

# **Curriculum and Syllabus**

**for**

**B.Tech**

**Electrical and Electronics Engineering**

**(Four Year Full Time)**

**Regulation 2017**

**(Based on OBE)**

## **DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

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



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

# **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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

## **Programme Educational Objective (PEO)**

<b>PEO1</b>	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.
<b>PEO2</b>	Our Graduates stay relevant in their chosen profession through lifelong learning and demonstrate social and ethical responsibility.

## **Graduate Attributes (GAs)**

1. **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.

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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



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

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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

## **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.

## DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

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



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

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)

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

# Curriculum and Syllabus

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**CURRICULUM 2017**

**SEMESTER I**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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
		<b>14</b>	<b>3</b>	<b>3</b>	<b>20</b>

**SEMESTER II**

<b>Code No.</b>	<b>Course Title</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
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
		<b>15</b>	<b>4</b>	<b>3</b>	<b>22</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited

think • innovate • transform

**SEMESTER III**

Code No.	Course Title	L	T	P	C
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
		<b>17</b>	<b>3</b>	<b>2</b>	<b>23</b>

**SEMESTER IV**

Code No.	Course title	L	T	P	C
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	-	-	-	-
		<b>19</b>	<b>2</b>	<b>2</b>	<b>23</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SEMESTER V**

Code No.	Course Title	L	T	P	C
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
		<b>16</b>	<b>4</b>	<b>2</b>	<b>23</b>

**SEMESTER VI**

Code No.	Course Title	L	T	P	C
*** 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
		<b>19</b>	<b>2</b>	<b>2</b>	<b>23</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SEMESTER VII**

Code No.	Course Title	L	T	P	C
***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
		<b>16</b>	<b>1</b>	<b>4</b>	<b>23</b>

**SEMESTER VIII**

Code No.	Course Title	L	T	P	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
		<b>10</b>	<b>0</b>	<b>12</b>	<b>22</b>

**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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTIVE GROUP - 1:**

Code No.	Course Title	L	T	P	C
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	T	P	C
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	T	P	C
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	3	0	0	3
E34	Energy Efficient Buildings	3	0	0	3

**ELECTIVE GROUP - 4:**

Code No.	Course Title	L	T	P	C
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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited

think • innovate • transform

**ELECTIVE GROUP - 5:**

Code No.	Course Title	L	T	P	C
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	T	P	C
E61	High Voltage Engineering	3	0	0	3
E62	Disaster Management	3	0	0	3
E63	Electrical Power Quality	3	0	0	3
E64	<b>Solar and Energy Storage System</b>	3	0	0	3

**OPEN ELECTIVES:**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ALGEBRA, DIFFERENTIAL CALCULUS AND APPLICATIONS**

<b>Course Outcomes(XMA 101):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<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
<b>CO2</b>	<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
<b>CO3</b>	<i>Explain</i> the convergence of series of positive terms, alternating series, and power series using tests of convergence	Cognitive	Understanding
<b>CO4</b>	<i>Compute</i> total and partial derivatives, Taylor series expansions of functions and the extremum of functions and their applications.	Cognitive	Understanding
<b>CO5</b>	<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	SUB NAME	L	T	P	C
<b>XMA 101</b>	<b>ALGEBRA, DIFFERENTIAL CALCULUS AND3 THEIR APPLICATIONS</b>		<b>1</b>	<b>0</b>	<b>4</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>
<b>UNIT I MATRICES</b>					<b>15</b>
Eigen values and Eigenvectors of a real matrix –Properties of Eigen values and Eigen vectors – Cayley-Hamilton theorem (excluding proof) - Similarity transformation (Concept only) – Orthogonal matrix - Orthogonal transformation of a symmetric matrix to diagonal form – Reduction of quadratic form to Canonical form by Orthogonal transformation.					
<b>UNIT IIGEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS</b>					<b>15</b>
Curvature – Cartesian and polar co-ordinates – Centre and radius of curvature – Circle of curvature – Involutives and evolutes – Envelopes – Properties of envelopes and evolutes.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT III INFINITE SERIES</b>	<b>15</b>						
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)							
<b>UNIT IV FUNCTIONS OF SEVERAL VARIABLES</b>	<b>15</b>						
Functions of two variables – Partial derivatives – Total differentiation – Taylor’s expansion – Maxima and Minima – Constrained maxima and minima – Lagrange’s Multiplier method – Jacobian Determinants.							
<b>UNIT V ORDINARY DIFFERENTIAL EQUATIONS AND APPLICATIONS</b>	<b>15</b>						
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.							
	<table border="1"> <thead> <tr> <th><b>LECTURE</b></th> <th><b>TUTORIAL</b></th> <th><b>TOTAL</b></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>45</b></td> <td style="text-align: center;"><b>30</b></td> <td style="text-align: center;"><b>75</b></td> </tr> </tbody> </table>	<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	<b>45</b>	<b>30</b>	<b>75</b>
<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>					
<b>45</b>	<b>30</b>	<b>75</b>					
<b>TEXT BOOKS</b>							
1) Grewal, B.S. Higher Engineering Mathematics, 40 <sup>th</sup> Edition, Khanna  2) Kreyszig, E, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Son(Asia) Ltd, Singapore, 2001.							
<b>REFERENCE BOOKS</b>							
1. Bali N.P and Narayana Iyengar, 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.							
<b>E REFERENCE BOOKS</b>							
www.nptel.ac.in  Advanced Engineering Mathematics Prof. Pratima Panigrahi Department of Mathematics Indian Institute of Technology, Kharagpur.							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**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
<b>CO 1</b>	3									1		1
<b>CO 2</b>	3									1		1
<b>CO 3</b>	3	2								1	1	2
<b>CO 4</b>	3	2			1					1	1	1
<b>CO 5</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COMPUTER PROGRAMMING**

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

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XCP102</b>	<b>COMPUTER PROGRAMMING</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>C:P:A = 3:1:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>

**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**

**Theory**

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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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 methods - Passing arrays to functions – Recursion - Programs using arrays and functions. Pointers - Pointer declaration - Address operator - Pointer expressions & pointer arithmetic - Pointers and function - Call by value - Call by Reference - Pointer to arrays - Pointers and structures - 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 - Functions and structures - Passing structure to elements to functions - Passing entire function to functions - 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.
3. Program to create linked list using Structures with pointers.

**UNIT V FILES**

**9+6**

**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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
 (Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
 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](https://iitbombayx.in/courses/IITBombayX/BMWCS101.1x/2015_T1/courseware)

**Mapping of COs with GAs:**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**MECHANICAL AND CIVIL ENGINEERING SYSTEMS**

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

SUBCODE	SUB NAME	L	T	P	C
<b>XBW103</b>	<b>MECHANICAL AND CIVIL ENGINEERING SYSTEMS</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A = 3:1:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT I Basics of Thermal and Energy Systems</b>					<b>9+6+6</b>
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.					
<b>Practical:</b>					
Petrol engine performance – BHP					
Diesel engine performance – BHP					
Demonstration of refrigeration and air conditioning units					
<b>UNIT Fundamentals of Machine Elements and Measurements</b>					<b>9+6+6</b>
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.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**Practical:**

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

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

**UNIT III Elements of Manufacturing**

**9+6+6**

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**

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**

**9+6+6**

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.**

	<b>LECTURE</b>	<b>T &amp; P</b>	<b>TOTAL</b>
	<b>45</b>	<b>30+30</b>	<b>105</b>

**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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**APPLIED CHEMISTRY**

<b>Course Outcomes(XAC104):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<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
<b>CO2</b>	<i>Explain</i> the fundamental principles of electrochemical reactions, its applications in redox reactions and calculate the different electrochemical processes.	Cognitive Psychomotor	Evaluating Keywords
<b>CO3</b>	<i>Interpret</i> the types of corrosion, <i>use and measure</i> its control by various methods including protective techniques.	Cognitive Affective Psychomotor	Understanding Receiving Mechanism
<b>CO4</b>	<i>Describe, 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
<b>CO5</b>	<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

<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XAC104</b>	<b>APPLIED CHEMISTRY</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A = 2.8:0.8 :0.4</b>					
		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>Theory Part</b>					
<b>UNIT I WATER TECHNOLOGY</b>					<b>7 + 8 + 9</b>
Sources and types of water – water quality parameters – BIS and ISO specifications- hardness: types and estimation of hardness (problems) - alkalinity: types and estimation (problems) – boiler feed water – requirements – disadvantages of using hard water in boilers – internal treatment, external treatment – demineralization process – desalination using reverse osmosis –domestic water treatment - Effluent treatment processes in industries					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT II ELECTROCHEMISTRY</b>	<b>8+5 +15</b>
<p>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.</p>	
<b>UNIT III CORROSION AND PROTECTIVE COATINGS</b>	<b>9 + 4 +3</b>
<p>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. <b>Protective coatings:</b> 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.</p>	
<b>UNIT IV ENERGY STORAGE DEVICES AND NUCLEAR ENERGY</b>	<b>12 + 7</b>
<p>Energy 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 . <b>Nuclear energy:</b> 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.</p>	
<b>UNIT V SPECTROSCOPY AND NANO CHEMISTRY</b>	<b>9 +6 +3</b>
<p>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. <b>Nanochemistry</b> - Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: Nanocluster, nanorod, nanotube and nanowire. Synthesis ; properties and applications of nano materials-<b>Buckminster fullerenes, CNT’S(Single walled carbon nano tubes and Multi-walled carbon tubes)-Graphene-</b> advantages and applications.</p>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**TEXT BOOKS**

1. Jain and Jain , “A Text book of Engineering Chemistry”, Dhanapatrai Publications, New Delhi, 2011.
2. Gadag and Nityananda Shetty , “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

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

**Laboratory Part**

**30 hrs**

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 sodium sulphate.
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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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>

	<b>LECTURE</b>	<b>TUTORIAL</b>	<b>PRACTICAL</b>	<b>TOTAL HOURS</b>
	<b>45</b>	<b>30</b>	<b>30</b>	<b>105</b>

**Mapping of CO’s with GA’s:**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**STUDY SKILLS**

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

<b>XGS 105</b>			<b>STUDY SKILLS</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
							<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>1</b>	<b>1</b>	<b>0</b>					<b>1</b>	<b>0</b>	<b>2</b>	<b>3</b>
<b>UNITI</b>	Introduction to study skills; Learning Skills and Strategies of Learning; Cognitive Study skills and physical study skills, Library skills (How to use Library), familiarization of library facilities by the librarian; familiarization of basic cataloguing techniques, how to ransack the library etc.								<b>5</b>	
<b>UNITII</b>	Reference Skills, how to use the library facilities for research and to write assignments; how to find out reference books, articles, journals and other e-learning materials; how to use a dictionary and thesaurus.								<b>5</b>	
<b>UNITIII</b>	Reading related study skills, Process of reading, various types of reading materials and varied reading techniques; familiarization to materials written by various authors; features of scientific writing and familiarization to scientific writing by renowned authors; note making skills								<b>5</b>	
<b>UNITIV</b>	Writing related study skills; process of writing, characteristics of writing, discourse analysis, use of visual aids, and note making and note taking skills								<b>5</b>	
<b>UNITV</b>	Exam preparation skills; anxiety reduction skills; familiarization with various types of exam/evaluation techniques etc.								<b>5</b>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>LANGUAGE LAB (Practical)</b>	
Sounds of English Language; vowels, consonants, diphthongs, word stress, sentence stress, intonation patterns, connected speech etc	5
Vocabulary building – grammar, synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, idioms and phrases.	5
Reading comprehension – reading for facts, meanings from context, scanning, skimming, inferring meaning, and critical reading. Active listening, listening for comprehension etc.	10
<b>L=15 hrs P -25 hrs Library – 5 Total:45 Hrs</b>	
<b>TEXT BOOKS</b>	
<b>Appropriate Chapters/Units from the following textbooks</b>	
<ol style="list-style-type: none"> <li>1. V.R. Narayanaswamy ,Strengthen Your Writing by (Orient Longman), 2000</li> <li>2. Ghosh, R N; Inthira, S R [Author],A Course in written English: New Delhi, 1978</li> <li>3. Jaya Sasikumar, Champa Tickoo, Writing With A Purpose, Published by Oxford University Press, 2000</li> <li>4. Freeman, Sarah: Study Strategies. New Delhi: Oxford University Press, 1979</li> <li>5. Paul Gunashekar M.L. Tickoo, Reading for Meaning, Published by S. Chand &amp; Company Ltd. Sultan Chand &amp; Company, 2000</li> <li>6. Bernard Hartley (Author), Peter Viney (Author) Streamline English: Departures (Oxford English) Paperback ,1990.</li> <li>7. Bernard Hartley (Author), Peter Viney (Author), Streamline English: Destinations, by , Oxford : Oxford University Press, 1992.</li> <li>8. Bernard Hartley (Author), Peter Viney (Author),Streamline English Directions, (Oxford University Press 1982).</li> </ol>	
<b>REFERENCE BOOKS</b>	
<ol style="list-style-type: none"> <li>1. Jaya Sasikumar, Champa Tickoo, Writing With A Purpose, Oxford University Press   Paper Back   Language – English. Freeman, Sarah: Study Strategies. <i>New Delhi: Oxford University Press, 1979.</i></li> <li>2. Reading for Meaning, Paul Gunashekar M.L. Tickoo, Published by S. Chand &amp; Company Ltd. Sultan Chand &amp; Company, 2000</li> <li>3. Susan Fawcett (Author)Evergreen: A Guide to Writing with Readings Paperback – January 4, 2013.</li> </ol>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**Mapping of COs with GAs:**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**HUMAN ETHICS, VALUES, RIGHTS AND GENDER EQUALITY**

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

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XUM 106</b>	<b>HUMAN ETHICS, VALUES , RIGHTS AND GENDER EQUALITY</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 1.8:0:0.2</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1+2 * *SS</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT IHUMAN ETHICS AND VALUES</b>					<b>7</b>
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.					
<b>UNIT II GENDER EQUALITY</b>					<b>9</b>
Gender Equality - Gender Vs Sex -, Concepts, definition, Gender equity, equality, empowerment. Status of Women in India Social, Economical, Education, Health,					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec 2 of UGC Act 1956) - NAAC Accredited  
 think • innovate • transform

Employment, HDI, GDI, GEM. Contributions of Dr. B.R. Ambedkar, Thanthai Periyar and Phule to Women Empowerment.

<b>UNIT III WOMEN ISSUES AND CHALLENGES</b>	<b>9</b>						
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.							
<b>UNIT IV HUMAN RIGHTS</b>	<b>9</b>						
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.							
<b>UNIT V GOOD GOVERNANCE AND ADDRESSING SOCIAL ISSUES</b>	<b>11</b> 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.							
	<table border="1"> <thead> <tr> <th>LECTURE</th> <th>SELF STUDY</th> <th>TOTAL</th> </tr> </thead> <tbody> <tr> <td style="text-align: center;">15</td> <td style="text-align: center;">30</td> <td style="text-align: center;">45</td> </tr> </tbody> </table>	LECTURE	SELF STUDY	TOTAL	15	30	45
LECTURE	SELF STUDY	TOTAL					
15	30	45					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**REFERENCE BOOKS**

1. Aftab A, (Ed.), Human Rights in India: Issues and Challenges, (New Delhi: Raj Publications, 2012).
2. Bajwa, G.S. and Bajwa, D.K. Human Rights in India: Implementation and Violations (New Delhi: D.K. Publications, 1996).
3. Chatrath, K. J. S., (ed.), Education for Human Rights and Democracy (Shimala: Indian Institute of Advanced Studies, 1998).
4. Jagadeesan. P. Marriage and Social legislations in Tamil Nadu, Chennai: Elachiapen Publications, 1990).
5. Kaushal, Rachna, Women and Human Rights in India (New Delhi: Kaveri Books, 2000)
6. 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](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**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>Scaled total</b>	<b>2</b>	<b>1</b>	<b>1</b>
---------------------	----------	----------	----------

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

**CALCULUS AND LAPLACE TRANSFORMS**

<b>Course Outcomes(XMA 201):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<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
<b>CO2</b>	<i>Apply multiple integral concepts to determine</i> area, volume and to understand the order of integration.	Cognitive	Applying
<b>CO3</b>	<i>Define</i> the gradient, divergent curl of vectors. <i>Compute</i> directional derivative, unit vector normal to the surface. <i>Apply</i> corresponding theorems to find the line, surface and Volume integrals.	Cognitive	Applying
<b>CO4</b>	Construct and examine the analytic functions, and their complex Conjugate and to Explain the concept of conformal mapping and its Construction bilinear transformation.	Cognitive	Creating Applying
<b>CO5</b>	Compute the poles, singularities and residues of functions and to solve the problems using contour integration.	Cognitive	Creating Applying

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XMA 201</b>	<b>CALCULUS AND LAPLACE TRANSFORMS</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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 LAPLACE TRANSFORMS**

**15**

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 II MULTIPLE 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 III VECTOR CALCULUS**

**15**

Gradient, divergence and curl - directional derivative – normal and tangent to a given surface  
 – angle between two surfaces – irrotational and solenoidal vector fields - Line, Surface and  
 Volume Integral – Green’s theorem in a plane, Gauss divergence theorem and Stoke’s  
 theorem (excluding proof).

