1. 2. 3.	 Luces M.Fualkenberry ,Walter Coffer, 'Electric Pearson Education, 1996. Hadisaddak, 'Power System Analysis,' Tata M Central Electricity Authority (CEA), 'Guidel New Delhi 	rical Power Dis IcGraw Hill Pu lines for Trans	tribution andTra Iblishing Compa mission System	ansmission', any',2003 n Planning',
 1. 2. 3. 4. 	 Luces M.Fualkenberry ,Walter Coffer, 'Electric Pearson Education, 1996. Hadisaddak, 'Power System Analysis,' Tata M Central Electricity Authority (CEA), 'Guidel New Delhi Tamil Nadu Electricity Board Handbook', 201 	rical Power Dis IcGraw Hill Pu lines for Trans 2.	tribution andTra ublishing Compa mission System	ansmission', any',2003 n Planning',
 1. 2. 3. 4. E I 	Luces M.Fualkenberry ,Walter Coffer, 'Electr Pearson Education, 1996. Hadisaddak, 'Power System Analysis,' Tata M Central Electricity Authority (CEA), 'Guidel New Delhi Tamil Nadu Electricity Board Handbook', 201 REFERENCES:	rical Power Dis IcGraw Hill Pu lines for Trans 2.	tribution andTra ublishing Compa mission System	ansmission', any',2003 1 Planning',

COs versus POs mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	1	3			1		3			1		2	2	3
CO 2	1	3	1									1	3	2
CO 3	1			1		1			1	1			2	3



 \mathbf{D}

CIT

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

FIIUIIE. + 91	- 4302 - 2	.04000	Fax. +	91-4302 -	204000			2	ĭ⊙ I	I I	UIN	LVL.	NDI	TT
CO 4	eee@pmu. I	2	W	eb: www. p	mu.edu			1 4	A DER	9010 ¹	(Under Sec.	innovat	$2^{156)\cdot \text{NAAC}}$	sform
CO 5		2									cimit	1	2	3
Total	4	10	1	1	1	1	3	1	1	2	1	5	11	13
Scaling	1	2	1	1	1	1	1	1	1	1	1	1	3	3

ELECTRONIC DEVICES AND CIRCUITS

Cours	se Outcomes(XEE403):	Domain	Level
CO1	<i>Classify</i> and <i>explain</i> semiconductor devices and <i>show</i> the input output characteristics of basic semiconductor devices	Cognitive	Understanding Understanding
CO2	<i>Explain</i> the construction, working and their characteristics of different types of transistors.	Cognitive	Understanding
CO3	<i>Classify</i> the different types of amplifiers and <i>design</i> procedure of amplifiers and <i>show</i> the frequency response of an amplifier	Cognitive Psychomotor	Understanding Creating Set
and Show we contract the contract of the contr



Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660

E	^{mail:} heade	<i>Classify</i> the different types of amplifiers and <i>show</i> design procedure of amplifiers.	h ine	Cognitive think • in Psychomotor	^{5C Act, 1956) • NAAC Accredited Understanding novate • transform Set}
	CO5	<i>Explain</i> the feedback amplifiers and oscillators.		Cognitive	Understanding

SUB CODE	SUB NAME	L	Т	Р	С				
XEE403	3 0								
C:P:A	ELECTRONIC DEVICES AND CIRCUITS	Т	Р	Н					
3:1:0		3	0	2	5				
UNIT- II	PN JUNCTION DEVICES			10 +	⊦ 20				
PN junction	diode -structure, operation and V-I characteristics, diffusion	and tra	nsient c	apacita	nce -				
Rectifiers –	Half Wave and Full Wave Rectifier,- Display devices- LED,	Laser of	liodes-	Zener	diode				
characteristi	cs-Zener Reverse characteristics – Zener as regulator								
UNIT- II TRANSISTORS									
BJT, JFET,	MOSFET- structure, operation, characteristics and Biasing U	JJT, Th	yristor	and IG	BT -				
Structure an	d characteristics.								
UNIT- III	AMPLIFIERS			9 +	- 5				
BJT small s	gnal model – Analysis of CE, CB, CC amplifiers- Gain and free	luency 1	response	e –MOS	SFET				
small signa	l model- Analysis of CS and Source follower - Gain and	frequer	ncy resp	ponse-	High				
frequency and	nalysis.								
UNIT- IV	MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AM	IPLIFI	ER	9 +	- 5				
BIMOS cas	cade amplifier, Differential amplifier - Common mode and I	Differen	ce mod	e analy	/sis –				
FET input s	tages - Single tuned amplifiers - Gain and frequency response	e – Neu	tralizati	on met	hods,				
power amplifiers – Types (Qualitative analysis).									
UNIT- V	UNIT- VFEEDBACK AMPLIFIERS AND OSCILLATORS9 + 3								
Advantages	of negative feedback - voltage / current, series , Shunt feed	lback –	positive	feedba	ack –				
Condition for	or oscillations, phase shift – Wien bridge, Hartley, Colpitts and C	Crystal o	oscillato	ors.					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

- 1. P-N Junction Diode Characteristics
- 2. Zener Diode Characteristics
- 3. V I characteristics of LED and LDR,
- 4. V I characteristics of Photodiode and Laser diode.
- 5. Half Wave Rectifier with and without filter.
- 6. Full Wave Rectifier with and without filter.
- 7. Frequency Response of CE amplifier
- 8. Frequency Response of CC amplifier.
- 9. Frequency Response of common source FET Amplifier.
- 10. RC Coupled Amplifier.
- 11. RC Phase Shift Oscillator
- 12. Wien Bridge Oscillator.

		Lecture	Tutorial	Lab	Total					
		45	0	30	75					
TEXT	TEXT BOOKS:									
1.	Jacob. Millman, Christos C.Halkias, 'Electronic Devices and Circuits', Tata McGraw Hill Publishing Limited, New Delhi, 2003.									
2.	David A.Bell, 'Electronic Devices and Circuits', P New Delhi, 2003.	rentice Hal	l of India I	Private I	_imited,					
3.	Principle of Electronics by V.K. Mehta, S.Chand									
4.	Theodre. F. Boghert, 'Electronic Devices & Circuits', Pearson Education, VI Edition, 2003.									
5.	Sedra and Smith, "Microelectronic circuits", Prentice	e Hall of Inc	lia, 2004.							
REFE	RENCE BOOKS:									
1.	Floyd, "Electronic Devices" Pearson Asia 5 th edition	2001.								
2.	Ben G. Streetman and Sanjay Banerjee, 'Solid Education, 2002 / PHI	State Ele	ctronic Dev	vices',	Pearson					
3.	Allen Mottershead, 'Electronic Devices and Circuits Hall of India Private Limited, New Delhi, 2003.	– An Introd	uction', Pr	entice						
4.	Electronic Devices and Circuits by Salivahanan – ' mited.	Tata Mcgra	w – Hill Ec	lucation	private					
5.	Rashid, "Microelectronic circuits" Thomson Publicat	ion, 2000.								

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

E-REFE	E-REFERENCES:								
1.	NPTEL, Electronic Devices and Circuits, Prof. T.S. Natarajan, IIT Madras								
2.	NPTEL, Electronic Devices and Circuits, Dr.S. Karmalkar, IIT Madras								

COs versus POs mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	3	2	2	-	-	1	1	1	1	-	-	1	2	1
CO 2	2	3	3	-	-	1	0	1	-	-	-	2	2	1
CO 3	1	3	2	-	-	2	1	2	-	1	-	2	1	2
CO 4	2	2	2	-	-	1	2	1	1	-	1	1	1	2
CO 5	2	2	2	-	-	0	1	2	1	1	1	2	2	1
Total	10	12	11	-	-	5	5	7	3	2	2	8	8	7
Scaling	2	3	3	0	0	1	1	2	1	1	1	2	2	2

0 – No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ELECTRICAL MACHINES II

Cours	se Outcomes(XEE404):	Domain	Level
CO1	<i>Explain</i> the fundamentals concepts of alternator and <i>name</i> the types of alternator. <i>Demonstrate</i> complete working of alternator and voltage regulation.	Cognitive	Understanding Remembering
CO2	Summarise the fundamentals concepts of synchronous motor and <i>perform</i> the starting, different torque and performance characteristics.	Cognitive Psychomotor	Understanding COR
CO3	Define the operation of induction motor, equivalent circuit and slip – torque characteristic. Show the testing and performance of an induction motor.	Cognitive Psychomotor	Remembering Set
CO4	<i>Classify</i> the types of starters of induction motor and <i>List</i> the different methods of speed control.	Cognitive Cognitive	Understanding Remembering
CO5	Define the concept of single phase induction motor and special machines. Perform the test like no load and blocked load test of single phase induction motor.	Cognitive Psychomotor	Remembering COR

SUB CODE	SUB NAME	L	Т	Р	С			
CODE								
XEE404		3	1	1	5			
C:P:A	ELECTRICAL MACHINES II	L	Т	Р	Н			
3:0:0		3	2	2	7			
UNIT-1	SYNCHRONOUS GENERATOR			10+1	2+12			
Constructio	nal details – Types of rotors – Winding Factors– EMF equation -	- Syncl	hronou	is read	ctance			
– Armature	reaction – Voltage regulation – E.M.F. M.M.F and Z.P.F metho	ods – S	ynchr	onizin	g and			
parallel ope	ration – Synchronizing torque.		5		0			
UNIT- II	UNIT-IISYNCHRONOUS MOTOR9+2+2							
Principle of	Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input							
and power of	developed equations – Starting methods – Current loci for consta	nt pow	er inp	ut, co	nstant			
excitation a	nd constant power developed – Handing and Damper Winding.	_	_					
UNIT-III	THREE PHASE INDUCTION MOTOR (IM)			10+8	8+8			
Constructio	nal details – Types of rotors – Principle of operation – Slip –	Coggin	g and	Craw	ling -			
Equivalent	circuit – Slip-torque characteristics - Condition for maximum	m tora	ue –	Losse	s and			
efficiency -	- Load test - No load and blocked rotor tests - Double cage rotors							
UNIT- IV	STARTING AND SPEED CONTROL OF THREE PHASE	IM		7+2-	-2			
Need for st	arting – Types of starters – DOL Stator resistance, rotor resistar	nce, au	totrans	forme	er and			
star-delta st	star-delta starters – Speed control – Change of voltage, frequency, number of poles and $slip - V/F$							
Control.		Γ		Г	-			
•								

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





UNIT- V SINGLE PHASE IM AND SPECIAL MACHINES

9+6+6

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor. A.C series motor, Stepper Motor – Introduction to Magnetic Levitation Systems.

- 1. OCC and Load Characteristics of three-phase alternator.
- 2. Regulation of three phase alternator by EMF /MMF methods.
- 3. Load test of a three phase alternator
- 4. V and Inverted V curves of Three Phase Synchronous Motor.
- 5. Load test on three-phase Squirrel Cage Induction motor.
- 6. Load test on Three-Phase Slip Ring Induction motor.
- 7. No load and blocked rotor test on three-phase induction motor.
- 8. Load test on single-phase induction motor
- 9. No load and blocked rotor test on single-phase induction motor.
- 10. Study of Induction motor starters

Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours

TEXT BOOKS:

1.	D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
2.	P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.
3.	B.L.Theraja, "A Textbook of Electrical Technology,"Vol. I&II, M/s S.Chand, Delhi,2013
REFE	RENCE BOOKS:
1.	A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
2.	J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
3.	P.C. Sen, "Principles of Electrical Machines and Power Electronics" John Wiley & Sons, 1997.
4.	DeshPande M.V., "Electrical Machines" PHI Learning Pvt Ltd., New Delhi – 2011.
5.	A. G. Warren, "Problems in Electrical Engineering", Parker and Smith Solutions, Newyork, 1940.
6.	K. Murugesh Kumar, 'Electric Machines', Vikas publishing house Pvt Ltd, 2002.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

E-REFERENCES:

http://freevideolectures.com/Course/2335/Basic-Electrical-Technology35-1. 38, Prof.L. Umanand, IISc Bangalore.

СО/РО	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	1	-	-	1	-	1
CO2	3	2	-	2	1	-	-	-	-	-	-	1	-	1
CO3	3	-	-	-	1	-	-	-	1	-	-	1	-	1
CO4	3	2	2	2	1	-	-	-	1	-	-	1	-	1
CO5	3	-	-	-	1	-	-	-	-	-	-	1	-	1
Total	15	6	4	6	5				3			5		5
Scaling	3	2	1	2	1				1			1		1

COs versus POs mapping

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ELECTROMAGNETIC FIELD THEORY

Cours	se Outcomes(XEE 405):	Domain	Level
CO1	<i>Illustrate and analyze</i> the spatial variations of physical quantities by various coordinate systems using stokes and divergence theorem.	Cognitive	Understanding Analyzing
CO2	<i>Apply</i> the knowledge of electrostatics using gauss and Coulombs law and their applications and <i>Analyze</i> boundary conditions.	Cognitive Cognitive	Applying Analyzing
CO3	<i>Apply and analyze</i> the magnetic field configuration using amperes Law, biot-savarts law and boundary conditions.	Cognitive Cognitive	Applying Analyzing
CO4	<i>Explain and Formulate</i> electromagnetic fields generated by dynamic charge distributions using Maxwell's equation.	Cognitive Cognitive	Understanding Creating
CO5	<i>Explain and Estimate</i> Electromagnetic wave propagation in different media.	Cognitive Cognitive	Understanding Evaluating

SUB	SUB NAME	L	Т	Р	С
CODE					
XEE		3	1	0	4
405	FLECTROMAGNETIC FIELD THEORY				
C:P:A		L	Т	Р	Н
2:0:0		3	0	0	3
UNIT- I	INTRODUCTION		0	9	
Sources and e	effects of electromagnetic fields - Vector fields - Different co-ordin	nate s	syster	ns (l	orief
description on	y) - Divergence theorem - Stoke's theorem.				
UNIT- II	ELECTROSTATICS		0	9	
Coulomb's La	w – Electric field intensity - Field due to point and continuous charges	s - Ga	uss's	s law	and
application - I	Electrical potential - Electric field and equipotential plots - Electric	field	in fr	ee sp	ace,
conductors, die	electric - Dielectric polarization, Electric field in multiple dielectrics - b	ounda	ary co	onditi	ons,
Poisson's and	Laplace's equation, Capacitance-energy density – Dielectric strength				
UNIT- III	MAGNETOSTATICS	09			
Lorentz Law	of force, magnetic field intensity-permeability - Biot-savart's Law	- An	pere	's La	ıw -
Magnetic field	l due to straight conductors, solenoid - Magnetic flux density (B)	- B	in fre	ee sp	ace,
conductor, Ma	gnetic materials - Magnetization - Boundary conditions - Scalar and	d vect	tor p	otent	ial -
Magnetic force	e - Torque - Inductance - Energy density - Magnetic circuits-permanent	magn	ets		
UNIT- IV	ELECTRODYNAMICS FIEL		0	9	
Faraday's law	of induced emf, -Transformer and motional EMF, Maxwell's equation	ns (d	iffere	ntial	and
integral forms) - Conduction current, Displacement current - Relation between field	l theo	ry ar	nd ci	rcuit
theory.					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600
 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





UNIT	- V	ELECTROMAGNETIC WAVES				09			
Generati	$\frac{1}{0}$ -	Electro Magnetic Wave equations –Wave par	ameters velo	city in	trinsic i	mnedance			
propagation constant – Wayes in free space, loss and lossless dielectrics, conductors-skin depth. Povnting									
vector – Plane wave reflection and refraction.									
	LECTURE TUTORIAL TOTAL								
			45	(0	45			
TEXT B	OOK	S:							
1.	John	.D.Kraus, 'Electromagnetics', McGraw Hill book	Co., New Yor	k, Fourt	h Editio	n, 2002.			
2.	Willi	iam. H.Hayt, 'Engineering Electromagnetics', Tata	a McGraw Hil	l edition	, 2001.				
3.	Josep	ph. A.Edminister, 'Theory and Problems of Elec	ctromagnetics ²	, Secon	nd editio	n, Schaum			
5.	Serie	es, Tata McGraw Hill, 1993.							
REFER	ENCE	E BOOKS:							
1.	D.Sa	thaiah-M.Anitha, 'Electro magnetic fields' Firs	st edition-200	7, SCI	ГЕСН р	ublications			
	(Indi	a) Pvt Ltd., Chennai							
2.	I.J. N Edi	Nagrath, D.P. Kothari, 'Electric Machines', Tata I ition, 2000.	McGraw Hill	Publishi	ng Co L	td, Second			
3.	Krau Fifth	s and Fleish, 'Electromagnetics with Application Edition, 1999.	ns', McGraw	Hill Inte	ernationa	l Editions,			
4	0 1'1			•/ 1	20	01			
4.	Sadil	ku, 'Elements of Electromagnetics', Second edition	n, Oxford Uni	versity I	Press, 20	01.			
E REFE	RENC	CES :							
1.	NPT	EL - Electromagnetic Fields, Prof. Harishankar Ra	amachandran,	IIT Ma	dras				
2.	NPT	EL - Electromagnetic Fields, Prof. Prof. Ravindra	Arora , IIT Ka	inpur.					

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu



PERIYAR MANIAMMAI UNIVERSITY (Under Sec. 3 of UGC Act. 1956) • NAAC Accredited think • innovate • transform

COs versus PO, PSO mapping

CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	-	1	-	1	1	-	-	1	-	1	1	1
CO2	2	3	-	2	-	1	-	-	-	-	-	-	1	1
CO3	2	3	-	-	-	1	1	1	-	-	-	1	-	2
CO4	2	2	-	-	-	1	-	-	1	-	-	-	1	2
CO5	2	2	1	-	-	-	-	2	-	-	-	1	1	1
Total	10	13	1	3	0	4	2	3	1	1	0	3	4	7
Scaling	2	3	1	1	0	1	1	1	1	1	0	1	1	2

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ECONOMICS FOR ENGINEERS

Cours	se Outcomes(XUM406):	Domain	Level
CO1	Understand the concepts of economics in engineering.	Cognitive	Remembering
CO2	Interpret Break-even analysis.	Cognitive	Understanding
CO3	Illustrate value engineering procedure.	Cognitive	Understanding
CO4	Understand and analyze replacement problem.	Cognitive	Understanding
CO5	Explain depreciation.	Cognitive	Understanding

XUM 406ECONOMICS FOR ENGINEERS3003C:P:A = 3:0:0IIIIIIL T P HIL T P H3003UNIT I INTRODUCTION TO ECONOMICSINTRODUCTION TO ECONOMICSFlow in an economy, Law of supply and demand, Concept of Engineering Economics - Engineering efficiency, Economic efficiency, Scope of engineering economics - types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Varginal Revenue, Sunk cost, Opportunity costI2Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, LimitationsSocial Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering procedure - Make or buy decisionsBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	SUBCODE	SUB NAME	L	Т	Р	C
C:P:A = 3:0:0LTPHImage: Image:	XUM 406	ECONOMICS FOR ENGINEERS	3	0	0	3
LTPH3003UNIT I INTRODUCTION TO ECONOMICS08Flow in an economy, Law of supply and demand, Concept of Engineering Economics - Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, LimitationsSocial Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decision- Business operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	C:P:A = 3:0:0					
3003UNIT I INTRODUCTION TO ECONOMICS08Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations12Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.10Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs07			L	Т	P	Η
UNIT IINTRODUCTION TO ECONOMICS08Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost12UNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations12Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.10Value engineering – Function, aims, Value engineering procedure - Make or buy decision- Business operating costs, Business overhead costs, Equipment operating costs07			3	0	0	3
Flow in an economy, Law of supply and demand, Concept of Engineering Economics – Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost UNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS 12 Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis. UNIT III VALUE ENGINEERING & COST ACCOUNTING: 10 Value engineering – Function, aims, Value engineering procedure - Make or buy decision- Business operating costs, Business overhead costs, Equipment operating costs UNIT IV REPLACEMENT ANALYSIS	UNIT I INTRO	DUCTION TO ECONOMICS				08
Engineering efficiency, Economic efficiency, Scope of engineering economics- types of costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost UNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS 12 Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations 12 Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis. 10 Value engineering – Function, aims, Value engineering procedure - Make or buy decision 10 Value Replacement project alternative costs 07	Flow in an econo	my, Law of supply and demand, Concept of Engine	eering	Ecor	nomic	×s –
costing, element of costs, preparation of cost sheet and estimation, Marginal cost, Marginal Revenue, Sunk cost, Opportunity cost12UNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.10Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs07	Engineering effici	ency, Economic efficiency, Scope of engineering e	conor	nics-	types	of
Revenue, Sunk cost, Opportunity costUNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, LimitationsSocial Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs10UNIT IV REPLACEMENT ANALYSIS07	costing, element o	f costs, preparation of cost sheet and estimation, Mar	ginal	cost, I	Marg	inal
UNIT IIBREAK-EVEN ANALYSIS & SOCIAL COST BENEFIT ANALYSIS12Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations13Social Cost Benefit Analysis: indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.14UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decision10Business operating costs, Business overhead costs, Equipment operating costs07	Revenue, Sunk cos	st, Opportunity cost				
 Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations Social Cost Benefit Analysis: compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis. UNIT III VALUE ENGINEERING & COST ACCOUNTING: 10 Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs UNIT IV REPLACEMENT ANALYSIS 07 	UNIT IIBREAK-	EVEN ANALYSIS & SOCIAL COST BENEFIT A	NALY	SIS		12
Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, LimitationsSocial Cost Benefit Analysis:compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decisionBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	Margin of Safety,	Profit, Cost & Quantity analysis-Product Mix decision	s and	CVP	analy	vsis,
Social Cost Benefit Analysis:compare different project alternatives, Calculate direct,indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.10UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decisionBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	Profit/Volume Rat	io (P/V Ratio), Application of Marginal costing, Limit	ations			
indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decisionBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	Social Cost Ben	efit Analysis: compare different project alternative	es, Ca	lculat	te dir	ect,
UNIT III VALUE ENGINEERING & COST ACCOUNTING:10Value engineering – Function, aims, Value engineering procedure - Make or buy decisionBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	indirect and extern	al effects; Monetizing effects; Result of a social cost be	enefit	analy	sis.	
Value engineering – Function, aims, Value engineering procedure - Make or buy decisionBusiness operating costs, Business overhead costs, Equipment operating costsUNIT IV REPLACEMENT ANALYSIS07	UNIT III VALU	E ENGINEERING & COST ACCOUNTING:				10
Business operating costs, Business overhead costs, Equipment operating costs UNIT IV REPLACEMENT ANALYSIS 07	Value engineering	- Function, aims, Value engineering procedure - Make	or bu	y dec	ision	
UNIT IV REPLACEMENT ANALYSIS 07	Business operating	costs, Business overhead costs, Equipment operating of	costs			
	UNIT IV REPLA	CEMENT ANALYSIS				07
Replacement analysis -Types of replacement problem, determination of economic life of an	Replacement analy	vsis -Types of replacement problem, determination of	econ	omic l	life of	f an
asset, Replacement of an asset with a new asset.	asset, Replacemen	t of an asset with a new asset.				





think • innovate • transform

UNIT VDEPRECIATION

08

Depreciation- Introduction, Straight line method of depreciation, declining balance method of depreciation-Sum of the years digits method of depreciation, sinking fund method of depreciation, Annuity method of depreciation, service output method of depreciation.

LECTURE	TUTORIAL	TOTAL
45	0	45

TEXT BOOKS

- 1. Sp Gupta, Ajay Sharma & Satish Ahuja, "Cost Accounting", V K Global Publications, Faridabad, Haryana, 2012
- 2. S.P.Jain & Narang, "Cost accounting Principles and Practice", Kalyani Publishers, Calcutta, 2012
- 3. Panneer Selvam, R, "Engineering Economics", Prentice Hall of India Ltd, New Delhi, 2001.
- 4. William G.Sullivan, James A.Bontadelli & Elin M.Wicks, "Engineering Economy", Prentice Hall International, New York, 2001.

REFERENCE BOOKS

- 1. Luke M Froeb / Brian T Mccann, "Managerial Economics A problem solving approach" Thomson learning 2007
- 2. Truett & Truett, "Managerial economics- Analysis, problems & cases " Wiley India 8th edition 2004.
- 3. Chan S.Park, "Contemporary Engineering Economics", Prentice Hall of India, 2002.
- 4. Donald.G. Newman, Jerome.P.Lavelle, "Engineering Economics and analysis" Engg. Press, Texas, 2002

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
<u> </u>												
CO 1	2					1	1				1	1
CO 2	2	3		1		2					2	1
CO 3	2			2		1	1	1		2	1	1
CO 4	3	1		1		1					3	1
CO 5	2			1		2	1				1	2
	11	4	0	5	0	7	3	1	0	2	8	6
Scaled to 0,1,2,3 scale	3	1	0	1	0	2	1	1	0	1	2	1

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

NUMERICAL METHODS

Cours	se Outcomes (XMA501)	Domain	Level
CO1	<i>Solve</i> algebraic and transcendental equations and to <i>Compute</i> Eigen values of a matrix by Power method.	Cognitive	Applying Understanding
CO2	<i>Interpret and</i> Approximate the data using Interpolation methods	Cognitive	Understanding
CO3	<i>Compute</i> the Numerical Differentiation and Integration <i>and to Apply</i> the <i>Trapezoidal</i> and Simpson's rules.	Cognitive	Understanding Applying
CO4	<i>Solve</i> the first order and second order differential equations using single step and multistep methods	Cognitive	Applying
CO5	<i>Apply</i> Finite difference methods to <i>Solve</i> two-point linear boundary value problems and to <i>Solve</i> One dimensional heat-flow equation and wave equation.	Cognitive	Applying Applying Applying

SU	JBCO	DE	SUB NAME	L	Τ	Р	C				
X	MA 5	501		2	1	0	3				
С	Р	Α	NUMERICAL METHODS	L	Т	Р	Η				
3	2.5	0		2	2	0	4				
UI	LEMS	5	12								
Solution of algebraic and transcendental equations - Fixed point iteration method - Newton-											
Raphson method- Solution of linear system of equations - Gauss Elimination method -Gauss-											
Jordan methods - Iterative methods of Gauss-Jacobi and Gauss-Seidel - Matrix Inversion by											
Gauss-Jordan method – Eigen values of a matrix by Power method.											
UI	II TIN	[INTERPOLATION AND APPROXIMATION				12				
Int	terpola	ation	with equal intervals - Newton's forward and backward d	liffere	nce fo	ormu	lae-				
Int	terpola	ation	with unequal intervals - Lagrange interpolation - Newton'	s divi	ded d	iffere	ence				
int	erpola	ation									
Ul	I TIN	II	NUMERICAL DIFFERENTIATION AND INTEGRAT	ION			12				
Approximation of derivatives using interpolation polynomials - Numerical integration using											
Trapezoidal, Simpson's 1/3 and Simpson's 3/8 rules - Romberg's method - Two point and											
three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal											
an	d Sin	npson	i's rules.								





think • innovate • transform

UNIT IV INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL 12 EQUATIONS

Single step-methods - Taylor's series method - Euler's method - Modified Euler's method - Fourth order Runge-Kutta method for solving first and second order equations - Multi-step methods - Milne's and Adams-Bash forth predictor-corrector methods for solving first order equations.

UNIT VBOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL12DIFFERENTIAL EQUATIONS

Finite difference methods for solving two-point linear boundary value problems – Finite difference techniques for the solution of two dimensional Laplace's and Poisson's equations on rectangular domain – One dimensional heat-flow equation by explicit and implicit methods - One dimensional wave equation by explicit method.

Lecture = 30; Tutorial = 30; Total = 60 Hours

TEXT BOOKS

- Grewal, B.S. and Grewal, J.S., "Numerical methods in Engineering and Science", 6th Edition, Khanna Publishers, New Delhi, (2004).
- Sankara Rao, K. "Numerical methods for Scientists and Engineers', 3rd Edition, Prentice Hall of India Private Ltd., New Delhi, (2007).