**UNIT IV ANALYTIC FUNCTIONS**

**15**

Function of a complex variable – analytic function – necessary and sufficient condition  
 (excluding proof) – Cauchy Riemann equations – properties of analytic functions - harmonic  
 conjugate - construction of an analytic function – Conformal mapping:  $w = z + c$ ,  $cz$ ,  $\frac{1}{z}$ ,  $\sin z$ ,  $-\cosh z$ ,  $z + \frac{k_2}{z}$  - Bilinear transformation.

**UNIT V COMPLEX INTEGRATION**

**15**

Statement and application of Cauchy’s integral theorem and integral formula - Taylor’s and  
 Laurent’s expansion - Residues – Cauchy’s Residue Theorem - Contour integration over unit  
 circle.

LECTURE	TUTORIAL	TOTAL
45	30	75

**TEXT BOOKS**

1. Grewal, B.S. Higher Engineering Mathematics, 41<sup>st</sup> Edition, Khanna Publication, Delhi, 2011.
2. Kreyszig, E, Advanced Engineering Mathematics, Eighth Edition, John Wiley and Son(Asia) Ltd, Singapore, 2001.

**REFERENCE BOOKS**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

**AR  
MAI  
UNIVERSITY**

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



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

1. Bali N.P and Narayana Iyengar, 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 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
<b>CO 1</b>	3											1
<b>CO 2</b>	3											1
<b>CO 3</b>	3	2								1	1	2
<b>CO 4</b>	3	2			1					1	1	1
<b>CO 5</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENGINEERING MECHANICS**

<b>Course Outcomes(XEM 202):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<i>Identify</i> and choose various types of loading and support conditions that act on structural and dynamic systems.	Cognitive	Understanding
<b>CO2</b>	<i>Apply</i> pertinent mathematical, physical and engineering mechanics principles to the system to predict the problem.	Cognitive	Applying
<b>CO3</b>	<i>Display and Apply</i> knowledge on the concepts of centroid and moment of inertia of various sections and solids.	Cognitive	Applying
<b>CO4</b>	<i>Analyze and Model</i> the problem using free-body diagrams and accurate equilibrium equations and finding the solution.	Cognitive Psychomotor	Analyzing Model
<b>CO5</b>	<i>Develop</i> concepts of friction, rigid body kinematics and dynamics with an emphasis on the modeling and analysis and solving simple dynamic problems involving kinematics and momentum.	Cognitive	Creating
<b>Semester</b>	<b>SEMESTER II</b>		
<b>Subject Name</b>	<b>ENGINEERING MECHANICS</b>		
<b>Subject Code</b>	<b>XEM 202</b>		
L -T -P -C 3- 1 - 0- 4	C: P: A 2.6: 02: 0.2	L -T -P- H 3- 2 - 0 -5	

---

2017\_OBE [B.TECH. (FT)]

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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

Email: head@ee@pnu.edu Web: www.pnu.edu



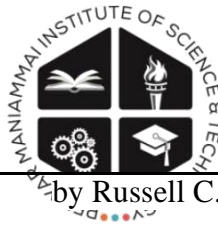
**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) - NAAC Accredited  
think • innovate • transform

**COURSE CONTENT**

<b>UNIT I BASICS AND STATICS OF PARTICLES</b>	<b>15</b>
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.	
<b>UNIT II EQUILIBRIUM OF RIGID BODIES</b>	<b>15</b>
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.	
<b>UNIT III PROPERTIES OF SURFACES AND SOLIDS</b>	<b>15</b>
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.	
<b>UNIT IV DYNAMICS OF PARTICLES</b>	<b>15</b>
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.	
<b>UNIT V ELEMENTS OF RIGID BODY DYNAMICS AND FRICTION</b>	<b>15</b>
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.	
	<b>L=45 hrs T -30 hrs</b>
<b>TEXT BOOKS</b>	
<ol style="list-style-type: none"> <li>1. D.S.Kumar “A text book of Engineering Mechanics” Publishers S.K.Kataria and Sons , 2012</li> <li>2. R.S.Khurmi “A Textbook of Engineering Mechanics” , S. Chand Publishers, 2011</li> <li>3. Engineering Mechanics: Statics (14th Edition) by Russell C. Hibbeler , Best Sellers, 2015</li> </ol>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

Head: [head@pmu.edu](mailto:head@pmu.edu)

Web: [www.pmu.edu](http://www.pmu.edu)

Enrol:

4. Engineering Mechanics: Dynamics (14th Edition) 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

by Russell C. Hibbeler , Best  
think • innovate • transform

1956) • NAAC Accredited

**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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRICAL AND ELECTRONICS ENGINEERING SYSTEMS**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XBE 203</b>	<b>ELECTRICAL AND ELECTRONICS ENGINEERING SYSTEMS</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:1:0</b>		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT I FUNDAMENTAL OF DC AND AC CIRCUITS, MEASUREMENTS</b>				<b>10 + 9 +</b>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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

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**

**9 + 3 + 5**

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**

**9 + 6 + 5**

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

**UNIT V MICROPROCESSORS**

**9 + 3**

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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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

Email: head@eees.pmu.edu

Web: www.pmu.edu

**TEXT BOOKS:**

1.	Mittle, V. N., 2007. Basic Electrical and Electronics Engineering. 1 <sup>st</sup> ed. New Delhi: Tata McGraw-Hill.
2.	Malvino, A. P., 2006. Electronics Principles. 7 <sup>th</sup> ed. New Delhi: Tata McGraw-Hill.
3.	Rajakamal, 2007. Digital System-Principle & Design. 2 <sup>nd</sup> 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 <sup>th</sup> ed. India: Penram International Publications.

**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 <sup>rd</sup> ed. New Delhi: McGraw-Hill.
4.	Millman, J. and Halkias, C. C., 2011. Integrated Electronics: Analog and Digital Circuits and Systems. 2 <sup>nd</sup> ed. New Delhi: McGraw-Hill.
5.	Mohammed Rafiquzzaman, 1992. Microprocessors - Theory and Applications: Intel and Motorola. Prentice Hall International.

**E-REFERENCES:**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

<b>CO4</b>										Under Sec. 3 of UGC Act, 1956) • NAAC Accredited	think • innovate • transform
<b>CO5</b>	<b>3</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>-</b>	<b>1</b>
<b>Total</b>	<b>15</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>5</b>				<b>3</b>		<b>5</b>
<b>Scaling</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>				<b>1</b>		<b>1</b>

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

**APPLIED PHYSICS**

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

<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XAP204</b>	<b>APPLIED PHYSICS</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A = 2.8:0.8:0.4</b>					

**DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING**

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



**PERIYAR MANIAMMAI UNIVERSITY**

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

3 | 2 | 2 | 7

<b>UNIT I MECHANICS AND PROPERTIES OF MATTER</b>	<b>9+6+12</b>
<p><b>Mechanics:</b> Force - Newton's laws of motion - work and energy - impulse and momentum - torque - law of conservation of energy and momentum - Friction.</p> <p><b>Elasticity:</b> 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. <b>Viscosity:</b> Coefficient of viscosity - Laminar flow - streamline flow - turbulent flow - Reynold's number - Poiseuille's method.</p>	
<b>UNIT II ACOUSTICS, ULTRASONICS AND SHOCK WAVES</b>	<b>9+6</b>
<p><b>Acoustics:</b> Classification of sound - Characteristics of musical sound - Loudness - Weber Fechner law - Decibel - Absorption coefficient - Reverberation - Reverberation time - Sabine's formula (growth and decay) - Factors affecting acoustics of buildings (reverberation time, loudness, focussing, echo, echelon effect - resonance and noise) and their remedies. <b>Ultrasonics:</b> Production: Magnetostriction and Piezoelectric methods - NDT: Ultrasonic flaw detector. <b>Shock waves:</b> Definition of Mach number - Description of a shock wave - Characteristics - Methods of creating shock waves.</p>	

<b>UNIT III OPTICS, LASERS AND FIBRE OPTICS</b>	<b>9+6+12</b>
<p><b>Optics:</b> Dispersion - Optical instrument: Spectrometer - Determination of refractive index and dispersive power of a prism - Interference of light in thin films: air wedge - Diffraction: grating. <b>LASER:</b> Introduction - Population inversion - Pumping - Laser action - Nd-YAG laser - CO<sub>2</sub> laser - Semiconductor Laser (homojunction) - Applications</p> <p><b>Fibre Optics:</b> Principle and propagation of light in optical fibre - Numerical aperture and acceptance angle - Types of optical fibre - Fibre optic communication system</p>	
<b>UNIT IV SOLID STATE PHYSICS</b>	<b>9+6+6</b>
<p><b>Crystal Physics:</b> Lattice - Unit cell - Lattice planes - Bravais lattice - Miller indices - Sketching a plane in a cubic lattice - Calculation of number of atoms per unit cell - Atomic radius - Coordination number - Packing density for SC, BCC, FCC and HCP structures.</p> <p><b>Semiconductors:</b> Semiconductor properties - Types of semiconductor - Intrinsic - Extrinsic: P-type and N-type semiconductor - PN junction diode - Biasing - Junction diode characteristics.</p>	
<b>UNIT V NOVEL ENGINEERING MATERIALS AND BIOMETRICS</b>	<b>9+6</b>
<p><b>Novel Engineering Materials:</b> Introduction - Metallic glasses: Melt spinning technique,</p>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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

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.

**E RESOURCES**

NPTEL , 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.  |

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
Under Sec. 8 of UGC Act 1956 - NAAC Accredited  
think • innovate • transform

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
<b>Total</b>	<b>15</b>	<b>6</b>	<b>9</b>	<b>6</b>	<b>4</b>				<b>3</b>			<b>5</b>
<b>Scaled to 0,1,2,3 scale</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>				<b>1</b>			<b>1</b>

1 - Low, 2 – Medium, 3 – High

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENGINEERING GRAPHICS**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

Subject Name	ENGINEERING GRAPHICS	L	T	P	C
Subject Code	XME205	2	1	0	3
Prerequisite	Nil	L	T	P	H
C:P:A	0.66 : 0.66 : 0.66	2	2	0	4

<b>UNIT I INTRODUCTION, FREE HAND SKETCHING OF ENGG OBJECTS AND CONSTRUCTION OF PLANE CURVE</b>	<b>6+6</b>
---	------------

Importance of graphics in engineering applications – use of drafting instruments – BIS specifications and conventions as per SP 46-2003.

Pictorial representation of engineering objects – representation of three dimensional objects in two dimensional media – need for multiple views – developing visualization skills through free hand sketching of three dimensional objects.

Polygons & curves used in engineering practice – methods of construction – construction of ellipse, parabola and hyperbola by eccentricity method – cycloidal and involute curves – construction – drawing of tangents to the above curves.

<b>UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES</b>	<b>6+6</b>
---	------------

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.

<b>UNIT III PROJECTION OF SOLIDS AND SECTIONS OF SOLIDS</b>	<b>6+6</b>
---	------------

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.

<b>UNIT IV DEVELOPMENT OF SURFACES AND INTERSECTION OF SOLIDS</b>	<b>6+6</b>
---	------------

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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

Email: head@ee@pmu.edu

Web: www.pmu.edu



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of UGC Act, 1956) - NAAC Accredited

curves of intersection –prism with cylinder, cylinder & cylinder, cone & cylinder with normal intersection of axes and with no offset.

<b>UNIT VISOMETRIC AND PERSPECTIVE PROJECTIONS</b>	<b>6+6</b>
--	------------

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones – principles of perspective projections – projection of prisms, pyramids and cylinders by visual ray and vanishing point methods.

<b>LECTURE: 30</b>	<b>TUTORIAL: 30</b>	<b>TOTAL :60</b>
--------------------	---------------------	------------------

**TEXT BOOKS**

1. Bhatt,N.D, “Engineering Drawing”, Charotar Publishing House, 46<sup>th</sup> Edition-2003.
2. Natarajan,K.V, “ A Textbook of Engineering Graphics”, Dhanalakshmi Publishers, Chennai, 2006 . Dr. P.K. Srividhya, P. Pandiyaraj, “Engineering Graphics”, PMU Publications, 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/>

**Mapping of CO’s with GA:**

	GA1	GA2	GA3	GA4	GA5	GA12
<b>CO1</b>	3	2	3	1	1	1
<b>CO2</b>	3	2	1	1	1	1
<b>CO3</b>	3	2	1	1	1	1
<b>CO4</b>	3	2	1	1	1	1

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

CO5	3	2	1	1	1	1
<b>Total</b>	15	10	7	5	5	5
<b>Scaled</b>	3	2	2	1	1	1

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

**SPEECH COMMUNICATION**

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

SEMESTER II				
COURSE CODE	SUBJECT NAME	Category		
		L	T	P

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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

Email: headeee@pnu.edu

Web: www.pnu.edu



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of UGC Act, 1956) - NAAC Accredited  
think • innovate • transform

<b>XGS206</b>	<b>SPEECH COMMUNICATION</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>Hour</b>
<b>1.8:0.8:0.4</b>		<b>2</b>	<b>0</b>	<b>1</b>	<b>3</b>

**SYLLABUS**

<b>UNIT</b>	<b>Content</b>	<b>Hours Allotted</b>
<b>I</b>	Introduction to public speaking; functions of oral communication; skills 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	<b>5</b>
<b>II</b>	Manuscript, impromptu, memorized and extemporaneous speeches; analyzing the audience and occasion; developing ideas; finding and using supporting materials.	<b>5</b>
<b>III</b>	Organization of Speech; introduction, development and conclusion; language used in various types of speeches; Adapting the speech structures to the Audience; paralinguistic features	<b>5</b>
<b>IV</b>	Basic tips; how to present a paper/assignment etc; using visual aids to the speeches; using body language to communicate.	<b>5</b>

<b>V</b>	Public speaking and speech anxiety, public speaking and critical listening Speech practice (4-6 speeches per student)	<b>25</b>						
	<table border="1"> <tr> <td><b>Lecture</b></td> <td><b>Practical</b></td> <td><b>Total</b></td> </tr> <tr> <td><b>20 Hours</b></td> <td><b>25 Hours</b></td> <td><b>45 Hours</b></td> </tr> </table>	<b>Lecture</b>	<b>Practical</b>	<b>Total</b>	<b>20 Hours</b>	<b>25 Hours</b>	<b>45 Hours</b>	
<b>Lecture</b>	<b>Practical</b>	<b>Total</b>						
<b>20 Hours</b>	<b>25 Hours</b>	<b>45 Hours</b>						

**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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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  
 0 – No relation 1- Low relation



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
 Accredited  
 think • innovate • transform

**TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>XMA 301</b>	<b>TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>	transform
<b>C:P:A = 3:0.25:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
		<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>	
<b>UNIT I PARTIAL DIFFERENTIAL EQUATIONS</b>						<b>15</b>
Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions – Solution of standard types of first order partial differential equations – Lagrange’s linear equation – Linear partial differential equations of second and higher order with constant coefficients.						
<b>UNIT II FOURIER SERIES</b>						<b>15</b>
Dirichlet’s conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series –Parseval’s identity – Harmonic Analysis.						