REFERENCES BOOKS

- 1. Chapra, S. C and Canale, R. P. "Numerical Methods for Engineers", 5th Edition, Tata McGraw-Hill, New Delhi, (2007).
- 2. Gerald, C. F. and Wheatley, P. O., "Applied Numerical Analysis", 6th Edition, Pearson Education Asia, New Delhi, (2006).
- 3. Brian Bradie, "A friendly introduction to Numerical analysis", Pearson Education Asia, New Delhi, (2007)
- 4. Jain M.K., Iyengar S.R.K, Jain R.K, "Numerical Methods problems and solutions", Revised Second Edition (2007).

E REFERENCES

www.nptel.ac.in

1. Elementary Numerical Analysis Prof. Rekha P. Kulkarni. Department of Mathematics, Indian Institute Of Technology, Bombay.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu



PERIYAR MANIAMMAI UNIVERSITY (Under Sec. 3 of UGC Act. 1956) • NAAC Accredited think • innovate • transform

COs versus GAs mapping

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO 1	3									1		1
CO 2	3									1		1
CO 3	3									1		1
CO 4	3	2			1					1	1	1
CO 5	3	2			1					1	1	1
	15	4	0	0	2	0	0	0	0	5	2	5

0 –No relation	1 – Low relation	2 – Medium relation	3 – High Relation
----------------	------------------	---------------------	-------------------

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

POWER SYSTEM ANALYSIS

Cours	e Outcomes (XEE502)	Domain	Level
CO1	Demonstrate the per phase analysis of power system.	Cognitive	Understanding
CO2	Develop the model of various components of power	Cognitive	Applying
	system and <i>Construct</i> the Y Bus and Z Bus for a power		
	system.		
CO3	Analyze the power system network with symmetrical	Cognitive	Analyzing
	and unsymmetrical faults. <i>Calibrate</i> the fault current in	Psychomotor	Complex
	a power system.	-	-
CO4	Summarize the power flow equation. Assess the voltage	Cognitive	Understanding
	profile of a power system by performing the load flow		Evaluating
	analysis and <i>Identify</i> the line loss and line flow.	Psychomotor	Perception
CO5	<i>Classify</i> and <i>determine</i> the stability of power system.	Cognitive	Understanding
	<i>Detect</i> the transient behavior of power system when it is		Evaluating
	subjected to a fault.	psychomotor	Perception

SU	B.CC	DE	SUB NAME	L	Т	Р	С							
X	EE5	02		2	1	0	3							
С	Р	Α	POWER SYSTEM ANALYSIS	LYSIS L T										
3	1	0		2	2	0	4							
UNIT I INTRODUCTION														
Need for system analysis in planning and operation of modern power system – per phase analysis -														
Sin	gle l	ine d	iagram - Per unit representation and Per unit calculation	s – Cl	nange	of b	ase –							
Intr	oduc	tion to	o Electricity Deregulation.											
UNIT IIMODELLING OF POWER SYSTEM COMPONENTS06+06														
Primitive network and its matrices - bus incidence matrix - bus admittance and bus impedance														
mat	rix f	orma	tion – Z – Bus building algorithm - Modelling of gener	ator, lo	oad, ti	ansfo	ormer,							
tran	smis	sion l	ine for different power system studies.											
U	NIT I	III	FAULT ANALYSIS-UNSYMMETRICAL FAULTS			06	+06							
Nee	ed for	shor	t circuit study - basic assumptions in fault analysis of power sy	stems.	Symm	netrica	al (or)							
bala	nced	three	e phase faults – problem formulation – fault analysis using Z	-bus m	atrix -	- algo	orithm							
and	flow	char	t. Computations of short circuit capacity, post fault voltage ar	nd curre	ents. In	ntrodu	uction							
to s	to symmetrical components - sequence impedances - sequence networks Unsymmetrical fault													
ana	analysis: L-G, L-L and L-L-G faults.													
UNIT IVPOWER FLOW ANALYSIS06+06														
Nee	Need for Power Flow Analysis – bus classification – derivation of power flow equation – solution													
by (Gauss	s-Sei	del, Newton-Raphson and Fast Decoupled Power Flow method	ds - co	mparis	on of	three							
met	hods													

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

UNIT V STABILITY ANALYSIS

06+06

Types of stability - Swing equation in state space form - equal area criterion - stability analysis of single machine connected to infinite bus by modified Euler's method using classical machine model – critical clearing angle and time. Causes of voltage instability – voltage stability proximity indices for two-bus system – methods of improving power system stability.

TEXT BOOKS

Lecture = 30; Tutorial = 30; Total = 60 Hours

- 1. Hadi Sadaat, "Power System Analysis", Tata McGraw Hill Publishing Company, 2002.
- 2. Nagarath, I.J., and Kothari, D.P., 'Modern Power System Analysis', Tata McGraw Hill Publishing Company, 2009.
- 3. John J. Grainger and Stevenson Jr. W.D., "Power System Analysis", McGraw Hill International Edition, 1994.
- 4. Pai. M.A "Computer techniques in Power System Analysis" Tata McGraw Hill Publishing Company, 3rd edition 2014.

REFERENCE BOOKS

- 1. Stagg, G.W. and El-Abaid, A. H. "Computer Methods in Power System Analysis", McGraw-Hill International Book Company, 2000.
- 2. Wadhwa C.L. "Electric Power Systems" Willey Eastern, 2007.

E-REFERENCES

- 1. http://nptel.ac.in/courses/108105067/ Prof. A. K. Sinha, IITechnology, Kharagpur.
- http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/ui/TOC.htm Prof. Arindam Ghosh, IIT Kanpur

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	3	2		2			1				1		2	
CO 2	3	2	2	2			1				1		2	1
CO 3	3	2	2	2	3		1				1		2	1
CO 4	3	3	2	3			1				1		2	1
CO 5		2	1	1							1		3	1
Total	12	11	7	10	3	0	4	0	0	0	5	0	11	4
Scaled to 0,1,2,3 scale	3	3	2	2	1	0	1	0	0	0	1	0	3	1

COs versus POs mapping

0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

POWER ELECTRONICS

Cours	se Outcomes (XEE 503)	Domain	Level
CO1	<i>Explain</i> about various power semiconductor devices and its modeling. <i>Demonstrate</i> the characteristics of power	Cognitive	Understanding
	devices.		
CO2	Compare the different types of firing and Commutation circuits.	Cognitive	Understanding
CO3	<i>Construct</i> the converters and choppers circuits and <i>Calibrates</i> the output DC load parameters	Cognitive	Applying
CO4	<i>Classify</i> the operation of various inverters and AC Voltage controller, <i>infer the</i> suitable device for voltage control.	Cognitive	Analyzing
CO5	Compare the 1ϕ , 3ϕ cyclo-converter with its various types.	Cognitive	Understanding

Sub.code	Sub Nome	L	Т	Р	С						
XEE503	XEE503Sub. Ivane30CPAPOWER ELECTRONICSLT										
C P A	POWER ELECTRONICS	L	Т	Р	Η						
3 1 0		3	2	2 7							
UNIT I POWER SEMI-CONDUCTOR DEVICES											
Review on Semiconductor devices - characteristics and modeling of power diodes, SC											
TRIAC, power BJT, power MOSFET and IGBT. Triggering and Commutation Circuits.											
UNIT II PHASE CONTROLLED CONVERTERS09+06+03											
2 pulse, 3 phase converters- effect of freewheeling diode, performance parameters and effect of											
source inductar	ce - firing circuits, Dual converters.										
UNIT III DC	TO DC CHOPPERS			09+06	6+06						
Types of Chop	pers, Class A to E, step up chopper - Analysis of V	Voltage	e, Curr	ent and	load-						
commutated ch	oppers –Introduction to Resonant converters.										
UNIT IV INV	ERTERS			09+06	+06						
Single phase, T	hree Phase voltage source inverters (Both 120° and 12	80° mo	de of c	conductio	ons) -						
PWM techniqu	es: Sinusoidal PWM, Multiple PWM, space vecto	or PWI	M - C	urrent so	ource						
inverters - Concepts of UPS.											
UNIT V AC	VOLTAGE CONTROLLERS			09+06	+06						
Single-phase and 3 phase AC voltage controllers Multi stage sequence control - step up and											
step down cyclo-converters - Single phase to single phase and Single phase to Three phase											
cyclo-converter	s- Introduction to matrix converters.										





think • innovate • transform

XEE 503 – Power Electronics Laboratory

Name of the Experiments:

- 1. Characteristics of SCR
- 2. Characteristics of MOSFET
- 3. Characteristics of IGBT
- 4. 1Φ fully Controlled rectifier with R, RL load.
- 5. BUCK- BOOST Converter using MOSFET.
- 6. IGBT based choppers.
- 7. 1Φ IGBT PWM inverter.
- 8. Parallel Inverter.
- 9. 1Φ AC voltage controller using SCR / TRIAC.
- 10. Mini Project (Related to above experiments).

Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours

TEXT BOOKS :

- 1. Rashid, M.H., 'Power Electronics Circuits Devices and Applications', Prentice Hall of India,2004.
- 2. Singh.M.D and Kanchandani , 'Power Electronics'-Tata McGraw Hill & Hill publication Company Ltd New Delhi-2009.
- 3. BimbhraP.S, "Power Electronics" Khanna Publishers; 2007
- 4. Ned Mohan, Tore M. Undeland and William P.Robbins, *Power Electronics:* Converters, Applications and Design, New Jersey, John Wiley and Sons, 2006.

REFERENCE BOOKS:

- 1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., 'Thyristorised Power Controllers', Wiley Eastern Limited, 1986.
- 2. Lander, W., 'Power Electronics', McGraw Hill and Company, Third Edition, 2009.
- 3. Sen.P.C "Power Electronics" Tata McGraw-Hill Publishing Co. Ltd., New Delhi 2005
- 4. Joseph Vithayathil "Power Electronics" McGraw-Hill New York 1996.

E REFERENCES:

- 1. *Lecture* Series on *Power Electronics* by Prof. B.G. Fernandes, Department of Electrical Engineering, IIT Bombay.
- 2. http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





COs versus PO, PSO mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	3	2	1	0	0	1	3	0	0	0	0	1	3	1
CO 2	2	1	2	1	0	0	1	0	0	0	0	0	2	2
CO 3	3	1	1	0	0	0	0	0	0	0	0	0	1	2
CO 4	1	3	2	0	0	1	0	0	0	0	0	0	2	1
CO 5	1	2	3	1	3	0	1	1	0	0	0	0	3	2
Total	10	9	9	2	3	2	5	1	0	0	0	1	11	6
Scaling	2	2	2	1	1	1	1	1	0	0	0	1	3	2

0 –No relation

1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





CONTROL SYSTEMS ENGINEERING

Cours	se Outcomes (XEE 504)	Domain	Level
CO1	Identify the basic elements, derive the transfer function and Construct the transfer function of DC motors and DC generators	Cognitive	Applying Applying
CO2	Explain the performance of I and II system with static and dynamic error coefficients.	Cognitive	Understanding
CO3	Describe Time domain & Frequency domain and shows the response of time and frequency domain	Cognitive	Remembering Understanding
CO4	<i>Explain</i> State space model and <i>construct and verify</i> the canonical state model and kalmans test for controllability and observability.	Cognitive	Understanding Applying
CO5	Describe State transition matrix	Cognitive	Remembering

SU	B CO	DE	SUB NAME	L	Т	Р	С					
X	EE 5	04										
С	Р	Α	CONTROL SYSTEMS ENGINEERING	L	Т	Р	Н					
3												
UNIT I SYSTEMS AND THEIR REPRESENTATION												
Basi	c ele	ments	in control systems - Open and closed loop systems -	Princ	iples	of feed	lback,					
Tran	sfer t	functi	on Block diagram reduction techniques - Signal flow graph	ns. Ma	ason g	gain for	mula,					
Mod	Modeling of electric systems translation and rotational mechanical systems.											
UNI	UNIT II TIME RESPONSE 08 + 09											
Tim	e resp	onse	- Time domain specifications - Types of test input - I and II	order	syste	m respo	onse –					
Erro	r coet	fficier	tts – Generalized error series – Steady state error									
UNI	T III	FRF	EQUENCY RESPONSE			09 + 03	+ 05					
Freq	uency	y dom	ain specification – Bode plot – Polar plot – Determination	of clo	osed 1	oop res	ponse					
from	n oper	n loop	response - Correlation between frequency domain and time	e dor	nain s	specific	ations					
serie	series, parallel, series-parallel compensators, Lead, Lag and Lead Lag Compensators.											
UNIT IV STABILITY OF CONTROL SYSTEM09 + 06 + 05												
Cha	Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root											
locu	s con	struct	ion - Effect of pole, zero addition - Gain margin and p	hase	marg	$in - N_{1}$	yquist					
stabi	ility c	riteric	n									

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





UNIT V STATE VARIABLE ANALYSIS & DIGITAL CONTRO SYSTEMS 09 + 03

Introduction to state Space Analysis – Physical Variable phase variable and canonical variable forms State Space representation of continuous time system. Transfer function from state variable representation – solutions of the state equations – concepts of controllability and observability

- 1. Transfer function and modeling of separately excited DC Generator.
- 2. Transfer function and modeling of Armature & field controlled DC Motor.
- 3. Transfer function of AC Servomotor.
- 4. Frequency response of Lag, Lead & Lag Lead networks.
- 5. Analysis of Synchro Transmitter and Receiver.
- 6. Performance of DC Stepper Motor
- 7. Transfer function and modeling of Ward Leonard speed control system applied to DC motor.
- 8. DC Position using feedback Control system.
- 9. Digital simulation of I order and II order system by using Scilab.
- 10. Determination of Phase margin and Gain margin of the Bode plot using Scilab.

Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours

TEXT BOOKS:

- 1. I.J. Nagrath& M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003
- 2. Norman S. Nise, "Control System Engineering" fifteh edition, John Wiley & Sons, inc, 2007.
- 3. M. Gopal, 'Control Systems, Principles & Design', Tata McGraw Hill, New Delhi, 2002.
- 4. Richard C. Dorf & Robert H. Bishop, "Modern Control Systems", Addidon Wesley, 2012.

REFERENCE BOOKS:

- 1. B.C. Kuo, 'Automatic Control Systems', Prentice Hall of India Ltd., New Delhi, 2014.
- 2. K. Ogata, 'Modern Control Engineering', 4th edition, Pearson Education, New Delhi, 2003 / PHI.
- 3. N. Bandyopadhyay, 'Control Engineering Theory and Practice', Prentice Hall of India, 2009
- 4. John J.D'azzo & Constantine H.Houpis, 'Linear control system analysis and design', Tata McGrow-Hill, Inc., 2013.

E-REFERENCES:

1. NTPEL, Control sytems Engineering (Web Course), Prof. M. Gopal, IIT Kharagpur.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO1	2	3	2	1	-	-	1	1	1	-	-	1	-	-
CO2	2	3	1		2	1	1	1	1	1	-	2	2	1
CO3	3	3	3	2	-	-	1	-	3	-	-	-	2	2
CO4	1	2	2	3	1	2	1	1	2	1	1	2	1	2
CO5	2	1	1	1	1	1	1	1	2	1	-	1	2	1
Total	10	13	9	7	4	4	5	4	9	3	1	6	7	6
Scaling	2	2	2	2	1	1	1	1	2	1	1	2	2	2

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

TOTAL QUALITY MANAGEMENT

Cours	se Outcomes (XUM 506)	Domain	Level
CO1	<i>List</i> and <i>Explain</i> the basic concepts of total quality concepts and its limitations.	Cognitive	Remembering Understanding
CO2	<i>Analyze</i> and <i>Explain</i> the Customer satisfaction, Employee involvement, supplier selection and appraise the performance by TQM principle.	Cognitive	Analyzing Evaluating
CO3	<i>Explain</i> and <i>Apply</i> the Statistical Process Control Tools.	Cognitive	Understanding Applying
CO4	<i>Select</i> and <i>Explain</i> the different TQM tools and their significance.	Cognitive	Remembering Understanding
CO5	<i>Explain</i> the importance aspects of different quality systems.	Cognitive	Understanding

SUB.	. C()DE	SUB. NAME	L	Т	Р	C				
XU	J M5	506		3	0	0	3				
C	P	Α	TOTAL QUALITY MANAGEMENT	L	Т	P	H				
3	0	0		3	0	0	3				
UNI	ΓΙ	IN	TRODUCTION				09				
Defin	nitio	n of q	uality – Dimensions of quality – Quality planning – Quality	cost	s – .	Anal	ysis				
techniques for quality costs - Basic concepts of Total Quality Management - Historical											
reviev	w –	Princi	ples of TQM – Leadership – Concepts – Role of senior manag	geme	ent –	- Qua	ılity				
Coun	cil	–Qual	ity statements – Strategic planning – Deming philosophy – I	Barr	iers	to T	QM				
imple	eme	ntatio	1								
UNI	ΓII	T(2M PRINCIPLES				09				
Custo	ome	r satis	faction - Customer perception of quality - Customer comp	olain	ts –	Ser	vice				
qualit	ty –	-Custo	mer retention – Employee involvement – Motivation, empo	wer	ment	t, tea	ms,				
recog	gniti	on ar	nd reward – Performance appraisal – Benefits – Con	tinu	ous	pro	cess				
impro	over	nent –	Juran trilogy – PDSA cycle – 5S – Kaizen – Supplier partner	ship	– Pa	artne	ring				
– Sou	ırciı	ng – S	upplier selection – Supplier rating – Relationship developmen	nt –	Perf	orma	ince				
meas	ures	s – Bas	sic concepts – Strategy – Performance measure.								
UNI	ΓII	I ST	ATISTICAL PROCESS CONTROL (SPC)				09				
The s	seve	en too	ls of quality - Statistical fundamentals - Measures of centre	al t	ende	ency	and				
dispe	rsio	n – F	Population and sample - Normal curve - Control charts for	or v	arial	bles	and				
attrib	utes	s – Pro	cess capability - Concept of six sigma - New seven managem	ent	tools	5.					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT IV TQM TOOLS

09

Benchmarking – Reasons to benchmark – Benchmarking process – Quality Function Deployment (QFD) – House of quality – QFD process – Benefits – Taguchi quality loss function – Total Productive Maintenance (TPM) – Concept – Improvement needs – FMEA – Stages of FMEA.

UNIT V QUALITY SYSTEMS

09

Need for ISO 9000 and other quality systems – ISO 9000:2000 quality system – Elements – Implementation of quality system – Documentation – Quality auditing – TS 16949 – ISO 14000 –Concept, requirements and benefits.

Lecture = 45; Tutorial = 00; Total = 45 Hours

TEXT BOOKS

- 1. Dale H. Besterfiled, et. Al. "Total Quality Management", New Delhi, Pearson Education, Inc.. 2007.
- 2. James R. Evans and William M. Lidsay, "The Management and Control of Quality", 5th Edition, South-Western, 2002.

REFERENCES

- 1. Feigenbaum, A.V., "Total Quality Management", McGraw Hill, 1991.
- 2. Oakland, J.S., "Total Quality Management", Butterworth Heineman, 1989.
- Narayana V. and Sreenivasan, N.S., "Quality Management Concepts and Tasks", New Age International, 1996
- 4. Zeiri, "Total Quality Management for Engineers", Wood Head Publishers, 1991

E- REFERENCES

1. http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay and Prof.Tapan P.Bagchi, IIT, Kharagpur.

COs Vs GA mapping

	GA1	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA12
CO1	2	1	1	1	1	1	1	1	1
CO2	1	1	1	1	1	1	1	1	1
CO3	2	2	2	2	1	1	1	1	-
CO4	1	2	2	1	1	2	-	2	-
CO5	1	1	1	2	1	2	1	2	2
Total	7	7	7	7	5	7	4	7	4
Scaled total	2	2	2	2	1	2	1	2	1

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

BUSINESS COMMUNICATION

Cours	se Outcomes (XGS507)	Domain	Level
CO1	To choose and apply different styles to various forms of business communication.	Cognitive	Remembering
CO2	Identify the proper tone of language required in writing and speaking in business communication.	Cognitive	Understanding
CO3	Display knowledge on grammar and other linguistic features in writing various forms of business communication.	Cognitive	Understanding
CO4	To distinguish between letters and memos and various forms of Business Communication.	Cognitive	Remembering Understanding
CO5	Learn how to write business reports, minutes, proposals.	Cognitive	Applying

SU	B. C	ODE	SUB NAME	Ι	4	T	Р	С		
X	KGS5	507		1		0	0	0		
С	Р	Α	BUSINESS COMMUNICATION	N I	4	Τ	Р	Η		
1	1	0		1		0	2	3		
UN	IT I							09		
Intr	oduc	tion to	business communication; modern developments	s in the style of v	vrit	ting	lette	ers		
memos and reports: block letters, semi block letters, full block letters, simplified letters etc.,										
UNIT II										
The language used in memos/minutes/telephone memos/ letters/ assignments art of writing										
E-m	nail e	tc. Adv	vantages of written and spoken communication.							
UN	IT II	Ι						09		
The	use	of activ	ve and passive voice; the use of grammar, propr	iety, accuracy , e	xa	ctne	ess , 1	the		
tone	e & 0	ther el	ements of language used in these writings.							
UN	ГΓГ	V						09		
The	forn	nat of v	various types of Reports/ projects etc.,							
UN	IT V							09		
Wri	ting	Busine	ss reports, proposals and minutes.							
LECTURE TUTORIAL TOTAL 30 15 45										

Text Books and Reference Books:

- 1. John Sealy, Writing and Speaking Author:, Oxford University Press, New Delhi Third Edition 2009.
- 2. Williams K S, Communicating in Business (8th Edition) Engage Learning India Pvt. Ltd.; 2012
- **3.** John Sealy, Writing and Speaking, Oxford University Press, New Delhi Third Edition 2009.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu



PERIYAR MANIAMMAI UNIVERSITY (Under Sec. 3 of UGC Act. 1956) • NAAC Accredited think • innovate • transform

Mapping of Course

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1										2		
CO2										2		
CO3				2						1		
CO4												1
CO5										1	2	

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

IN-PLANT TRAINING - II

Cours	se Outcomes(XEE508):	Domain	Level
CO1	<i>Relate</i> classroom theory with workplace practice	Cognitive	Understanding
CO2	<i>Comply with</i> Factory discipline, management and business practices.	Affective	Responding
CO3	Demonstrates teamwork and time management.	Affective	Valuing
CO4	Describe and Display hands-on experience on practical	Psychomotor	Perception
	skills obtained during the programme.		Set
CO5	<i>Summarize</i> the tasks and activities done by technical documents and oral presentations.	Cognitive	Understanding

Mapping COs with GAs

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA10	GA11	GA12
CO1	2											
CO2							1	3			1	
CO3									3	1	3	1
CO4		1	2	1	3							3
CO5				3						3		1
Total	2	1	2	4	3	0	1	3	3	4	4	5
Scaled	1	1	2	1	1	0	1	1	1	1	1	1

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

PROTECTION AND SWITCHGEAR

Cours	se Outcomes (XEE 602)	Domain	Level
CO1	To <i>Illustrate</i> and <i>recall</i> the principle, characteristics and	Cognitive	Understanding
	working of different types of relay.	Cognitive	Remembering
CO2	To <i>choose</i> relevant protection systems for the Generator	Cognitive	Applying
	and Transformers.	Cognitive	Evaluating
CO3	To <i>compare</i> the concepts of arc quenching techniques of different equipments	Cognitive	Analyzing
	of unrefent equipments.		
CO4	To <i>classify</i> the different type of Circuit breakers and its	Cognitive	Analyzing
	selection criteria.	U	
CO5	To <i>select</i> of different type of equipments used for over voltage protection and Lightning arrestors.	Cognitive	Applying

C	SUB CODE		SUB NAME	L	Т	Р	С			
XI	EE 60	2		3	0	0	3			
С	Р	A	PROTECTION AND SWITCHGEAR	L	Т	Р	Н			
3	0	0		3	0	0	3			
UNIT- I RELAYS										
Ge Sch qua and	General classification, Principle of operation, types, characteristics, Torque equation, Relaying Schemes, Relay Co- ordination. Requirement of relays, Primary & backup protection, Desirable qualities of relays, Terminology used in protective relay, Over current relays directional, distance and differential under frequency negative sequence relays									
UN	NIT-]	Π	APPARATUS PROTECTION			()9			
Pro fail .Pr Cu	otectic lure, otectio rrent,	on ove on Ov	of Generator: Earth Fault, percentage, differential, Loss of excita er current, Negative phase sequence, heating, Reverse power of Transformers: Internal and external fault protection, Differentia erheating. Transformer Protection - Incipient fault.	ation, prote ll, Ea	Prinction rth f	me m sch ault,	over emes Over			
UN	IIT-II	Ι	THEORY OF CIRCUIT INTERRUPTION			0	9			
Phy arc cap	Physics of arc phenomena and interruption- rate of rise of recovery voltage. Elementary principle of arc quenching, Recovery and re-striking voltage, arc quenching devices, current chopping, capacitive current, resistance switching, interruption of capacitive current.									
UN	IT-I	V	CIRCUIT BREAKERS			0	9			
Sw SF rea Inte	itchge 6, Vae ctor & ellige	ear, cuu & in nt c	fault clearing, description and operation of Bulk oil, Minimum oil, m circuit breakers and DC circuit breakers, LT Switch gear, HRC fu fluence of reactors in CB ratings, selection of circuit breakers, Testir ircuit breakers.	Air b ses, c ng of	reak, curre circu	Air l nt lim it bre	olast, iting aker,			

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

09

UNIT- V PROTECTION AGAINST OVERVOLTAGES

Switching surges, Phenomena of Lightning, over voltage due to lightning, Protection against lightning, Lightning arrestors, selection of lightning arrestors, Surge absorbers, and diverters, Rod gap, Horn gap expulsion type & valve type lightning arrestors, solid resistance and reactance earthing, Arc suppression coil, Earthing transformers, Earthwires, insulation co-ordination.

Lecture = 45; Tutorial = 00; Total = 45 Hours

TEXT BOOKS

- 1. Badri Ram, Vishwakarma D N., "Power System Protection and Switchgear" Tata McGraw Hill Publishing House Limited, New Delhi, 2005.
- 2. Soni, M.L., Gupta, P.V., Bhatnagar, U.S. and Chakrabarti, A., "A Text Book on Power Systems Engineering", Dhanpat Rai & Sons Company Limited, New Delhi, 2008.
- 3. Sunil, S.Rao, "Switchgear Protection and Power Systems (Theory, Practice & Solved Problems", Khanna Publishers Limited, New Delhi, 12th Edition, 2008.
- 4. B.Ravindranath, and N.Chander, 'Power System Protection and Switchgear', WileyEastern Ltd., 2000.

REFERENCE BOOKS

- 1. Paithankar Y. G., Bhide S. R., "Fundamentals of Power System Protection" Prentice Hall of India Limited, New Delhi, 2nd Edition, 2010.
- 2. Wadhwa, C.L., "Electrical Power Systems", New Age International Publishers Limited, 2006, New Delhi,6th Edition, 2010
- 3. Patra, S.P., Basu, S.K. and Chowduri, S., 'Power systems Protection', Oxford and International Book House Publishing Co, 2000.

E-REFERENCES

1. NTPEL, Power System Generation, Transmission and Distribution ,Prof. D. P. Kothari Center for Energy Studies ,Indian Institute of Technology, Delhi

СО/РО	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	2	2	2	1	-	-	-	1	-	-	-	1	1
CO2	2	2	-	2	1	-	-	-	-	-	-	-	1	1
CO3	2	-	-	-	1	-	-	-	1	-	-	-	1	1
CO4	2	2	2	2	1	-	-	-	1	-	-	-	1	1
CO5	2	-	-	-	1	-	-	-	-	-	-	-	1	1
Total	10	6	4	6	5				3				1	5
Scaling	2	1	1	1	1				1				1	1

COs versus POs mapping

0 – No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

DESIGN OF ELECTRICAL APPARATUS

	Course Outcomes (XEE603)	Domain	Level
CO1	Able to <i>define</i> and <i>recall</i> the different fundamental concepts of electrical and magnetic circuit parameters, Laws, MMF calculations, and their applications.	Cognitive	Remembering Remembering
CO2	Compare the main dimensions of different machines, and relate its impact on the Analyze various parts of AC and DC machines.	Cognitive	Understanding Understanding Analyzing
CO3	Categorize different types of Transformer based on its design. Understand about single phase and three phase transformer parameters and its efficiency calculation.	Cognitive	Understanding
CO4	Classify types of three phase Induction motor. Analyze the design procedure of each part of the motor.	Cognitive	Understanding Analyzing
CO5	Classify types of three phase Synchronous motor. Analyze the design procedure of each part of the motor	Cognitive	Understanding Analyzing

SU	B CO	DE	SUB NAME	L	Т	Р	С				
X	EE60	3		3	1	0	4				
С	Р	Α	DESIGN OF ELECTRICAL APPARATUS	L	Т	P	Η				
UNIT IBASIC CONSIDERATIONS IN MACHINES DESIGN09											
Cone	Concept of magnetic circuit - MMF calculation for various types of electrical machines - real and										
apparent flux density of rotating machines – magnetic leakage.											
UNI	ΤIΙ	D.C	. MACHINES			09	+06				
Cons	structio	onal o	details - output equation - main dimensions - choice of specific lo	ading	s - c	hoic	e of				
num	ber of	pole	s - armature design - design of field poles and field coil - design	of co	mmut	ator	and				
brus	hes.										
UNI	TIII	TRA	ANSFORMERS			09	+06				
Cons	structio	onal c	letails of core and shell type transformers - output rating of single ph	ase an	nd thr	ee pl	nase				
transformers - optimum design of transformers - design of core, yoke and windings for core and shell											
type transformers.											
UNI	TIV	TH	REE PHASE INDUCTION MOTOR			09	+06				
Constructional details of squirrel cage and slip ring motors – output equation – main dimensions – choice											
of sp	of specific loadings – design of stator – design of squirrel cage and slip ring rotor.										

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT V SYNCHRONOUS MACHINES

09+06

Constructional details of cylindrical pole and salient pole alternators – output equation – choice of specific loadings – main dimensions – short circuit ratio – design of stator and rotor of cylindrical pole and salient pole machines - design of field coil.

Lecture = 45; Tutorial = 30; Total = 75 Hours

TEXT BOOKS:

- 1. A.K. Sawhney, 'A Course in Electrical Machine Design', DhanpatRai and Sons, New Delhi, 1984.
- 2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxford and International Book House Publishing Company Pvt Ltd., New Delhi, 1987.
- 3. G Warren, "Problems in Electrical Engineering", Parker and Smith Solutions, Newyork, 1940.
- 4. J. G. Jamnani, "Elements of electrical design' 2nd Edition, Mahajan publishing house.

REFERENCE BOOKS:

- 1. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2002.
- 2. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications and Distributors, Delhi, 2002.
- 3. T. Stolarski, Y. Nakasone and S. Yoshimoto, "Engineering analysis with ANSYS software", Butterworth Heinemann Publisher, 2006.
- 4. K.G.Upadhyay, "Design of Electrical Machines", New age international publishers.

E REFERENCES :

- 1. Web Content http://www.library.dce.edu/e-resources/books/ee/
- 2. Web Course http://elearning.vtu.ac.in/

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

COs versus PO, PSO mapping

CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	2	1	1	2	-	-	1	-	-	1	1
CO2	3	3	-	3	3	3	-	3	-	1	3	-	1	1
CO3	2	-	-	-	2	2	2	3	-	-	-	-	2	2
CO4	-	1	3	-	-	1	-	-	1	-	-	-	2	2
CO5	-	-	1	-	3	-	-	2	-	-	-	-	1	2
Total	7	4	4	5	9	7	4	8	1	2	3	0	7	8
Scaling	2	1	1	1	2	2	1	2	1	1	1	0	2	2

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

DIGITAL LOGIC CIRCUITS

Cours	e Outcomes (XEE 604)	Domain	Level
CO1	Name numerical values in various number systems and	Cognitive	Remembering
	show number conversions between different number	Psychomotor	Set
	systems.		
CO2	Explain Boolean functions and minimization techniques	Cognitive	Understanding
	using k -maps and postulates and theorems of Boolean		
	Algebra, minimization of Boolean functions using basic		
	laws.		
CO3	<i>Explain</i> logic gates and their applications and <i>construct</i>	Cognitive	Understanding
	and <i>verify</i> the logic gates and construct simple adders	Psychomotor	Set
	and sub tractors using logic gates. Able to <i>design</i> digital	Cognitive	Creating
	combinational circuits.		6
CO4	<i>Explain</i> sequential digital circuits like flip-flops,	Cognitive	Understanding
	registers, counters and <i>verify</i> the state tables of flip-flops	Psychomotor	Set
	using NAND and NOR gates.	-	
CO5	<i>Explain</i> the synchronous sequential circuits and	Cognitive	Understanding
	programmable logic devices.		

C	SUB OD	E	SUB NAME	L	Т	Р	С				
XI	EE 6	04		3	1	1	5				
С	Р	L	Т	Р	Н						
3	1	0		3	2	2	7				
U	NIT	Ί	NUMBER SYSTEM AND CODES		1	0 + 9	+ 20				
Nu	mbe	r sy	stems- base-2, 8, 10, 16 - Radix conversion - Alphanumeric code	s – v	variou	is coc	les –				
erre	or de	etect	ion and correction.								
UI	NIT	Π	BOOLEAN ALGEBRA AND MINIMIZATION TECHNIQUES	5		08 +	09				
Bas	sic I	Bool	ean functions - AND, OR NOT operations - postulates and the	orem	ns of	Boo	olean				
Alg	gebra	a —	De-Morgan's laws - minimization of Boolean functions using ba	asic	laws	– sui	n of				
pro	duct	t and	l product of sum forms – Minterms and Maxterms – K- map of sw	vitch	ing f	unctic	ons –				
mi	nimi	zatio	on using K-map method and Quine –Mc Clusky method.								
UN	UNIT III LOGIC CIRCUITS LOGIC FAMILIES AND COMBINATIONAL 09 + 03 +05										
Digital Logic Families - introduction to RTL, DTL, TTL, ECL and MOS families and their											
cha	characteristics - internal circuits of basic gates AND, OR, NOT and XOR using Bipolar, MOS and										
CM	CMOS families - Combinational logic and representation of logic functions - simplification and										
im	implementation of combinational logic circuits - multiplexer and demultiplexer – encoder and										
dec	ode	r –ac	lder- subtractor and magnitude comparators.								

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT IV SYNCHRONOUS SEQUENTIAL LOGIC CIRCUITS

09 + 06+05

Sequential Logic - Flipflops SR, JK, D and T flip-flops – Analysis of synchronous sequential circuits – Memories. Counters — state diagram – state reduction and Assignment – Morre and Mealy model.

UNIT V AS SYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES

09 + 03

As synchronous sequential logic circuits-transition table, flow table-race condition, hazard and error in digital circuits, analysis of As synchronous sequential logic circuits- Introduction to programmable logic devices, PROM-PLA-PAL. Application of gates by SAMA standards.

- 1. Binary to Gray and Gray to binary code converters.
- 2. Excess -3 to BCD and vice-versa code converters.
- 3. Verification and study of logic gates.
- 4. Study and verify NAND as a universal gate.
- 5. Implementation and verification of Multiplexers and Demultiplexers using logic gates.
- 6. Implementation and verification of Encoders and Decoders using logic gates.
- 7. Design and verify operation of Half / Full adder
- 8. Design and verify operation of Half/Full sub tractor.
- 9. Verification of state tables of RS, JK, T and D flip flops using NAND and NOR gates.
- 10. Shift registers and Counters.

Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours

TEXT BOOKS:

- 1. Malvino and Leach, 'Digital Principles and Applications', McGraw Hill, 2001.
- 2. Moris Mano, 'Digital Design', Prentice Hall of India, 2000.
- 3. Rajakamal, "Digital system-Principle & Design", Pearson education 2nd edition 2007
- 4. Comer "Digital Logic & State Machine Design", Oxford 2012.

REFERENCE BOOKS:

- 1. Taub and Schilling, 'Digital Integrated Circuits', McGraw Hill, 2002.
- 2. Millman, J. and Halkias, C.C., 'Integrated Electronics: Analog and Digital Circuits and Systems', McGraw Hill, Kogakusha Ltd., Tokyo, 2001.
- 3. Samuel C. Lee "Digital Circuits and Logic Designs" Prentice Hall of India; 2000
- 4. Fletcher, W.I., 'An Engineering Approach to Digital Design', Prentice Hall of India, 2002.
- 5. Anand kumar, Fundamental of Digital circuits, PHI 2003.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

E-REFERENCES:

1. NPTEL, Digital Logic Circuits, Prof. S.Srinivasan, IIT Madras.

2. NPTEL, Digital Logic Circuits, Prof. D. Roychoudhury, IIT Kharagpur

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	1	3	-	-	1	1	1	-	1	-	2	2	1
CO 2	3	2	1	-	-	2	0	2	1	-	-	2	1	2
CO 3	2	2	1	-	-	1	2	2	1	1	-	1	2	2
CO 4	2	3	3	-	-	1	1	1	-	-	1	1	1	2
CO 5	3	2	2	-	-	0	1	1	1	1	1	2	2	2
Total	12	10	10	-	-	5	5	7	3	3	2	8	8	9
Scale value	3	2	2	0	0	1	1	2	1	1	1	2	2	2

COs versus POs mapping

0 – No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





POWER SYSTEM OPERATION AND CONTROL + innovate • transform

Cours	se Outcomes (XEE 605)	Domain	Level
CO1	Explain power system load characteristics and generation reserve requirements.	Cognitive	Understanding
CO2	Demonstrate and Apply the mathematical knowledge to model and analysis of power system for frequency control.	Cognitive Cognitive	Understanding Applying
CO3	Identify fundamental aspects of reactive power and its effect on system voltage and Select the suitable voltage control method for the system operating condition.	Cognitive	Applying
CO4	Formulate economic dispatch and unit commitment problem and its solution.	Cognitive	Creating
C05	Apply computer control methods for power system operation and control	Cognitive	Applying

SUB CODE	SUB NAME	L	Т	Р	С
XEE 605		3	0	1	4
C P A	POWER SYSTEM OPERATION AND CONTROL	L	Т	Р	Η
3 0 0		3	0	2	5
Unit-1 INTRODUCTION			09		
An overview of power system operation and control - system load variation - load characteristics -					
load curves and load-duration curve - load factor - diversity factor - Reserve requirements: Installed					
reserves, spinning reserves, cold reserves, hot reserves - Importance of load forecasting - quadratic					
and exponential curve fitting techniques for forecasting – plant level and system level controls.					
Unit- 2 REAL POWER - FREQUENCY CONTROL			09		
Basics of speed governing mechanism and modeling - speed-load characteristics - load					
sharingbetween two synchronous machines in parallel - concept of control area - LFC control of a					
single-area system: static and dynamic analysis of uncontrolled and controlled cases - two-					
areasystem: modeling - static analysis of uncontrolled case - tie line with frequency bias control -					
state variable model					
Unit- 3	REACTIVE POWER–VOLTAGE CONTROL			()9
Generation and absorption of reactive power - basics of reactive power control - excitation systems					
- modeling - static and dynamic analysis - stability compensation - methods of voltage control: tap-					
changing transformer, injection reactive power - SVC (TCR + TSC) and STATCOM - secondary					
voltage control.					
Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





Unit-4 UNIT COMMITMENT AND ECONOMIC DISPATCH

09 Formulation of economic dispatch problem - I/O cost characterization - incremental cost curve -

coordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and λ -iteration method - statement of unit commitment problem – priority-listmethod forward dynamic programming.

Unit-5 **COMPUTER CONTROL OF POWER SYSTEMS**

09

Need for computer control of power systems - concept of energy control centre - functions - system monitoring - data acquisition and control - system hardware configuration - SCADA and EMS functions - network topology - state estimation - WLSE - Contingency Analysis - state transition diagram showing various state transitions and control strategies.

- 1. Formation of Bus Admittance Matrix.
- 2. Formation of Bus Impedance Matrix using building Algorithm.
- Symmetrical Fault Analysis. 3.
- 4. Unsymmetrical Fault Analysis.
- 5. Solution of power flow using Gauss-Seidel Method.
- Solution of power flow using Newton Raphson Method. 6.
- Solution of power flow using Fast Decoupled Power Flow Method. 7.
- Transient Stability Analysis of Single-Machine Infinite Bus System 8.

Small Signal Stability Analysis of Single-Machine Infinite Bus System

	Lecture = 45 ; Lab = 30 ; Total = 75 Hours
TEXT BOOKS:	

- 1. Olle.I.Elgerd, 'Electric Energy Systems theory An introduction', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
- 2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
- 3. Kundur P., 'Power System Stability and Control, Tata McGraw Hill, New Delhi, 5th reprint, 2008.

REFERENCE BOOKS:

- 1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition,2011.
- 2. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21streprint, 2010.
- 3. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

E-REFERENCES:

NPTEL: http://nptel.ac.in/courses/108104052/ 1.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





COs versus PO, PSO mapping

CO/ PO/PSO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
C01	3	3	1	1	2	-	-	-	-	1	-	-	2	1
CO2	2	3	2	2	2	-	-	-	1	1	1	-	2	-
CO3	2	2	2	2	3	-	-	-	-	-	1	1	2	-
CO4	2	2	3	3	2	-	-	-	-	1	-	-	1	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	1	1
Total	10	12	10	10	11	0	0	0	1	3	2	2	8	2
Scaling	2	3	2	1	3	0	0	0	1	1	1	1	2	1

0 -No relation1 - Low relation2 - Medium relation3 - High Relation





think • innovate • transform

ENVIRONMENTAL STUDIES

Cours	e Outcomes (XUM607)	Domain	Level
CO1	Describe the significance of natural resources and	Cognitive	Remembering
	explain anthropogenic impacts.		Understanding
CO2	<i>Illustrate</i> the significance of ecosystem and biodiversity	Cognitive	Understanding
	for maintaining ecological balance		
CO3	<i>Identify</i> the facts , consequences , preventive measures of	Cognitive	Remembering
	major pollution and <i>Recognize</i> the disaster phenomenon	Affective	Receiving
CO4	Explain the socio- economics, policy dynamics and	Cognitive	Understanding
	practice the control measures of global issues for	coginave	Analyzing
	sustainable development.		
CO5	<i>Recognize</i> the impact of population and <i>apply</i> the	Cognitive	Understanding
	concept to develop various welfare programs.	Cognitive	Applying

SUB. CODE		DE	SUB. NAME	L	Т	Р	С
XUM607		507		0	0	0	0
С	C P A		ENVIRONMENTAL STUDIES	L	Т	Р	Η
2.5 0 0.5		0.5		3	0	0	3

UNIT I INTRODUCTION TO ENVIRONMENTAL STUDIES AND ENERGY 09 Definition, scope and importance – Need for public awareness – Forest resources: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – Role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT II ECOSYSTEMS AND BIODIVERSITY

09

Concept of an ecosystem – Structure and function of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Ecological succession – Food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) Forest ecosystem (b) Grassland ecosystem (c) Desert ecosystem (d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to Biodiversity – Definition: genetic, species and ecosystem diversity - Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

ENVIRONMENTAL POLLUTION UNIT III

12

09

Definition – Causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards - Soil waste Management: Causes, effects and control measures of urban and industrial wastes - Role of an individual in prevention of pollution - Pollution case studies - Disaster management: flood, earthquake, cyclone and landslide.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT

Urban problems related to energy - Water conservation, rain water harvesting, watershed management - Resettlement and rehabilitation of people; its problems and concerns, Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, Wasteland reclamation - Consumerism and waste products - Environment Production Act -Air (Prevention and Control of Pollution) Act – Water (Prevention and control of Pollution) Act - Wildlife Protection Act - Forest Conservation Act - Issues involved in enforcement of environmental legislation - Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT

06 Population growth, variation among nations - Population explosion - Family Welfare Programme - Environment and human health - Human Rights - Value Education - HIV / AIDS - Women and Child Welfare - Role of Information Technology in Environment and human health - Case studies.

Lecture = 45; Tutorial = 00; Total = 45 Hours

TEXT BOOKS

- 5. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.
- 6. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003
- 7. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.
- 8. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers & Distributors Pvt. Ltd, New Delhi, 2006.
- 9. Introduction to International disaster management, Butterworth Heinemann, 2006.
- 10. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.

REFERENCE BOOKS

- 1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.
- 2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.
- 3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.
- 4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.
- 5. Sundar, Disaster Management, Sarup & Sons, New Delhi, 2007.
- 6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

E REFERENCE

- 1. Bharat Raj Singh , 2015, Global Warming: Causes, Impacts and Remedies , InTech.
- 2. Richard C. J. Somerville, The Forgiving Air: Understanding Environmental Change, 1998,
- 3. University of California Press Benny Joseph, Environmental Studies, 2005, Tata McGraw Hill.

	GA											
	1	2	3	4	5	6	7	8	9	10	11	12
CO1	3											1
CO2	2					2	1			1		1
CO3	2	1	3			3	1		2	1		1
CO4	1	1	2			3	2	3				1
CO5	2	1	1			3						1
Total	10	3	6			11	4	3	2	2		5
Scaled to 0,1,2,3 scale	2	1	2			3	1	1	1	1	1	1

Mapping of CO's with GA's:

0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

ACADEMIC WRITING

Cours	e Outcomes (XGS608)	Domain	Level
CO1	Ability to <i>identify</i> the features of a technical project report and Knowledge on the linguistic competence to write a technical report	Cognitive	Creating
CO2	Ability to <i>integrate</i> both technical subject skill and language skill to write a project	Cognitive	Creating
CO3	Confidence to <i>present</i> a project in 10 to 15 minutes	Affective	responding
CO4	The learner <i>identifies</i> and absorbs the pronunciation of sounds in English Language and learns how to mark the stress in a word and in a sentence properly	Cognitive	Creating
CO5	The program enables the speaker speaks clearly and fluently with confidence and it trains the learner to listen actively and critically	psychomotor	Perception

SU	B. CO	DE	SUB. NAME	L	Т	Р	С					
X	CD 60)8		0	0	0	0					
С	Р	Α	ACADEMIC WRITING	L	Т	Р	Н					
1.8	0.8	0.4		0	0	0	0					
UN	ΙΤΙ						10					
Basic	princ	iples o	of good technical writing, Style in technical writin	ıg, out li	nes a	nd ab	stracts,					
language used in technical writing: technical words, jargons etc												
Special techniques used in technical writing: Definition, description of mechar												
Desc	ription	of a p	rocess, Classifications, division and interpretation									
UNI	ГШ						25					
Repo	rt/ pro	ject la	yout the formats: chapters, conclusion, bibliograph	ny, annez	xure a	nd gl	ossary,					
Grap	hics ai	ds etc	- Presentation of the written project 10 – 15 minute	es								
UNI	ΓIV						15					
Sounds of English Language; vowels, consonants, diphthongs, word stress, sentence stres												
inton	ation _I	pattern	s, connected speech etc Vocabulary building -	gramma	ır, sy	nonyı	ns and					
anton	antonyms, word roots, one-word substitutes, prefixes and suffixes, idioms and phrases.											
UNI	ΤV						15					
Read	ing co	mpreh	nension - reading for facts, meanings from cont	text, sca	nning	, skir	nming,					
inferr	ring m	eaning	, critical reading, active listening, listening for com	nprehens	ion et	c.						
			Lecture = 45; La	b = 30; '	Fotal	= 75	Hours					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





TEXT BOOKS

- 3. Gordon H. Mills, Technical Writing April, 1978, Oxford Univ Press
- 4. Barun K. Mitra, Effective Technical Communication: A Guide for scientists and Engineers. Author, Publication: Oxford University press. 2007

Software for lab:

• English Teaching software (Young India Films)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9
CO1		2	1			2	2		
CO2	1	1			2	3			3
CO3	2		2	3	2	2	3	2	3
CO4				2			3		
CO5							3		2
Total									
Scaled									

Mapping COs with Pos

0-No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

MICROPROCESSORS AND MICROCONTROLLERS

Cours	se Outcomes (XEE 702)	Domain	Level
CO1	To <i>understand</i> the architecture and basic concepts of 8085 microprocessor.	Cognitive	Understanding
CO2	To <i>understand</i> the memory organization, flags, stack, and special function registers, I/O ports, connecting external memory, counters and timers, serial data I/O, Interrupts present in 8051 microcontroller.	Cognitive	Understanding
CO3	To <i>understand</i> the 8051 Microcontroller instructions to <i>develop and show</i> assembly language programs for basic logical and arithmetic operations, by using jump and call instructions.	Cognitive Psychomotor	Understanding Applying Set
CO4	To <i>identify</i> timer and counter programming, Interrupt programming and <i>show</i> the I/O interfacing techniques with 8051 microcontroller.	Cognitive Psychomotor	Applying Set
CO5	To design and test assembly language program in 8051 microcontroller for displaying Waveform generation, speed control of DC motor, Stepper motor control, seven segments LED display	Cognitive Psychomotor	Creating Mechanism

SUB	. CO	DE	SUB NAME	L	Т	Р	С					
X	EE 7(02	MICDODDOCESSODS AND	3	0	1	4					
С	Р	Α	MICROCONTROL L FRS	L	Т	Р	Н					
3	1	0	MICROCONTROLLERS	3	0	2	5					
UNI	ΤI		INTEL 8085 PROCESSOR									
Architecture – Instruction format addressing modes – Basic timing diagram – input/output												
base	d sim	ple pr	ograms.									
UNIT II 8051 MICROCONTROLLER ARCHITECTURE												
8051 architecture, memory organization, flags, stack, and special function registers,												
conn	ecting	g exte	rnal memory, counters and timers, serial data I/O, Interrupts									
UNIT III 8051 MICROCONTROLLER INSTRUCTIONS AND ADDRESSING MODES AND AND												
Mic: oper	cocont ations	troller 5, jum	instructions - addressing modes, moving data, logical p and call instructions – subroutines - Interrupts and returns.	opera	tions,	arith	metic					
UNIT IV MICROCONTROLLER PROGRAMMING AND INTERFACING BASICS												
Mici conn	rocont	troller n to R	programming - Assembly Language Programming, timer an S 232 and RS 485, Interrupt programming	d coun	ter pro	gram	ming,					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT VINTERFACING PERIPHERALS AND MICROCONTROLLER
APPLICATIONS9+6

Serial and parallel I/O (8251 and 8255), Programmable DMA controller, Programmable interrupt controller, ADC/DAC interfacing. Programming concepts Regarding Waveform generation, speed control of DC motor, Stepper motor control, seven segments LED display.

- 1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.
- 2. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions.
- 3. Design program for code conversions.
- 4. Interfacing of Keyboard with 8085.
- 5. Interfacing of Keyboard with 8051.
- 6. Interfacing of seven segment display with 8085.
- 7. Interfacing of seven segment display with 8051.
- 8. Interfacing of 8 bit D/A and A/D Converters.
- 9. Serial communication, I/O Port operations.
- 10. Demonstration of basic instructions with 8051 Micro controller execution, including:
 - a. Conditional jumps, looping
 - b. Calling subroutines.
 - c. Stack parameter testing
- 11. Design and implementation of Traffic Light control.
- 12. Design and implementation of Stepper motor control.

Lecture = 45; Lab = 30; Total = 75 Hours

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

TEXT BOOKS

- 1. Ramesh .S. Gaonkar, 'Microprocessor architecture, Programming and its applications with the 8085' Penram International Publications (India), 4thEdition,2000
- 2. N.Senthilkumar, M.Saravanan, S.Jeevananthan'Microprocessors and microcontroller', Oxford university press, 2010
- 3. Kenneth Ayala, 'The 8051 Microcontroller', Cengage Learning Publications, 3rd Edition, 2007.
- 4. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay 'The 8051 Microcontroller and Embedded Systems using Assembly and C', Prentice Hall Publications, 2nd Edition, 2008.