<b>UNIT III APPLICATIONS OF BOUNDARY VALUE PROBLEMS</b>						<b>15</b>
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 Cartesian coordinates.						
<b>UNIT IV FOURIER TRANSFORM</b>						<b>15</b>
Fourier integral theorem (without proof) – Fourier transform pairs – Fourier Sine and Cosine transforms – properties – Transforms of simple functions – Convolution theorem – Parseval’s identity.						
<b>UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS</b>						<b>15</b>
Z-transform – Elementary properties – Inverse Z – transform – Convolution theorem – Initial and Final value theorems - Formation of difference equations – Solution of difference equations using Z-transform.						
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>		
		<b>45</b>	<b>30</b>	<b>75</b>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

think • innovate • transform

**TEXT BOOKS**

1. Grewal, B.S., “Higher Engineering Mathematics”, 40<sup>th</sup> 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
3. Bali N.P. and Manish Goyal, “A Text Book of Engineering Mathematics” 7<sup>th</sup> Edition Lakshmi Publications (P) Limited, New Delhi, (2007)

**E REFERENCES**

[www.nptel.ac.in](http://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
<b>CO 1</b>	3									1		1
<b>CO 2</b>	3									1		1
<b>CO 3</b>	3	2								1	1	2
<b>CO 4</b>	3	2			1					1	1	1
<b>CO 5</b>	3	2			1					1	1	1
	15	6	0	0	2	0	0	0	0	5	3	6

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

1 – Low Relation, 2 – Medium Relation, 3 – High Relation • link • innovate • transform

**ELECTRIC CIRCUIT ANALYSIS**

<b>Course Outcomes(XEE302):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Able to <i>define</i> and <i>recall</i> the different fundamental electrical component, Laws and their applications.	Cognitive Cognitive	Remembering Remembering
<b>CO2</b>	<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
<b>CO3</b>	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
<b>CO4</b>	<i>Analyse</i> the transient response of a first and second order circuit consisting of RLC circuit. <i>Design</i> the sinusoidal steady state response of aDC and AC circuit consisting of RLC components.	Cognitive Cognitive	Analyzing Creating
<b>CO5</b>	<i>Create</i> and <i>Measure</i> different electrical parameters in a coupled single phase and three phase circuits.	Cognitive Cognitive	Creating Evaluating

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

SUB CODE	SUB NAME	(Under Sec. 19 of UGC Act 1956) - NAAC Accredited			
		L	T	P	H
<b>XEE 302</b>	<b>ELECTRIC CIRCUIT ANALYSIS</b>	<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>
<b>UNIT -I BASIC CIRCUIT CONCEPTS</b>					<b>9 +9</b>
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 Kirchoff's Laws - Analysis of series and parallel circuits - network reduction: voltage and current division, source transformation, star/delta transformation					
<b>UNIT -II</b>	<b>SINUSOIDAL STEADY STATE ANALYSIS</b>				<b>9 +9</b>
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.					
<b>UNIT- III</b>	<b>CIRCUIT ANALYSIS &amp; NETWORK THEOREMS</b>				<b>9 +6</b>
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					

<b>UNIT- IV</b>	<b>TRANSIENT RESPONSE AND ANALYSIS</b>				<b>9 +3</b>
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 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.					
<b>UNIT- V</b>	<b>COUPLED CIRCUITS, NETWORKS AND THREE PHASE CIRCUITS</b>				<b>9 +3</b>
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.					
<b>Lecture = 45; Tutorial = 30; Lab = 0; Total = 75 Hours</b>					
<b>TEXT BOOKS:</b>					
1.	William H.Hayt Jr, Jack E.Kemmerly, and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw-Hill Publishing Co Ltd, New Delhi, 2002				
2.	Joseph A.Edminister, Mahmood Nahvi, "Electric Circuits", Schaum's Series, Tata McGraw-Hill, New Delhi 2001.				
3.	B.R.Gupta and V.Singhal, "Fundamentals of Electric Networks", S.Chand & Co., New				

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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

	Delhi, 2006.
4.	A.Chakrabarti, “Circuit Theory (Analysis and Synthesis)”, Dhanapatrai Publications, 2010.
<b>REFERENCE BOOKS:</b>	
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 <sup>rd</sup> Edition, New Delhi, 2006.
4.	Bell D A, “Fundamentals of Electric Circuits”, Reston, USA
<b>E-REFERENCES:</b>	
1.	NPTEL : <a href="http://nptel.ac.in/courses/108102042/">http://nptel.ac.in/courses/108102042/</a>
2.	MOODLE : <a href="http://moodle.cecs.pdx.edu/course/view.php?id=16">http://moodle.cecs.pdx.edu/course/view.php?id=16</a>

**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
<b>Total</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>5</b>	<b>7</b>	<b>8</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

Email: headeee@pmu.edu			Web: www.pmu.edu									(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited							
												think • innovate • transform							
<b>Scaling</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>				

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

**ELECTRICAL MACHINES - I**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

SUB CODE	SUB NAME	think • innovate • transform			
		L	T	P	C
<b>XEE 304</b>	<b>ELECTRICAL MACHINES I</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:1:0</b>		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT- I BASIC CONCEPTS OF ROTATING MACHINES</b>					<b>8+2+0</b>
Principles of electromechanical energy conversion - Energy in Magnetic System Field energy co-energy - Single and multiple excited systems - M.M.F of distributed A.C. windings - Rotating magnetic field - Magnetic saturation and leakage flux - Generated voltage					
<b>UNIT- II</b>	<b>DC GENERATORS</b>	<b>10+8+12</b>			
Constructional details and components of D.C machine - Principles of Operation - Lap and Wave Winding - EMF equation - Methods of excitation - Self and separately excited generators - Armature reaction and commutation - Characteristics of series, shunt and compound generators - Parallel operation of DC shunt and compound generators.					
<b>UNIT-III</b>	<b>DC MOTORS</b>	<b>8+6+6</b>			
Principles of operation - Types of D.C motors - Back EMF-Torque equation - Characteristics of series, shunt and compound motors - Speed control of DC series and shunt motors - Starting of DC motors - Types of starters.					

<b>UNIT- IV</b>	<b>TRANSFORMERS</b>	<b>10 +8+6</b>			
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 windings - Equivalent circuit - Transformer on load - Regulation and Efficiency - Parallel operation of single phase transformers - Auto transformer - Three phase transformers.					
<b>UNIT-V</b>	<b>TESTING OF DC MACHINES AND TRANSFORMERS</b>	<b>9+6+ 6</b>			
Losses and efficiency in DC machines and transformers - Condition for maximum efficiency - Testing of DC machines - Brake test, Swinburne's test, Retardation test and Hopkinson's test - Testing of transformers - open circuit and short circuit tests - All day efficiency.					
<ol style="list-style-type: none"> <li>1. Study of D.C. Motor Starters.</li> <li>2. Open Circuit Characteristics (OCC) and load Characteristics of D.C self-excited generator.</li> <li>3. Load characteristics of D.C shunt generator</li> <li>4. Load characteristics of D.C. shunt motor.</li> <li>5. Load characteristics of D.C series motor.</li> <li>6. Speed control of D.C shunt motor.</li> <li>7. Load test on single-phase transformer.</li> <li>8. Open circuit and short circuit tests on single phase transformer.</li> </ol>					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

Email: headeee@pmu.edu

www.pmu.edu

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

(Under Sec. 4 of UGC Act 1956) NAAC Accredited  
think • innovate • transform

**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

**REFERENCE 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-REFERENCES:**

1.	NTPEL, Electrical Machines (Web Course), Prof. N. K. De, Prof. T. K. Bhattacharya and Prof. G. D. Roy, IIT Kharagpur.
2.	<a href="http://freevideolectures.com/Course/2335/Basic-Electrical-Technology/22-27">http://freevideolectures.com/Course/2335/Basic-Electrical-Technology/22-27</a> Prof.L.Umanand., IISc Bangalore.
3.	<a href="http://nptel.ac.in/Onlinecourses/Nagendra/">http://nptel.ac.in/Onlinecourses/Nagendra/</a> , Dr. Nagendra Krishnapura , IIT Madras.

**COs versus POs mapping**

CO/PO	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	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

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

<b>Total</b>	<b>15</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>5</b>								
<b>Scaling</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>				<b>1</b>			<b>1</b>	<b>1</b>

**MATERIAL SCIENCE**

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

**SUBCODE**

<b>MATERIAL SCIENCE</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
-------------------------	----------	----------	----------	----------

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

**XEM 305**

**C:P:A = 3:0:0**

3	0	0	3
L	T	P	H
3	0	0	3

<b>UNIT - I</b>	<b>Crystal Structure</b>	<b>9 Hrs</b>
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.		
<b>UNIT – II</b>	<b>Defects in Crystals</b>	<b>9 Hrs</b>
Point defects; Dislocations, Types of dislocations, Burgers vector and its representation; Planar defects, stacking faults, twins, grain boundaries.		
<b>UNIT - III</b>	<b>Ceramic, Electrical &amp; Electronic Materials</b>	<b>9 Hrs</b>
<b>Ceramic Materials:</b> Introduction, ceramic structures, silicate structures, processing of ceramics; Properties, glasses; Composite Materials- Introduction, classification, concrete, metal-matrix and ceramic –matrix composites. <b>Electrical &amp; Electronic Properties of Materials:</b> Electrical Conductivity, Electronic and Ionic Conductivity, Intrinsic and Extrinsic Semi conductivity, Semiconductor Devices, Dielectric Properties, Piezo-electricity.		
<b>UNIT – IV</b>	<b>Mechanical Properties of Materials</b>	<b>9 Hrs</b>
Concepts of stress and strain, Stress-Strain diagrams; Properties obtained from the Tensile test; Elastic deformation, Plastic deformation. Impact Properties, Strain rate effects and Impact behavior. Hardness of materials.		

<b>UNIT - V</b>	<b>Magnetic Materials and Nano Materials</b>	<b>9 Hrs</b>
<b>Magnetic Materials:</b> Introduction, Magnetic fields or quantities, types of magnetism, classification of magnetic materials, soft magnetic materials, H magnetic materials, Ferrites, Ferro, Para Magnetic materials. <b>Nano Materials:</b> Introduction – Nano material preparation, purification, sintering nano particles of Alumina and Zirconia, Silicon carbide, nanoop, nano-magnetic, nano-electronic, and other important nano materials.		
<b>TOTAL HOURS : 45 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	Askeland D.R.,& P. P. Fullay (2007), The Science and Engineering of Materials – 7 <sup>th</sup> Cengage Learning Publishers.	
2.	William D. Callister, Jr (2008), Callister’s Materials Science and Engineering, (Adopted by	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

R. Balasubramaniam) Wiley-Eastern

**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

**CO Vs GA Mapping**

	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		
<b>Total</b>	<b>15</b>	<b>6</b>		<b>3</b>			<b>3</b>			<b>3</b>		
<b>Scaled</b>	<b>3</b>	<b>2</b>		<b>1</b>			<b>1</b>			<b>1</b>		

**ENTREPRENEURSHIP DEVELOPMENT**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>COURSE CODE</b>	<b>COURSE NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEP 306</b>	<b>ENTREPRENEURSHIP DEVELOPMENT</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A = 3:0:1</b>					
		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT- IENTREPRENEURIAL TRAITS AND FUNCTIONS</b>					<b>9</b>
Definition of Entrepreneurship; competencies and traits of an entrepreneur; factors affecting Entrepreneurship Development; Role of Family and Society ; Achievement Motivation; Entrepreneurship as a career and national development;					
<b>UNIT -II NEW PRODUCT DEVELOPMENT AND VENTURE CREATION</b>					<b>9</b>
Ideation to Concept development; Sources and Criteria for Selection of Product; market assessment ; Feasibility Report ;Project Profile; processes involved in starting a new venture; legal formalities; Ownership; Case Study.					
<b>UNIT –III ENTREPRENEURIAL FINANCE</b>					<b>9</b>
Financial forecasting for a new venture; Finance mobilization; Business plan preparation; Sources of Financing, Angel Investors and Venture Capital; Government support in startup promotion.					
<b>UNIT –IV LAUNCHING OF SMALL BUSINESS AND ITS MANGEMENT</b>					<b>9</b>
Operations Planning - Market and Channel Selection - Growth Strategies - Product Launching – Incubation, Monitoring and Evaluation of Business - Preventing Sickness and Rehabilitation of Business Units.					

<b>UNIT –V TECHNOLOGY MANAGEMENT, IPR PORTFOLIO FOR NEW 9 PRODUCT VENTURE</b>			
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.			
	<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
	<b>45</b>	<b>0</b>	<b>45</b>
<b>TEXT BOOKS</b>			
1. Hisrich, 2016, Entrepreneurship, Tata McGraw Hill, New Delhi. 2.S.S.Khanka, 2013, Entrepreneurial Development, S.Chand and Company Limited, New Delhi.			
<b>REFERENCE BOOKS</b>			
1. Mathew Manimala, 2005, Entrepreneurship Theory at the Crossroads, Paradigms & Praxis,			

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited

think • innovate • transform

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 of India, Ahmedabad. Available from: <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**

Course 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>Make use</i> to use effective and appropriate language at various interpersonal situations to avoid conflict.	Cognitive	Applying

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

			<b>INTERPERSONAL COMMUNICATION</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>			
<b>C</b>	<b>P</b>	<b>A</b>								<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>1</b>	<b>1</b>	<b>0</b>								<b>1</b>	<b>0</b>	<b>2</b>	<b>3</b>
											<b>Hours</b>		
<b>UNIT - I</b>	Universals of interpersonal communications; Axioms of interpersonal Communication; culture in interpersonal communication and the self in interpersonal communication								<b>9</b>				
<b>UNIT - II</b>	Apprehension and assertiveness; aggressiveness and assertiveness; perception in interpersonal communication; listening in interpersonal communication.								<b>9</b>				
<b>UNIT -III</b>	Verbal and non verbal messages; relationship and involvement; relationship maintenance and repair.								<b>9</b>				
<b>UNIT -IV</b>	Power in interpersonal relationship; conflict in interpersonal relationship; friends and relatives; primary and family relationships.								<b>9</b>				
<b>UNIT -V</b>	Socialization, need for socialization and benefits of socialization among students.								<b>9</b>				
			<b>LECTURE</b>		<b>Interactive Session (IS)</b>		<b>TOTAL</b>						
			<b>30</b>		<b>15</b>		<b>45</b>						

**TEXT BOOKS**

1. *DeVito, Joseph*, The *Interpersonal Communication* Book, 13th Edition - , Published by *Longman* Pub Group, Updated in its *13<sup>th</sup> 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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**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
<b>Total</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>3</b>	<b>4</b>	<b>4</b>	<b>5</b>
<b>Scaled</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>

**OPERATIONS RESEARCH**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

Enroll: head@eees.pmu.edu

Web: www.pmu.edu

<b>CO5</b>	<i>Apply</i> the concepts of Game theory to <i>Compute</i> solution and saddle point.	<b>Cognitive</b>	<b>Applying</b>
------------	---	------------------	-----------------

SUBCODE	SUB NAME	L	T	P	C
<b>XOR 401</b>	<b>OPERATIONS RESEARCH</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A = 3:0.25:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I LINEAR MODELS</b>					<b>9</b>
Basics of OR, Linear programming problems (L.P.P), Mathematical Formulation of L.P.P, Graphical method, Simplex algorithm, Duality.					
<b>UNIT II TRANSPORTATION MODELS</b>					<b>9</b>
Transportation problem, Assignment problem, Travelling Salesman problem.					
<b>UNIT III PROJECT SCHEDULING BY PERT-CPM</b>					<b>9</b>
PERT-CPM, product planning control with PERT-CPM.					
<b>UNIT IV NETWORK MODELS</b>					<b>9</b>
Network definition, Minimal Spanning Tree Problem, Shortest Route Problem, Maximal Flow Problem, Minimal Cost Capacitated Flow Problem.					
<b>UNIT V GAME THEORY</b>					<b>9</b>
Introduction - competitive game - finite and infinite game - two person zero sum game - rectangular game - solution of game- saddle point, solution of a rectangular game with saddle point.					
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
		<b>45</b>	<b>0</b>	<b>45</b>	

**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).

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

3. Gupta R. K. “Linear Programming”, Krishna Prakashan Media (P) Ltd. ,(2009).

**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.

**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

**TRANSMISSION AND DISTRIBUTION OF ELECTRIC POWER**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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

Email: head@eeel.pmu.edu

Web: www.pmu.edu



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of U.C. Act, 1956) • NAAC Accredited  
think • innovate • transform

the different protection and grounding schemes.

SUBCODE	SUB NAME	L	T	P	C	
<b>XEE 402</b>	<b>TRANSMISSION &amp; DISTRIBUTION OF ELECTRIC POWER</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
<b>UNIT I</b>	<b>INTRODUCTION</b>					<b>09</b>
Structure of electric power system: Various levels such as generation, transmission and distribution; HVDC and EHV AC transmission: comparison of economics of transmission, technical performance and reliability, application of HVDC transmission system – Basic Concepts of FACTS Controllers-power system planning.						
<b>UNIT II</b>	<b>TRANSMISSION LINE PARAMETERS</b>					<b>09</b>
Parameters of single and three phase transmission lines with single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors: Symmetrical and unsymmetrical spacing and transposition; application of self and mutual GMD; skin and proximity effects; interference with neighbouring communication circuits.						
<b>UNIT III</b>	<b>MODELLING AND PERFORMANCE OF TRANSMISSION LINE</b>					<b>09</b>
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 based on thermal loading, angle and voltage stability considerations; shunt and series compensation; Ferranti effect and corona loss.						

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

Accredited  
nsform

grounding grids; design principles of substation grounding system; neutral grounding. Radial and ring-main distributors

	LECTURE	TUTORIAL	TOTAL
	45	0	45

**TEXT BOOKS**

1. C. L. Wadhwa, ‘Electrical Power Systems’ (Hardcover) New Age Publications, 2005.
2. B.R.Gupta, ‘Power System Analysis and Design’, S.Chand, New Delhi, 2003.
3. S.N. Singh, ‘Electric Power Generation, Transmission and Distribution’, Prentice Hall India Pvt. Ltd, 2002.

**REFERENCE BOOKS**

1. Luces M.Fualkenberry ,Walter Coffer, ‘Electrical Power Distribution andTransmission’, Pearson Education, 1996.
2. Hadisaddak, ‘Power System Analysis,’ Tata McGraw Hill Publishing Company’,2003
3. Central Electricity Authority (CEA), ‘Guidelines for Transmission System Planning’, New Delhi
4. Tamil Nadu Electricity Board Handbook’, 2012.