REFERENCE BOOKS

- 1. Ray A. K., Bhurchandi K. M., 'Advanced Microprocessor and Peripherals', Tata McGraw-Hill Publications, 3 r d E d i t i o n , 2013.
- 2. Sencer Yeralan, Helen Emery, 'Programming and interfacing the 8051 Microcontroller', Addison-Wesley Publications, 1st Edition, 2000.
- 3. Krishna Kant, 'Microprocessors and Microcontrollers, Architecture, Programming and System Design-8085, 8086, 8051, 8096', Prentice Hall India Ltd Publications, 1st Edition, 2010.
- 4. Douglas. V. Hall Microprocessors and Interfacing Tata McGraw Hill- Revised 2nd edition, 2006

E-REFERENCES:

1. NTPEL, Microprocessor (Web Course), Prof. S.P.Da, IIT Kharagpur.

			D O A	DO 4		DOC	DO	DOO		DO10	DO11	DO1	DCC1	DCOA
	PO1	PO2	PO3	PO4	PO5	PO6	PO 7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO/PO														
CO1	1	-	2	-	-	-	-	-	-	1	1	-	1	1
CO2	1	2	1	3	1	-	-	-	2	1	2	1	1	1
CO3	-	-	-	-	-	1	2	-	1	2	-	-	1	1
CO4	1	1	2	2	1	-	-	-	2	1	2	1	-	1
CO5	1	2	2	1	-	-	3	-	3	2	1	-	-	1
Total	4	5	5	6	2	1	5	-	8	7	6	2	3	5
Scaling	1	1	1	1	1	1	1	-	1	1	1	1	1	1

COs versus POs mapping

0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





MEASUREMENT AND INSTRUMENTATION think • innovate • transform

Co	irse Outcomes (XEE703)	Domai	in	L	evel						
CO	1 Describe functional elements of measuring	Remer	nberi	ing							
	Instruments. Design of bridge circuits for the										
	measurement of unknown parameters.CognitiveD2 <i>Explain</i> the construction and working of different typesCognitive										
CO	CO2 <i>Explain</i> the construction and working of different types Cognitive Under of indicating and integrating instruments										
~~~	of indicating and integrating instruments.										
CO	<b>CO3</b> <i>Describe</i> the operation of A/D and D/A converters and Cognitive Rememberin to <i>perform</i> its characteristics.										
	to <i>perform</i> its characteristics.										
CO	CO4 <i>Explain</i> the construction and operation of recording Cognitive Understandin Instruments. Carryout calibration test for measuring										
	instruments. <b>Carryout</b> calibration test for measuring										
CO	<b>CO5</b> <i>Explain</i> the different types of transducers. Cognitive Remembering										
	S Explain the different types of transducers.	Cogniti	ve	Remer		ing					
SU	B.CODE SUB NAME			T	P 1	C					
	EE 003		3			5					
C	P A WIEASUKEWIEN I AND INSTRUMENTA	LION	L	L	Р	H					
3	1 0		3	2	2	7					
UN	IT I INTRODUCTION				09-	+06					
Fur	ctional elements of an instrument - errors in measure	ement - s	static	and	dyna	mic					
cha	racteristics statistical evaluation of measurement data - stand	ard and ca	alibra	tion							
UN	IT 2 ELECTRICAL AND ELECTRONIC INSTRUME	ENTS			0	9					
DC	Ammeter - Multirange ammeter - Extension of amme	eter range	: - 1	RF am	mete	r –					
Vo	tmeter – Analog Electromechanical instruments-Galvanon	neter- mul	tiran	ge vol	tmete	er –					
Ext	ending Voltmeter range – Transistor voltmeter – Dual slo	pe integra	ating	type I	DVM						
inst	rument transformer – Magnetic measurement- instruments f	or measur	eme	nt of fr	reque	ncy					
and	phase.				00.	10					
	IT 3 SIGNAL CONDITIONING CIRCUITS	<b>TT</b> ?:?-	1	D.	09+	18					
Bri Dri	lge circuits – wheatstone's bridge – Maxwell's Bridge	- wien s	Dr10	ige, Ke	esona	ince					
DII incl	rumentation amplifier – filter circuits data acquisition	system _	Snec	trum s	ipine malw	1 —					
Wa	gner's Earth (Ground) connection- Earthing techniques	system –	spec	uum c	mary	ZCI-					
TIN	IT A STORACE AND DISDLAV DEVICES				00 1	06					
	introduction Plack diagrams of Oscillassona sim	nla CDO	oir	ouit di		VU					
CN stor	O = Infoduction = Block diagrams of Oschloscope = sim	pie CKO recorder –	– Cli . strii	cuit ui s chart	recoi	78 – rder					
-n	inters $-$ I FD I CD and Dot matrix displays $-$ Data logger-V	virtual Inst	rume	onts		luci					
		intuur inist	.i uiii		00						
	IT 5 TRANSDUCERS	-			09						
Cla			- :	1 *	1	4					
1 tron	ssification of transducers – selection of transducers – resis	tive, capa	citive	e and i	nduc	tive					
trar	suffication of transducers – selection of transducers – resis sducers – piezo electric transducers – optical and digital	tive, capa transduce	citive rs. p	e and i H elec	nduc trode	tive s –					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

- 1. Study of Voltmeter, Ammeter and Wattmeter Range Extension.
- 2. Characteristics of Thermal Transducers (Thermocouples).
- 3. Measurement of Pressure using LVDT.
- 4. AC Bridges:
  - a) Maxwell Inductance Bridge
  - b) Anderson Bridge
- 5. Wheatstone bridge.
- 6. Instrumentation Amplifiers.
- 7. A/D and D/A converters.
- 8. Calibration of Single phase and Three phase Energy meter.
- 9. Calibration of Current Transformer and potential transformer.
- 10. Measurement of Three phase power and power factor by two watt meter method.

#### Lecture = 45; Tutorial = 30; Practical = 30; Total = 105 Hours

#### TEXT BOOKS

- 1. Sawhney A.K 'A Course in Electrical & Electronic Measurements and Instrumentation' Dhanpat Rai and Sons,2007.
- **2.** Doebeling, E.O., 'Measurement Systems Application and Design', McGraw Hill Publishing Company.
- 3. H.S. Kalsi, 'Electronic Instrumentation', Tata Mc Graw Hill Co., 1995.
- 4. B Gupta, 'A course in Electronic and Electrical Measurement', S.K.Kataria & sons,Delhi-2003

#### **REFERENCES BOOKS**

- **1.** Golding E.W and Wills F.E 'Measurements and Measuring Instruments' Sir Isaac Pitman and Sons(P) Ltd, 1997.
- 2. Moorthy, D.V.S., 'Transducers and Instrumentation', Prentice Hall of India Pvt. Ltd., 1995
- **3.** Dalley, J.W., Riley, W.F. and Meconnel, K.G., 'Instrumentation for Engineering Measurement', John Wiley & Sons, 1993

#### **E REFERENCES**

1. NPTEL, Measurements and Instruments, Prof.T.Anjaneyulu, Department of EEE, Indian Institute of Technology, Delhi.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

#### COs versus POs mapping

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	1			1		1	1			3			2	3
CO 2	1	1										1	2	3
CO 3	1		1		1			2		1			2	2
<b>CO 4</b>	1	2										1	2	2
CO 5									1		1	1	2	3
Total	4	3	1	1	1	1	1	2	1	4	1	3	10	13
Scaling	1	3	1	1	1	1	1	1	1	1	1	1	2	3

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

## **CYBER SECURITY**

Cours	e Outcomes (XUM706)	Domain	Level
CO1	To learn the basic concepts of networks and cyber- attacks.	Cognitive	Remembering
CO2	To define the concepts of system vulnerability scanning and the scanning tools	Cognitive	Remembering
CO3	To understand the network defense mechanisms and the tools used to detect and quarantine network attacks.	Cognitive	Remembering
CO4	To learn the different tools for scanning.	Cognitive	Remembering
CO5	To identify the types of cybercrimes, cyber laws and cyber-crime investigations.	Cognitive	Remembering

SU		DF	SUB NAME	Т	Т	D	C					
30	D. CO	DE	SUDIVAIVIL	L	L	I	U					
X	UM 7(	)6		3	0	0	3					
С	Р	Α	CYBER SECURITY	CYBER SECURITY L T I								
3	0	0		3	0	0	3					
UNIT I INTRODUCTION 0												
History of Information Systems and its Importance, Basics, Changing Nature of Information												
Syste	Systems, Need for Distributed Information Systems: Role of Internet and Web Services.											
Infor	mation	Syste	m Treats and attacks, Classification of Threats and	assess	sing I	Dam	ages					
Secu	rity in	mobi	le and Wireless Computing-Security Challenges i	n Mo	bile	Dev	ices,					
authe	nticatio	on ser	vice Security, Security Implication for Organization	s, Laj	ptops	secu	ırity					
Conc	epts in	Intern	et and World Wide Web: Brief review of Internet Prote	ocols '	TCP/I	P, IF	PV4,					
and	and IPV6. Functions of various networking components-routers, bridges, switches, hub,											
gatew	gateway and Modulation Techniques.											
UNI	UNIT IISYSTEMS VULNERABILITY SCANNING09											
Over	view o	f vuln	erability scanning. Open Port / Service Identification	ı. Bar	mer /	Ver	sion					

Overview of vulnerability scanning, Open Port / Service Identification, Banner / Version Check, Traffic Probe, Vulnerability Probe, Vulnerability Examples, OpenVAS, Metasploit. Networks Vulnerability Scanning - Netcat, Socat, understanding Port and Services tools - Datapipe, Fpipe, WinRelay, Network Reconnaissance – Nmap, THC-Amap and System tools. Network Sniffers and Injection tools – Tcpdump and Windump, Wireshark, Ettercap, Hping Kismet.

## UNIT III NETWORK DEFENCE TOOLS

Firewalls and Packet Filters: Firewall Basics, Packet Filter Vs Firewall, How a Firewall Protects a Network, Packet Characteristic to Filter, Stateless Vs Stateful Firewalls, Network Address Translation (NAT) and Port Forwarding, the basic of Virtual Private Networks, Linux Firewall, Windows Firewall, Snort: Introduction Detection System, Cryptool.

09

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu

**TOOLS FOR SCANNING** 

**UNIT IV** 





think • innovate • transform

Scanni	ing for web vulnerabilities tools: Metasploit tool, Nikto, W3af, HTTP utilities - C	url,
OpenS	SSL and Stunnel, Application Inspection tools - Zed Attack Proxy, Sqlmap. DVV	VA,
Webgo	oat, Password Cracking and Brute-Force Tools - John the Ripper, L0htcrack, Pwdur	mp,
THC-H	Hydra.	
UNIT	V INTRODUCTION TO CYBER CRIME AND LAW	09
Cyber	Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Crimi	inal
Behav	ior, Clarification of Terms, Traditional Problems Associated with Computer Cri-	me,
Introdu	uction to Incident Response, Digital Forensics, Computer Language, Netw	ork
Langu	age, Realms of the Cyber world, A Brief History of the Internet, Recognizing	and
Defini	ng Computer Crime, Contemporary Crimes, Computers as Targets, Contamina	ants
and D	estruction of Data, Indian IT ACT 2000.	
Introdu	uction to Cyber Crime Investigation: Password Cracking, Key loggers and Spywa	are,
Virus	and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, S	QL
injecti	on, Buffer Overflow, Attack on wireless Networks	
	Lecture = 45; Tutorial = 0; Total = 45 How	urs
TEXT	BOOKS	
1.	Nina Godbole, "Information Systems Security: Security Management, Metrics,	
	Frameworks and Best Practices, w/cd", Wiley Publications, 2008, ISBN 10:	
	8126516925, ISBN 13 : 9788126516926	
2.	Thomas J. Mowbray, "Cybersecurity: Managing Systems, Conducting Testing	and
	Investigating Intrusions", Wiley Publications, 2013, Kindle Edition, ISBN	10:
	812654919X, ISBN 13 : 9788126549191	
3.	D.S. Yadav, "Foundations of Information Technology", New Age Internation	onal
	publishers, 3 rd Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623.	
REFE	RENCE BOOKS	
1.	Mike Shema, "Anti-Hacker Tool Kit", McGraw Hill Education, 4 th edition, 2014,	
2.	Nina Godbole, Sunit Belapure, "Cyber Security Understanding Cyber Crin	nes,
	Computer Forensics and Legal Perspectives", Wiley publications, 2013, ISBN	10:
	8126521791, ISBN 13 : 9788126521791.	
3.	Corey Schou, Daniel Shoemaker, "Information Assurance for the Enterprise:	A
	Roadmap to Information Security (McGraw-Hill Information Assurance & Security	y)",
	Tata McGraw Hill, 2013, ISBN-10: 00/2255242, ISBN-13: 978-0072255249.	
4.	Vivek Sood, "Cyber Laws Simplified", McGraw Hill Education (INDIA) Priv	vate
	Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063.	

5. Steven M.Furnell, "Computer Insecurity", Springer Publisher, 2005 Edition.



09

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### **E REFERENCES**

- 1. https://www.cryptool.org/en/
- 2. https://www.metasploit.com/
- 3. http://sectools.org/tool/hydra/
- 4. http://www.hping.org/
- 5. http://www.winpcap.org/windump/install/
- 6. http://www.tcpdump.org/
- 7. https://www.wireshark.org/
- 8. https://ettercap.github.io/ettercap/
- 9. https://www.concise-courses.com/hacking-tools/top-ten/
- 10. https://www.cirt.net/Nikto2
- 11. http://sqlmap.org/

#### **COs versus POs mapping**

	GA1	GA2	GA3	GA4	GA5	GA6	GA7	GA8	GA9	GA1 0	GA1 1	GA 12
CO1	3	3	3	2	1	1	1	1	1	0	0	1
CO2	2	1	1	1	1	1	1	1	1	0	0	1
CO3	2	2	2	1	1	1	1	1	1	0	0	1
CO4	1	1	1	1	0	0	0	0	0	0	0	1
CO5	1	1	1	2	2	1	1	2	2	0	0	1
Total	9	8	8	7	5	4	4	5	5	0	0	5
Origin al	9	8	8	7	5	4	4	5	5	0	0	5
Scaled to 0,1,2,3 scale	2	2	2	2	1	1	1	1	1	0	0	1

0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### **CAREER DEVELOPMENT SKILLS**

Cours	e Outcomes (XCD 708)	Domain	Level
CO1	<i>Knowledge</i> on a career related communication and learning the different formats of CV	Cognitive	Remembering
CO2	<i>Prepare</i> how to face an interview and to learn how to prepare for an interview	Psychomotor	Set
CO3	Communicates with the group of people in discussion	Affective	Responding

SU	B. CO	DE	SUBJECT NAME	L	Т	Р	С				
X	GS70	8		0	0	0	0				
С	Р	А	CAREER DEVELOPMENT SKILLS	L	Т	Р	Н				
1.8	0.8	0.4		2	0	2	4				
UNIT I											
CV Writing; difference between resume and CV; characteristics of resume and CV; basic											
eleme	elements of CV and resume, use of graphics in resume and CV; forms and functions of Cover										
Lette	rs										
UNI	TII						10				
Interv	view s	skills;	tips for various types of interviews. Types of q	uestic	ons as	sked;	body				
langu	lage, e	etiquet	te and dress code in interview, interview mistakes	, telep	phonic	c interv	view,				
frequ	frequently asked questions. Planning for the interview.										
UNITIII 10											
Moch	Mock interviews - workshop on CV writing - Group Discussion										
	Lecture = 20; Workshop = 10; Total = 30 Hours										

#### **TEXT BOOKS**

- 1. Paul McGee, How To Write a CV That Really Works: A Concise, Clear and Comprehensive Guide to Writing an Effective CV, Hachette UK, 2014
- 2. Mary Ellen Guffey, Dana Loewy Essentials of Business Communication, , Cengage Learning, 2012
- 3. Michael Spiropoulos, Interview Skills that win the job: Simple techniques for answering all the tough questions, Allen & Unwin, 2005
- 4. William L. Fleisher, Effective Interviewing and Interrogation Techniques, , Nathan J. Gordon, Academic Press, 2010.

#### **REFERENCE WEBSITES**

- 1. http://www.utsa.edu/careercenter/PDFs/Interviewing/Types%20of%20Interviews.pdf
- 2. http://www.amu.apus.edu/career-services/interviewing/types.htm
- 3. http://www.careerthinker.com/interviewing/types-of-interview/

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### LINEAR INTEGRATED CIRCUITS

Cours	se Outcomes(E11):	Domain	Level
CO1	Illustrate and classify the different manufacturing process	Cognitive	Understanding
	of ICs.	Cognitive	Understanding
<b>CO2</b>	<i>Explains</i> the terminal characteristics of op – amps.	Cognitive	Understanding
CO3	<i>Illustrate</i> and <i>design</i> the various application of op – amps.	Cognitivo	Understanding
		Cognitive	Creating
CO4	Illustrate the various functional block, characteristics and	Cognitive	Understanding
	applications of special ICs.	eogintive	
<b>CO5</b>	Classify and explain the different techniques of data	Comitive	Understanding
	converters.	Cognitive	Understanding

SUB CODE	SUB NAME L T										
E11		2	1	0	3						
C:P:A	LINEAR INTEGRATED CIRCUITS	L	Т	Р	Η						
2:0:0		2	2	0	4						
UNIT- I	IC FABRICATION			6	+ 6						
Introduction	Introduction of IC fabrication, Advantages & Limitation of ICs, Scale of integration, classification										
of ICs; IC Terminology; Fundamentals of monolithic IC technology, Crystal growth and wafer											
preparation,	preparation, Epitaxial growth, Oxidation, Photolithography, etching, Diffusion, Ion implantation,										
Metallization, packaging of ICs.											
UNIT- IICHARACTERISTICS OF OP – AMP6+6											
Basics of Op – amp, Ideal Op – amp characteristics, DC characteristics, AC characteristics, Open											
Loop and C	losed Loop configuration of Op - amp, Packages of Op - and	mp, In	verting	g & N	Non –						
inverting an	nplifier, Voltage follower, Differential amplifier; Frequency r	respons	e of (	Op –	amp;						
Basic applica	ations of op – amp – summer, Differentiator and Integrator.										
UNIT- III	APPLICATION OF OP – AMP			6	+ 6						
Instrumentat	ion amplifier, First and second order active filters, V / I	and I	/ V	conve	erters,						
Comparators	- Regenerative comparator (Schmitt Trigger), Multi vibrators	Astabl	e & N	lonos	table;						
Waveform g	enerators- RC phase shift oscillator; Wien bridge oscillator; Tri	angula	r wave	gene	rator;						
Clippers, Clampers.											
UNIT- IV	UNIT- IV SPECIAL ICs 6+6										
555 Timer c	Fircuit – Functional block, Characteristics and applications; 56	66 – V	oltage	cont	rolled						
oscillator cir	cuit; 565 – Phase lock loop circuit functioning and applications.										

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT	UNIT- V     ANA LOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS; SPECIAL FUNCTION ICS.									
Introduc	tion of A	/D and D/A converters, Sample & Hold	circuit, D /A c	converter (R – 2F	ladder and					
weighted	weighted resistor types), A / D converter – Dual slope, Successive approximation and Flash types.									
ICL 8038 function generator IC. Isolation Amplifiers.										
			LECTURE	TUTORIAL	TOTAL					
		30	60							
TEXT BOOKS:										
1.	1.Ramakant . A. Gayakwad 'Op – Amps and Linear Integrated Circuits', Prentice Hall of India 3 rd Edition, 2001.									
2	Linear Integrated Circuits by D. Roy Choudhury and Shail B. Jain, New Age International									
2.	Publish	ners.								
REFER	ENCE B	BOOKS:								
1.	S.M. S	ze, 'VLSI Technology, 2 nd Edition, Tata	McGraw Hill,2	2000.						
2	Sergio	Franco, 'Design with Operational Ampli	fiers and Anal	og and Integrated	Circuits',					
۷.	2 nd Edi	tion, McGraw Hill,2002.								
3.	3. National Semiconductor/Texas – TTL/MOS/VLSI Data Manuals.									
E REFE	E REFERENCES :									
1.	1. NPTEL, Linear Integrated Circuits, Prof. Clark Tu – Cuong Nguyen, IIT Madras.									
2.	NPTEI	L,Linear Integrated Circuits, Prof. TS. Na	tarajan, IIT M	adras.						

#### COs versus PO, PSO mapping

CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	2	3	-	2	3	-	-	-	-	-	-	-	2	2
CO2	2	1	1	2	2	-	-	-	-	-	-	-	1	1
CO3	1	2	-	3	2	-	-	-	1	-	1	-	1	1
CO4	1	2	-	2	2	-	-	-	-	-	-	-	2	1
CO5	3	2	-	2	2	-	-	-	-	-	-	-	1	2
Total	09	10	01	11	11	0	0	0	01	0	01	0	07	07
Scaling	2	2	1	3	3	0	0	0	1	0	1	0	2	2

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

Cours	se Outcomes(E12):	Domain	Level							
CO1	<i>Explains</i> the continuous and discrete time signals and basic property of the systems.	Cognitive	Understanding							
CO2	<i>Analyze</i> the continuous time signals with the help of Fourier and Laplace transforms.	Cognitive	Analyzing							
CO3	<i>Explain</i> about the various techniques applied for obtaining continuous time signals and systems.	Cognitive	Understanding							
CO4	<i>Analyze the</i> discrete time signals with the help of Z-transforms.	Cognitive	Analyzing							
CO5	<i>Explain</i> about the various techniques for obtaining discrete time signals and systems.	Cognitive	Understanding							

SUB CODE	SUB NAME	SUB NAME L T										
E12		2	1	0	3							
C:P:A	SIGNALS AND SYSTEMS L T											
2:0:0		2	2	0	4							
UNIT-I	CLASSIFICATION OF SIGNALS AND SYSTEMS			6	+6							
Continuous time signals (CT signals), discrete time signals (DT signals) - Step, Ramp, Pulse, Impulse, Exponential, Classification of CT and DT signals - periodic and periodic, random signals, CT systems and DT systems, Basic properties of systems.												
UNIT- II	NIT- II ANALYSIS OF CONTINUOUS TIME SIGNALS 6+6											
Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in												
	JS15. LINEAR TIME INVARIANT - CONTINUOUS TIME SIGI	NALS		6	+6							
Differential concept, fre	equation, Block diagram representation, Impulse response, Con- quency response, Fourier and Laplace transforms in analysis.	volutio	n and (	Corre	lation							
UNIT-IV	ANALYSIS OF DISCRETE TIME SIGNALS			6	+6							
Sampling o properties (	f CT signals and anti aliasing Filter design, Decimation in Time DTFT), Z-transform and properties of Z-transform.	Fouri	er Trai	nsforr	n and							
UNIT- V	LINEAR TIME INVARIANT - DISCRETE TIME SYSTEM	AS		6	+6							
Difference	equations, Block diagram representation, Impulse response, C	onvolu	tion s	um, I	Linear							
time invaria	ant systems (LTI) analysis using Decimation in Time Fourier T	ransfor	m and	l prop	erties							
(DTFT), Sta	ate variable equations and matrix representation of system											
	Lecture = 30; Tutorial = 30; Total = 60 Hou	rs										

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

TEXT	F BOOKS:								
1	Allan V.Oppenheim, S.Wilsky and S.H.Nawab -2007, -Signals and Systems, Pearson								
1.	Education.								
2	Edward W Kamen & Bonnie's Heck 2007, -Fundamentals of Signals and Systems,								
۷.	Pearson Education.								
3.	Simon Haykins and Barry Van Veen,2004- Signals and Systems John Wiley & sons, Inc.								
4	Rodger E. Ziemer, William H. Tranter, D. Ronald Fannin. 2002-Signals and Systems, fourth								
4.	Edition, Pearson Education.								
REFF	ERENCE BOOKS:								
1. H P Hsu, Rakesh Ranjan,2007 - Signals and Systems, Schaum's Outlines, Tata Mce Hill, Indian Reprint,									
								2	S.Salivahanan, A. Vallavaraj, C. Gnanapriya,2007, -Digital Signal Processing, McGraw
۷.	Hill International ,TMH,								
2	Robert A. Gabel and Richard A.Roberts, 1987 -Signals and Linear Systems, John Wiley, III								
5.	edition.								
1	J.G.Prokiis and D.G. Manolakies, 1989-Introduction to Digital Signal Processing								
4.	MacMillan Publishing company.								
E-RE	FERENCES:								
1.	http://freevideolectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur								
2	NPTEL, Signals and System Prof. K.S. Venktesh Department of Electrical Engineering								
2.	Indian Institute of Technology, Kanpur.								

	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	3	0	1			1							2	2
CO 2	3	3	1	2	1	1			1			1	2	2
CO 3	3	2	2			1				1		1	2	2
CO 4	2	2	2	1								1	2	2
CO 5	2	2	2		1				1			1	2	2
Total	13	9	8	3	2	3	0	0	2	1	0	4	10	10
<u> </u>			-	-	-	-	0	0			0		-	
scale	3	2	2	1	1	1	0	0	1	1	0	1	2	3

## COs versus PO, PSO mapping

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES

Cours	se Outcomes(E13):	Domain	Level
CO1	<i>Recall</i> the functions and concepts of electrical maintenance department. <i>Name</i> the tools required.	Cognitive	Remembering
CO2	<i>List</i> the various types of losses and <i>compare</i> with heat produced and its dissipation in the rotating machine.	Cognitive	Remembering Understanding
CO3	<i>Name</i> the various types of lubrication and lubricators and <i>choose</i> the correct lubrication for various operations of rotating machines.	Cognitive	Remembering Remembering
CO4	<i>Select</i> the motor for particular application and <i>demonstrate</i> the different types of installation and trouble shootings.	Cognitive	Applying Understanding
CO5	<i>Recall</i> the methods and procedure for domestic installation. <i>Compare</i> the faults and ensure the precautions to avoid mishaps.	Cognitive	Remembering Understanding

SUB CODE	SUB NAME	L	Т	Р	С					
E13		2	1	0	3					
C:P:A	CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES	L	Т	Р	Н					
2:0:0	WACHINES	2	2	0	4					
UNIT- I	PRINCIPLES AND PLANNING OF MAINTENANCE			6	+6					
Introduction	n, Essentials of preventive maintenance programme, Functions o	f electi	rical m	ainte	nance					
department.	Tools required, loading and unloading of electrical machinery									
UNIT- II	HEATING AND COOLING OF ELECTRICAL MACHINE	ES		6	+6					
Introduction, Energy losses in electrical conductors, Energy losses in magnetic conductors, Energy losses in insulating materials, Efficiency in electrical machines, Modes of heat dissipation, Radiation, Convection, Conduction, Causes of overheating, Ventilation of electrical machines, transformer cooling, Cooling of, Synchronous machines										
UNIT-III	LUBRICATION			6	+6					
Introduction, Purpose of lubrication, Classification of lubricants, liquid lubricants, Semi-liquid lubricants, Solid lubricants. Characteristics of lubricants, Viscosity, Viscosity index, Oiliness, Specific gravity-flash point, fire point, freezing point or pour point, Volatility. Methods of lubrication Ring oiling, Needle lubricator, Wick lubrication.										
UNIT-IV	INIT-IV MOTORS 6+6									
Selection of Pre commi maintenanc	F motors, Storage pre installation check, Installation, Alignment, or ssioning checks, Drying out, Commissioning, Overhauling e, Trouble shooting in electric motors, Maintenance schedule of s	Connect of mo synchro	cting a otors, onous 1	nd sta Preve nachi	rting, entive ne					

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

6+6

#### UNIT-V DOMESTIC INSTALLATIONS

Introduction, Testing the electrical installation of a building-testing of insulation resistance to earth, testing of insulation resistance between conductors, Continuity or open circuit test, Short circuit test, Testing of earth continuity path, polarity test, Localization of fault, IE Rules for domestic installations. Electric Fire, Precautions to avoid fire,

#### Lecture = 30; Tutorial = 30; Lab = 00; Total = 60 Hours

TEXT 1	BOOKS:
1.	SK Bhattacharya, "Electrical Machines", Tata Mc Graw Hill, New Delhi, 1998.
2.	Kenneth B. Rexford, "Electrical Control for Machnines", Delmar cengage leaning, November 22, 1996.
3.	Frank D. Petruzella, "Electric Motors Control systems", McGraw Hill Education, May 2009.
REFER	RENCE BOOKS:
1.	Nagrath and Kothari, "Electrical Machines", Tata McGraw Hill, New Delhi, 2010
2.	Diane Lobsiger, Peter Giuliani & Kenneth Rexford, "Electrical Control for Machines", 7 th edition, Delmar Cengage Learning, January 2015.
3.	JB Gupta, "Electrical and Electronics Engineering", S.K. Kataria&Sons, New Delhi, 2009.
4.	Philip Kiameh "Electrical Equipment Handbook: Troubleshooting and Maintenance" McGraw Hill Inc., New Delhi, 2003, ISBN: 9780071396035
E-REF	ERENCES:
1.	https://accessengineeringlibrary.com/browse/electrical-equipment-handbook- troubleshooting-and-maintenance

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	1	2	-	1	-	-	-	1	-	-	1	-	1
CO2	3	1	-	1	1	-	-	-	-	-	-	1	-	1
CO3	3	1	-	1	1	-	-	-	1	-	-	1	-	1
CO4	3	1	2	1	1	-	-	-	1	-	-	1	-	1
CO5	3	1	-	-	1	-	-	-	-	-	-	1	-	1
Total	15	5	4	3	5				3			5		5
Scaling	3	1	1	1	1				1			1		1

#### Table 1: COs versus POs mapping

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### DIGITAL SIGNAL PROCESSING

Cours	se Outcomes(E14):	Domain	Level
CO1	<i>Discuss</i> to represent real world signals in digital format and <i>Describes</i> transform-domain (Fourier and z-transforms) representation of the signals.	Cognitive	Remembering
CO2	<b>Design</b> the linear systems approach to signal processing problems using high-level programming language.	Cognitive	Creating
CO3	<i>Distinguish</i> the basic architecture of microprocessors and digital signal processors.	Cognitive	Analyzing
<b>CO</b> 4	<i>Choose</i> appropriate dynamics for expanding the filter structure.	Cognitive	Remembering
C05	<i>Describe</i> the applications of linear filters and their real- time implementation challenges.	Cognitive	Remembering

SUB CODE	SUB NAME	L	Т	Р	С							
E14												
C:P:A	DIGITAL SIGNAL PROCESSING											
3:0:0		2	2	0	4							
UNIT- I	INTRODUCTION			6	+6							
Characterization and classification of signals - examples of signals – multichannel –multi- dimensional - continuous versus discrete - analog versus digital - concept of frequency. Concepts of signal processing - typical applications - advantages of digital signal processing compared with analog processing												
UNIT-II	DISCRETE TIME SYSTEMS ANALYSIS			6	+6							
Representat functions –	ions-classifications - time domain and frequency domain cha Convolution - Z-transform and Inverse Z- transform applications	aracteri s	zation	- tra	ansfer							
UNIT-III	FREQUENCY ANALYSIS OF SIGNAL			6	+6							
Analysis of analog and discrete signals-using Fourier series, Fourier transform, computation of DFT. Fourier transform of discrete sequence and discrete Fourier transform-properties of transforms-computation of DIT and DIF-computation of discrete Fourier transforms-Radix 2. FFT algorithms - circular convolution												
UNIT-IV	UNIT-IVDESIGN ANALOG AND DIGITAL FILTERS6+6											
Sampling or reconstruction	Sampling of continuous signals-analog filter design-anti aliasing filters-sample and hold circuit- reconstructing filters-Block diagram representation – IIR and FIR structures											

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

6+6

#### UNIT- V DIGITAL SIGNAL PROCESSORS

Introduction - Block diagram and construction. Instruction and addressing of Texas commercial processors (TMS 302 C 54X processors) Techniques of 'C54X' Internal memory organization, program memory addressing. Comparison b/w DSP processors and general purpose processor.

## Lecture = 30; Tutorial = 30; Lab = 0; Total = 60 Hours

TEXT	BOOKS:
1	S.K. Mitra, 'Digital signal processing-A Computer based approach', Tata McGraw-Hill
1.	Edition, 2007
2.	Alan V Oppenheim, Ronald W.Schafer, "Digital Signal Processing", Prentice Hall, 2011
3	S. Salivahanan, A. Vallavaraj and C. Gnanapriya., "Digital Signal Processing" Tata
5.	McGraw-Hill Edition, 2012
4	E.C. Ifeachor and B.W. Jervis, "Digital signal processing - A practical approach", Second
ч.	edition, Pearson, 2013
REFER	RENCE BOOKS:
1.	Lonnie C. Lumen, 'Fundamentals of Digital Signal Processing', John Wily and Sons, 2008
2	J.G. Prookis and D.G. Manolakis, 'Introduction to Digital Signal Processing', Macmillan.
۷.	Publishing company, 2013.
3.	R.G.Lyons, 'Understanding Digital Signal Processing', Addison Wesley, 2008
4.	Johny R. Johnson, Introduction to Digital Signal Processing, PHI, 2007.
E-REF	ERENCES:
1.	NTPEL, Digital Signal Processing (Web Course), Prof. S. C. Dutta Roy, IIT Delhi

## Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2	1	-	-	-	-	-	-	1	-	-	-	-	_
CO2	2	1	2	2	-	-	-	-	-	1	-	2	-	-
CO3	1	3	-	3	1	-	2	3	-	1	1	-	2	1
CO4	2	2	-	1	1	1	-	-	2	2	-	1	1	-
CO5	2	1	1	1	-	-	-	-	-	-	2	-	1	1
Total	9	8	3	7	2	1	2	3	3	4	3	3	4	2
Scalin g	2	2	1	2	1	1	1	1	1	1	1	1	1	1

0 - No relation, 1 - Low relation, 2 - Medium, relation, 3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### SOLID STATE DRIVES

Cours	se Outcomes(E21):	Domain	Level
CO1	<i>Outline</i> the fundamentals of Electric Drives and their ratings.	Cognitive	Understanding
CO2	<i>List</i> the various control techniques of DC Drives.	Cognitive	Remembering
CO3	<i>Categorize</i> the different speed control methods for an Induction motor drive	Cognitive	Analyzing
CO4	<i>Illustrate</i> the solid state converters based controllers for Rotor control of an Induction motor drive	Cognitive	Understanding
C05	<i>Make use of</i> the assorted control strategies of synchronous motor drive.	Cognitive	Applying

Sub.code	Sub Nome	L	Т	Р	С							
E21	Sub. Maine	0	3									
C:P:A	SOLID STATE DRIVES	Р	Н									
3:0:0	3 0 0 3											
UNIT-IDRIVE CHARACTERISTICS10												
Fundamentals of Electric Drives-Advantage of Electric Drives-selection of Motor power rating-												
Thermal model	of motor for heating and cooling - Classes of dut	y cycle	Determi	nation of	f motor							
rating - Control	of Electric drives- modes of operation - speed co	ontrol an	d drive c	lassifica	tions.							
UNIT-II	SOLID STATE CONTROL OF DC DRIVES	5		1	0							
DC motor and	their performance - Transient analysis - Ward	Leonar	d drives	- Stead	y state							
analysis of the single and three phase fully controlled converter fed separately excited DC												
motor drive – c	ontinuous and discontinuous mode Chopper con	ntrolled	DC driv	es - Tin	ne ratio							
control and curr	ent limit control.											
UNIT-III	STATOR CONTROLLED	INDUC	CTION	8	3							
	MOTORDRIVES											
Induction Moto	r Drives-Stator control-Stator voltage and free	quency of	control -	- VSI,C	SI and							
cyclo converter	fed induction motor drives -open loop and close	d VVVF	F control									
UNIT-IV	<b>ROTOR CONTROLLED INDUCTION MO</b>	TORD	RIVES	8	8							
Rotor resistanc	e control - Slip power recovery schemes	–Sub s	ynchrono	ous and	super							
synchronous op	erations – Power factor improvement – Closed lo	op cont	rol.									
UNIT-V	SYNCHRONOUS MOTOR DRIVES			Ç	)							
Separate contro	lled mode - Self controlled mode of synchrono	ous moto	or – Cor	nstant m	arginal							
angle control a	nd motor power factor control - Cyclo conve	erter fea	d synchr	onous r	notors-							
Digital Control	and Drive Applications.											
	Lecture = 45; Tutorial = 0; Lab = 0; Total	= 45 Ho	ours									

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

TEXT	BOOKS:
1.	Dubey.G.K. "Fundamentals of Electrical drives", Narora publications, 2008
2.	R. Krishnan, "Electricmotor& Drives; Modelling, Analysis and Control", Prentice Hall of India, 2001.
3.	Gopal K. Dubey, Fundamentals of Electrical Drives, New Delhi, 2nd Edition, Narosa Publishing House, 2001.
4.	B. K. Bose, 'Power Electronics and AC Drives', Prentice Hall Onglewood cliffs, New Jersey, 1998.
REFE	RENCE BOOKS:
1.	Murphy, J.M.D and TurnbullF.G., 'Thyristor control of AC Motors', Pergamon Press,1990.
2.	Sen. P.C., 'Thyristor D.C. Drives', John Wiley and Sons, 1981.
3.	Vedam Subrahmaniyam, 'Electric Drives Concepts and Applications', Tata McGraw HillPublishing company Ltd., 2011.
4.	Gaekward, "Analog and Digital control systems", Wiley Eastern Ltd, 1989.
E REF	ERENCES:
1.	<i>Lecture</i> Series on Solid state devices by Prof. S.Karmalkar, Department of Electrical Engineering, IIT Madras.
2.	http://nptel.ac.in/courses/108108077/

#### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	РО	PO1	PO1	PO1	PS	PS								
	1	2	3	4	5	6	7	8	9	0	1	2	01	02
CO 1	3	2	1	0	2	0	1	0	0	0	0	0	0	3
CO 2	3	1	0	0	2	0	1	0	0	0	0	0	3	2
CO 3	1	2	3	0	2	0	0	1	0	0	0	0	1	2
CO 4	0	2	0	0	3	0	1	0	0	0	0	0	2	2
CO 5	3	1	1	0	0	1	1	1	0	0	0	1	1	2
Total	10	8	5	0	9	1	4	2	0	0	0	1	7	11
Scalin g	2	2	1	0	2	1	1	1	0	0	0	1	2	3

3-High Relation, 2-Medium Relation, 1-Low Relation, 0-No Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### **POWER PLANT ENGINEERING**

Cours	se Outcomes(E22):	Domain	Level
CO1	<i>Explain</i> about the various types of the power generation and function of boilers	Cognitive	Understanding
CO2	Choose Various Measurements in power plants.	Cognitive	Remembering
CO3	<i>Illustrate</i> Various <i>analyzers</i> in power plants, and <i>identify</i> the pollution monitoring instruments.	Cognitive	Understanding Applying
CO4	<i>Infer</i> all control loops in boiler , and interlocks in boiler operation-boiler trip protection.	Cognitive	Understanding
CO5	<i>Explain</i> about turbine speed vibration – lubricant oil temperature control – cooling system and <i>select</i> the SCADA and other monitoring and control software	Cognitive	Understanding Remembering

SUB CODE	SUB NAME L T								
E22		3	0	0	3				
C:P:A	POWER PLANT ENGINEERING L T								
3:0:0	3:0:0								
UNIT- I	<b>OVERVIEW OF POWER GENERATION</b>				9				
Principle of Power Generation, Brief survey of methods of power generation – hydro, thermal, nuclear, solar, wind and tidal power – importance of instrumentation in power generation– Material handling of power plant equipment thermal power plants – building blocks – details of boiler processes UP&I diagram of boiler – cogeneration.									
UNIT- II	MEASUREMENTS IN POWER PLANTS				9				
Electrical n parameters pressure an measuremen	Electrical measurements – current, voltage, power, frequency, power – factor etc. – non electrical parameters – flow of feed water, fuel, air and steam with correction factor for temperature – steam pressure and steam temperature – drum level measurement – radiation detector – smoke density measurement – dust monitor emission measurements performance measurements								
UNIT-III	ANALYZERS IN POWER PLANTS				9				
Flue gas ox impurities in analyzer – p	Flue gas oxygen analyzer – Deminaral - Steam and Water Analysis System (SWAT) analysis of impurities in feed water and steam – dissolved oxygen analyzer – chromatography – PH meter – fuel analyzer – pollution monitoring instruments								
UNIT-IV	CONTROL LOOPS IN BOILER				9				
Combustion control – air/fuel ratio control – furnace draft control – drum level control –low and high protection- main steam and reheat steam temperature control – super heater control – at temperature – deaerator level control – distributed control system in power plants – interlocks in									

boiler operation-boiler trip protection

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

9

#### UNIT- V TURBINE – MONITORING AND CONTROL SOFTWARE

Speed, vibration, shell temperature monitoring and control – steam pressure control – lubricant oil temperature control – cooling system and application of SCADA and other monitoring and control software .

#### Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours

TEX	T BOOKS:
1.	Sam G. Dukelow, "The control of Boilers" Instrument Society of America, 2000.
2.	V.K. Mehta and Rohit Mehta "Principles of Power system" S. Chand & Company, New Delhi, 2003
3.	Er. R.K. Rajput, A text book of power plant engineering, Forth edition, 2015.
4.	Dr. P. C. Sharma's A Textbook of Power Plant Engineering, published by S. K. Kataria, 2013.
REF	ERENCE BOOKS:
1.	Power station Engineering and Economy by Bernhardt G.A.Skrotzki and William A.Vopat- Tata McGraw Hill Publishing Company Ltd., New Delhi, 20th reprint 2002
2.	R.K.Jain, "Mechanical and Industrial Measurements" Khanna Publishers, New Delhi, 2002.
3.	Arora Domkundwar, A course in Power Plant engineering, Dhanpat Rai & Co,2001
E-RI	EFERENCES:
1	www.electrical4u.com

#### CO/PO **PO1** PO2 PO3 **PO4 PO5 PO6 PO7 PO8 PO9 PO10 PO11** PO12 PSO1 PSO₂ **CO1** 3 2 2 3 2 1 -1 -1 2 -_ -**CO2** 3 1 2 1 1 1 1 2 ------**CO3** 3 1 1 1 1 2 1 -------**CO4** 3 2 2 2 1 1 1 3 1 -----CO5 3 1 1 2 1 1 --------15 6 4 6 5 4 5 7 Total 11 1 Scaling 3 2 1 2 1 1 3 2

#### **COs versus POs mapping**

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





## POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS

Cours	se Outcomes(E23):	Domain	Level
CO1	<i>Explain</i> the fundamentals of renewable energy systems and government support on developing new technology for Renewable Energy Systems.	Cognitive	Understanding
CO2	<i>Illustrate</i> the operation of various electrical machines on renewable energy conversion system.	Cognitive	Understanding
CO3	<i>Categorize</i> the different types of power converters used for renewable energy conversion.	Cognitive	Analyzing
CO4	<i>Construct</i> the Grid connected solar and wind power generation systems.	Cognitive	Applying
CO5	<i>Find</i> the need of hybrid system and Recall the power conversion and storage systems.	Cognitive	Remembering

E23300C:P:APOWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMSLTP3:0:0RENEWABLE ENERGY SYSTEMS300UNIT-IINTRODUCTION TO ENERGY300Trends in energy consumption - World energy scenario - Energy source and their availability Conventional and renewable sources - Need to develop new energy technologies- MNRE Re and Regulations-TEDA-Wind and solar survey in India and World.10UNIT-IIELECTRICAL MACHINES FOR RENEWABL EENERGY8	Sub. Code	Sub Nomo	L	Т	Р	С				
C:P:A       POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS       L       T       P         3:0:0       RENEWABLE ENERGY SYSTEMS       3       0       0       0         UNIT- I       INTRODUCTION TO ENERGY       3       0       0       10         Trends in energy consumption - World energy scenario - Energy source and their availability Conventional and renewable sources - Need to develop new energy technologies- MNRE Read Regulations-TEDA-Wind and solar survey in India and World.       NNRE Read Read Regulations-TEDA-Wind and solar survey in India and World.       8         UNIT-II       ELECTRICAL MACHINES FOR RENEWABL EENERGY       8	E23	Sub. Manie	3	0	0	3				
3:0:0       RENEWABLE ENERGY SYSTEMS       3       0       0         UNIT-I       INTRODUCTION TO ENERGY       10         Trends in energy consumption - World energy scenario - Energy source and their availability conventional and renewable sources - Need to develop new energy technologies- MNRE Ruand Regulations-TEDA-Wind and solar survey in India and World.       NNRE Ruand World.         UNIT-II       ELECTRICAL MACHINES FOR RENEWABL EENERGY       8	C:P:A	POWER ELECTRONICS FOR	POWER ELECTRONICS FOR L T							
UNIT-I       INTRODUCTION TO ENERGY       10         Trends in energy consumption - World energy scenario - Energy source and their availability convention and renewable sources - Need to develop new energy technologies- MNRE Read Regulations-TEDA-Wind and solar survey in India and World.       MNRE Read to develop new energy technologies- MNRE Read to develop new energy technologies- MNRE Read to develop new energy technologies - MNRE Read to develop ne	3:0:0	RENEWABLE ENERGY SYSTEMS	0	3						
Trends in energy consumption - World energy scenario - Energy source and their availabilit         Conventional and renewable sources - Need to develop new energy technologies- MNRE Ry         and Regulations-TEDA-Wind and solar survey in India and World.         UNIT-II         ELECTRICAL MACHINES FOR RENEWABL EENERGY         8         CONVERSION	UNIT- I		10							
UNIT-II ELECTRICAL MACHINES FOR RENEWABL EENERGY 8 CONVERSION	Trends in energy consumption - World energy scenario - Energy source and their availability – Conventional and renewable sources - Need to develop new energy technologies- MNRE Rules and Regulations-TEDA-Wind and solar survey in India and World.									
	UNIT-IIELECTRICAL MACHINES FOR RENEWABL EENERGY CONVERSION8									
Review of reference theory fundamentals-principle of operation and analysis :Induct										
Generator (IG), Permanent Magnet Synchronous Generator (PMSG), squirrel cage induct	Generator (	(IG), Permanent Magnet Synchronous Generator (PM	MSG), s	quirrel	cage inc	luction				
generator (SCIG) and Doubly Fed Induction Generator (DFIG).	generator (S	SCIG) and Doubly Fed Induction Generator (DFIG)	•							
UNIT- IIIPOWER CONVERTERS10	UNIT- III	POWER CONVERTERS			1	0				
Solar: Block diagram of solar photo voltaic system, line commutated converters (inversion	Solar: Block	ck diagram of solar photo voltaic system, line com	mutated	l conver	ters (inv	ersion-				
mode) -Maximum power point tracking - Applications - Water pumping - Street light	mode) -Max	aximum power point tracking - Applications - Wa	ter pum	nping –	Street li	ghting,				
battery sizing, array sizing. Wind: three phase AC voltage controllers-AC-DC-AC convert	battery sizin	ng, array sizing. Wind: three phase AC voltage cont	trollers	AC-DC-	AC con	verters,				
Grid Interactive Inverters-matrix converters.	Grid Interact	ctive Inverters-matrix converters.								
UNIT-IVANALYSIS OF WIND AND PV SYSTEMS8	UNIT-IV	ANALYSIS OF WIND AND PV SYSTEMS			8	3				
Standalone operation affixed and variable speed wind energy conversion systems and senergy conversion system based on PV system -Inter connections with Grid - Po conditioning schemes.										

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





UNI	T-V	9					
Need	for H	lybrid Systems- Range and type of Hybrid systems- Case studies	s of Wind-PV-				
Powe	r conv	erters for distributed power systems- Storage - Reliability evolution					
	Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours						
TEX	T BOC	DKS:					
1.	S. F Con	Rao and Parulekar, Energy Technology – Non Conventional, F ventional, New Delhi, Khanna Publishers, 1999.	Renewable and				
2.	Muk	cund R. Patel, Wind and Solar Power System, New York, CRC Press	LLC, 1999.				
3.	Ned App	Mohan, Tore M. Undeland and William P.Robbins, Power Electroni lications and Design, New Jersey, John Wiley and Sons, 2003.	cs: Converters,				
4.	S.N. Pre	Bhadra,D.Kastha,&S.Banerjee "WindElectrical systems",OxfordUni sss,2009	versity				
REF	EREN	CE BOOKS:					
1.	Ras	hid.M.H "power electronicsHandbook",Academicpress, 2001.					
2.	Rai.	G.D, "Nonconventional energysources", Khannapublishes, 1993					
3.	Gray	y,L.Johnson, "Windenergysystem", prenticehall linc, 1995.					
E RE	FERE	INCES:					
1.	Lectu Electu	ure Series on Energy Resources & Technologyby Prof. S.Banerjee, rical Engineering, IIT Kharagpur	Department of				
2.	Princ V.V.S	iples and Performance of Solar Energy Thermal Systems: A W Satyamurty Professor of Mechanical Engineering, IIT Kharagpur.	Veb Course by				

## Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	P 0 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2	3	1	0	2	0	1	0	0	0	0	0	3	0
CO 2	3	1	0	0	2	0	1	0	0	0	0	0	1	1
CO 3	1	2	3	0	1	0	0	1	0	0	0	0	3	2
CO 4	0	2	0	0	3	0	1	0	0	0	0	0	2	2
CO 5	3	1	1	0	0	2	1	1	0	0	0	1	2	1
Total	9	9	5	0	8	2	4	2	0	0	0	1	11	6
Scaling	2	2	1	0	2	1	1	1	0	0	0	1	3	2

3-High Relation, 2-Medium Relation, 1-Low Relation, 0-No Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### WIND ENERGY CONVERSION SYSTEMS

Cours	se Outcomes(E24):	Domain	Level
CO1	<i>Illustrate</i> the components, schemes, power obtained and power Coefficient of wind turbine.	Cognitive	Understanding
CO2	<i>Explain</i> and <i>design</i> the different methods of wind turbines.	Cognitive	Understanding Creating
CO3	<i>Classify</i> types of fixed speed systems and <i>design</i> procedure of each part of the fixed speed systems.	Cognitive	Understanding Creating
CO4	<i>Explain</i> the variable speed systems and the power – wind speed characteristics of variable speed system.	Cognitive	Understanding
CO5	<i>Classify</i> and <i>explain</i> the different techniques of grid connected systems.	Cognitive	Understanding Understanding

SUB CODE	SUB NAME L T								
E24	3 0								
C:P:A	C:P:AWIND ENERGY CONVERSION SYSTEMSLT								
3:0:0									
UNIT- I	INTRODUCTION				9				
Components of WECS-WECS schemes-Power obtained from wind-simple momentum theory-									
Power coefficient-Sabinin's theory-Aerodynamics of Wind turbine.									
UNIT- II	UNIT- II WIND TURBINES 9								
HAWT-VAWT-Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations-									
Tip speed	Tip speed ratio-No. of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control-								
stall contro	ol-Schemes for maximum power extraction.								
UNIT-III	FIXED SPEED SYSTEMS				9				
Generating	g Systems- Constant speed constant frequency systems -	Choice	of G	lenera	tors-				
Deciding	factors-Synchronous Generator-Squirrel Cage Induction	n Gen	erator-	Mod	el of				
Wind Spee	ed-Model wind turbine rotor - Drive Train model- Generator model-	del for	Steady	y state	e and				
Transient s	Transient stability analysis.								
UNIT-IVVARIABLE SPEED SYSTEMS9									
Need of	variable speed systems-Power-wind speed characteristics-Va	ariable	speed	l con	stant				
frequency	systems synchronous generator- DFIG- PMSG -Variable speed	l gener	ators 1	nodel	ling-				
Variable s	peed variable frequency schemes.								

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Email: headeee@pmu.edu

Fax: + 91- 4362 - 264660 Web: www. pmu.edu





think • innovate • transform

#### UNIT-V **GRID CONNECTED SYSTEMS**

9

Wind interconnection requirements, low-voltage ride through (LVRT), ramp rate limitations, and supply of ancillary services for frequency and voltage control, current practices and industry trends wind interconnection impaction steady-state and dynamic performance of the power system including modellingissue.

		LECTURE	TUTORIAL	TOTAL					
		45	0	45					
TEXT	TEXT BOOKS:								
1.	L.L.Freris"WindEnergyconversionSystems",PrenticeHall,2000								
2.	S.N.Bhadra, D.Kastha,S.Banerjee, "Wind Electrical Sytems", Oxford University								
REFE	REFERENCE BOOKS:								
1.	IonBoldea, "Variablespeedgenerators", Taylor & Francisgroup, 2006.								
2.	E.W.Golding "Thegeneration of Electricity by windpower",Redwoodburn Ltd., Trowbridge,2001.								
3.	N.Jenkins,"Wind Energy Technology" JohnWiley&Sons,2001								
4.	S.Heir "Grid Integration of WECS", Wiley 2001.								
E REF	E REFERENCES :								
1.	NPTEL, Wind energy conversion, Prof. Shireesh. B, Kedre, IIT Bombay								
2.	NPTEL, Wind energy conversion, Prof. S. Banerjee, IIT Kharagpur								

## COs versus PO, PSO mapping

CO/ PO/PS O	PO1	PO2	PO3	PO4	PO5	PO6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	1	1	-	-	-	-	-	-	-	2	1
CO2	3	2	1	2	2	-	-	-	-	-	-	-	2	1
CO3	2	1	-	1	2	-	-	-	1	-	1	-	1	1
CO4	2	2	1	2	1	-	-	-	-	-	-	-	2	1
CO5	2	2	-	1	2	-	-	-	-	-	-	-	1	2
Total	11	09	02	7	8	0	0	0	01	0	01	0	09	06
Scaling	3	2	1	2	2	0	0	0	1	0	1	0	2	2

0 –No relation 1 - Low relation 2 - Medium relation 3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### **BIO-MEDICAL INSTRUMENTATION**

Cours	se Outcomes(E31):	Domain	Level
CO1	<i>Identify</i> the origin of bio-potentials and various bioelectric	Cognitive	Applying
	signals that are recorded routinely in modern clinical		
	practice.		
CO2	<i>Explain</i> the various techniques of measuring blood flow,	Cognitive	Understanding
	pressure & volume.		
CO3	Describe and apply the safety issues, safe design, and safe	Cognitive	Remembering
	use of medical instrumentation, specifically electrical		
	safety.		
<b>CO4</b>	<i>Choose</i> the appropriate amplifier and filters for medical	Cognitive	Applying
	instrumentation.		
<b>CO5</b>	<i>Describe</i> the parameters constraining the resolution of CT,	Cognitive	Remembering
	MRI & Ultrasound image.		

SUB	SUB NAME	L	Т	Р	С		
CODE			•	•	U		
E31		3	0	0	3		
C:P:A	<b>BIO-MEDICAL INSTRUMENTATION</b>	L	Т	Р	Η		
3:0:0		3	0	0	3		
UNIT-I	HUMAN SYSTEM AND BIO POTENTIAL ELECTRODES	5			9		
Different ty	Different types of human system, origin of bio-potential and its propagation. Electrode-electrolyte						
interface, el	interface, electrode-skin interface, half cell potential, Types of electrode, PH electrode, Recording						
problems, measurement with two electrodes - human cell structure.							
UNIT-II	IT-II ELECTRODE CONFIGURATION 9						
Bio signals characteristics – frequency & amplitude ranges. ECG – Enthoven's triangle, standard 12							
load system	, PQPs waveform. EEG - 10-20 electrode system, brain waves, t	ecordi	ng seti	up of	EEG,		
EMG, ERG	, and EOG – unipolar and bipolar mode.						
UNIT-III	UNIT-IIIBIO AMPLIFIER AND TRANSDUCER9						
Need for 1	Bio –amplifier, power amplifier, isolation amplifier, feedbac	k amp	lifier.	Resi	stive,		
Inductive, C	Inductive, Capacitive transducer and application, Fibre optic, photoelectric transducer – description,						
features applicable for biomedical instrumentation							
UNIT-IV	CARDIAC MEASUREMENTS				9		
Blood pres	Blood pressure measurement – blood flow measurement – phonocardiography – vector						
cardiography. Heart lung machine -ventilator - Anesthetic machine - cardiac pacemaker -							
defibrillator	patient safety - electrical shock hazards.		-				

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu
 Web: www. pmu.edu





think • innovate • transform

UNIT-	V MEDICAL DIAGNOSTICS INSTRUMENTS AND SYSTEMS	9					
CT scar	CT scanner - MRI Scan and Ultrasonic scanner -X Ray - Laser Equipment and application- bio-						
telemetr	telemetry Kidney dialysis machine – electron microscope – blood cell counter- Endoscopy						
	Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours						
TEXT	TEXT BOOKS:						
1.	1. Khandpur, R.S., 'Handbook of Biomedical Instrumentation', Tata McGraw Hill, 2007.						
2.	2. ArumugamM.,'Bio Medical Instrumentation', Anuradha agencies Pub., 2012.						
3.	3. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation' Universities press (India) Ltd. Orient Longmon Ltd. 2008						
4.	Instrumentation , Oniversities press (initia) Etd, Orient Longinan itd, 2000.         4.       J. Webster, 'Medical Instrumentation', John Wiley & Sons, 2003.						
REFE	<b>REFERENCE BOOKS:</b>						
1.	1. Geddes L.A., and Baker, L.E., 'Principles of Applied Bio-medical Instrumentation', 3rd Edition, John Wiley and Sons, 2011.						
2.	2. Cromwell, Weibell and Pfeiffer, 'Biomedical Instrumentation and Measurements', 2 nd Edition, Prentice Hall of India, 2014.						
3.	3. Tompkins W.J., Biomedical Digital Signal Processing, Prentice Hall of India, 2008.						
4.	4. J. Wilson, J.F.B. Hawkes, 'Laser Principles and Applications',.( Prentice-Hall, New York), (2006)						
E-REF	E-REFERENCES:						
1.	http://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/Bio medical instrumenta	ation					

## Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	2	2	1	1	-	-	1	-	1	-	-	-	1	-
CO2	-	-	3	-	-	-	2	2	-	-	2	2	1	-
CO3	-	-	3	-	-	3	3	-	-	-	-	-	3	1
CO4	1	2	-	3		-	2	-	-	2	-	-	2	1
CO5	1	1	-	3	2	-	-	-	-	-	-	-	1	-
Total	4	5	7	6	2	3	8	2	1	2	2	2	8	2
Scalin g	1	1	2	2	1	1	2	1	1	1	1	1	2	1

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

#### ELECTRICAL ENERGY UTILIZATION AND CONSERVATION

Cours	se Outcomes(E32):	Domain	Level	
CO1	Choose an industrial drive with relevant factors and	Cognitive	Remembering	
	<i>develop</i> electric traction system.		Applying	
CO2	Classify the lamps and lighting. Develop lighting scheme	Cognitive	Understanding	
	for residential, commercial and industrial applications.		Applying	
CO3	<i>Explain</i> electric heating and <i>develop a</i> heating system.	Cognitive	Understanding	
			Applying	
<b>CO4</b>	Demonstrate the furnaces, welding and identify their	Cognitive	Understanding	
	applications.			
CO5	<i>Explain</i> the application of electrolytic process and	Cognitive	Understanding	
	electroplating.			

SUB CODE	SUB NAME	L	Τ	Р	С
E32	ELECTRICAL ENERGY UTILIZATION AND	3	0	0	3
C:P:A	CONSERVATION	L	Т	Р	H
3:0:0		3	0	0	3
UNIT I	ELECTRIC DRIVES AND TRACTION				10

ELECTRIC DRIVES AND TRACTION Fundamentals of electric drive - choice of an electric motor - application of motors for particular services - traction motors - characteristic features of traction motor - systems of railway electrification - electric braking - train movement and energy consumption - traction motor control - track equipment and collection gear.

UNIT II	ELECTRIC LIGHTING
---------	-------------------

08

09

Definition of terms – types of lamp – types of lighting –Lighting Scheme, methods of lighting calculation design of illumination - residential - commercial - industrial - energy saving measures.

UNIT III HEATING AND WELDING Advantages of electric heating - Models fo heat transfer - Methids of heating: Resistance heating, Induction heating, Dielectric heating - Requirement of heating material - design of heating element. Furnaces: Induction furnace, Arc furnace - Welding types: Resistance, Electric Arc, Welding generator, Welding transformer and its characteristics - plasma cutting.




think • innovate • transform

### UNIT IV ELECTRO-CHEMICAL PROCESSES

Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, Efficiency - Batteries – types – Charging Methods.

### UNIT V ENERGY CONSERVATION AND AUDIT

09

09

Tariff – Need for electrical energy conservation – ways of energy conservation. Energy Auditing: Aim, Strategy, Periodic process review, energy audit of electrical system – Instruments for energy audit – Demand side management: Planning and implementation, load management, End use energy conservation.

	LECTURE	TUTORIAL	TOTAL
	45	00	45
TEVT DOOVS.			

### **TEXT BOOKS:**

- 1. Wadhwa, C.L., 'Generation, Distribution and Utilization of electric energy, New age International Publications, 2006.
- 2. B. R. Gupta, "Generation of Electrical Energy", Eurasia Publishing House Private Limited, New Delhi, 2003.

### **REFERENCE BOOKS:**

- 1. S. L Uppal, "Electrical Power", Khanna Publishers, 1988.
- 2. Suryanarayana, N.V., 'Utilisation of Electric Power', Wiley Eastern Ltd. 1993.

### **E REFERENCES**

- 1. http://nptel.ac.in/courses/108105058/ Prof. S. Banerjee, IIT Kharagpur.
- 2. https://www.youtube.com/watch?v=uy9lZCdkQIM Prof.D.P.Kothari, IIT Delhi

### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	2			2	1							2	1	1
CO 2	3	2	2	2	2							1	1	1
CO 3	2		2			2						1	1	1
CO 4	2	2		2		2						1	1	2
CO 5	2	2				2						1	1	2
Total	11	6	4	6	3	6	0	0	0	0	0	6	5	7
Scaled to 0,1,2,3 scale	3	2	1	2	1	2	0	0	0	0	0	2	1	1

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





### think • innovate • transform

### POLLUTION PERFORMANCE ANALYSIS OF ELECTRICAL SYSTEMS

Cours	se Outcomes(E33):	Domain	Level
CO1	<i>Explain</i> the different pollution testing mechanism and causes for insulators failures.	Cognitive	Understanding
CO2	<i>Explain</i> the performance of insulator, surge diverter and indoor <i>Explain</i> the performance of insulator, surge diverter and indoor.	Cognitive	Understanding
CO3	<i>Show</i> the effect of pollution and the protective characteristics of gap and gapless arresters.	Cognitive	Remembering
CO4	<i>Outline</i> protective characteristics of gap and gapless arresters. <i>Develop</i> the modeling of surge diverter.	Cognitive	Understanding Applying
CO5	<i>Show</i> the pollution performance of the indoor switchgear, organic insulator.	Cognitive	Understanding

SUB CODE	SUB NAME	L	Τ	Р	С						
E33	POLLUTION PERFORMANCE ANALYSIS OF ELECTRICAL SYSTEMS	3	0	0	3						
C:P:A		L	Т	Р	H						
3:0:0		3	0	0	3						
UNIT- I	INTRODUCTION	<u>.</u>		<b>i</b>	09						
Fundament effect of c pollution fl	Fundamental process of pollution flashover–Causes of failure in insulators-development and effect of contamination layer – creep age distance–pollution conductivity–mechanism of pollution flashover–analytical determination of flashover voltage.										
UNIT-II	POLLUTIONTESTING				09						

Artificial pollution testing—salt-fogmethod—solid layer method—monitoring of parameters—measurement of layer conductivity—field testing methods.

UNIT-III	POLLUTIONPERFORMANCEC	FIN	SULATORS			09				
Ceramicano	Inon-ceramicinsulators-mitigation	of	pollution	induced	flash	over-				
designofshedprofiles-ribfactoreffectinACandDC insulators-modeling.										
UNIT-IV	POLLUTIONPERFORMANCEC	<b>FSU</b>	RGEDIVER	TERS		09				
Externalinsulation–effectofpollutionontheprotectivecharacteristicsofgapandgapless arresters– modelingofsurgedivertersunder pollutedconditions.										

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNI	<b>I-V POLLUTIONPERFORMANCEO</b>	FINDOOR	EQUIPMENT	09
Cond under	lensation and contamination of indoor switch r polluted conditions – accelerated testing teo	n gear – perf chniques.	formance of orga	nic insulator
		45	0	45
TEX	TBOOKS			
1.	Kuffel,E.,Zaengl,W.S.andKuffelJ.,"HighV IndiaPvt.Ltd,2005.	oltageEngir	neeringFundame	ntals",Elsvier
2.	Ragaller, "SurgesinHighKlaus VoltageNetw	works", Pler	numPress,New Y	ork,1980.
3.	Looms, J.S.T., "Insulators for HighVoltages"	',Peter Pere	grinus.Ltd., Lond	don,1988.
REF	ERENCE BOOKS			
1.	DieterKindandKurtFeser,"HighVoltageTes EngineeringSeries,New Delhi,1999.	stTechnique	s",SecondEdition	n,SBAElectrical
2.	2. Ravi S.Gorur, "Outdoor Insulators", Inc.F	Phoenix,Ari	zona85044,USA	,1999
E-RF	EFERENCES			
1.	E-learning course on Design and Testin Chennai	g on powe	er apparatus , E	Dr.R.Sarathi, IIT

### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O 1	PS O 2
CO 1	1	3		1				2		1		2	2	3
CO 2	1				1						1	1	2	3
CO 3	1		1				1			1		1	2	1
CO 4	1	2										1	2	3
Total	4	5				1			1	2		6	10	10
Scalin g	1	1	1	1	1	1	1	2	1	1	1	2	2	2

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **ENERGY EFFICIENT BUILDING**

Cours	se Outcomes(E34):	Domain	Level
CO1	<i>Classify</i> The Historic buildings and Modern architectures, according to different types of climates.	Cognitive	Understanding
CO2	<i>Interpret</i> Energy conservation in buildings and Heat gain/loss through building components.	Cognitive	Understanding
CO3	<i>Choose different</i> types of passive solar heating. Summarize design guideline for different type's of passive solar heating.	Cognitive	Remembering Understanding
CO4	<i>Identify</i> The energy conservation methodology in buildings and apply the control systems concepts for energy conservation in a building.	Cognitive	Applying
CO5	<i>Infer</i> different types of Energy Efficient controlling techniques for different applications.	Cognitive	Understanding

SUB CODE	SUB NAME	L	Т	Р	С					
E34		3	0	0	3					
C:P:A	ENERGY EFFICIENT BUILDING	L	Т	Р	Н					
3:0:0		3	0	0	3					
UNIT-I	CLIMATEAND SHELTER									
Historicbuildings-Modernarchitecture-Examplesfromdifferentclimatezones- Thermal										
Solargeome	Solargeometryandshading-Heatingandcoolingloads-Energy estimates and site planning-Integrative									
Modeling m	Modeling method sand building simulation									
UNIT-II	UNIT-II PRINCIPLESOFENERGYCONSCIOUSBUILDINGDESIGN 9									
Energy co	nservation in buildings – Day lighting – Water heating and	photo	voltaic	syste	ems-					
Advances	n the rmalinsulation-Heat gain/lossthroughbuildingcomponents	–Solar	archite	ecture	;					
UNIT-III	PASSIVESOLARHEATING				9					
Directgain-	thermalstoragewall-Sunspace-Convectiveairloop-Passivecooling	g-Vent	ilation	-Radi	iation					
-Evaporatio	n and Dehumidification–Mass effect–Design guidelines.									
UNIT-IV	ENERGYCONSERVATIONINBUILDING				9					
Air conditi performand Controlsys Intelligent	Air conditioning – HVAC equipments – Computer packages for thermal design of buildings and performance prediction – Monitoring and instrumentation of passive buildings– Controlsystemsforenergyefficientbuildings–Illustrativepassivebuildings– Intelligentbuildingdesignprinciples									

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT-V	EFFICIENTTECHNOLOGIESINELECTRICAL SYSTEMS	9
Maximu	im demand controllers, automatic power factor controllers, energy efficient motors,	soft
starters	and soft switches, light sensors.	
	Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours	
TEXT B	OOKS:	
1.	Mili Majumdar, "Energy-Efficient Buildings in India" Published by Tata Energy R Institute, New Delhi,2001	lesearch
2.	J.A.Clarke, "EnergySimulationinBuildingDesign(2e)"Butterworth2001.	
3.	J.K.NayakandJ.A.Prajapati Handbookon "EnergyConsciousBuildings",Solar control MNES,2006	rEnergy
4.	J.R.Williams, "PassiveSolar Heating", AnnArbar Science, 2000	
REFER	ENCE BOOKS:	
1.	Dorota Chwieduk - " Solar Energy in Buildings" Published by Pergamon Press, 20	014
2.	J.L.Threlkeld, "Thermal EnvironmentalEngineering", PrenticeHall, 1970.	
3.	"EnergyconservationBuildingCodes",BereauofEnergyEfficiency, 2006.	
4.	R.W.Jones,J.D.Balcomb,C. E.Kosiewiez,G. Lazarus,R.D.McFarlandandW.O.Wray,"PassiveSolar DesignHandbook",Vol.3,ReportofU.S.Department of Energy(DOE/CS-0127/3),198	S. 82.
E-REFE	RENCES:	
1.	www.terrin.org	

### **COs versus POs mapping**

CO/P O	PO 1	PO 2	РО 3	PO 4	PO 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	2	3	2	1	-	1	-	1	1	-	1	3	2
CO2	3	3	1	2	1	-	1	-	-	1	-	1	2	2
CO3	3	1	-	-	1	-	1	-	1	-	1	1	3	1
CO4	3	2	2	2	1	-	1	-	1	-	-	1	2	1
CO5	3	1	-	-	1	-	1	-	-	-	-	1	2	1
Total	15	9	10	6	5		4		3	2	1	5	12	7
Scalin g	3	2	2	2	1		1		1	1	1	1	3	2

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

	Cours	e Outcomes(E41):	D	omain		L	evel			
	CO1	Able to <i>define</i> and <i>explain</i> the construction, open	ration,	• •	R	emen	nberi	ng		
		types and their characteristics of synchronous reluc motor.	ctance Co	gnitive	U	nders	stand	ing		
	CO2	Explain the construction, working and types of ste	epping Co	anitiva	U	nders	stand	ing		
		motor and <i>analyze</i> the linear and non-linear character	istics.	ginuve	A	Analyzing				
	CO3	<i>Explain</i> the construction, operation and characterist switched reluctance motor and <i>Illustrate</i> the different of power controllers.	tics of t types Co	ognitive	U	Understanding				
	CO4	Outline the operation, characteristics of permanent m	nagnet		U	nders	stand	ing		
		dc motor and types of power controller. Formula	te the	Cognitive						
		EMF and Torque equation and phasor diagram, defin	ne the	gnitive	R	emen	nberi	ng		
		commutation logic.								
	CO5	Explain the operation and characteristics of perm	anent		U	nders	stand	ing		
		magnet synchronous motor and Discuss the p	hasor Co	gnitive	C	reatir	ng			
			C	reatir	ng					
	SUB	SUB NAME			L	Т	Р	С		
	CODE E41				2	0	0	2		
	<u>е</u> 41 С•р•д	SPECIAL ELECTRICAL MACH	INES		3 L	<u> </u>	U P	<u>э</u> Н		
	<u>3:0:0</u>				3	0	0	3		
ι	JNIT-I	SYNCHRONOUS RELUCTANCE MOTORS				09				
Con	structio	nal features – types – axial and radial air gap moto	ors – operatir	ng princ	iple – reluctance –					
pha	sor diag	ram - characteristics – Vernier motor.								
U	NIT-II	STEPPING MOTORS				0	9			
Con	structio	nal features – principle of operation – variable relucta	ance motor –	Hybrid	moto	$\mathbf{r} - \mathbf{s}$	ingle	and		
Mu	lti stack	configurations – theory of torque predictions – linear	and non-line	ar analy	sis –	chara	cteri	stics		
		p control - drive circuits.				0	0			
U.	<b>NII-III</b>	SWITCHED RELUCTANCE MOTORS	inting many				y Janli			
anal	lysis – N	Aicroprocessor based control – closed loop control - ch	aracteristics.	er cont	roner	s – r	NOUII	near		
U	NIT-IV	PERMANENT MAGNET BRUSHLESS DC M	IOTORS			0	9			
Prin	nciple o	f operation -EMF and Torque equations - Types	of Power C	ontroller	rs – '	Torqu	ie Sp	peed		
cha	characteristics – Commutation logic - Control.									
UN	UNIT-VPERMANENT MAGNET SYNCHRONOUS MOTORS09									
. Pr	inciple ( verter -	of operation – EMF and torque equations – reactance volt-ampere requirements – torque speed characteristic	– phasor dia cs - micropro	lgram – cessor b	powe ased	er con contr	trolle ol.	ers -		
			LECTURE	TUTC	RIA	LI	ГОТ	AL		
			45		0		45	5		

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

TEXT	BOOKS:						
1	Miller, T.J.E., 'Brushless Permanent Magnet and Reluctance Motor Drives', Clarendon Press,						
1.	Oxford, 2002						
2	Aearnley, P.P., 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus,						
۷.	London, 1982.						
3	P.P. Aearnley, 'Stepping Motors – A Guide to Motor Theory and Practice', Peter Perengrinus,						
5.	London, 2005.						
4	R.Krishnan, 'Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and						
4.	Application', CRC Press, New York, 2001.						
REFEI	RENCE BOOKS:						