**E REFERENCES:**

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

**COs versus POs mapping**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

<small>Email: headeee@pmu.edu</small>														
<b>CO 4</b>	1	2						1						
<b>CO 5</b>		2												
<b>Total</b>	4	10	1	1	1	1	3	1	1	2	1	5	11	13
<b>Scaling</b>	1	2	1	1	1	1	1	1	1	1	1	1	3	3

**ELECTRONIC DEVICES AND CIRCUITS**

<b>Course Outcomes(XEE403):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<i>Classify</i> and <i>explain</i> semiconductor devices and <i>show</i> the input output characteristics of basic semiconductor devices.	Cognitive	Understanding Understanding
<b>CO2</b>	<i>Explain</i> the construction, working and their characteristics of different types of transistors.	Cognitive	Understanding
<b>CO3</b>	<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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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

Email: head@eees.pmu.edu

Web: www.pmu.edu



**PERIYAR  
MANIAMMAI  
UNIVERSITY**

(Under Sec. 3 of U.C. Act 1956) • NAAC Accredited

<b>CO4</b>	<i>Classify</i> the different types of amplifiers and <i>show</i> the design procedure of amplifiers.	Cognitive think • innovate • transform Psychomotor	Understanding Set
<b>CO5</b>	<i>Explain</i> the feedback amplifiers and oscillators.	Cognitive	Understanding

SUB CODE	SUB NAME	L	T	P	C
<b>XEE403</b>	<b>ELECTRONIC DEVICES AND CIRCUITS</b>	<b>3</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:1:0</b>		<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>
<b>UNIT- II</b>	<b>PN JUNCTION DEVICES</b>				<b>10 + 20</b>
PN junction diode –structure, operation and V-I characteristics, diffusion and transient capacitance - Rectifiers – Half Wave and Full Wave Rectifier,– Display devices- LED, Laser diodes- Zener diode characteristics-Zener Reverse characteristics – Zener as regulator					
<b>UNIT- II</b>	<b>TRANSISTORS</b>				<b>8 + 9</b>
BJT, JFET, MOSFET- structure, operation, characteristics and Biasing UJT, Thyristor and IGBT - Structure and characteristics.					
<b>UNIT- III</b>	<b>AMPLIFIERS</b>				<b>9 + 5</b>
BJT small signal model – Analysis of CE, CB, CC amplifiers- Gain and frequency response –MOSFET small signal model– Analysis of CS and Source follower – Gain and frequency response- High frequency analysis.					
<b>UNIT- IV</b>	<b>MULTISTAGE AMPLIFIERS AND DIFFERENTIAL AMPLIFIER</b>				<b>9 + 5</b>
BIMOS cascade amplifier, Differential amplifier – Common mode and Difference mode analysis – FET input stages – Single tuned amplifiers – Gain and frequency response – Neutralization methods, power amplifiers –Types (Qualitative analysis).					
<b>UNIT- V</b>	<b>FEEDBACK AMPLIFIERS AND OSCILLATORS</b>				<b>9 + 3</b>
Advantages of negative feedback – voltage / current, series , Shunt feedback –positive feedback – Condition for oscillations, phase shift – Wien bridge, Hartley, Colpitts and Crystal oscillators.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
 (Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
 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 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’, Prentice Hall of India Private Limited, New Delhi, 2003.
3.	Principle of Electronics by V.K. Mehta , S.Chand
4.	Theodore. F. Boghert, ‘Electronic Devices & Circuits’, Pearson Education, VI Edition, 2003.
5.	Sedra and Smith, “ Microelectronic circuits”, Prentice Hall of India, 2004.

**REFERENCE BOOKS:**

1.	Floyd, “Electronic Devices” Pearson Asia 5 <sup>th</sup> edition 2001.
2.	Ben G. Streetman and Sanjay Banerjee, ‘Solid State Electronic Devices’, Pearson Education, 2002 / PHI
3.	Allen Mottershead, ‘Electronic Devices and Circuits – An Introduction’, Prentice Hall of India Private Limited, New Delhi, 2003.
4.	Electronicmited. Devices and Circuits by Salivahanan – Tata McGraw – Hill Education private
5.	Rashid, “Microelectronic circuits” Thomson Publication, 2000.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**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
<b>CO 1</b>	3	2	2	-	-	1	1	1	1	-	-	1	2	1
<b>CO 2</b>	2	3	3	-	-	1	0	1	-	-	-	2	2	1
<b>CO 3</b>	1	3	2	-	-	2	1	2	-	1	-	2	1	2
<b>CO 4</b>	2	2	2	-	-	1	2	1	1	-	1	1	1	2
<b>CO 5</b>	2	2	2	-	-	0	1	2	1	1	1	2	2	1
<b>Total</b>	10	12	11	-	-	5	5	7	3	2	2	8	8	7
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRICAL MACHINES II**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEE404</b>	<b>ELECTRICAL MACHINES II</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT- 1</b>	<b>SYNCHRONOUS GENERATOR</b>				<b>10+12+12</b>
Constructional details – Types of rotors – Winding Factors– EMF equation – Synchronous reactance – Armature reaction – Voltage regulation – E.M.F, M.M.F and Z.P.F methods – Synchronizing and parallel operation – Synchronizing torque.					
<b>UNIT- II</b>	<b>SYNCHRONOUS MOTOR</b>				<b>9+2+2</b>
Principle of operation – Torque equation – Operation on infinite bus bars - V-curves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed – Handing and Damper Winding.					
<b>UNIT-III</b>	<b>THREE PHASE INDUCTION MOTOR (IM)</b>				<b>10+8+8</b>
Constructional details – Types of rotors – Principle of operation – Slip – Cogging and Crawling - Equivalent circuit – Slip-torque characteristics - Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Double cage rotors.					
<b>UNIT- IV</b>	<b>STARTING AND SPEED CONTROL OF THREE PHASE IM</b>				<b>7+2+2</b>
Need for starting – Types of starters – DOL Stator resistance, rotor resistance, autotransformer and star-delta starters – Speed control – Change of voltage, frequency, number of poles and slip – V/F Control .					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT- V</b>	<b>SINGLE PHASE IM AND SPECIAL MACHINES</b>	<b>9+6+6</b>
<p>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.</p>		
<ol style="list-style-type: none"> <li>1. OCC and Load Characteristics of three-phase alternator.</li> <li>2. Regulation of three phase alternator by EMF /MMF methods.</li> <li>3. Load test of a three phase alternator</li> <li>4. V and Inverted V curves of Three Phase Synchronous Motor.</li> <li>5. Load test on three-phase Squirrel Cage Induction motor.</li> <li>6. Load test on Three-Phase Slip Ring Induction motor.</li> <li>7. No load and blocked rotor test on three-phase induction motor.</li> <li>8. Load test on single-phase induction motor</li> <li>9. No load and blocked rotor test on single-phase induction motor.</li> <li>10. Study of Induction motor starters</li> </ol>		
<p><b>Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours</b></p>		
<b>TEXT BOOKS:</b>		
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	
<b>REFERENCE BOOKS:</b>		
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.	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**E-REFERENCES:**

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

**COs versus POs mapping**

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	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
<b>Total</b>	<b>15</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>5</b>				<b>3</b>			<b>5</b>		<b>5</b>
<b>Scaling</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>				<b>1</b>			<b>1</b>		<b>1</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTROMAGNETIC FIELD THEORY**

<b>COURSE CODE</b> <b>XEE 405</b>			<b>ELECTROMAGNETIC FIELD THEORY</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
							<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>

**PREREQUISITE:**

**COURSE OUTCOMES:**

<b>Course Outcomes</b>	<b>Domain</b>	<b>Level</b>
<i>After the completion of the course, students will be able to</i>		
CO1 : <b>List and classify</b> the spatial variations of physical quantities by various coordinate systems using stokes and divergence theorem.	Cognitive	Remembering Understanding
CO2 : <b>Define</b> the knowledge of electrostatics using gauss and Coulombs law and their applications and <b>Explain</b> boundary conditions, poissons, laplace equation.	Cognitive	Remembering Understanding
CO3 : <b>Recall and outline</b> the magnetic field configuration using amperes Law, biot-savarts law, Lorentz law and boundary conditions.	Cognitive	Remembering Understanding
CO4 : <b>State and Explain</b> electromagnetic fields generated by dynamic charge distributions using Maxwell’s equation and faradays law	Cognitive	Remembering Understanding
CO5 : <b>Define</b> and <b>outline</b> Electromagnetic wave propagation in different media.	Cognitive	Remembering Understanding

**UNIT I INTRODUCTION 9 + 6**

Sources and effects of electromagnetic fields - Vector fields - Different co-ordinate systems (brief description only) - Divergence theorem - Stoke’s theorem.

**UNIT -II ELECTROSTATICS 9 + 6**

Coulomb’s Law – Electric field intensity - Field due to point and continuous charges - Gauss’s law and application - Electrical potential - Electric field and equipotential plots - Electric field in free space, conductors, dielectric - Dielectric polarization, Electric field in multiple dielectrics - boundary conditions, Poisson’s and Laplace’s equation, Capacitance-energy density – Dielectric strength

**UNIT –III MAGNETOSTATICS 9 + 6**

Lorentz Law of force, magnetic field intensity-permeability - Biot–savart’s Law - Ampere’s Law - Magnetic field due to straight conductors, solenoid - Magnetic flux density (B) - B in free space, conductor, Magnetic materials - Magnetization - Boundary conditions - Scalar and vector potential - Magnetic force - Torque - Inductance - Energy density - Magnetic circuits-permanent magnets..

**UNIT –IV ELECTRODYNAMICS FIELD 9 + 6**

Faraday’s law of induced emf, -Transformer and motional EMF, Maxwell’s equations (differential and integral forms) - Conduction current, Displacement current - Relation between field theory and circuit theory.

**UNIT –V ELECTROMAGNETIC WAVES 9 + 6**

Generation – Electro Magnetic Wave equations –Wave parameters; velocity, intrinsic impedance,

propagation constant – Waves in free space, loss and lossless dielectrics, conductors-skin depth, Poynting vector – Plane wave reflection and refraction.

LECTURE	TUTORIAL	PRACTICAL	TOTAL
45	30	0	75

#### TEXT BOOKS

1. John.D.Kraus, 'Electromagnetics', McGraw Hill book Co., New York, Fourth Edition 2002.
2. William. H.Hayt, 'Engineering Electromagnetics', Tata McGraw Hill edition, 2001.
3. Joseph. A.Edminister, 'Theory and Problems of Electromagnetics', Second edition, Schaum Series, Tata McGraw Hill, 1993.

#### REFERENCE BOOKS

1. D.Sathaiah-M.Anitha, 'Electro magnetic fields' First edition-2007, SCITECH publications (India) Pvt Ltd., Chennai
2. I.J. Nagrath, D.P. Kothari, 'Electric Machines', Tata McGraw Hill Publishing Co Ltd, Second Edition, 2000
3. Kraus and Fleish, 'Electromagnetics with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
4. Sadiku, 'Elements of Electromagnetics', Second edition, Oxford University Press, 2001.5.

#### WEB SITES AND WEB RESOURCES:

1. NPTEL - Electromagnetic Fields, Prof. Harishankar Ramachandran , IIT Madras
2. NPTEL - Electromagnetic Fields, Prof. Prof. Ravindra Arora , IIT Kanpur.

#### 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
<b>Total</b>	<b>10</b>	<b>13</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>4</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>3</b>	<b>4</b>	<b>7</b>
<b>Scaling</b>	<b>2</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>2</b>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ECONOMICS FOR ENGINEERS**

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

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XUM 406</b>	<b>ECONOMICS FOR ENGINEERS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A = 3:0:0</b>					
		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I INTRODUCTION TO ECONOMICS</b>					<b>08</b>
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					
<b>UNIT II BREAK-EVEN ANALYSIS &amp; SOCIAL COST BENEFIT ANALYSIS</b>					<b>12</b>
Margin of Safety, Profit, Cost & Quantity analysis-Product Mix decisions and CVP analysis, Profit/Volume Ratio (P/V Ratio), Application of Marginal costing, Limitations <b>Social Cost Benefit Analysis:</b> compare different project alternatives, Calculate direct, indirect and external effects; Monetizing effects; Result of a social cost benefit analysis.					
<b>UNIT III VALUE ENGINEERING &amp; COST ACCOUNTING:</b>					<b>10</b>
Value engineering – Function, aims, Value engineering procedure - Make or buy decision Business operating costs, Business overhead costs, Equipment operating costs					
<b>UNIT IV REPLACEMENT ANALYSIS</b>					<b>07</b>
Replacement analysis –Types of replacement problem, determination of economic life of an asset, Replacement of an asset with a new asset.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT VDEPRECIATION</b>	<b>08</b>
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.	
<b>LECTURE</b>	<b>TUTORIAL</b>
<b>45</b>	<b>0</b>
<b>TOTAL</b>	<b>45</b>

<b>TEXT BOOKS</b>
<ol style="list-style-type: none"> <li>1. Sp Gupta, Ajay Sharma &amp; Satish Ahuja, “Cost Accounting”, V K Global Publications, Faridabad, Haryana, 2012</li> <li>2. S.P.Jain &amp; Narang, “Cost accounting – Principles and Practice”, Kalyani Publishers, Calcutta, 2012</li> <li>3. Panneer Selvam, R, “Engineering Economics”, Prentice Hall of India Ltd, New Delhi, 2001.</li> <li>4. William G.Sullivan, James A.Bontadelli &amp; Elin M.Wicks, “Engineering Economy”, Prentice Hall International, New York, 2001.</li> </ol>
<b>REFERENCE BOOKS</b>
<ol style="list-style-type: none"> <li>1. Luke M Froeb / Brian T Mccann, “ Managerial Economics – A problem solving approach” Thomson learning 2007</li> <li>2. Truett &amp; Truett, “Managerial economics- Analysis, problems &amp; cases “ Wiley India 8th edition 2004.</li> <li>3. Chan S.Park, “Contemporary Engineering Economics”, Prentice Hall of India, 2002.</li> <li>4. Donald.G. Newman, Jerome.P.Lavelle, “Engineering Economics and analysis” Engg. Press, Texas, 2002</li> </ol>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**NUMERICAL METHODS**

Course 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 and to <i>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

SUBCODE			SUB NAME			
<b>XMA 501</b>			<b>NUMERICAL METHODS</b>			
<b>C</b>	<b>P</b>	<b>A</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>3</b>	<b>2.5</b>	<b>0</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>			<b>SOLUTION OF EQUATIONS AND EIGEN VALUE PROBLEMS</b>			
			<b>12</b>			
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.						
<b>UNIT II</b>			<b>INTERPOLATION AND APPROXIMATION</b>			
			<b>12</b>			
Interpolation with equal intervals - Newton’s forward and backward difference formulae- Interpolation with unequal intervals - Lagrange interpolation – Newton’s divided difference interpolation						
<b>UNIT III</b>			<b>NUMERICAL DIFFERENTIATION AND INTEGRATION</b>			
			<b>12</b>			
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 and Simpson’s rules.						

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS</b>	<b>12</b>
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.		
<b>UNIT V</b>	<b>BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS</b>	<b>12</b>
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.		
<b>Lecture = 30; Tutorial = 30; Total = 60 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Grewal, B.S. and Grewal, J.S., “ Numerical methods in Engineering and Science”, 6<sup>th</sup> Edition, Khanna Publishers, New Delhi, (2004).</li> <li>2. Sankara Rao, K. “Numerical methods for Scientists and Engineers’, 3rd Edition, Prentice Hall of India Private Ltd., New Delhi, (2007).</li> </ol>		
<b>REFERENCES BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Chapra, S. C and Canale, R. P. “Numerical Methods for Engineers”, 5th Edition, Tata McGraw-Hill, New Delhi, (2007).</li> <li>2. Gerald, C. F. and Wheatley, P. O., “Applied Numerical Analysis”, 6th Edition, Pearson Education Asia, New Delhi, (2006).</li> <li>3. Brian Bradie, “A friendly introduction to Numerical analysis”, Pearson Education Asia, New Delhi, (2007)</li> <li>4. Jain M.K. , Iyengar S.R.K, Jain R.K, “Numerical Methods problems and solutions”, Revised Second Edition (2007).</li> </ol>		
<b>E REFERENCES</b>		
<p>www.nptel.ac.in</p> <ol style="list-style-type: none"> <li>1. Elementary Numerical Analysis Prof. Rekha P. Kulkarni. Department of Mathematics, Indian Institute Of Technology, Bombay.</li> </ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**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
<b>CO 1</b>	3									1		1
<b>CO 2</b>	3									1		1
<b>CO 3</b>	3									1		1
<b>CO 4</b>	3	2			1					1	1	1
<b>CO 5</b>	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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POWER SYSTEM ANALYSIS**