1	Kenjo, T., 'Stepping Motors and their Microprocessor Controls', Clarendon Press London,						
1.	2002.						
2.	Kenjo, T., and Nagamori, S., 'Permanent Magnet and Brushless DC Motors', Clarendon Press,						
	London, 1988.						
3.	K Dhavalini 'Special Electrical Machines' Anuradha Publications						
	K. Dhayanni, Special Electrical Machines, Andradia I doneations.						
4.	S.Albert Alexander, J.Gnanavadivel, "Special Electrical Machines", Anuradha Publications.						
-							
E REF	ERENCES :						
1.	NPTEL-Special Electrical Machines- Prof. P. Sasidhara Rao-IIT Madras.						
	1						

2. NPTEL-Special Electrical Machines- Prof. Dr. Krishna Vasudevan -IIT Madras.

						<b>545 I</b>	<b>0</b> , <b>1</b>	U ma	hhus	5				
CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	1	1	-	-	-	-	-	1	1	1
CO2	3	2	-	1	1	2	-	1	-	-	-	-	1	1
CO3	2	3	-	-	2	1	1	1	-	1	-	1	2	1
CO4	2	2	-	-	-	1	-	-	-	1	-	1	1	2
CO5	2	2	-	-	2	-	-	2	-	-	-	1	1	2
Total	11	9	0	1	6	5	1	4	0	2	0	4	7	7
Scaling	2	2	0	1	2	1	1	1	0	1	0	1	2	2

COs versus PO, PSO mapping

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **ENERGY MANAGEMENT AND AUDITING**

Cours	se Outcomes (E42)	Domain	Level
CO1	<i>Explain</i> the stages and process of energy management	Cognitive	Understanding
	Program.		
CO2	Analyze economic models of load management	Cognitive	Analyzing
	systems. Explain monitoring and control of energy	cognitive	Understanding
	management systems.		_
CO3	Compare different energy management techniques for	Cognitive	Understanding
	Electric loads and drives.		
<b>CO4</b>	Explain the different metering arrangement and their	Cognitive	Understanding
	Performance in a electrical system.	Cognitive	
<b>CO5</b>	Define the lighting scheme and Standards for energy	Cognitive	Remembering
	conservation. <i>Explain</i> the methods of improving the	esgintive	Understanding
	power quality.		C C

SU	B.CO	DE	SUB NAME	L	Т	Р	С	
	E42			3	0	0	3	
С	P	Α	ENERGY MANAGEMENT AND AUDITING	L	Т	Р	Η	
3	0	0		3	0	0	3	
UN	IT 1		INTRODUCTION				09	
Ne ma ene	Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.							
UN	IT 2		ENERGY COST AND LOAD MANAGEMENT				09	
Im Ut col ma	Important concepts in an economic analysis - Economic models-Time value of money- Utility rate structures- cost of electricity-Loss evaluation Load management: Demand control techniques-Utility monitoring and control system- HVAC and energy management.							
UN	11 3		ELECTRICAL EQUIPMENT		15, A	IND	09	
Sy syı	stems nchro	s an nous	d equipment- Electric motors-Transformers and reactors machines-Energy management in industrial drive.	-Capa	icitors	and		
UN	IT 4		METERING FOR ENERGY MANAGEMENT				09	
Re	Relationships between parameters-Units of measure-Typical cost factors- Utility meters -							
Tiı	Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current							
tra	transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering							
loc	location vs. requirements.							

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





# UNIT 5LIGHTING SYSTEMS & COGENERATION09Concept of lighting systems - The task and the working space -Light sources - Ballasts -<br/>Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of<br/>harmonics on power quality - Cost analysis techniques-Lighting and energy standards-BEE<br/>standards09

### TEXT BOOKS

### Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours

- **1.** Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, 'Guide to Energy Management', Fifth Edition, The Fairmont Press, Inc., 2006
- **2.** Eastop T.D &Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN -0-582-03184, 1990.

### **REFERENCES BOOKS**

- **1.** IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 2011.
- 2. Amit K. Tyagi, ' Handbook on Energy Audits and Management', TERI,2003

### **E REFERENCES**

**1.** E-learning course on Energy audit and management, Dr..K.Shanti swarup, Indian Institute of Technology, Chennai.

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	1	3							2	1			2	3
CO 2	1					1					2		2	2
CO 3	1			1	1			1		1			2	3
CO 4	1	2	2								3	1	2	2
CO 5		2					2					1	1	3
Total	4	7	2	1	1	1	2	1	2	2	5	2	9	13
Scaling	1	2	1	1	1	1	1	1	1	1	1	1	2	3

### COs versus PO, PSO mapping





09

09

09

09

### ELECTRICAL SAFETY

Cours	se Outcomes(E43):	Domain	Level
CO1	Describe electrical hazards and safety equipment.	Cognitive	Understanding
CO2	Analyze and apply various grounding and bonding techniques.	Cognitive	Applying
CO3	Select appropriate safety method for low, medium and high voltage equipment.	Cognitive	knowledge
CO4	Participate in a safety team.	Cognitive	knowledge
C05	Carry out proper maintenance of electrical equipment by understanding various standards.	Cognitive	knowledge

SUBCODE	SUB NAME	L	Т	Р	С
E43	ELECTRICAL SAFETY	3	0	0	3
C:P:A = 3:0:0		L	Т	Р	Η
		3	0	0	3

### UNIT I

Primary and secondary hazards- arc, blast, shocks-causes and effects-safety equipment- flash and thermal protection, head and eye protection-rubber insulating equipment, hot sticks, insulated tools, barriers and signs, safety tags, locking devices- voltage measuring instruments- proximity and contact testers-safety electrical one line diagram- electrician's safety kit.

### UNIT II

General requirements for grounding and bonding- definitions- grounding of electrical equipment bonding of electrically conducting materials and other equipment-connection of grounding and bonding equipment- system grounding- purpose of system grounding- grounding electrode system grounding conductor connection to electrodes-use of grounded circuit conductor for grounding equipment- grounding of low voltage and high voltage systems.

### UNIT III

The six step safety methods- pre job briefings - hot-work decision tree-safe switching of power system- lockout-tag out- flash hazard calculation and approach distances- calculating the required level of arc protection-safety equipment, procedure for low, medium and high voltage systems- the one minute safety audit

### UNIT IV

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





09

### UNIT V

Safety related case for electrical maintenance- reliability centered maintenance (RCM) - eight step maintenance programme- frequency of maintenance- maintenance requirement for specific equipment and location- regulatory bodies- national electrical safety code- standard for electrical safety in work place- occupational safety and health administration standards, Indian Electricity Acts related to Electrical Safety.

LECTURE	TUTORIAL	TOTAL
45	0	45

### **TEXT BOOKS**

1. John Cadick, Mary Capelli-Schellpfeffer, Dennis Neitzel, Al Winfield , 'Electrical Safety Handbook', McGraw-Hill Education, 4thEdition, 2012.

### **REFERENCE BOOKS**

1. Maxwell Adams.J, 'Electrical Safety- a guide to the causes and prevention of electric hazards', The Institution of Electric Engineers, IET 1994.

2. Ray A. Jones, Jane G. Jones, 'Electrical Safety in the Workplace', Jones & Bartlett Learning, 2000.

### COs versus PO, PSO mapping

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	1	3								1			2	3
CO 2	1					1					2		2	2
CO 3	1			1				1		1			2	3
CO 4	1	1	2								2	1	2	3
CO 5		1					2					1	1	3
Total	4	5	2	1		1	2	1		2	4	2	9	14
Scaling	1	1	1	1		1	1	1		1	1	1	2	3





think • innovate • transform

### SUSTAINABLE ENERGY UTILIZATION

Cours	se Outcomes(E44):	Domain	Level
CO1	<i>Explain</i> the physics that govern an indoor climate, and assess the changes needed to improve the indoor climate in existing buildings.	Cognitive	Understanding
CO2	<i>Apply</i> heating/cooling load calculations for a single family residence.	Cognitive	Applying
CO3	<i>Describe</i> different types of heating systems, and assess their applicability.	Cognitive	Understanding
CO4	<i>Describe</i> the function of passive systems and discuss about alternative cooling processes.	Cognitive	Understanding
CO5	<i>Distinguish</i> the need of energy in building and various conservation techniques to use energy in sustainable manner.	Cognitive	Analyzing

SUB CODE	SUB NAME	L	Т	Р	С
E44		3	0	0	3
C:P:A	SUSTAINABLE ENERGY UTILIZATION	L	Т	Р	Η
3:0:0		3	0	0	3

UNIT IHEAT FLOW CALCULATIONS IN BUILDINGS9Unsteady heat flows through walls, roof, windows etc.Direct heat gains through windows.Convective gains/losses, air exchange rates.Gains from people, appliances etc. Air conditioningload calculations.Image: Convective gains/losses are convected by the second second

# UNIT IINEED OF ENERGY IN BUILDINGS9Role of building design and building services to evaluate the energy performance in buildings.Study of Climate and its influence in building design for energy requirement - EnvironmentalStudy of Climate and its influence in building design for energy requirement - EnvironmentalHeat gainand heal loss phenomenon of buildings - Role of building enclosures, openings and materialsin thermal environment - Energy efficient light design of buildings .UNIT IIIPASSIVE COOLING / HEATING CONCEPTS9

Building form and orientation, internal and external shading devices, ventilation, passive concepts for composite climates, evaporative and nocturnal cooling, earth–air tunnel, sky-thermal system, and solar chimney-based hybrid system.Introduction and use of different building simulation software such as TRNSYS, ECOTECT etc. Case studies of non-air conditioned buildings- Case studies of air conditioned buildings

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

UNIT	IVENERGY EFFICIENT BUILDINGS9							
Introd	uction - Definition and concepts, Energy and Water as a resource - Criticality of resources							
and no	eeds of modern living - Envelop heat loss and heat gain and its evaluation, Thermal							
Comp	ort improvement methods, Optimum performance, other building comports, IAQ							
requir	ements.							
UNIT	VELECTRICAL ENERY CONVERSION9							
Oppor	tunities and Techniques for energy conservation in Buildings - Adoption to							
sustaiı	sustainable resources, process and Technologies. Green Buildings, Intelligent							
Buildi	ngs, Rating of Buildings, Efficient Use of Buildings, Solar Passive Architecture, Eco-							
housir	ng concepts and National and International norms.							
	LECTURE TUTORIAL TOTAL							
	45 00 45							
TEXI	BOOKS							
1.	Koenigsberger, et.al Manual of Tropical housing and Building Longman Group Ltd							
	London (now published by Orient Longman Ltd, Madras, India), 1974.							
2.	Oliver and Daniel, D Chiras Natural Resource Conservation Management for a							
	sustainable future, Prentice Hall International Ltd, London, 2009.							
3.	USAID International resource book, Energy Conservation Building design Tip Sheet -							
	Building Lighting Design.							
4.	MS Sodha, NK Bansal, PK Bansal, A Kumar and MAS Malik, Solar Passive Building,							
••	Science and Design Pergamon Press 1986							
	Serence and Design, Perganion Press, 1900							
5.	JR Williams, Passive Solar Heating, Ann Arbar Science, 1983.							
REFF	CRENCES							
1.	RWJones, JD Balcomb, CE Kosiewiez, GS Lazarus, RD McFarland and WOWray,							
	Passive Solar Design Handbook, Vol 3, Report of US Department of Energy (DOE/CS-							
	0127/3), 1982.							
2	I Krieder and A Dabi Heating and Cooling of Duildings, Design for Efficiency							
۷.	J KIEUCI and A Kaol, realing and Cooling of Bundings. Design for Efficiency, McGrow Hill 1004							
3.	, RD Brown, TJ Gillespie, Microclimatic Landscape Design, John Wiley and Sons, New							
	York, 1990.							
4.	TA Markus, EN Morris, Building, Climate and Energy, Spottwoode Ballantype Ltd,							
L	London, 1980.							

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

### **E REFERENCES**

- 1. http://ocw.mit.edu/courses/nuclear-engineering/22-081j-introduction-to-sustainableenergy-fall-2010/lectures-and-readings/ Prof. Michael Golay, MIT.
- 2. http://textofvideo.nptel.iitm.ac.in/112105051/lec1.pdf Prof. V. V. Satyamurty, IIT, Kharagpur.

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	2	2										1	
CO 2	2	2	3	2									1	2
CO 3		1		2	2	1							1	2
CO 4	1	2					2	2					1	2
CO 5		2						2			1	1	1	3
Total	4	9	5	4	2	1	2	4	0	0	1	1	5	9
Scaled to 0,1,2,3 scale	1	2	1	1	1	1	1	1	0	0	1	1	1	2

### COs versus PO PSO manning

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





### think • innovate • transform

### ELECTRIC VEHICLES AND POWER MANAGEMENT

Cours	e Outcomes (E51)	Domain	Level
C01	<b>Explain</b> power system load characteristics and	Cognitive	Understanding
	generation reserve requirements.		
CO2	Demonstrate and Apply the mathematical knowledge	Cognitive	Understanding
	to model and analysis of power system for frequency	cogintive	Applying
	control.		11 9 6
CO3	Identify fundamental aspects of reactive power and its	Cognitive	Applying
	effect on system voltage and Select the suitable voltage	cogintive	
	control method for the system operating condition.		
<b>CO4</b>	Formulate economic dispatch and unit commitment	Cognitive	Creating
	problem and its solution.	Cognitive	
CO5	Apply computer control methods for power system	Cognitive	Applying
	operation and control.	-	

SU	B. CO	DE	SUB NAME	L	Т	Р	С					
	E51			3	0	0	3					
С	Р	Α	ELECTRIC VEHICLES AND POWER MANAGEMENT	MANAGEMENT L T 3 2								
3	0	0		3	2	0	5					
ι	JNIT	Ι	INTRODUCTION			09	)+06					
An o	vervie	ew of	power system operation and control - system load variation	n - loa	d chara	acteria	stics -					
load	load curves and load-duration curve - load factor - diversity factor - Reserve requirements: Installed											
reser	reserves, spinning reserves, cold reserves, hot reserves - Importance of load forecasting - quadratic											
and exponential curve fitting techniques for forecasting – plant level and system level controls.												
UNIT II REAL POWER - FREQUENCY CONTROL 09												
Basic	es of	spee	d governing mechanism and modeling - speed-load	charac	cteristi	cs –	load					
shari	ngbetv	ween t	wo synchronous machines in parallel - concept of control	area -	LFC o	contro	ol of a					
singl	e-area	syste	em: static and dynamic analysis of uncontrolled and c	ontroll	ed ca	ses -	two-					
areas	ystem	: mod	eling - static analysis of uncontrolled case - tie line with	frequer	ncy bia	as cor	ntrol -					
state	variat	ole mo	del									
UNIT III         REACTIVE POWER-VOLTAGE CONTROL         09												
Gene	Generation and absorption of reactive power - basics of reactive power control - excitation systems											
- mo	deling	g - stat	ic and dynamic analysis - stability compensation - method	s of vo	ltagec	ontrol	l: tap-					
chan	ging t	ransfo	rmer, injection reactive power - SVC (TCR + TSC) and S	бТАТС	COM -	seco	ndary					
volta	voltage control.											

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





### think • innovate • transform

### UNIT IV UNIT COMMITMENT AND ECONOMIC DISPATCH

09+06

Formulation of economic dispatch problem – I/O cost characterization – incremental cost curve - coordination equations without and with loss (No derivation of loss coefficients) - solution by direct method and  $\lambda$ -iteration method - statement of unit commitment problem – priority-listmethod - forward dynamic programming.

### UNIT V COMPUTER CONTROL OF POWER SYSTEMS

09+06

Need for computer control of power systems - concept of energy control centre – functions - system monitoring - data acquisition and control - system hardware configuration – SCADA and EMSfunctions - network topology - state estimation – WLSE - Contingency Analysis - state transitiondiagram showing various state transitions and control strategies.

### Lecture = 45; Tutorial = 30; Lab = 0; Total =75 Hours

### TEXT BOOKS

- 1. Olle.I.Elgerd, 'Electric Energy Systems theory An introduction', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.
- 2. Allen. J. Wood and Bruce F. Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.
- 3. Kundur P., 'Power System Stability and Control, Tata McGraw Hill, New Delhi, 5th reprint, 2008.

### **REFERENCE BOOKS:**

- 1. Nagrath I.J. and Kothari D.P., 'Modern Power System Analysis', Tata McGraw-Hill, Fourth Edition, 2011.
- 2. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21streprint, 2010.
- 3. Abhijit Chakrabarti, Sunita Halder, 'Power System Analysis Operation and Control', PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.

### **E-REFERENCES:**

1. NPTEL : http://nptel.ac.in/courses/108104052/

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

### COs versus PO, PSO mapping

CO/ PO/PSO	PO1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
C01	3	3	1	1	2	-	-	-	-	1	-	-	2	1
CO2	2	3	2	2	2	-	-	-	1	1	1	-	2	-
CO3	2	2	2	2	3	-	-	-	-	-	1	1	2	-
CO4	2	2	3	3	2	-	-	-	-	1	-	-	1	-
CO5	1	2	2	2	2	-	-	-	-	-	-	1	1	1
Total	10	12	10	10	11	0	0	0	1	3	2	2	8	2
Scaling	2	3	2	1	3	0	0	0	1	1	1	1	2	1

### 0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





09

09

09

09

# ADVANCED CONTROL SYSTEM ENGINEERING

Cours	se Outcomes (E52)	Domain	Level
CO1	<b>Discuss</b> to represent State space model and <b>Describes</b> Controllability & Observability of the systems.	Cognitive	Remembering
CO2	<b>Design</b> the Non linear systems approach to system stability using Liapunov's and Popov's stability criteria	Cognitive	Creating
CO3	<b>Distinguish</b> the time-optimal control problem and infinite time regulator problem.	Cognitive	Analyzing
CO4	<b>Choose</b> appropriate dynamics for data extrapolation by using Z- Transforms	Cognitive	Perception
CO5	<b>Describe</b> the applications of non linear systems and their real-time implementation challenges	Cognitive	Remembering

SU	B.CC	DDE	SUB NAME	L	Т	P	C		
	E52			3	0	0	3		
С	Р	Α	ADVANCED CONTROL SYSTEM ENGINEERING	L	Т	Р	Η		
3	0	0		3	0	0	3		
UNIT I			STATE VARIABLE ANALYSIS AND DESIGN						

State models – solution of state equations- controllability and observability – pole assignment by state feedback – full and reduced order observers. Mathematical model of Electrical and mechanical system.

### UNIT II NONLINEAR SYSTEMS

Common types of non-linear phenomena – construction of phase trajectories – system analysis by phase plane method – describing function method – describing function of nonlinear elements – stability analysis by describing function method – Liapunov's and Popov's stability criteria.

### UNIT III OPTIMAL CONTROL

Problem formulation – necessary conditions of optimality – state regulator problem – Matrix Riccati equation – infinite time regulator problem – output regulator and tracking problems – time-optimal control problem.

### UNIT IV DIGITAL CONTROL SYSTEM

haracteristics of sampling - Data extrapolation – Review of Z transform theory - characteristic response of a sample and ZOH combination – stability analysis by mathematical tests and root locus diagrams – design using Root loci. Frequency response of DT system.

### UNIT V ALGORITHM AND STRATEGY FOR COMPUTER CONTROL

Scaling data - linearization of input data - arithmetical operations and functions - integration - control law algorithm - PID control law - self-tuning strategy.

Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **TEXT BOOKS**

- 1. M. Goal, 'Digital Control and State Variable Methods', Tata McGraw-Hill, 1997.
- 2. Chessman, Wilson and Leila, 'Advanced Control System Technology', Viva-low priced edition, 1998.
- 3. Benjamin C. Kuo, "Digital Control Systems". Oxford University Press, 1992.
- 4. S. Majhi, Advanced Control Theory-Relay Feedback Approach, Cengage Asia/India Pvt.Ltd, 2009.

### **REFERENCE BOOKS**

- 1. R.C.Dorf and R.H.Bishop, 'Modern Control Systems', Addison-Wesley, 1995. (MATLAB Reference)
- 2. Nagrath, I.J. and Gopal, M., 'Control System Engineering', Wiley Eastern, Reprint 1995
- 3. K. Ogata, "Modern Control Engineering" 2nd Edition, Prentice Hall India, New Delhi, 1992.
- 4. A. Johnson and H. Moradi, New Identifications and Design Methods, Springer -Verlag, 2005.

### **E-REFERENCES**

1. NTPEL, Advanced Control Systems by Prof. Somanath Majhi, Department of Electronics & Electrical Engineering, IIT Guwahati.

### Mapping of Course Outcomes (COs) with Programme Outcomes (POs)

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	1	-	-	-	-	-	-	1	-	-	-	-	
CO2	2	1	2	2	-	-	-	-	-	1	-	2	-	-
CO3	1	3	-	3	1	-	2	3	-	1	1	-	2	1
<b>CO4</b>	2	2	-	1	1	1	-	-	2	2	-	1	1	-
CO5	2	1	1	1	-	-	-	-	-	-	2	-	1	1
Total	9	8	3	7	2	1	2	3	3	4	3	3	4	2
Scaling	2	2	1	2	1	1	1	1	1	1	1	1	1	1

### 0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **SMART GRIDS**

Cours	e Outcomes (E53)	Domain	Level
CO1	<i>Explain</i> the paradigm shift between traditional power transmission and distribution and smart power grids verbally and in writing.	Cognitive	understanding
CO2	<i>List</i> and <i>illustrate</i> drivers, challenges and benefits to the integration of renewable and distributed generation into large power grids.	Cognitive	Remembering Understanding
CO3	Describe and <i>assess</i> smart grid technologies that enhance transmission and distribution systems.	Cognitive	Evaluating
CO4	<i>Appraise</i> current implementations of smart grid technologies and/or policies using regional data sources.	Cognitive	Evaluating
CO5	<i>Take part in</i> project teams using appropriate communication skills in order to present information about smart grid industry practices and community engagement.	Cognitive	Analyzing

SUB.CODE	SUB NAME	L	Т	Р	С					
E53		3	0	0	3					
C P A	SMART GRIDS	L	Т	Р	Н					
3 0 0		3	0	0	3					
UNIT I	INTRODUCTION TO SMART GRID				09					
Evolution of	Electric Grid, Concept, Definitions and Need for Smart Grid, Sm	art g	rid f	uncti	ions,					
opportunities,	challenges and benefits, Difference between conventional & Sn	nart (	Grid,	Con	cept					
of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid, Diverse										
perspectives from experts and global Smart Grid initiatives										
UNIT IISMART GRID TECHNOLOGIES09										
Smart energy resources, Smart substations, Substation Automation, Feeder Automation , Transmission										
systems: EM	S, FACTS and HVDC, Wide area monitoring, Protection and co	ontrol	, Dis	stribu	ution					
systems: DM	IS, Volt/VAr control, Fault Detection, Isolation and service re	stora	tion,	Ou	tage					
management,	High-Efficiency Distribution Transformers, Phase Shifting Transforme	ers, P	lug in	n Hy	brid					
Electric Vehic	eles (PHEV)		-	•						
UNIT III	SMART METERS AND ADVANCED METERING INFRASTRU	CTU	RE		09					
Introduction	to Smart Meters, Advanced Metering infrastructure (AMI) drivers	and	bene	efits,	AMI					
protocols, sta	ndards and initiatives, AMI needs in the smart grid, Phasor Measure	ment	Un	it(PN	ЛU),					
Intelligent El	ectronic Devices(IED) & their application for monitoring & protection	n.								
UNIT IVPOWER QUALITY MANAGEMENT IN SMART GRID09										
Power Qualit	y & EMC in Smart Grid, Power Quality issues of Grid connected	Rene	wable	e En	ergy					
Sources, Pow	er Quality Conditioners for Smart Grid, Web based Power Quality	moni	toring	g, Po	ower					
Quality Audit	Quality Audit.									

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





### think • innovate • transform

### UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 09

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

### **TEXT BOOKS**

### Lecture = 45; Tutorial = 0; Total = 45 Hours

- 1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, "Smart Grid: Technology and Applications", Wiley
- 2. Stuart Borlase "Smart Grid : Infrastructure, Technology and Solutions", CRC Press 2012.
- 3. Yang Xiao, Communication and Networking in Smart Grids, CRC press, 2012

### **REFERENCE BOOKS**

- 1. NouredineHadjsaïd and Jean-Claude SabonnadièreSmart, SmartGrids, ISTE Ltd. 2012.
- 2. Vehbi C. Güngör, DilanSahin, TaskinKocak, SalihErgüt, ConcettinaBuccella, Carlo Cecati, and Gerhard P. Hancke, Smart Grid Technologies: Communication Technologies and Standards IEEE Transactions On Industrial Informatics, Vol. 7, No. 4, November 2011.
- 3. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang "Smart Grid The New and Improved Power Grid: A Survey", IEEE Transaction on Smart Grids.

### **E REFERENCES**

- 1. https://iit.edu/news/iittoday/?tag=smart-grid
- 2. https://www.smartgrid.gov/the_smart_grid/





think • innovate • transform

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu

### COs versus PO, PSO mapping

CO/ PO/PSO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	1	1	2	-	2	-	3	-	1	1	-	-	1	1
CO2	-	-	-	1	-	-	-	-	2	1	2	-	1	1
CO3	1	-	-	-	1	-	-	-	-	-	-	-	1	2
CO4	-	-	2	2	-	-	-	-	2	1	2	-	1	1
CO5	-	-	-	-	-	-	3	-	3	2	1	-	1	2
Total	2	1	4	3	3	0	6	0	8	5	5	0	5	7
Scaling	1	1	1	1	1	0	2	0	2	1	1	0	1	2

### 0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### FUNDAMENTALS OF NANOSCIENCE

Cours	e Outcomes (E54)	Domain	Level	
CO1	<i>Outlines</i> and <i>classifies</i> the science of nano materials along with its structures.	Cognitive	Understanding	
CO2	<i>Explains</i> the Properties and structures of various nano materials.	Cognitive	Understanding	
CO3	<i>Illustrates</i> the synthesization of different nano materials in different methods.	Cognitive	Understanding	
CO4	<i>Explains</i> about various nano materials based upon its physical and chemical properties	Cognitive	Understanding	
CO5	<i>Apply</i> the knowledge of nano materials and science in various fields.	Cognitive	Applying	

SU	B.CO	DE	SUB NAME	L	Т	Р	С			
	E54			3	0	0	3			
С	Р	Α	FUNDAMENTALS OF NANOSCIENCE	L	Т	Р	Η			
3	0	0		3	0	0	3			
U	<b>NIT</b>	Ι	INTRODUCTION				09			
Scientific Revolution of nano technology-Feyman's theory-Length of scale-Classification of nano structures and nano structured materials-Limitation of nanomaterials.										
UNIT IIPROPERTIES OF NANOMATERIALS09										
Nanocomposites and Properties- Metal-Metal nanocomposites, Polymer-Metal nanocomposites Ceramic nanocomposites, Dielectric and CMR based nanocomposites. Mechanical Properties Modulus and the Load-Carrying Capability of Nanofillers, Failure Stress and Strain Toughness Glass Transition and Relaxation Behavior, Abrasion and Wear Resistance, Permeability Dimensional Stability Contents, Thermal Stability and Flammability, Electrical and Optica Properties, Resistivity, Permittivity and Breakdown Strength, Refractive Index.										
Syn Mill prec synt Intro Opt Scar	Synthesis of Nanomaterials by Physical Methods -Inert gas condensation, Arc discharge, Ball Milling, Molecular beam epitaxy.Chemical methods for Synthesis of Nanomaterials : Chemical precipitation and co-precipitation, Sol-gel synthesis, Microwave heating synthesis, Sonochemical synthesis; Electrochemical synthesis; Photochemical synthesis. Introduction to microscopy- Scanning Electron Microscopy, Transmission Electron Microscopy, Optical Absorption and Emission Spectroscopy, Thermo gravimetric Analysis, Differential Scanning Calorimetry.									

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu



Lecture = 45; Tutorial = 00; Total = 45 Hours



think • innovate • transform

### UNIT IV NANOMATERIALS

Fullerenes, carbon nanotube, graphene. Monomers & polymers, block copolymers, Composite materials; ceramics, alloys, silicates. Quantum hetero-structures: quantum well, quantum wire, quantum dot, nanofossils, smart dust, porous & nonporous inorganic materials, hydrogel & aerosols. Bionanomaterials: biomimetic systems, bioceramics, dendrimers, micelles, liposomes, block copolymers

### UNIT V APPLICATIONS

09

09

NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, Nanocrystal.

Nanobiotechlogy: nanoprobes in medical diagnostics and biotechnology, Nano medicines, Targetted drug delivery, Bioimaging - Micro Electro Mechanical Systems (MEMS).

Nano Electro Mechanical Systems (NEMS)- Nanosensors, nano crystalline silver for bacterial inhibition.

Nanoparticles for sunbarrier products - In Photostat, printing, solar cell, battery.

ILMI DOOMD
------------

- 1. A.S. Edelstein and R.C. Cammearata, eds., 1996-Nanomaterials: Synthesis, Properties and Applications- Institute of Physics Publishing, Bristol and Philadelphia,
- 2. P.M. Ajayan, L.S. Schadler, P.V.Braun, 2003 -Nanocomposite Science and Technology-WILEY-VCH Verlag GmbH Co. KGaA, Weinheim
- 3. Nick Kanello Poulos,2011-Nanoporous materials: Advance techniques for characterization, Modeling and Processing Edited by CRC press.
- 4. Claudia Altavilla and Enrico Ciliberto, 2011, Inorganic nanoparticles : Synthesis, Application and Perspectives. Edited by CRC Press.

### **REFERENCE BOOKS**

- 1. Elsevier Gary Wiederrcht, 2010-Handbook of Nanofabrication.
- 2. Ed. CR Rowe, CRC- Handbook of Thermo electrics.
- 3. G Timp (Editor), 1999-Nanotechnology, AIP press/Springer.
- 4. Akhlesh Lakhtakia (Editor)-The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulation. Prentice-Hall of India (P) Ltd, New Delhi

### **E-REFERENCES**

 http://nptel.ac.in/courses/118102003/ NPTEL, Nano structured Materials-Synthesis, Properties, Self Assembly and Applications Prof. Ashok k Ganguli Department of Chemistry Indian Institute of Technology, Delhi.

2. http://nptel.ac.in/syllabus/118104008/NPTEL, Nanostructures and Nanomaterials: Characterization and Properties Dr.Kantesh Balani, Dr.Anaandh Subramaniyam IIT Kanpur

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





COs versus PO, PSO mapping

	<b>PO1</b>	PO2	PO3	PO4	PO5	PO6	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	3	1							1		1	1	1	3
CO 2	3	0	3			1						1	2	3
CO 3	3	3	2		3	1						1	2	3
CO 4	3	2	1		2	1						1	2	3
CO 5	3	2	3	0	3	1	2	1	1	0	2	1	2	3
Total	15	8	9	0	8	4	2	1	2	0	3	5	10	15
Scaled to 0,1,2,3 scale	3	2	2		2	1	1	1	1	0	1	1	2	3

### 0 -No relation1 - Low relation2 - Medium relation3 - High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





### HIGH VOLTAGE ENGINEERING

Cours	e Outcomes (E61)	Domain	Level
CO1	<i>Explain</i> the different causes of overvoltage and <i>Illustrate</i> overvoltage control due to switching. <i>classify</i> the various methods for protection of lightning	Cognitive	Understanding
CO2	<i>Explain</i> and <i>Classify</i> breakdown mechanisms in solid, liquid and gases dielectrics <i>and list out the application of insulating materials</i>	Cognitive	Understanding
CO3	Able to define and <i>Classify</i> the different methods to generate the various types of high voltages and high currents.	Cognitive	Understanding
CO4	<i>Classify</i> and <i>analyze</i> the different techniques used to measure the various types of high voltages and high currents.	Cognitive	Understanding Analyzing
CO5	<b>Recall and Illustrate</b> the different testing methods to test the various high voltage components of power System and <i>define</i> the International, Indian standards and insulation co-ordination.	Cognitive	Remembering Understanding

	SUB	<b>7</b> .	SUB NAME	L	Τ	Р	С				
	E61	_		3	0	0	3				
С	P	Α	HIGH VOLTAGE ENGINEERING	L	Т	Р	Η				
3	0	0		3	0	0	3				
UN	IT I		OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS			09					
Natural Causes of overvoltage-Lightning phenomena and its effects on power system - Over voltage											
to switching surge-power frequency overvoltage-control of overvoltage due to switching - protection											
tran	smiss	ion li	nes against overvoltage – Becoleys lattice diagram.								
UN	IT II		ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUI	DS		0	9				
Gas	eous	break	down in uniform and non-uniform fields - corona discharges - Va	cuum	brea	kdov	vn -				
con	ductio	n an	d breakdown in pure and commercial liquids - Breakdown mecha	nisms	in s	olid	and				
com	posit	e diel	ectrics-Applications of insulating materials.								
UN	IT III	[	GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS	5		0	9				
Gen	eratic	on of l	High DC, AC, impulse voltages and currents. Tripping and control of i	mpuls	se gen	erato	ors.				
UNIT IV         MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS         0											
Mea	Measurement of High direct current voltages - measurement of voltages: alternating and impulse										
voltages- Measurement of High currents: direct, alternating and impulse currents.											
Dig	ital te	chniq	ues in high voltage measurement.								

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

Lecture = 45; Tutorial = 00; Total = 45 Hours

09

### UNIT V HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS

High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards-Insulation co-ordination.

### **TEXT BOOKS**

- 1. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon press, Oxford,2010.