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

SUB.CODE			SUB NAME	L	T	P	C
XEE502			POWER SYSTEM ANALYSIS	2	1	0	3
C	P	A		L	T	P	H
3	1	0		2	2	0	4
UNIT I			INTRODUCTION				06+06
Need for system analysis in planning and operation of modern power system – per phase analysis - Single line diagram - Per unit representation and Per unit calculations – Change of base – Introduction to Electricity Deregulation.							
UNIT II			MODELLING OF POWER SYSTEM COMPONENTS				06+06
Primitive network and its matrices – bus incidence matrix – bus admittance and bus impedance matrix formation – Z – Bus building algorithm - Modelling of generator, load, transformer, transmission line for different power system studies.							
UNIT III			FAULT ANALYSIS-UNSYMMETRICAL FAULTS				06+06
Need for short circuit study - basic assumptions in fault analysis of power systems. Symmetrical (or) balanced three phase faults – problem formulation – fault analysis using Z-bus matrix – algorithm and flow chart. Computations of short circuit capacity, post fault voltage and currents. Introduction to symmetrical components – sequence impedances – sequence networks Unsymmetrical fault analysis: L-G, L-L and L-L-G faults.							
UNIT IV			POWER FLOW ANALYSIS				06+06
Need for Power Flow Analysis – bus classification – derivation of power flow equation – solution by Gauss–Seidel, Newton–Raphson and Fast Decoupled Power Flow methods – comparison of three methods.							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>STABILITY ANALYSIS</b>	<b>06+06</b>
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.		
<b>Lecture = 30; Tutorial = 30; Total = 60 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>Hadi Sadaat, “Power System Analysis”, Tata McGraw Hill Publishing Company, 2002.</li> <li>Nagarath, I.J., and Kothari, D.P., ‘Modern Power System Analysis’, Tata McGraw Hill Publishing Company, 2009.</li> <li>John J. Grainger and Stevenson Jr. W.D., “Power System Analysis”, McGraw Hill International Edition, 1994.</li> <li>Pai. M.A “Computer techniques in Power System Analysis” Tata McGraw Hill Publishing Company, 3<sup>rd</sup> edition 2014.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>Stagg, G.W. and El-Abaid, A. H. “Computer Methods in Power System Analysis”, McGraw-Hill International Book Company, 2000.</li> <li>Wadhwa C.L. “Electric Power Systems” Willey Eastern, 2007.</li> </ol>		
<b>E-REFERENCES</b>		
<ol style="list-style-type: none"> <li><a href="http://nptel.ac.in/courses/108105067/">http://nptel.ac.in/courses/108105067/</a> Prof. A. K. Sinha, IITechnology, Kharagpur.</li> <li><a href="http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/ui/TOC.htm">http://nptel.ac.in/courses/Webcourse-contents/IIT-KANPUR/power-system/ui/TOC.htm</a> Prof. Arindam Ghosh, IIT Kanpur</li> </ol>		

**COs versus POs mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POWER ELECTRONICS**

Course Outcomes (XEE 503)		Domain	Level
CO1	<i>Explain</i> about various power semiconductor devices and its modeling. <i>Demonstrate</i> the characteristics of power devices.	Cognitive	Understanding
CO2	<i>Compare</i> 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	<i>Compare</i> the 1 $\phi$ , 3 $\phi$ cyclo-converter with its various types.	Cognitive	Understanding

Sub.code			Sub. Name	L	T	P	C
XEE503				3	0	1	4
C	P	A	POWER ELECTRONICS	L	T	P	H
3	1	0		3	2	2	7
<b>UNIT I POWER SEMI-CONDUCTOR DEVICES</b>						<b>09+06+09</b>	
Review on Semiconductor devices - characteristics and modeling of power diodes, SCR, TRIAC, power BJT, power MOSFET and IGBT. Triggering and Commutation Circuits.							
<b>UNIT II PHASE CONTROLLED CONVERTERS</b>						<b>09+06+03</b>	
2 pulse, 3 phase converters- effect of freewheeling diode, performance parameters and effect of source inductance - firing circuits, Dual converters.							
<b>UNIT III DC TO DC CHOPPERS</b>						<b>09+06+06</b>	
Types of Choppers, Class A to E, step up chopper - Analysis of Voltage, Current and load-commutated choppers –Introduction to Resonant converters.							
<b>UNIT IV INVERTERS</b>						<b>09+06+06</b>	
Single phase, Three Phase voltage source inverters (Both 120° and 180° mode of conduction) - PWM techniques: Sinusoidal PWM, Multiple PWM, space vector PWM - Current source inverters - Concepts of UPS.							
<b>UNIT V AC VOLTAGE CONTROLLERS</b>						<b>09+06+06</b>	
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-converters- Introduction to matrix converters.							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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.  $1\Phi$  fully Controlled rectifier with R, RL load.
5. BUCK- BOOST Converter using MOSFET.
6. IGBT based choppers.
7.  $1\Phi$  IGBT PWM inverter.
8. Parallel Inverter.
9.  $1\Phi$  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. Bimbhra P.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](http://www.nptel.ac.in/courses/108105066/PDF/L-1(SSG)(PE)%20((EE)NPTEL).pdf)

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus PO, PSO mapping**

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

**0 –No relation  
relation**

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



**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**CONTROL SYSTEMS ENGINEERING**

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

SUB CODE			SUB NAME				L	T	P	C
<b>XEE 504</b>			<b>CONTROL SYSTEMS ENGINEERING</b>				<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>1</b>	<b>0</b>					<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT I SYSTEMS AND THEIR REPRESENTATION</b>								<b>10 + 09 + 20</b>		
Basic elements in control systems – Open and closed loop systems – Principles of feedback, Transfer function Block diagram reduction techniques – Signal flow graphs. Mason gain formula, Modeling of electric systems translation and rotational mechanical systems.										
<b>UNIT II TIME RESPONSE</b>								<b>08 + 09</b>		
Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error										
<b>UNIT III FREQUENCY RESPONSE</b>								<b>09 + 03 + 05</b>		
Frequency domain specification – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications series, parallel, series-parallel compensators, Lead, Lag and Lead Lag Compensators.										
<b>UNIT IV STABILITY OF CONTROL SYSTEM</b>								<b>09 + 06 + 05</b>		
Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V STATE VARIABLE ANALYSIS &amp; DIGITAL CONTROL SYSTEMS</b>	<b>09 + 03</b>
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	
<ol style="list-style-type: none"> <li>1. Transfer function and modeling of separately excited DC Generator.</li> <li>2. Transfer function and modeling of Armature &amp; field controlled DC Motor.</li> <li>3. Transfer function of AC Servomotor.</li> <li>4. Frequency response of Lag, Lead &amp; Lag – Lead networks.</li> <li>5. Analysis of Synchro Transmitter and Receiver.</li> <li>6. Performance of DC Stepper Motor</li> <li>7. Transfer function and modeling of Ward – Leonard speed control system applied to DC motor.</li> <li>8. DC Position using feedback Control system.</li> <li>9. Digital simulation of I order and II order system by using Scilab.</li> <li>10. Determination of Phase margin and Gain margin of the Bode plot using Scilab.</li> </ol>	
<b>Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours</b>	
<b>TEXT BOOKS:</b>	
<ol style="list-style-type: none"> <li>1. I.J. Nagrath &amp; M. Gopal, ‘Control Systems Engineering’, New Age International Publishers, 2003</li> <li>2. Norman S. Nise, "Control System Engineering" fifth edition, John Wiley &amp; Sons, inc, 2007.</li> <li>3. M. Gopal, ‘Control Systems, Principles &amp; Design’, Tata McGraw Hill, New Delhi, 2002.</li> <li>4. Richard C. Dorf &amp; Robert H. Bishop, “ Modern Control Systems”, Addison – Wesley, 2012.</li> </ol>	
<b>REFERENCE BOOKS:</b>	
<ol style="list-style-type: none"> <li>1. B.C. Kuo, ‘Automatic Control Systems’, Prentice Hall of India Ltd., New Delhi, 2014.</li> <li>2. K. Ogata, ‘Modern Control Engineering’, 4<sup>th</sup> edition, Pearson Education, New Delhi, 2003 / PHI.</li> <li>3. N. Bandyopadhyay, ‘Control Engineering Theory and Practice’, Prentice Hall of India, 2009</li> <li>4. John J.D’azzo &amp; Constantine H.Houpis, ‘Linear control system analysis and design’, Tata McGraw-Hill, Inc., 2013.</li> </ol>	
<b>E-REFERENCES:</b>	
<ol style="list-style-type: none"> <li>1. NTPPEL, Control systems Engineering (Web Course), Prof. M. Gopal, IIT Kharagpur.</li> </ol>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**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
<b>CO1</b>	2	3	2	1	-	-	1	1	1	-	-	1	-	-
<b>CO2</b>	2	3	1		2	1	1	1	1	1	-	2	2	1
<b>CO3</b>	3	3	3	2	-	-	1	-	3	-	-	-	2	2
<b>CO4</b>	1	2	2	3	1	2	1	1	2	1	1	2	1	2
<b>CO5</b>	2	1	1	1	1	1	1	1	2	1	-	1	2	1
<b>Total</b>	10	13	9	7	4	4	5	4	9	3	1	6	7	6
<b>Scaling</b>	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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**TOTAL QUALITY MANAGEMENT**

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

SUB. CODE			SUB. NAME				L	T	P	C
XUM506			TOTAL QUALITY MANAGEMENT				3	0	0	3
C	P	A					L	T	P	H
3	0	0					3	0	0	3

**UNIT I INTRODUCTION**

**09**

Definition of quality – Dimensions of quality – Quality planning – Quality costs – Analysis techniques for quality costs – Basic concepts of Total Quality Management – Historical review – Principles of TQM – Leadership – Concepts – Role of senior management – Quality Council – Quality statements – Strategic planning – Deming philosophy – Barriers to TQM implementation

**UNIT II TQM PRINCIPLES**

**09**

Customer satisfaction – Customer perception of quality – Customer complaints – Service quality – Customer retention – Employee involvement – Motivation, empowerment, teams, recognition and reward – Performance appraisal – Benefits – Continuous process improvement – Juran trilogy – PDCA cycle – 5S – Kaizen – Supplier partnership – Partnering – Sourcing – Supplier selection – Supplier rating – Relationship development – Performance measures – Basic concepts – Strategy – Performance measure.

**UNIT III STATISTICAL PROCESS CONTROL (SPC)**

**09**

The seven tools of quality – Statistical fundamentals – Measures of central tendency and dispersion – Population and sample – Normal curve – Control charts for variables and attributes – Process capability – Concept of six sigma – New seven management tools.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV   TQM TOOLS</b>	<b>09</b>
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.	
<b>UNIT V   QUALITY SYSTEMS</b>	<b>09</b>
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.	
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>	
<b>TEXT BOOKS</b>	
<ol style="list-style-type: none"> <li>1. Dale H. Besterfield, et. Al. “Total Quality Management”, New Delhi, Pearson Education, Inc.. 2007.</li> <li>2. James R. Evans and William M. Lidsay, “The Management and Control of Quality”, 5<sup>th</sup> Edition, South-Western, 2002.</li> </ol>	
<b>REFERENCES</b>	
<ol style="list-style-type: none"> <li>1. Feigenbaum, A.V., “Total Quality Management”, McGraw Hill, 1991.</li> <li>2. Oakland, J.S., “Total Quality Management”, Butterworth Heineman, 1989.</li> <li>3. Narayana V. and Sreenivasan, N.S., “Quality Management – Concepts and Tasks”, New Age International, 1996</li> <li>4. Zeiri, “Total Quality Management for Engineers”, Wood Head Publishers, 1991</li> </ol>	
<b>E- REFERENCES</b>	
<ol style="list-style-type: none"> <li>1. <a href="http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay">http://nptel.ac.in/faq/110101010/Prof.IndrajitMukherjee,IIT,Bombay</a> and Prof.Tapan P.Bagchi, IIT, Kharagpur.</li> </ol>	

**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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**BUSINESS COMMUNICATION**

Course 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

SUB. CODE			SUB NAME			L	T	P	C
XGS507			BUSINESS COMMUNICATION			1	0	0	0
C	P	A				L	T	P	H
1	1	0				1	0	2	3
<b>UNIT I</b>								<b>09</b>	
Introduction to business communication; modern developments in the style of writing letters memos and reports: block letters, semi block letters, full block letters, simplified letters etc.,									
<b>UNIT II</b>								<b>09</b>	
The language used in memos/minutes/telephone memos/ letters/ assignments art of writing E-mail etc. Advantages of written and spoken communication.									
<b>UNIT III</b>								<b>09</b>	
The use of active and passive voice; the use of grammar, propriety, accuracy , exactness , the tone & other elements of language used in these writings.									
<b>UNIT IV</b>								<b>09</b>	
The format of various types of Reports/ projects etc.,									
<b>UNIT V</b>								<b>09</b>	
Writing Business reports, proposals and minutes.									
						<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
						<b>30</b>	<b>15</b>	<b>45</b>	

**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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**IN-PLANT TRAINING - II**

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

Mapping COs with GAs

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**PROTECTION AND SWITCHGEAR**

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

SUB CODE		SUB NAME			L	T	P	C	
XEE 602		<b>PROTECTION AND SWITCHGEAR</b>			<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
C	P				A	L	T	P	H
<b>3</b>	<b>0</b>				<b>0</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT-I</b>	<b>RELAYS</b>						<b>09</b>		
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.									
<b>UNIT- II</b>	<b>APPARATUS PROTECTION</b>						<b>09</b>		
Protection of Generator: Earth Fault, percentage, differential, Loss of excitation, Prime mover failure, over current, Negative phase sequence, heating, Reverse power protection schemes .Protection of Transformers: Internal and external fault protection, Differential, Earth fault, Over Current, Overheating. Transformer Protection - Incipient fault.									
<b>UNIT-III</b>	<b>THEORY OF CIRCUIT INTERRUPTION</b>						<b>09</b>		
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.									
<b>UNIT- IV</b>	<b>CIRCUIT BREAKERS</b>						<b>09</b>		
Switchgear, fault clearing, description and operation of Bulk oil, Minimum oil, Air break, Air blast, SF6, Vacuum circuit breakers and DC circuit breakers, LT Switch gear, HRC fuses, current limiting reactor & influence of reactors in CB ratings, selection of circuit breakers, Testing of circuit breaker, Intelligent circuit breakers.									

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT- V</b>	<b>PROTECTION AGAINST OVERVOLTAGES</b>	<b>09</b>
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.		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Badri Ram, Vishwakarma D N., “Power System Protection and Switchgear” Tata McGraw Hill Publishing House Limited, New Delhi, 2005.</li> <li>2. Soni, M.L., Gupta, P.V., Bhatnagar, U.S. and Chakrabarti, A., “A Text Book on Power Systems Engineering”, Dhanpat Rai &amp; Sons Company Limited, New Delhi, 2008.</li> <li>3. Sunil, S.Rao, “Switchgear Protection and Power Systems (Theory, Practice &amp; Solved Problems”, Khanna Publishers Limited, New Delhi, 12th Edition, 2008.</li> <li>4. B.Ravindranath, and N.Chander, ‘Power System Protection and Switchgear’, WileyEastern Ltd., 2000.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Paithankar Y. G., Bhide S. R., “Fundamentals of Power System Protection” Prentice Hall of India Limited, New Delhi, 2nd Edition, 2010.</li> <li>2. Wadhwa, C.L., “Electrical Power Systems”, New Age International Publishers Limited, 2006, New Delhi, 6th Edition, 2010</li> <li>3. Patra, S.P., Basu, S.K. and Chowduri, S., ‘Power systems Protection’, Oxford and International Book House Publishing Co, 2000.</li> </ol>		
<b>E-REFERENCES</b>		
<ol style="list-style-type: none"> <li>1. NTPEL, Power System Generation, Transmission and Distribution ,Prof. D. P. Kothari Center for Energy Studies ,Indian Institute of Technology, Delhi</li> </ol>		

**COs versus POs mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DESIGN OF ELECTRICAL APPARATUS**

<b>Course Outcomes (XEE603)</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	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
<b>CO2</b>	<b>Compare</b> the main dimensions of different machines, and <b>relate</b> its impact on the <b>Analyze</b> various parts of AC and DC machines.	Cognitive	Understanding Understanding Analyzing
<b>CO3</b>	Categorize different types of Transformer based on its design. <b>Understand</b> about single phase and three phase transformer parameters and its efficiency calculation.	Cognitive	Understanding
<b>CO4</b>	<b>Classify</b> types of three phase Induction motor. <b>Analyze</b> the design procedure of each part of the motor.	Cognitive	Understanding Analyzing
<b>CO5</b>	<b>Classify</b> types of three phase Synchronous motor. <b>Analyze</b> the design procedure of each part of the motor	Cognitive	Understanding Analyzing

<b>SUB CODE</b>			<b>SUB NAME</b>				<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEE603</b>			<b>DESIGN OF ELECTRICAL APPARATUS</b>				<b>3</b>	<b>1</b>	<b>0</b>	<b>4</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>2</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>
<b>UNIT I</b>	<b>BASIC CONSIDERATIONS IN MACHINES DESIGN</b>							<b>09+06</b>		
Concept of magnetic circuit – MMF calculation for various types of electrical machines – real and apparent flux density of rotating machines – magnetic leakage.										
<b>UNIT II</b>	<b>D.C. MACHINES</b>							<b>09+06</b>		
Constructional details – output equation – main dimensions - choice of specific loadings – choice of number of poles – armature design – design of field poles and field coil – design of commutator and brushes.										
<b>UNIT III</b>	<b>TRANSFORMERS</b>							<b>09+06</b>		
Constructional details of core and shell type transformers – output rating of single phase and three phase transformers – optimum design of transformers – design of core, yoke and windings for core and shell type transformers.										
<b>UNIT IV</b>	<b>THREE PHASE INDUCTION MOTOR</b>							<b>09+06</b>		
Constructional details of squirrel cage and slip ring motors – output equation – main dimensions – choice of specific loadings – design of stator – design of squirrel cage and slip ring rotor.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT VSYNCHRONOUS MACHINES</b>	<b>09+06</b>
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.	
<b>Lecture = 45; Tutorial = 30; Total = 75 Hours</b>	
<b>TEXT BOOKS:</b>	
<ol style="list-style-type: none"><li>1. A.K. Sawhney, ‘A Course in Electrical Machine Design’, DhanpatRai and Sons, New Delhi, 1984.</li><li>2. S.K. Sen, ‘Principles of Electrical Machine Design with Computer Programmes’, Oxford and International Book House Publishing Company Pvt Ltd., New Delhi, 1987.</li><li>3. G Warren, “Problems in Electrical Engineering”, Parker and Smith Solutions, Newyork, 1940.</li><li>4. J. G. Jamnani, “Elements of electrical design’ 2nd Edition, Mahajan publishing house.</li></ol>	
<b>REFERENCE BOOKS:</b>	
<ol style="list-style-type: none"><li>1. R.K. Agarwal, ‘Principles of Electrical Machine Design’, S.K.Kataria and Sons, Delhi, 2002.</li><li>2. V.N. Mittle and A. Mittle, ‘Design of Electrical Machines’, Standard Publications and Distributors, Delhi, 2002.</li><li>3. T. Stolarski, Y. Nakasone and S. Yoshimoto, “Engineering analysis with ANSYS software”, Butterworth – Heinemann Publisher, 2006.</li><li>4. K.G.Upadhyay, “Design of Electrical Machines”, New age international publishers.</li></ol>	
<b>E REFERENCES :</b>	
<ol style="list-style-type: none"><li>1. Web Content - <a href="http://www.library.dce.edu/e-resources/books/ee/">http://www.library.dce.edu/e-resources/books/ee/</a></li><li>2. Web Course - <a href="http://elearning.vtu.ac.in/">http://elearning.vtu.ac.in/</a></li></ol>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**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	-	-	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
<b>Total</b>	<b>7</b>	<b>4</b>	<b>4</b>	<b>5</b>	<b>9</b>	<b>7</b>	<b>4</b>	<b>8</b>	<b>1</b>	<b>2</b>	<b>3</b>	<b>0</b>	<b>7</b>	<b>8</b>
<b>Scaling</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DIGITAL LOGIC CIRCUITS**

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

SUB CODE			SUB NAME				L	T	P	C
<b>XEE 604</b>			<b>DIGITAL LOGIC CIRCUITS</b>				<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>1</b>	<b>0</b>					<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT I</b>		<b>NUMBER SYSTEM AND CODES</b>						<b>10 + 9 + 20</b>		
Number systems- base-2, 8, 10, 16 – Radix conversion – Alphanumeric codes – various codes – error detection and correction.										
<b>UNIT II</b>		<b>BOOLEAN ALGEBRA AND MINIMIZATION TECHNIQUES</b>						<b>08 + 09</b>		
Basic Boolean functions – AND, OR NOT operations – postulates and theorems of Boolean Algebra – De-Morgan’s laws – minimization of Boolean functions using basic laws – sum of product and product of sum forms – Minterms and Maxterms – K- map of switching functions – minimization using K-map method and Quine –Mc Clusky method.										
<b>UNIT III</b>		<b>LOGIC CIRCUITS LOGIC FAMILIES AND COMBINATIONAL</b>						<b>09 + 03 + 05</b>		
Digital Logic Families – introduction to RTL, DTL, TTL, ECL and MOS families and their characteristics – internal circuits of basic gates AND, OR, NOT and XOR using Bipolar, MOS and CMOS families – Combinational logic and representation of logic functions – simplification and implementation of combinational logic circuits - multiplexer and demultiplexer – encoder and decoder –adder– subtractor and magnitude comparators.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>SYNCHRONOUS SEQUENTIAL LOGIC CIRCUITS</b>	<b>09 + 06+05</b>
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.		
<b>UNIT V</b>	<b>AS SYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES</b>	<b>09 + 03</b>
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.		
<ol style="list-style-type: none"> <li>1. Binary to Gray and Gray to binary code converters.</li> <li>2. Excess -3 to BCD and vice-versa code converters.</li> <li>3. Verification and study of logic gates.</li> <li>4. Study and verify NAND as a universal gate.</li> <li>5. Implementation and verification of Multiplexers and Demultiplexers using logic gates.</li> <li>6. Implementation and verification of Encoders and Decoders using logic gates.</li> <li>7. Design and verify operation of Half / Full adder</li> <li>8. Design and verify operation of Half/Full sub tractor.</li> <li>9. Verification of state tables of RS, JK, T and D flip flops using NAND and NOR gates.</li> <li>10. Shift registers and Counters.</li> </ol>		
<b>Lecture = 45; Tutorial = 30; Lab = 30; Total = 105 Hours</b>		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Malvino and Leach, 'Digital Principles and Applications', McGraw Hill, 2001.</li> <li>2. Moris Mano, 'Digital Design', Prentice Hall of India, 2000.</li> <li>3. Rajakamal, "Digital system-Principle &amp; Design", Pearson education 2<sup>nd</sup> edition 2007</li> <li>4. Comer " Digital Logic &amp; State Machine Design" , Oxford 2012.</li> </ol>		
<b>REFERENCE BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Taub and Schilling, 'Digital Integrated Circuits', McGraw Hill, 2002.</li> <li>2. Millman, J. and Halkias, C.C., 'Integrated Electronics: Analog and Digital Circuits and Systems', McGraw Hill, Kogakusha Ltd., Tokyo, 2001.</li> <li>3. Samuel C. Lee "Digital Circuits and Logic Designs" Prentice Hall of India; 2000</li> <li>4. Fletcher, W.I., 'An Engineering Approach to Digital Design', Prentice Hall of India, 2002.</li> <li>5. Anand kumar, Fundamental of Digital circuits, PHI 2003.</li> </ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POWER SYSTEM OPERATION AND CONTROL**

Course Outcomes (XEE 605)		Domain	Level
CO1	<b>Explain</b> power system load characteristics and generation reserve requirements.	Cognitive	Understanding
CO2	<b>Demonstrate</b> and <b>Apply</b> the mathematical knowledge to model and analysis of power system for frequency control.	Cognitive Cognitive	Understanding Applying
CO3	<b>Identify</b> fundamental aspects of reactive power and its effect on system voltage and <b>Select</b> the suitable voltage control method for the system operating condition.	Cognitive	Applying
CO4	<b>Formulate</b> economic dispatch and unit commitment problem and its solution.	Cognitive	Creating
CO5	<b>Apply</b> computer control methods for power system operation and control	Cognitive	Applying

SUB CODE			SUB NAME				L	T	P	C
<b>XEE 605</b>			<b>POWER SYSTEM OPERATION AND CONTROL</b>				<b>3</b>	<b>0</b>	<b>1</b>	<b>4</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>0</b>	<b>2</b>	<b>5</b>
<b>Unit- 1</b>			<b>INTRODUCTION</b>						<b>09</b>	
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.										
<b>Unit- 2</b>			<b>REAL POWER - FREQUENCY CONTROL</b>						<b>09</b>	
Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between 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-area system: modeling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model										
<b>Unit- 3</b>			<b>REACTIVE POWER–VOLTAGE CONTROL</b>						<b>09</b>	
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.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>Unit- 4</b>	<b>UNIT COMMITMENT AND ECONOMIC DISPATCH</b>	<b>09</b>
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 <b>method and</b> $\lambda$ -iteration method - statement of unit commitment problem – priority-listmethod - forward dynamic programming.		
<b>Unit- 5</b>	<b>COMPUTER CONTROL OF POWER SYSTEMS</b>	<b>09</b>
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.		
<ol style="list-style-type: none"> <li>1. Formation of Bus Admittance Matrix.</li> <li>2. Formation of Bus Impedance Matrix using building Algorithm.</li> <li>3. Symmetrical Fault Analysis.</li> <li>4. Unsymmetrical Fault Analysis.</li> <li>5. Solution of power flow using Gauss-Seidel Method.</li> <li>6. Solution of power flow using Newton Raphson Method.</li> <li>7. Solution of power flow using Fast Decoupled Power Flow Method.</li> <li>8. Transient Stability Analysis of Single-Machine Infinite Bus System</li> </ol>		
Small Signal Stability Analysis of Single-Machine Infinite Bus System		
<b>Lecture = 45; Lab = 30; Total =75 Hours</b>		
<b>TEXT BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Olle.I.Elgerd, ‘Electric Energy Systems theory - An introduction’, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.</li> <li>2. Allen. J. Wood and Bruce F. Wollenberg, ‘Power Generation, Operation and Control’, John Wiley &amp; Sons, Inc., 2003.</li> <li>3. Kundur P., ‘Power System Stability and Control, Tata McGraw Hill, New Delhi, 5th reprint, 2008.</li> </ol>		
<b>REFERENCE BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Nagrath I.J. and Kothari D.P., ‘Modern Power System Analysis’, Tata McGraw-Hill, Fourth Edition,2011.</li> <li>2. Hadi Saadat, ‘Power System Analysis’, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21<sup>st</sup> reprint, 2010.</li> <li>3. Abhijit Chakrabarti, Sunita Halder, ‘Power System Analysis Operation and Control’, PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.</li> </ol>		
<b>E-REFERENCES:</b>		
1. NPTEL : <a href="http://nptel.ac.in/courses/108104052/">http://nptel.ac.in/courses/108104052/</a>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
 (Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
 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
CO1	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
<b>Total</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>2</b>
<b>Scaling</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENVIRONMENTAL STUDIES**

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

SUB. CODE			SUB. NAME			
XUM607			L	T	P	C
			0	0	0	0
C	P	A	ENVIRONMENTAL STUDIES			
2.5	0	0.5	L	T	P	H
			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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT III</b>	<b>ENVIRONMENTAL POLLUTION</b>	<b>12</b>
<p>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.</p>		
<b>UNIT IV</b>	<b>SOCIAL ISSUES AND THE ENVIRONMENT</b>	<b>09</b>
<p>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 Protection 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.</p>		
<b>UNIT V</b>	<b>HUMAN POPULATION AND THE ENVIRONMENT</b>	<b>06</b>
<p>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.</p>		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>5. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co, USA, 2000.</li> <li>6. Townsend C., Harper J and Michael Begon, Essentials of Ecology, Blackwell Science, UK, 2003</li> <li>7. Trivedi R.K and P.K.Goel, Introduction to Air pollution, Techno Science Publications, India, 2003.</li> <li>8. Disaster mitigation, Preparedness, Recovery and Response, SBS Publishers &amp; Distributors Pvt. Ltd, New Delhi, 2006.</li> <li>9. Introduction to International disaster management, Butterworth Heinemann, 2006.</li> <li>10. Gilbert M.Masters, Introduction to Environmental Engineering and Science, Pearson Education Pvt., Ltd., Second Edition, New Delhi, 2004.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards, Vol. I and II, Enviro Media, India, 2009.</li> <li>2. Cunningham, W.P.Cooper, T.H.Gorhani, Environmental Encyclopedia, Jaico Publ., House, Mumbai, 2001.</li> <li>3. S.K.Dhameja, Environmental Engineering and Management, S.K.Kataria and Sons, New Delhi, 2012.</li> <li>4. Sahni, Disaster Risk Reduction in South Asia, PHI Learning, New Delhi, 2003.</li> <li>5. Sundar, Disaster Management, Sarup &amp; Sons, New Delhi, 2007.</li> <li>6. G.K.Ghosh, Disaster Management, A.P.H.Publishers, New Delhi, 2006.</li> </ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**E REFERENCE**

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

**Mapping of CO's with GA's:**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ACADEMIC WRITING**

Course Outcomes (XGS608)		Domain	Level
<b>CO1</b>	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
<b>CO2</b>	Ability to <i>integrate</i> both technical subject skill and language skill to write a project	Cognitive	Creating
<b>CO3</b>	Confidence to <i>present</i> a project in 10 to 15 minutes	Affective	responding
<b>CO4</b>	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
<b>CO5</b>	The program enables the speaker speaks clearly and fluently with confidence and it trains the learner to listen actively and critically	psychomotor	Perception

SUB. CODE			SUB. NAME	L	T	P	C
<b>XCD 608</b>			<b>ACADEMIC WRITING</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>C</b>	<b>P</b>	<b>A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>1.8</b>	<b>0.8</b>	<b>0.4</b>		<b>0</b>	<b>0</b>	<b>0</b>	<b>0</b>
<b>UNIT I</b>							<b>10</b>
Basic principles of good technical writing, Style in technical writing, out lines and abstracts, language used in technical writing: technical words, jargons etc							
<b>UNIT II</b>							<b>10</b>
Special techniques used in technical writing: Definition, description of mechanism, Description of a process, Classifications, division and interpretation							
<b>UNIT III</b>							<b>25</b>
Report/ project layout the formats: chapters, conclusion, bibliography, annexure and glossary, Graphics aids etc - Presentation of the written project 10 – 15 minutes							
<b>UNIT IV</b>							<b>15</b>
Sounds of English Language; vowels, consonants, diphthongs , word stress, sentence stress, intonation patterns, connected speech etc. - Vocabulary building – grammar, synonyms and antonyms, word roots, one-word substitutes, prefixes and suffixes, idioms and phrases.							
<b>UNIT V</b>							<b>15</b>
Reading comprehension – reading for facts, meanings from context, scanning, skimming, inferring meaning, critical reading, active listening, listening for comprehension etc.							
<b>Lecture = 45; Lab = 30; Total = 75 Hours</b>							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**TEXT BOOKS**

- Gordon H. Mills, Technical Writing – April, 1978, Oxford Univ Press
- 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)

**Mapping COs with Pos**

	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									

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**MICROPROCESSORS AND MICROCONTROLLERS**

Course 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 <i>design</i> and <i>test</i> assembly language program in 8051 microcontroller for <i>displaying</i> Waveform generation, speed control of DC motor, Stepper motor control, seven segments LED display	Cognitive Psychomotor	Creating Mechanism

SUB. CODE			SUB NAME				L	T	P	C
XEE 702			<b>MICROPROCESSORS AND MICROCONTROLLERS</b>				3	0	1	4
C	P	A					L	T	P	H
3	1	0					3	0	2	5
<b>UNIT I</b>			<b>INTEL 8085 PROCESSOR</b>				<b>09</b>			
Architecture – Instruction format addressing modes – Basic timing diagram – input/output – 8085 based simple programs.										
<b>UNIT II</b>			<b>8051 MICROCONTROLLER ARCHITECTURE</b>				<b>12</b>			
8051 architecture, memory organization, flags, stack, and special function registers, I/O ports - connecting external memory, counters and timers, serial data I/O, Interrupts										
<b>UNIT III</b>			<b>8051 MICROCONTROLLER INSTRUCTIONS AND ADDRESSING MODES</b>				<b>21</b>			
Microcontroller instructions - addressing modes, moving data, logical operations, arithmetic operations, jump and call instructions – subroutines - Interrupts and returns.										
<b>UNIT IV</b>			<b>MICROCONTROLLER PROGRAMMING AND INTERFACING BASICS</b>				<b>18</b>			
Microcontroller programming - Assembly Language Programming, timer and counter programming, connection to RS 232 and RS 485, Interrupt programming										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>INTERFACING PERIPHERALS AND MICROCONTROLLER APPLICATIONS</b>	<b>9+6</b>
<p>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.</p>		
<ol style="list-style-type: none"><li>1. Simple arithmetic operations: Multi precision addition / subtraction / multiplication / division.</li><li>2. Programming with control instructions: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions.</li><li>3. Design program for code conversions.</li><li>4. Interfacing of Keyboard with 8085.</li><li>5. Interfacing of Keyboard with 8051.</li><li>6. Interfacing of seven segment display with 8085.</li><li>7. Interfacing of seven segment display with 8051.</li><li>8. Interfacing of 8 bit D/A and A/D Converters.</li><li>9. Serial communication, I/O Port operations.</li><li>10. Demonstration of basic instructions with 8051 Micro controller execution, including:<ol style="list-style-type: none"><li>a. Conditional jumps, looping</li><li>b. Calling subroutines.</li><li>c. Stack parameter testing</li></ol></li><li>11. Design and implementation of Traffic Light control.</li><li>12. Design and implementation of Stepper motor control.</li></ol>		
<b>Lecture = 45; Lab = 30; Total = 75 Hours</b>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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. NTPPEL, Microprocessor (Web Course), Prof. S.P.Da,IIT Kharagpur.