- M.S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill,4thEdition, 2004.
- E. Kuffel and W.S. Zaengl, 'High Voltage Engineering Fundamentals', Pergamon Press, Oxford, London, 2012
- 4. August F.Metraux. "Some problems and actual limits of test techniques at extra high voltages", Haefely publications EIS 14.

### **REFERENCE BOOKS**

- 1. C.L.Wadhwa, 'High Voltage Engineering', New Age International (P) Ltd, 2nd Edition2006.
- 2. Ravindra Arora, Wolfgang Mosch, "High Voltage Insulation Engineering", New Age International (P) Limited, 2011.
- 3. Chinnappa ,K.M., Need for next higher voltage level in India", National seminar on high voltage AC and Dc Transmission,New delhi.

### **E REFERENCES**

- 1. Web Content http://www.library.dce.edu/e-resources/books/ee/
- 2. NPTEL-High Voltage Engineering, C.L. Wadhwa -IIT Madras.

COs versus PO, PSO mapping														
CO/ PO/PSO	РО 1	PO 2	PO 3	PO 4	PO 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	1	-	1	-	-	-	2	2	2
CO2	3	2	-	-	-	-	-	-	-	-	-	1	1	2
CO3	2	2	-	-	1	1	-	1	-	-	-	1	1	1
CO4	2	2	-	-	-	-	1	-	-	-	-	1	2	2
CO5	2	2	-	2	-	1	-	-	-	-	-	2	2	2
Total	12	10	2	2	1	3	1	2	0	0	0	7	8	9
Scaling	3	2	1	1	1	1	1	2	0	0	0	2	2	2

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### DISASTER MANAGEMENT

Cours	e Outcomes (E62)	Domain	Level
CO1	To define different public health aspects of disaster	Cognitive	Remembering
	events at local and global levels, even when limited	cognitive	
	information is available.		
CO2	To <i>relate</i> the environmental, social, cultural, economic,	Cognitive	Understanding
	legal and organisational aspects influencing	cogintive	
	vulnerabilities and capacities to face disasters.		
CO3	To analyze the information on risks, relief needs and	Cognitive	Analyzing
	lessons learned from earlier disasters in order to	Cognitive	
	formulate strategies for mitigation in future scenarios.		
<b>CO4</b>	To appraise the different factors affecting		Evaluating
	Vulnerabilities, disaster events and Climate Change	Cognitive	
	Adaptation		
CO5	To analyze the components of Disaster relief and		Analyzing
	evaluate research work on the field of Water, Food,	Cognitive	Evaluating
	Sanitation, Shelter, Health and Waste Management		8
	Institutional arrangements.		

SU	J <b>B.C</b>	ODE	SUB NAME	L	Т	Р	C		
	<b>E6</b>	2		3	0	0	3		
С	Р	Α	DISASTER MANAGEMENT	L	Т	Р	Н		
3	0	0		3	0	0	3		
	UNI	ГΙ	INTRODUCTION TO DISASTERS				06		
Co	oncep	ts, and	definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)						
1	UNI	ΓII	DISASTERS				12		
Cl	Classification Causes, Impacts (including social, economic, political, environmental, hea								
ps	ychos	social,	etc.) Differential impacts- in terms of caste, class, gender, age, le	ocation	, disab	ility (	Global		
tre	nds ii	n disas	ter urban disasters, pandemics, complex emergencies, Climate cha	ange.					
τ	JNIT	' III	APPROACHES TO DISASTER RISK REDUCTION				09		
Di	saste	r cycle	e - its analysis, Phases, Culture of safety, prevention, mitig	ation a	and pr	epare	dness		
co	mmu	nity ł	based DRR, Structural- nonstructural nesures, roles and	l resp	onsibil	ities	of -		
co	mmu	nity, l	Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULB	s), sta	tes, C	lentre	, and		
otl	ner st	ake-ho	olders.						
т	INIT	י <b>ד</b> ע	INTER-RELATIONSHIP BETWEEN DISASTER	S	A	ND	10		
ľ		1 V	DEVELOPMENT				10		
Fa	ctors	affect	ng Vulnerabilities, differential impacts, impact of Developmer	it proje	cts suc	ch as	dams,		
embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous									
kn	owle	dge, ar	propriate technology and local resources.						

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

06

### UNIT V DISASTER RISK MANAGEMENT IN INDIA

Hazard and Vulnerability profile of India Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management Institutional arrangements (Mitigation, Response and Preparedness, DM Act and Policy, Other related policies, plans, programmes and legislation)

### Lecture = 45;Tutorial = 00;Total = 45 Hours

### TEXT BOOKS

- 1. Kapur, Anu & others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur.
- 2. Environment Engineering and Disaster Management, Sanjay K. Sharma, 2011
- 3. Disaster Management, Dr. Mrinalini Pandey, WILEY INDIA PVT. LTD, 2010.

### **REFERENCE BOOKS**

- 1. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000.
- 2. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.
- 3. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.
- 4. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000.
- 5. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.

СО/РО	PO1	PO 2	PO3	РО 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO1 0	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	1	-	-	-	1	1
CO2	3	2	-	2	1	-	-	-	-	-	-	-	1	1
CO3	3	-	1	-	1	-	-	-	1	-	-	-		1
CO4	3	1	2	2	1	-	-	-	1	-	-	-		1
CO5	3	-	-	-	1	-	-	-	-	-	-	-	1	1
Total	15	5	5	6	5				3				3	5
Scaling	3	1	1	1	1				1				1	1

### **COs versus POs mapping**

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **ELECTRICAL POWER QUALITY**

C	ours	e Outco	nes (E63) Doma	in	L	evel				
C	01	<i>Infer</i> the events a	e electrical power quality terms, power quality Cognit and causes for reduction in power quality.	ive	Unders	standi	ng			
C	02	Analyse sag and	the voltage sag performance, mitigation of Cognit effects on drives	ive	Analyz	zing				
C	03	<i>Find</i> the industric controll	he harmonics sources from commercial and cognitate al load. <i>Interpret</i> the Effect of harmonics and ing harmonic distortion.	ive	Remer Unders	nberii standi	ng ng			
C	04	<i>Constru</i> factor compen	<i>tet</i> a Filter circuit for harmonics and power improvement. <i>Compare</i> the VAR Cognite sators-SVC and STATCOM	ive	Applyi Unders	ing standi	ng			
C	05	<i>Inferen</i> monitor various Quality	<i>ce a</i> mathematical simulation tools for ing and diagnostic techniques for power quality power quality problems and measurement equipment.	ive	Analyz					
SI	J <b>B.C</b>	ODE	SUB NAME	L	Т	Р	С			
	<b>E6</b>	3		3	0	0	3			
С	P	Α	ELECTRICAL POWER QUALITY	L	Т	Р	H			
3	0	0		3	0	0	3			
UN			RODUCTION		•		09			
Qua in P	D lity p ower	efinition henome Quality	of Electric Power Quality- Description of poor powe na – Basic terminologies – various events in Power Qualit — Power Quality Standards and power quality strategy.	r qual y – Ca	ity evenuses fo	nts. I r redu	ower			
UN	IT II	VOI	TAGE SAG				09			
indu com	So action aputer	motor s s and co	f sags – estimating voltage sag performance, sag severit starting - mitigation of voltage sags - effect on adjustable nsumer electronics	ies – v e AC I	voltage Drives,	sag d DC d	lue to rives,			
UN	NIT III HARMONICS 09									
syst Har	Harmonic sources from commercial and industrial loads, locating harmonic sources. Power system response characteristics - Harmonics Vs transients. Effect of harmonics - evaluation of Harmonic distortion - devices for controlling harmonic distortion									
UN	IT IV	/ FIL	TERING AND POWER FACTOR IMPROVEMENT				09			
Pow Shu stati	ONTER         FILTERING AND POWER FACTOR IMPROVEMENT         09           Power factor improvement- Passive Compensation. Passive Filtering Active Harmonic Filtering- Shunt Injection Filter for single phase, three-phase three-wire and three-phase four-wire systems static VAR compensators-SVC and STATCOM         09									

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

09

### UNIT V POWER QUALITY MONITORING

Monitoring considerations - monitoring and diagnostic techniques for various power quality problems - modeling of power quality (harmonics and voltage sag) problems by mathematical simulation tools - power line disturbance analyzer – Quality measurement equipment - harmonic / flicker meters - disturbance analyzer. Applications of expert systems for power quality monitoring

### Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours

### **TEXT BOOKS**

- 1. Roger. C. Dugan, Mark. F. McGranagham, Surya Santoso, H.WayneBeaty, "Electrical Power Systems Quality" McGraw Hill,2003
- 2. C. Sankaran, "Power Quality" CRC Press, 2002.
- 3. Alexander Kusko "Power Quality in Electrical Systems" The McGraw-Hill Companies, Inc, 2007.
- 4. Ewald F. Fuchs and Mohammad A.S. Masoum" Power Quality in Power Systems and Electrical Machines", 2011

### **REFERENCE BOOKS**

- 1. Silvester and Ferrari, "Finite for Electrical Engineers", Cambridge University Press, 1983
- 2. S.R.H.Hoole, Computer Aided, Analysis and Design of Electromagnetic Devices, Elsevier, New York, Amsterdam, London, 1989
- 3. D.A.Lowther and P.P Silvester, "Computer Aided Design in Magnetics", Springer Verlag, New York, 1956

### **E-REFERENCES**

1. http://www.copper.org/applications/electrical/pq/issues.html

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

**COs versus POs mapping** 

CO/P O	<b>PO</b> 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PSO 1	PSO 2
CO1	3	1	3	1	1	_	1	_	1	1	-	1	3	2
CO2	3	3	1	2	1	-	1	-	-	1	-	1	1	-
CO3	3	2	1	1	1	-	1	-	1	-	-	1	2	1
CO4	3	2	1	2	1	-	1	-	1	-	-	1	1	1
CO5	2	1	1	-	1	-	1	-	-	-	-	1	2	1
Total	14	9	7	6	5	-	5		3	2		5	9	5
Scalin g	3	2	2	2	1		1		1	1		1	2	1

0 –No relation 1 – Low relation 2 – Medium relation 3 – High Relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### **OE1 INDUSTRIAL AUTOMATION**

Course	Outcomes (OE1)	Domain	Level
CO1	Able to <i>define</i> and <b>Explain</b> the fundamentals of Pneumatics,	Cognitive	Remembering
	hydraulics and electrical drives. <i>List</i> out the advantages, disadvantages and its application		Understanding
CO2	Apply the knowledge of electrical ladder diagrams for hydraulic and pneumatic system and able to <i>define</i> pressure, proximity switches and intelligent Relays.	Cognitive	Applying Remembering
CO3	<b>Explain</b> and <b>Categorize</b> different types of Sensors and their application. <i>List</i> out timer, counter and their application.	Cognitive	Understanding Analyzing Remembering
CO4	<b>Illustrat</b> e the knowledge in the PLC logic, Architecture and <b>design</b> the industrial automated system for specific applications and <b>Apply</b> the knowledge of PLC programming to interface pneumatics.	Cognitive	Understanding Creating Applying
CO5	Outline the overview of robotics and their application. Apply the knowledge of robotics programming	Cognitive	Understanding Applying

SUI	B.CO	DE	SUB NAME	L	Т	Р	С				
	OE1			3	0	0	3				
С	Р	Α	Industrial Automation	L	Т	Р	Η				
2	0	0		3	0	0	3				
ι	JNIT	Ι	INTRODUCTION TO PNEUMATICS AUTOMATION	09							
Intro	oduct	ion to	o Pneumatics- Overall structure- Electro pneumatic -hydraulics- O	Overall -structure -							
Adv	Advantages and disadvantages – Application-Electrical drives.										
U	NIT		0	9							
Esse	ential	Electrical Ladder									
diag	gram	Pneu	matic system- Hydraulic system-pressure and proximity switches- Int	ellige	nt Re	elays.					
U	NIT I	Π	SMART SENSORS AND TIMERS IN CONTROLLERS		0	9					
Intro	oduct	ion to	o sensors- characteristics- types of sensors-resistive - inductive-cap	paciti	ve- r	nagn	etic-				
ultra	asonic	: - pho	otoelectric- nano sensors- timers-counters-types-applications.								
U	NIT I	[V	PROGRAMMABLE LOGIC CONTROLLERS	09							
Evo	lutior	of P	LC – Sequential and Programmable controllers – Architecture – Progra	ogramming of PLC							
Rela	ay log	ic and	d Ladder logic – Functional blocks – PLC interface to pneumatics.								
U	NIT	09									
Intro	Introduction and overviews of Robotics - Terms and Definition, Historical development of robotics,										
clas	sifica	tion a	and configuration of robots, Basic components - Drives, controller g	rippe	r, app	olicat	ion-				
prog	rogramming in Robotics.										
	Lecture = 45: Tutorial = 0: Lab = 0: Total = 45 Hours										

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





### TEXT BOOKS

- 1. James Dally, W., "Instrumentation for Engineering Measurements", John Wiley & sons
- 2. Patranabis, D., "Sensors and Transducers", Wheeler Publishing, 2000.
- 3. Harry Colestock, Industrial Robotics, McGraw Hill Book Co., New Delhi, 2005.
- 4. Harry Colestock, Industrial Robotics, McGraw Hill Book Co., New Delhi, 2005.

### **REFERENCE BOOKS**

- 1. Anthony Esposito, Fluid Power with Applications, Pearson Education, 5th Edition, New Delhi, 2000.
- 2. Stuart A. Boyer., SCADA: Supervisory Control and Data Acquisition, 3rdEdition, The instrumentation systems and Automation Society, 2009.
- 3. Micro-sensors; principles and applications-J.W.Gardner.
- 4. Semiconductor sensors and its application-S.M.Sze.

## **E REFERENCES**

- 1. NPTEL- Industrial automation, Prof. S. Mukhopadhyay IIT Kharagpur.
- 2. Web Course http://elearning.vtu.ac.in/

CO/ PO/PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	2	1	1	1	-	-	1	1	-	2	1
CO2	3	2	-	-	1	1	-	1	-	1	3	2	2	1
CO3	2	3	-	-	1	1	1	-	-	-	-	1	2	1
CO4	2	1	3	-	-	1	-	1	1	-	-	1	-	2
CO5	2	2		-	1	-	-	2	-	-	-	1	-	2
Total	12	10	3	2	4	4	2	4	1	2	4	5	6	7
Scaling	3	2	1	1	1	1	1	1	1	1	1	0	2	2

### COs versus PO, PSO mapping

0 -No relation 1 - Low relation 2 - Medium relation 3 - High Relation

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91 - 4362 - 264660 Err





### ENERGY MANAGEMENT AND AUDITING

Cou	rse	Outco	omes (OE2)	Doma	in	Level					
CO1		<i>Explain</i> the stages and process of energy management Cognitive Understand Program.									
CO2	<b>2</b> Analyze economic models of load management systems. <i>Explain</i> monitoring and control of energy management systems.										
CO3	CO3Compare different energy management techniques for Electric loads and drives.CognitiveUnderstand										
CO4	<b>CO4</b> <i>Explain</i> the different metering arrangement and their Performance in a electrical system. Cognitive										
CO5Define the lighting scheme and Standards for energy conservation. Explain the methods of improving the power quality.CognitiveRemember Understan											
SUB	<b>S.C</b> (	ODE	SUB NAME		L	T	P	C			
(	DE	2			3	0	0	3			
С	Р	Α	ENERGY MANAGEMENT AND AUDITING L T								
3	0	0	3 0 0								
Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting-energy audit process.											
UNI	T 2	)	ENERGY COST AND LOAD MANAGEMEN	Τ				09			
Important concepts in an economic analysis - Economic models-Time value of money- Utility rate structures- cost of electricity-Loss evaluation Load management: Demand control techniques-Utility monitoring and control system- HVAC and energy management.											
UNI	UNIT 3 ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT										
Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines-Energy management in industrial drive.											
UNIT 4 METERING FOR ENERGY MANAGEMENT											
Relationships between parameters-Units of measure-Typical cost factors- Utility meters - Timing of meter disc for kilowatt measurement - Demand meters - Paralleling of current transformers - Instrument transformer burdens-Multitasking solid-state meters - Metering location vs. requirements.											

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India Phone: + 91 - 4362 - 264600 Fax: + 91- 4362 - 264660 Email: headeee@pmu.edu Web: www. pmu.edu





think • innovate • transform

### **UNIT 5** LIGHTING SYSTEMS & COGENERATION

09

Concept of lighting systems - The task and the working space -Light sources - Ballasts -Luminaries - Lighting controls-Optimizing lighting energy - Power factor and effect of harmonics on power quality - Cost analysis techniques-Lighting and energy standards-BEE standards

### Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours

### **TEXT BOOKS**

- 3. Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, 'Guide to Energy Management', Fifth Edition, The Fairmont Press, Inc., 2006
- 4. Eastop T.D & Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific & Technical, ISBN -0-582-03184, 1990.

### **REFERENCES BOOKS**

- **3.** IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 2011.
- 4. Amit K. Tyagi, 'Handbook on Energy Audits and Management', TERI,2003

### **E REFERENCES**

2. E-learning course on Energy audit and management, Dr..K.Shanti swarup, Indian Institute of Technology, Chennai.

	cos versus i o, i bo mapping													
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO 1	PSO 2
CO 1	1	3							2	1			2	3
CO 2	1					1					2		2	2
CO 3	1			1	1			1		1			2	3
CO 4	1	2	2								3	1	2	2
CO 5		2					2					1	1	3
Total	4	7	2	1	1	1	2	1	2	2	5	2	9	13
Scaling	1	2	1	1	1	1	1	1	1	1	1	1	2	3

### COs versus PO PSO manning

**0** –No relation **1** – Low relation **2** – Medium relation **3** – High Relation
Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

# **OE3 RENEWABLE ENERGY TECHNOLOGY**

Cours	e Outcomes (OE3)	Domain	Level
CO1	Infers the Power Demand and identifies the various	Cognitive	Understanding
	renewable energy systems to meet out the demand.		Applying
CO2	Explains about the Performance of various solar	Cognitive	Understanding
	collectors and <i>apply</i> the recent advancement in PV		Applying
	systems to improve the efficiency.		
CO3	<i>Explain about</i> the performance characteristics of wind	Cognitive	Understanding
	energy and its application in hybrid systems.		
CO4	Apply the Bio-energy in various conversion	Cognitive	Applying
	technologies and processes, for sustainable		
	development.		
<b>CO5</b>	<i>Compares</i> the role-play of various energy resources.	Cognitive	Understanding

SU	B.CO	DE	SUB NAME	L	Т	Р	С			
	OE :	3		3	0	0	3			
С	Р	Α	<b>RENEWABLE ENERGY TECHNOLOGY</b>	Т	Р	Η				
3	0	0		3	0	0	3			
U	NIT	Ι				)9				
Primary energy sources, Renewable Vs non-renewable vs non-renewable primary energy sources, Renewable vs non										
ene	rgy r	esour	ces in India, Current usage of renewable energy sources in	n India	, futu	e po	tential			
of 1	enew	able	energy in power production and development of renewable	energy	y techr	nologi	es.			
U	UNIT II SOLAR ENERGY									
Sol	ar Ra	adiati	on and its measurements, Solar Thermal Energy Convers	ion fr	om	Flat-	plate			
Sol	ar C	ollec	tors, Concentrating Collectors and its Types, Efficient	cy and	d perfe	ormar	nce of			
coll	ector	s, Di	rect Solar Electricity Conversion from Photovoltaics- types	s of so	olar ce	ells a	nd its			
app	licati	on of	battery charger, Recent Advances in PV Applications- B	uilding	g Integ	grated	l PV,			
Grie	d Co	nnect	ted PV Systems.							
U	NIT I	II	WIND ENERGY				)9			
Win	Wind energy principles, wind site and its resource assessment, wind assessment, Factors									
infl	influencing wind, wind turbine components, wind energy conversion systems(WECS),									
Cla	Classification of WECS devices, Hybrid systems - safety and environmental aspects, economic									
aspe	ects.									





think • innovate • transform

09

### UNIT IV BIO-ENERGY

Energy from biomass, Principle of biomass conversion technologies process and their classification, Bio gas generation, types of biogas plants, selection of site for biogas plant, classification of biogas plants, Advantage and disadvantages of biogas generation, biomass gasifies, Application of biomass and biogas plants and their economics.

# UNIT V OTHER TYPES OF ENERGY

09

Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, Potential in India. Tidal and wave energy.

### Lecture = 45; Tutorial = 00; Total = 45 Hours

### **TEXT BOOKS**

- 1. G.D. Rai, Non-Conventional Energy Sources- Khanna Publishers.
- 2. Twidell & Wier, Renewable Energy Resources –CRC Press (Taylor & Francis).
- 3. D.P.Kothari, K.C.Singha, Renewable energy sources and emerging technologies P.H.I
- 4. Mukund R.Patel, 1999.Wind And Solar Power Systems- CRC Press ,Florida,

## **REFERENCE BOOKS**

- 1. Tiwari and Ghosal Narosa- Renewable energy resources,
- 2. Ramesh & Kumar ,Narosa -Renewable Energy Technologies ,
- 3. K Mittal ,Wheeler, Non-Conventional Energy Systems ,
- 4. Volker Quaschning , 2005-Understanding the Renewable Energy Systems,- Earth Scan,London,UK,

# **E-REFERENCES**

- http://www.nptelvideos.in/2012/11/energy-resources-and-technology.html NPTEL, Lecture Series on Energy Resources and Technology, Prof.S.Banerjee,Department of Electrical Engineering, IIT Kharagpur.
- 2. http://freevideolectures.com/Course/2352/Power-System-Generation-Transmission-and-Distribution/6 NPTEL, Renewable Energy Technology, Prof. D.P.Kothari IIT Delhi Course.
- http://textofvideo.nptel.iitm.ac.in/112105051/lec43.pdfNPTEL, Renewable Energy Technology,Prof. V. V. Satyamurty Department of Mechanical Engineering Indian Institute of Technology, Kharagpur.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





# COs versus PO, PSO mapping

	PO1	PO2	PO3	PO4	PO5	<b>PO6</b>	<b>PO7</b>	<b>PO8</b>	PO9	PO10	PO11	PO12	PSO	PSO
													1	2
CO 1	2	2			1		3	1	1	1	0	1	2	3
CO 2	2	2	2	2			2	1	1	1	2	1	2	3
CO 3	3	3												3
CO 4	3	2	2		3		3	1	1	1		1	2	3
CO 5		2											2	3
Total	10	11	4	2	4	0	8	3	3	3	2	3	8	15
Scaled	2	3	1	1	2	0	2	1	1	1	1	1	2	3
to 0,1,2,3 scale														

0 –No relation	1 – Low relation	2 – Medium relation	3 – High Relation
----------------	------------------	---------------------	-------------------

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





# ELECTRICAL SAFETY

Cours	se Outcomes(XEEOC1):	Domain	Level
CO1	Describe electrical hazards and safety equipment.	Cognitive	Understanding
CO2	Analyze and apply various grounding and bonding techniques.	Cognitive	Applying
CO3	Select appropriate safety method for low, medium and high voltage equipment.	Cognitive	knowledge

SUBCODE	SUB NAME	L	Т	P	C
XEEOC1	ELECTRICAL SAFETY	1	0	0	1
C:P:A = 3:0:0		L	Т	Р	Η
		1	0	0	1
UNIT I		******			15

principals of electric safety - Electricity & Human body - Earthing / Grounding Risk assessment & management - Safety against over voltage, extra-low and residual voltages - Safe practices – RCD, PPE, CB, lockout/tag out -Hazardous areas, Electrical insulation - Electrical fires, Arc flash - Electrical safety in hospitals and Industries.

Hazards of electricity - basic physics of electrical hazards - electrical safety equipment safety procedures and methods - grounding and bonding of electrical systems and equipment - electrical maintenance and its relationship to safety - regulatory and legal safety requirements and standards accident prevention, accident investigation, rescue, and first aid - medical aspects of electrical trauma - low-voltage, medium- and high-voltage safety synopsis Human factors in electrical safety.

	LECTURE	TUTORIAL	TOTAL
	15	0	15
TEXT BOOKS	•		
1. John Cadick, Mary Capelli-Schellpfeffer, Dennis	Neitzel, Al W	infield ,'Electric	cal Safety
Handbook', McGraw-Hill Education, 4thEdition, 20	012.		
REFERENCE BOOKS			
1. Maxwell Adams.J, 'Electrical Safety- a guide to	the causes and	prevention of el	ectric
hazards', The Institution of Electric Engineers, IET	1994.		
2. Ray A. Jones, Jane G. Jones, 'Electrical Safe	ety in the Wo	orkplace', Jones	& Bartlett
Learning, 2000.	-	-	

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

### COs versus POs mapping

СО/РО	РО 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2										2			
CO2	2	1									2			
CO3	2	1									1			
Total	6	2									5			
Scaling	3	2									2			

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fmail: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

### MICROGRIDS

Cours	se Outcomes(XEEC	)C2):		Domain	l 🗌	Le	vel	
CO1	Understand concep issues.	t of microgrid and impler	nentation	Cognitiv	e Ui	Understanding		
CO2	CO2 Understand issues related to power electronics Cognitive face.					ognitive Underst		
CO3	CO3 Acquire knowledge about modelling and stability Cog- analysis of solving power quality issues in Microgrid.					owle	dge	
	SUBCODE	SUB NA	ME		L	Т	P	C
XEEOC2 MICROGRIDS						0	0	1
(	C:P:A = 3:0:0				L	Т	Р	Η
					1		0	1
UNIT	<b>I MICROGRIDS</b>	AND THEIR POWER (	<b>UALITY I</b>	SSUES	<b>i</b>			15
Conce config AC m mode, regula	ept and definition of guration of a microgr nicrogrids, modes of , Power quality issu atory standards, Micr	microgrid, review of so rid: AC and DC microgrid operation and control o res in microgrids- Mode ogrid economics.	urces of mid ls, Power El- f microgrid: ling and Sta	crogrids, t ectronics i grid con ability ana	ypica interfa necteo alysis	l stru ices i l and of N	cture n DC islan Iicrog	and and ded grid,
			LECTUR	E TUTO	ORIA	LI	ΓΟΤΑ	۱L
	15						15	
TEX	TEXT BOOKS							
1 T-1								

1. John Twidell and Tony Weir, "Renewable Energy Resources" Tyalor and Francis Publications, 2005.

2. S. Chowdhury, S. P. Chowdhury, P. Crossley, "Microgrids and Active Distribution.

### **REFERENCE BOOKS**

1. Chetan Singh Solanki, "Solar Photo Voltaics", PHI learning Pvt. Ltd., New Delhi, 2009.

2. Freris,"Wind Energy Conversion System", Prentice Hall, 1990.

3. Networks." Institution of Engineering and Technology, 30 Jun 2009.

**COs versus POs mapping** 

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2										2			
CO2	2	1									2			
CO3	2	1									1			
Total	6	2									5			
Scaling	3	2									2			

1-Low relation 2- Medium Relation 3- High relation

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91 - 4362 - 264600

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### **DISTRIBUTED GENERATION**

Cours	se Outcomes(XEEOC3):	Domain	Level
CO1	Understand the units of energy, energy demand, energy efficiency, and distributed generation concepts.	Cognitive	Understanding
CO2	Understand the principles and technology of different types of energy sources: fuel cell, Photovoltaic, and wind Power generation	Cognitive	Understanding
CO3	Understand the concept of energy storage and various types of storage elements.	Cognitive	Understanding

SUBCODE	SUB NA	ME		T	P	C
XEEOC3	DISTRIBUTED (	<b>ENERATIO</b>	N 1	0	0	1
C:P:A = 3:0:0			L	Т	Р	Η
	•		1	0	0	1
UNIT I- INTRODUCTI	ÓN		<b>i</b>	i.	<b>i</b>	6
Recent trends in energy	consumption - World en	ergy scenario	- Energy sc	urces	and t	heir
availability - Qualitative	study of different renewa	ble energy res	ources: Sola	ır, win	nd, oc	ean,
Biomass, Fuel cell, Hydro	ogen energy systems and h	ybrid renewat	ole energy sy	vstems	- nee	d to
develop new energy techn	ologies.					
UNIT II DISTRIBUTEI	D GENERATIONS (DG)					6
	· · · · · · · · · · · · · · · · · · ·			11 .•	1	
Concept of distributed ger	herations, topologies, sele	ction of source	s - DG insta	llation	class	es -
security issues in DG imp	lementations.					
UNIT III ENERGY S	STORAGE					3
Need for Energy storage S	Systems- Batteries, ultra-c	apacitors, and	flywheels	Capti	ive po	wer
plants.	•	•	•	1	1	
1		LECTURE	TUTORIA		ΓΟΤΑ	L
		15	0		15	5
TEXT BOOKS				i		
1. Electric Energy: An Int	roduction, Mohamed A. E	ll-Sharkawi, C	CRC Press, 3	3 rd Edi	tion,	
2012.						
<b>REFERENCE BOOKS</b>						
1. Distributed Power Gene	eration, Planning & Evalu	ation by H. Le	e Willis & V	Valter	G. Sc	ott,
3 rd Edition, CRC Press Ta	ylor & Francis Group, 20	00. 				
2. Control of Power Inver	ters in Renewable Energy	and Smart Gri	d Integration	n by Q	uing-	
Chang Zhong, Wiley, IEE	E Press, 2013.					

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

# **COs versus POs mapping**

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2										2			
CO2	2	1									2			
CO3	2	1									2			
Total	6	2									6			
Scaling	3	2									3			

1-Low relation 2- Medium Relation 3- High relation





think • innovate • transform

#### **ENERGY AUDITING**

Cours	se Outcomes(XEEOC4):	Domain	Level
CO1	Understand the importance of energy auditing & energy management.	Cognitive	Understanding
CO2	Apply their own ideas in optimizing the energy requirements to overcome the demand.	Cognitive	Applying
CO3	Acquire knowledge about energy monitoring and targeting to improve the energy efficiency.	Cognitive	knowledge

SUBCODE	SUB NAME	L	Т	Р	С
XEEOC4	ENERGY AUDITING	1	0	0	1
C:P:A = 3:0:0		L	Т	Р	Η
		1	0	0	1
UNIT I ENERGY MAN	AGEMENT & AUDIT				15

Energy Scenario: energy needs of growing economy, energy pricing, energy sector reforms, Re-structuring of the energy supply sector, Energy Conservation Act-2001 and its features -Need for energy audit - Energy management & audit approach: understanding energy costs, bench marking, energy performance, matching energy use to requirement, maximizing system efficiencies, energy audit instruments.

Energy Monitoring and Targeting: Defining monitoring & targeting, elements of monitoring & targeting, data and information-analysis, techniques -energy consumption, production, cumulative sum of differences (CUSUM) - Energy Efficiency in Electrical Utilities: electrical load management and maximum demand control, power factor improvement, energy saving opportunities with energy efficient motors.

	LECTURE	TUTORIAL	TOTAL
	15	0	15
ΤΕΥΤ ΒΟΟΚS	•••••••••••••••••••••••••••••••••••••••		

1. Energy Management Principles: C.B.Smith, Pergamon Press, 1981.

2. Industrial Energy Management and Utilization – L.C. Witte, P.S. Schmidt, D.R. Brown Hemisphere Publication, Washington, 1988.

### **REFERENCE BOOKS**

1. Industrial Energy Conservation Manuals, MIT Press, Mass, 1982

2. Energy Conservation guide book Patrick/Patrick/Fardo, Prentice hall, 1993.

3. Energy Management Handbook – W.C. Turner, John Wiley and Sons, A WileyInterscience publication, 1988.

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

# COs versus POs mapping

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
C01	2										2			
CO2	2	1									2			
CO3	2										2			
Total	6	1									6			
Scaling	3	1									3			

1-Low relation 2- Medium Relation 3- High relation

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

 Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

 Phone: + 91 - 4362 - 264600

 Fax: + 91- 4362 - 264660

 Email: headeee@pmu.edu

 Web: www. pmu.edu





think • innovate • transform

#### PERSONALITY DEVELOPMENT

Cours	se Outcomes(XEEOC5):	Domain	Level
CO1	Have inter personal skills and be an effective goal oriented team player.	Cognitive	Understanding
CO2	Be professionals with idealistic, practical and moral values.	Cognitive	Applying
CO3	Have communication and problem solving skills.	Cognitive	knowledge
CO4	Have engineer attitude and understand its influence on behavior.	Cognitive	knowledge

SUBCODE	SUB NAME	L	Т	P	C
XEEOC5	PERSONALITY DEVELOPMENT	1	0	0	1
C:P:A = 3:0:0		L	Т	Р	Η
		1	0	0	1
UNIT I SOFT SKILLS					15
Self Analysis - Creativity	: Out of box thinking, Lateral Thinking - At	titude	- Mo	otivat	ion:
Factors of motivation, Self	talk, Intrinsic & Extrinsic Motivators - Goal S	Setting	-Inter	perso	onal
Skills- Gratitude - Team	Work- Leadership- Stress Management-	Conflie	ct Re	solut	ion:
Conflicts in Human Relat	ions – Reasons Case Studies, Approaches to	conflic	et rese	olutic	on –
Decision Making: : Import	tance and necessity of Decision Making, Proce	ess and	l pract	ical v	way
of Decision Making, Weig	hing Positives & Negatives.				
	LECTURE TUT	ORIA	L T	ΟΤΑ	<b>T</b>

	LECIURE	IUIUKIAL	IUIAL
	15	0	15
TEXT BOOKS			

1. SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications.

2. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.

### **REFERENCE BOOKS**

1.Carnegie Dale, How to win Friends and Influence People, New York- Simon & Schuster, 1998.

2. Thomas A Harris, I am ok, You are ok, New York-Harper and Row, 1972

3. Daniel Coleman, Emotional Intelligence, Bantam Book, 2006

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

# COs versus POs mapping

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	РО 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						3		3	3	3	3			
CO2						3		3	3	3	3			
CO3						3		3	3	3	3			
CO4						3		3	3	3	3			
Total						12		12	12	12	12			
Scaling						3		3	3	3	3			

1-Low relation

2- Medium Relation 3- High relation

Periyar Nagar, Vallam, Thanjavur - 613 403, Tamil Nadu, India

Fax: + 91- 4362 - 264660

Web: www. pmu.edu

Phone: + 91 - 4362 - 264600

Email: headeee@pmu.edu





think • innovate • transform

# INDUSTRIAL LECTURES

SUBCODE	SUB NAME	L	Т	Р	С
XEEOC6	INDUSTRIAL LECTURES	1	0	0	1
C:P:A = 0:0:0		L	Т	Р	Η
		1	0	0	1
A minimum of five lectures	of two hours duration each by indus	stry experts w	ill be	arran	ged the
end of each lecture.	iuation methodology, will in general	, be based on	quizz	Les al	uic
	LECTURE	TUTORIA	L 7	OTA	L
	15	0		15	

# **COs versus POs mapping**

СО/РО	PO 1	PO 2	PO 3	PO 4	РО 5	PO 6	<b>PO</b> 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1						3		3	3	3	3			
Scaling						1		1	1	1	1			

1-Low relation 2- Medium Relation 3- High relation