**COs versus POs mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
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
<b>Total</b>	4	5	5	6	2	1	5	-	8	7	6	2	3	5
<b>Scaling</b>	1	1	1	1	1	1	1	-	1	1	1	1	1	1

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**MEASUREMENT AND INSTRUMENTATION**

Course Outcomes (XEE703)		Domain	Level				
CO1	<i>Describe</i> functional elements of measuring Instruments. <i>Design</i> of bridge circuits for the measurement of unknown parameters.	Cognitive	Remembering				
CO2	<i>Explain</i> the construction and working of different types of indicating and integrating instruments.	Cognitive	Understanding				
CO3	<i>Describe</i> the operation of A/D and D/A converters and to <i>perform</i> its characteristics.	Cognitive	Remembering				
CO4	<i>Explain</i> the construction and operation of recording Instruments. <b>Carryout</b> calibration test for measuring instruments.	Cognitive	Understanding				
CO5	<i>Explain</i> the different types of transducers.	Cognitive	Remembering				
<b>SUB.CODE</b>		<b>SUB NAME</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEE 603</b>				<b>3</b>	<b>1</b>	<b>1</b>	<b>5</b>
<b>C</b>	<b>P</b>	<b>A</b>	<b>MEASUREMENT AND INSTRUMENTATION</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>1</b>	<b>0</b>		<b>3</b>	<b>2</b>	<b>2</b>	<b>7</b>
<b>UNIT I</b>	<b>INTRODUCTION</b>						<b>09+06</b>
Functional elements of an instrument - errors in measurement - static and dynamic characteristics statistical evaluation of measurement data - standard and calibration							
<b>UNIT 2</b>	<b>ELECTRICAL AND ELECTRONIC INSTRUMENTS</b>						<b>09</b>
DC Ammeter – Multirange ammeter – Extension of ammeter range – RF ammeter – Voltmeter – Analog Electromechanical instruments-Galvanometer- multirange voltmeter – Extending Voltmeter range – Transistor voltmeter – Dual slope integrating type DVM – instrument transformer –Magnetic measurement- instruments for measurement of frequency and phase.							
<b>UNIT 3</b>	<b>SIGNAL CONDITIONING CIRCUITS</b>						<b>09+18</b>
Bridge circuits – Wheatstone’s bridge – Maxwell’s Bridge - Wien’s bridge, Resonance Bridge – Hay’s Bridge – Schering Bridge –De saulty bridge- differential amplifier – instrumentation amplifier – filter circuits, data acquisition system –Spectrum analyzer-Wagner’s Earth (Ground) connection- Earthing techniques.							
<b>UNIT 4</b>	<b>STORAGE AND DISPLAY DEVICES</b>						<b>09+06</b>
CRO – introduction – Block diagrams of Oscilloscope – simple CRO – circuit displays – storage oscilloscope – digital CRO – X-Y recorder – magnetic recorder – strip chart recorder – printers – LED, LCD and Dot matrix displays – Data logger-Virtual Instruments							
<b>UNIT 5</b>	<b>TRANSDUCERS</b>						<b>09</b>
Classification of transducers – selection of transducers – resistive, capacitive and inductive transducers – piezo electric transducers – optical and digital transducers. pH electrodes – Load cell-transducers for measurement of displacement, temperature, level, flow, pressure, velocity, acceleration, torque, speed, Smart Sensors.							



**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**CYBER SECURITY**

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

<b>SUB. CODE</b>			<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
<b>XUM 706</b>			<b>CYBER SECURITY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>C</b>	<b>P</b>	<b>A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
<b>3</b>	<b>0</b>	<b>0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>UNIT I</b>		<b>INTRODUCTION</b>					<b>09</b>	
History of Information Systems and its Importance, Basics, Changing Nature of Information Systems, Need for Distributed Information Systems: Role of Internet and Web Services. Information System Treats and attacks, Classification of Threats and assessing Damages Security in mobile and Wireless Computing-Security Challenges in Mobile Devices, authentication service Security, Security Implication for Organizations, Laptops security Concepts in Internet and World Wide Web: Brief review of Internet Protocols TCP/IP, IPV4, and IPV6. Functions of various networking components-routers, bridges, switches, hub, gateway and Modulation Techniques.								
<b>UNIT II</b>		<b>SYSTEMS VULNERABILITY SCANNING</b>					<b>09</b>	
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 – Tcpcdump and Windump, Wireshark, Ettercap, Hping Kismet.								
<b>UNIT III</b>		<b>NETWORK DEFENCE TOOLS</b>					<b>09</b>	
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.								

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>TOOLS FOR SCANNING</b>	<b>09</b>
Scanning for web vulnerabilities tools: Metasploit tool, Nikto, W3af, HTTP utilities - Curl, OpenSSL and Stunnel, Application Inspection tools – Zed Attack Proxy, Sqlmap. DVWA, Webgoat, Password Cracking and Brute-Force Tools – John the Ripper, LOhtcrack, Pwdump, THC-Hydra.		
<b>UNIT V</b>	<b>INTRODUCTION TO CYBER CRIME AND LAW</b>	<b>09</b>
Cyber Crimes, Types of Cybercrime, Hacking, Attack vectors, Cyberspace and Criminal Behavior, Clarification of Terms, Traditional Problems Associated with Computer Crime, Introduction to Incident Response, Digital Forensics, Computer Language, Network Language, Realms of the Cyber world, A Brief History of the Internet, Recognizing and Defining Computer Crime, Contemporary Crimes, Computers as Targets, Contaminants and Destruction of Data, Indian IT ACT 2000. Introduction to Cyber Crime Investigation: Password Cracking, Key loggers and Spyware, Virus and Worms, Trojan and backdoors, Steganography, DOS and DDOS attack, SQL injection, Buffer Overflow, Attack on wireless Networks		
<b>Lecture = 45; Tutorial = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
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 International publishers, 3 <sup>rd</sup> Edition, 2006, ISBN-10: 8122417620, ISBN-13: 978-8122417623.		
<b>REFERENCE BOOKS</b>		
1. Mike Shema, “Anti-Hacker Tool Kit”, McGraw Hill Education, 4 <sup>th</sup> edition, 2014, 2. Nina Godbole, Sunit Belapure, “Cyber Security Understanding Cyber Crimes, 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)”, Tata McGraw Hill, 2013, ISBN-10: 0072255242, ISBN-13: 978-0072255249. 4. Vivek Sood, “Cyber Laws Simplified”, McGraw Hill Education (INDIA) Private Limited in 2001, ISBN-10: 0070435065, ISBN-13: 978-0070435063. 5. Steven M.Furnell, “Computer Insecurity”, Springer Publisher, 2005 Edition.		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
 (Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
 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.tcpcap.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	GA10	GA11	GA12
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
Original	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 relation 1 – Low relation 2 – Medium relation 3 – High Relation**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**CAREER DEVELOPMENT SKILLS**

Course Outcomes (XCD 708)		Domain	Level
CO1	Knowledge on a career related communication and learning the different formats of CV	Cognitive	Remembering
CO2	Prepare 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

SUB. CODE			SUBJECT NAME				L	T	P	C
XGS708			CAREER DEVELOPMENT SKILLS				0	0	0	0
C	P	A					L	T	P	H
1.8	0.8	0.4					2	0	2	4
UNIT I									10	
CV Writing; difference between resume and CV; characteristics of resume and CV; basic elements of CV and resume, use of graphics in resume and CV; forms and functions of Cover Letters										
UNIT II									10	
Interview skills; tips for various types of interviews. Types of questions asked ; body language, etiquette and dress code in interview, interview mistakes, telephonic interview , frequently asked questions. Planning for the interview.										
UNIT III									10	
Mock interviews - workshop on CV writing – Group Discussion										
<b>Lecture = 20; Workshop = 10; Total = 30 Hours</b>										

TEXT BOOKS
<ol style="list-style-type: none"> <li>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</li> <li>2. Mary Ellen Guffey, Dana Loewy Essentials of Business Communication, , Cengage Learning, 2012</li> <li>3. Michael Spiropoulos, Interview Skills that win the job: Simple techniques for answering all the tough questions, Allen &amp; Unwin, 2005</li> <li>4. William L. Fleisher, Effective Interviewing and Interrogation Techniques, , Nathan J. Gordon, Academic Press, 2010.</li> </ol>
REFERENCE WEBSITES
<ol style="list-style-type: none"> <li>1. <a href="http://www.utsa.edu/careercenter/PDFs/Interviewing/Types%20of%20Interviews.pdf">http://www.utsa.edu/careercenter/PDFs/Interviewing/Types%20of%20Interviews.pdf</a></li> <li>2. <a href="http://www.amu.apus.edu/career-services/interviewing/types.htm">http://www.amu.apus.edu/career-services/interviewing/types.htm</a></li> <li>3. <a href="http://www.careerthinker.com/interviewing/types-of-interview/">http://www.careerthinker.com/interviewing/types-of-interview/</a></li> </ol>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**LINEAR INTEGRATED CIRCUITS**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E11</b>	<b>LINEAR INTEGRATED CIRCUITS</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>2:0:0</b>		<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>UNIT- I</b>	<b>IC FABRICATION</b>				<b>6 + 6</b>
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, Epitaxial growth, Oxidation, Photolithography, etching, Diffusion, Ion implantation, Metallization, packaging of ICs.					
<b>UNIT- II</b>	<b>CHARACTERISTICS OF OP – AMP</b>				<b>6 + 6</b>
Basics of Op – amp, Ideal Op – amp characteristics, DC characteristics, AC characteristics, Open Loop and Closed Loop configuration of Op – amp, Packages of Op – amp, Inverting & Non – inverting amplifier, Voltage follower, Differential amplifier; Frequency response of Op – amp; Basic applications of op – amp – summer, Differentiator and Integrator.					
<b>UNIT- III</b>	<b>APPLICATION OF OP – AMP</b>				<b>6 + 6</b>
Instrumentation amplifier, First and second order active filters, V / I and I / V converters, Comparators- Regenerative comparator (Schmitt Trigger), Multi vibrators Astable & Monostable; Waveform generators- RC phase shift oscillator; Wien bridge oscillator; Triangular wave generator; Clippers, Clampers.					
<b>UNIT- IV</b>	<b>SPECIAL ICs</b>				<b>6 + 6</b>
555 Timer circuit – Functional block, Characteristics and applications; 566 – Voltage controlled oscillator circuit; 565 – Phase lock loop circuit functioning and applications.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT- V</b>	<b>ANA LOG TO DIGITAL AND DIGITAL TO ANALOG CONVERTERS; SPECIAL FUNCTION ICS.</b>			<b>6 + 6</b>
Introduction of A/D and D/A converters, Sample & Hold circuit, D /A converter (R – 2R ladder and weighted resistor types), A / D converter – Dual slope, Successive approximation and Flash types. ICL 8038 function generator IC. Isolation Amplifiers.				
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
		<b>30</b>	<b>30</b>	<b>60</b>
<b>TEXT BOOKS:</b>				
1.	Ramakant . A. Gayakwad ‘Op – Amps and Linear Integrated Circuits’, Prentice Hall of India 3 <sup>rd</sup> Edition, 2001.			
2.	Linear Integrated Circuits by D. Roy Choudhury and Shail B. Jain, New Age International Publishers.			
<b>REFERENCE BOOKS:</b>				
1.	S.M. Sze, ‘VLSI Technology, 2 <sup>nd</sup> Edition, Tata McGraw Hill,2000.			
2.	Sergio Franco, ‘Design with Operational Amplifiers and Analog and Integrated Circuits’, 2 <sup>nd</sup> Edition, McGraw Hill,2002.			
3.	National Semiconductor/Texas – TTL/MOS/VLSI Data Manuals.			
<b>E REFERENCES :</b>				
1.	NPTEL, Linear Integrated Circuits, Prof. Clark Tu – Cuong Nguyen, IIT Madras.			
2.	NPTEL,Linear Integrated Circuits, Prof. TS. Natarajan, IIT Madras.			

**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
<b>CO1</b>	2	3	-	2	3	-	-	-	-	-	-	-	2	2
<b>CO2</b>	2	1	1	2	2	-	-	-	-	-	-	-	1	1
<b>CO3</b>	1	2	-	3	2	-	-	-	1	-	1	-	1	1
<b>CO4</b>	1	2	-	2	2	-	-	-	-	-	-	-	2	1
<b>CO5</b>	3	2	-	2	2	-	-	-	-	-	-	-	1	2
<b>Total</b>	09	10	01	11	11	0	0	0	01	0	01	0	07	07
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SIGNALS AND SYSTEMS**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E12</b>	<b>SIGNALS AND SYSTEMS</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>2:0:0</b>		<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>UNIT-I</b>	<b>CLASSIFICATION OF SIGNALS AND SYSTEMS</b>				<b>6+6</b>
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.					
<b>UNIT- II</b>	<b>ANALYSIS OF CONTINUOUS TIME SIGNALS</b>				<b>6+6</b>
Fourier series analysis, Spectrum of C.T. signals, Fourier Transform and Laplace Transform in Signal Analysis.					
<b>UNIT-III</b>	<b>LINEAR TIME INVARIANT - CONTINUOUS TIME SIGNALS</b>				<b>6+6</b>
Differential equation, Block diagram representation, Impulse response, Convolution and Correlation concept, frequency response, Fourier and Laplace transforms in analysis.					
<b>UNIT-IV</b>	<b>ANALYSIS OF DISCRETE TIME SIGNALS</b>				<b>6+6</b>
Sampling of CT signals and anti aliasing Filter design, Decimation in Time Fourier Transform and properties (DTFT), Z-transform and properties of Z-transform.					
<b>UNIT- V</b>	<b>LINEAR TIME INVARIANT - DISCRETE TIME SYSTEMS</b>				<b>6+6</b>
Difference equations, Block diagram representation, Impulse response, Convolution sum, Linear time invariant systems (LTI) analysis using Decimation in Time Fourier Transform and properties (DTFT), State variable equations and matrix representation of system					
<b>Lecture = 30; Tutorial = 30; Total = 60 Hours</b>					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**TEXT BOOKS:**

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab -2007, -Signals and Systems, Pearson Education.
2. Edward W Kamen & Bonnie’s Heck 2007, -Fundamentals of Signals and Systems, 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 Edition, Pearson Education.

**REFERENCE BOOKS:**

1. H P Hsu, Rakesh Ranjan,2007 - Signals and Systems, Schaum’s Outlines, Tata McGraw Hill, Indian Reprint,
2. S.Salivahanan, A. Vallavaraj, C. Gnanapriya,2007, -Digital Signal Processing, McGraw Hill International ,TMH,
3. Robert A. Gabel and Richard A.Roberts, 1987 -Signals and Linear Systems, John Wiley,III edition.
4. J.G.Prokiis and D.G. Manolakies, 1989-Introduction to Digital Signal Processing MacMillan Publishing company.

**E-REFERENCES:**

1. <http://freevidelectures.com/Course/2339/Digital-Signal-Processing-IITKharagpur>
2. NPTEL, Signals and System Prof. K.S. Venkatesh Department of Electrical Engineering Indian Institute of Technology, Kanpur.

**COs versus PO, PSO mapping**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES**

<b>Course Outcomes(E13):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<i>Recall</i> the functions and concepts of electrical maintenance department. <i>Name</i> the tools required.	Cognitive	Remembering
<b>CO2</b>	<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
<b>CO3</b>	<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
<b>CO4</b>	<i>Select</i> the motor for particular application and <i>demonstrate</i> the different types of installation and trouble shootings.	Cognitive	Applying Understanding
<b>CO5</b>	<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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E13</b>	<b>CONTROL AND MAINTENANCE OF ELECTRICAL MACHINES</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>2:0:0</b>		<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>UNIT- I</b>	<b>PRINCIPLES AND PLANNING OF MAINTENANCE</b>				<b>6+6</b>
Introduction, Essentials of preventive maintenance programme, Functions of electrical maintenance department. Tools required, loading and unloading of electrical machinery					
<b>UNIT- II</b>	<b>HEATING AND COOLING OF ELECTRICAL MACHINES</b>				<b>6+6</b>
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					
<b>UNIT-III</b>	<b>LUBRICATION</b>				<b>6+6</b>
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.					
<b>UNIT-IV</b>	<b>MOTORS</b>				<b>6+6</b>
Selection of motors, Storage pre installation check, Installation, Alignment, Connecting and starting, Pre commissioning checks, Drying out, Commissioning, Overhauling of motors, Preventive maintenance, Trouble shooting in electric motors, Maintenance schedule of synchronous machine					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT-V</b>	<b>DOMESTIC INSTALLATIONS</b>	<b>6+6</b>
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,		
<b>Lecture = 30; Tutorial = 30; Lab = 00; Total = 60 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	SK Bhattacharya, “Electrical Machines”, Tata Mc Graw Hill, New Delhi, 1998.	
2.	Kenneth B. Rexford, “Electrical Control for Machines”, Delmar cengage learning, November 22, 1996.	
3.	Frank D. Petruzella, “Electric Motors Control systems”, McGraw Hill Education, May 2009.	
<b>REFERENCE BOOKS:</b>		
1.	Nagrath and Kothari, “Electrical Machines”, Tata McGraw Hill, New Delhi, 2010	
2.	Diane Lobsiger, Peter Giuliani & Kenneth Rexford, “Electrical Control for Machines”, 7 <sup>th</sup> 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	
<b>E-REFERENCES:</b>		
1.	<a href="https://accessengineeringlibrary.com/browse/electrical-equipment-handbook-troubleshooting-and-maintenance">https://accessengineeringlibrary.com/browse/electrical-equipment-handbook-troubleshooting-and-maintenance</a>	

**Table 1: COs versus POs mapping**

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
<b>Total</b>	<b>15</b>	<b>5</b>	<b>4</b>	<b>3</b>	<b>5</b>				<b>3</b>			<b>5</b>		<b>5</b>
<b>Scaling</b>	<b>3</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>				<b>1</b>			<b>1</b>		<b>1</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DIGITAL SIGNAL PROCESSING**

<b>Course Outcomes(E14):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<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
<b>CO2</b>	<i>Design</i> the linear systems approach to signal processing problems using high-level programming language.	Cognitive	Creating
<b>CO3</b>	<i>Distinguish</i> the basic architecture of microprocessors and digital signal processors.	Cognitive	Analyzing
<b>CO4</b>	<i>Choose</i> appropriate dynamics for expanding the filter structure.	Cognitive	Remembering
<b>CO5</b>	<i>Describe</i> the applications of linear filters and their real-time implementation challenges.	Cognitive	Remembering

SUB CODE	SUB NAME	L	T	P	C
<b>E14</b>	<b>DIGITAL SIGNAL PROCESSING</b>	<b>2</b>	<b>1</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>2</b>	<b>2</b>	<b>0</b>	<b>4</b>
<b>UNIT- I</b>	<b>INTRODUCTION</b>				<b>6+6</b>
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					
<b>UNIT-II</b>	<b>DISCRETE TIME SYSTEMS ANALYSIS</b>				<b>6+6</b>
Representations-classifications - time domain and frequency domain characterization - transfer functions – Convolution - Z-transform and Inverse Z- transform applications					
<b>UNIT-III</b>	<b>FREQUENCY ANALYSIS OF SIGNAL</b>				<b>6+6</b>
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					
<b>UNIT-IV</b>	<b>DESIGN ANALOG AND DIGITAL FILTERS</b>				<b>6+6</b>
Sampling of continuous signals-analog filter design-anti aliasing filters-sample and hold circuit-reconstructing filters-Block diagram representation – IIR and FIR structures					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT- V</b>	<b>DIGITAL SIGNAL PROCESSORS</b>	<b>6+6</b>
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.		
<b>Lecture = 30; Tutorial = 30; Lab = 0; Total = 60 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	S.K. Mitra, 'Digital signal processing-A Computer based approach', Tata McGraw-Hill 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 McGraw-Hill Edition, 2012	
4.	E.C. Ifeachor and B.W. Jervis, " Digital signal processing - A practical approach", Second edition, Pearson, 2013	
<b>REFERENCE BOOKS:</b>		
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. 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.	
<b>E-REFERENCES:</b>		
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
<b>CO1</b>	2	1	-	-	-	-	-	-	1	-	-	-	-	-
<b>CO2</b>	2	1	2	2	-	-	-	-	-	1	-	2	-	-
<b>CO3</b>	1	3	-	3	1	-	2	3	-	1	1	-	2	1
<b>CO4</b>	2	2	-	1	1	1	-	-	2	2	-	1	1	-
<b>CO5</b>	2	1	1	1	-	-	-	-	-	-	2	-	1	1
<b>Total</b>	9	8	3	7	2	1	2	3	3	4	3	3	4	2
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SOLID STATE DRIVES**

<b>Course Outcomes(E21):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<i>Outline</i> the fundamentals of Electric Drives and their ratings.	Cognitive	Understanding
<b>CO2</b>	<i>List</i> the various control techniques of DC Drives.	Cognitive	Remembering
<b>CO3</b>	<i>Categorize</i> the different speed control methods for an Induction motor drive	Cognitive	Analyzing
<b>CO4</b>	<i>Illustrate</i> the solid state converters based controllers for Rotor control of an Induction motor drive	Cognitive	Understanding
<b>CO5</b>	<i>Make use of</i> the assorted control strategies of synchronous motor drive.	Cognitive	Applying

<b>Sub.code</b>	<b>Sub. Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E21</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>	<b>SOLID STATE DRIVES</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT-I</b>	<b>DRIVE CHARACTERISTICS</b>				<b>10</b>
Fundamentals of Electric Drives-Advantage of Electric Drives-selection of Motor power rating- Thermal model of motor for heating and cooling - Classes of duty cycle Determination of motor rating - Control of Electric drives- modes of operation - speed control and drive classifications.					
<b>UNIT-II</b>	<b>SOLID STATE CONTROL OF DC DRIVES</b>				<b>10</b>
DC motor and their performance - Transient analysis - Ward Leonard drives - Steady state analysis of the single and three phase fully controlled converter fed separately excited DC motor drive – continuous and discontinuous mode Chopper controlled DC drives - Time ratio control and current limit control.					
<b>UNIT-III</b>	<b>STATOR CONTROLLED INDUCTION MOTORDRIVES</b>				<b>8</b>
Induction Motor Drives-Stator control-Stator voltage and frequency control – VSI,CSI and cyclo converter fed induction motor drives –open loop and closed VVVF control.					
<b>UNIT-IV</b>	<b>ROTOR CONTROLLED INDUCTION MOTORDRIVES</b>				<b>8</b>
Rotor resistance control – Slip power recovery schemes –Sub synchronous and super synchronous operations – Power factor improvement – Closed loop control.					
<b>UNIT-V</b>	<b>SYNCHRONOUS MOTOR DRIVES</b>				<b>9</b>
Separate controlled mode - Self controlled mode of synchronous motor – Constant marginal angle control and motor power factor control – Cyclo converter fed synchronous motors-Digital Control and Drive Applications.					
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**REFERENCE 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 REFERENCES:**

1.	<i>Lecture</i> Series on Solid state devices by Prof. S.Karmalkar, Department of Electrical Engineering, IIT Madras.
2.	<a href="http://nptel.ac.in/courses/108108077/">http://nptel.ac.in/courses/108108077/</a>

**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
<b>CO 1</b>	3	2	1	0	2	0	1	0	0	0	0	0	0	3
<b>CO 2</b>	3	1	0	0	2	0	1	0	0	0	0	0	3	2
<b>CO 3</b>	1	2	3	0	2	0	0	1	0	0	0	0	1	2
<b>CO 4</b>	0	2	0	0	3	0	1	0	0	0	0	0	2	2
<b>CO 5</b>	3	1	1	0	0	1	1	1	0	0	0	1	1	2
<b>Total</b>	10	8	5	0	9	1	4	2	0	0	0	1	7	11
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POWER PLANT ENGINEERING**

<b>Course Outcomes(E22):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<i>Explain</i> about the various types of the power generation and function of boilers	Cognitive	Understanding
<b>CO2</b>	<i>Choose</i> Various Measurements in power plants.	Cognitive	Remembering
<b>CO3</b>	<i>Illustrate</i> Various <i>analyzers</i> in power plants, and <i>identify</i> the pollution monitoring instruments.	Cognitive	Understanding Applying
<b>CO4</b>	<i>Infer</i> all control loops in boiler , and interlocks in boiler operation-boiler trip protection.	Cognitive	Understanding
<b>CO5</b>	<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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E22</b>	<b>POWER PLANT ENGINEERING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT- I OVERVIEW OF POWER GENERATION</b>					<b>9</b>
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.					
<b>UNIT- II</b>	<b>MEASUREMENTS IN POWER PLANTS</b>				<b>9</b>
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.					
<b>UNIT-III</b>	<b>ANALYZERS IN POWER PLANTS</b>				<b>9</b>
Flue gas oxygen analyzer – Demineral - 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					
<b>UNIT-IV</b>	<b>CONTROL LOOPS IN BOILER</b>				<b>9</b>
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					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT- V</b>	<b>TURBINE – MONITORING AND CONTROL SOFTWARE</b>	<b>9</b>
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 .		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS:</b>		
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.	
<b>REFERENCE BOOKS:</b>		
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	
<b>E-REFERENCES:</b>		
1	www.electrical4u.com	

**COs versus POs mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	2	2	2	1	-	-	-	1	-	-	1	3	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	-	-	-	-	-	-	1	2	1
<b>Total</b>	<b>15</b>	<b>6</b>	<b>4</b>	<b>6</b>	<b>5</b>				<b>4</b>			<b>5</b>	<b>11</b>	<b>7</b>
<b>Scaling</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>2</b>	<b>1</b>				<b>1</b>			<b>1</b>	<b>3</b>	<b>2</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS**

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

<b>Sub. Code</b>	<b>Sub. Name</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E23</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>	<b>POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT- I INTRODUCTION TO ENERGY</b>					<b>10</b>
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.					
<b>UNIT-II</b>	<b>ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION</b>				<b>8</b>
Review of reference theory fundamentals-principle of operation and analysis :Induction Generator (IG),Permanent Magnet Synchronous Generator (PMSG), squirrel cage induction generator (SCIG) and Doubly Fed Induction Generator (DFIG).					
<b>UNIT- III</b>	<b>POWER CONVERTERS</b>				<b>10</b>
Solar: Block diagram of solar photo voltaic system, line commutated converters (inversion-mode) -Maximum power point tracking – Applications – Water pumping – Street lighting, battery sizing, array sizing. Wind: three phase AC voltage controllers-AC-DC-AC converters, Grid Interactive Inverters-matrix converters.					
<b>UNIT-IV</b>	<b>ANALYSIS OF WIND AND PV SYSTEMS</b>				<b>8</b>
Standalone operation affixed and variable speed wind energy conversion systems and solar energy conversion system based on PV system -Inter connections with Grid - Power conditioning schemes.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT-V</b>	<b>HYBRID RENEWABLE ENERGY SYSTEMS</b>	<b>9</b>
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV-Power converters for distributed power systems- Storage - Reliability evolution		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	S. Rao and Parulekar, Energy Technology – Non Conventional, Renewable and Conventional, New Delhi, Khanna Publishers, 1999.	
2.	Mukund R. Patel, Wind and Solar Power System, New York, CRC Press LLC, 1999.	
3.	Ned Mohan, Tore M. Undeland and William P. Robbins, Power Electronics: Converters, Applications and Design, New Jersey, John Wiley and Sons, 2003.	
4.	S.N.Bhadra, D.Kastha, & S.Banerjee “Wind Electrical systems”, Oxford University Press, 2009	
<b>REFERENCE BOOKS:</b>		
1.	Rashid.M.H “power electronics Handbook”, Academic press, 2001.	
2.	Rai.G.D, “Nonconventional energy sources”, Khanna publishes, 1993	
3.	Gray, L. Johnson, “Wind energy system”, prentice hall inc, 1995.	
<b>E REFERENCES:</b>		
1.	<i>Lecture Series on Energy Resources &amp; Technology</i> by Prof. S.Banerjee, Department of Electrical Engineering, IIT Kharagpur	
2.	Principles and Performance of Solar Energy Thermal Systems: A Web Course by V.V.Satyamurthy Professor of Mechanical Engineering, IIT Kharagpur.	

**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
<b>CO 1</b>	2	3	1	0	2	0	1	0	0	0	0	0	3	0
<b>CO 2</b>	3	1	0	0	2	0	1	0	0	0	0	0	1	1
<b>CO 3</b>	1	2	3	0	1	0	0	1	0	0	0	0	3	2
<b>CO 4</b>	0	2	0	0	3	0	1	0	0	0	0	0	2	2
<b>CO 5</b>	3	1	1	0	0	2	1	1	0	0	0	1	2	1
<b>Total</b>	9	9	5	0	8	2	4	2	0	0	0	1	11	6
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**WIND ENERGY CONVERSION SYSTEMS**

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

SUB CODE	SUB NAME	L	T	P	C
<b>E24</b>	<b>WIND ENERGY CONVERSION SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT- I</b>	<b>INTRODUCTION</b>				<b>9</b>
Components of WECS-WECS schemes-Power obtained from wind-simple momentum theory- Power coefficient-Sabinin’s theory-Aerodynamics of Wind turbine.					
<b>UNIT- II</b>	<b>WIND TURBINES</b>				<b>9</b>
HAWT-VAWT-Power developed-Thrust-Efficiency-Rotor selection-Rotor design considerations- Tip speed ratio-No. of Blades-Blade profile-Power Regulation-yaw control-Pitch angle control- stall control-Schemes for maximum power extraction.					
<b>UNIT-III</b>	<b>FIXED SPEED SYSTEMS</b>				<b>9</b>
Generating Systems- Constant speed constant frequency systems -Choice of Generators- Deciding factors-SynchronousGenerator-Squirrel Cage Induction Generator- Model of Wind Speed-Model wind turbine rotor - Drive Train model- Generator model for Steady state and Transient stability analysis.					
<b>UNIT-IV</b>	<b>VARIABLE SPEED SYSTEMS</b>				<b>9</b>
Need of variable speed systems-Power-wind speed characteristics-Variable speed constant frequency systems synchronous generator- DFIG- PMSG -Variable speed generators modelling- Variable speed variable frequency schemes.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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 impactation steady-state and dynamic performance of the power system including modelling issue.					
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
		<b>45</b>	<b>0</b>	<b>45</b>	
<b>TEXT BOOKS:</b>					
1.	L.L.Freri's "Wind Energy Conversion Systems", Prentice Hall, 2000				
2.	S.N.Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2010.				
<b>REFERENCE BOOKS:</b>					
1.	Ion Boldea, "Variable speed generators", Taylor & Francis group, 2006.				
2.	E.W.Golding "The generation of Electricity by wind power", Redwoodburn Ltd., Trowbridge, 2001.				
3.	N.Jenkins, "Wind Energy Technology" John Wiley & Sons, 2001				
4.	S.Heir "Grid Integration of WECS", Wiley 2001.				
<b>E REFERENCES :</b>					
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	PO 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
<b>Total</b>	11	09	02	7	8	0	0	0	01	0	01	0	09	06
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**BIO-MEDICAL INSTRUMENTATION**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E31</b>	<b>BIO-MEDICAL INSTRUMENTATION</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT-I</b>	<b>HUMAN SYSTEM AND BIO POTENTIAL ELECTRODES</b>				<b>9</b>
Different types of human system, origin of bio-potential and its propagation. Electrode-electrolyte interface, electrode-skin interface, half cell potential, Types of electrode, PH electrode, Recording problems, measurement with two electrodes - human cell structure.					
<b>UNIT-II</b>	<b>ELECTRODE CONFIGURATION</b>				<b>9</b>
Bio signals characteristics – frequency & amplitude ranges. ECG – Enthoven’s triangle, standard 12 lead system, PQRS waveform. EEG – 10-20 electrode system, brain waves, recording setup of EEG, EMG, ERG, and EOG – unipolar and bipolar mode.					
<b>UNIT-III</b>	<b>BIO AMPLIFIER AND TRANSDUCER</b>				<b>9</b>
Need for Bio –amplifier, power amplifier, isolation amplifier, feedback amplifier. Resistive, Inductive, Capacitive transducer and application, Fibre optic, photoelectric transducer – description, features applicable for biomedical instrumentation					
<b>UNIT-IV</b>	<b>CARDIAC MEASUREMENTS</b>				<b>9</b>
Blood pressure measurement – blood flow measurement – phonocardiography – vector cardiography. Heart lung machine –ventilator – Anesthetic machine – cardiac pacemaker - defibrillator patient safety - electrical shock hazards.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT-V</b>	<b>MEDICAL DIAGNOSTICS INSTRUMENTS AND SYSTEMS</b>	<b>9</b>
CT scanner – MRI Scan and Ultrasonic scanner – X Ray – Laser Equipment and application- bio-telemetry Kidney dialysis machine – electron microscope – blood cell counter- Endoscopy		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	Khandpur, R.S., 'Handbook of Biomedical Instrumentation', Tata McGraw Hill, 2007.	
2.	ArumugamM., 'Bio Medical Instrumentation', Anuradha agencies Pub., 2012.	
3.	C.Rajaroo and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2008.	
4.	J. Webster, 'Medical Instrumentation', John Wiley & Sons, 2003.	
<b>REFERENCE BOOKS:</b>		
1.	Geddes L.A., and Baker, L.E., 'Principles of Applied Bio-medical Instrumentation', 3rd Edition, John Wiley and Sons, 2011.	
2.	Cromwell, Weibell and Pfeiffer, 'Biomedical Instrumentation and Measurements', 2 <sup>nd</sup> Edition, Prentice Hall of India, 2014.	
3.	Tompkins W.J., Biomedical Digital Signal Processing, Prentice Hall of India, 2008.	
4.	J. Wilson, J.F.B. Hawkes, 'Laser Principles and Applications', (Prentice-Hall, New York), (2006)	
<b>E-REFERENCES:</b>		
1.	<a href="http://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/Bio%20medical%20instrumentation">http://nptel.ac.in/courses/Webcourse-contents/IIT-Delhi/Bio medical instrumentation</a>	

**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
<b>CO1</b>	2	2	1	1	-	-	1	-	1	-	-	-	1	-
<b>CO2</b>	-	-	3	-	-	-	2	2	-	-	2	2	1	-
<b>CO3</b>	-	-	3	-	-	3	3	-	-	-	-	-	3	1
<b>CO4</b>	1	2	-	3	-	-	2	-	-	2	-	-	2	1
<b>CO5</b>	1	1	-	3	2	-	-	-	-	-	-	-	1	-
<b>Total</b>	4	5	7	6	2	3	8	2	1	2	2	2	8	2
<b>Scaling</b>	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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRICAL ENERGY UTILIZATION AND CONSERVATION**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
<b>E32</b>	<b>ELECTRICAL ENERGY UTILIZATION AND CONSERVATION</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>UNIT I</b>	<b>ELECTRIC DRIVES AND TRACTION</b>					<b>10</b>
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.						
<b>UNIT II</b>	<b>ELECTRIC LIGHTING</b>					<b>08</b>
Definition of terms – types of lamp – types of lighting –Lighting Scheme, methods of lighting calculation design of illumination – residential – commercial – industrial – energy saving measures.						
<b>UNIT III</b>	<b>HEATING AND WELDING</b>					<b>09</b>
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.						

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>ELECTRO-CHEMICAL PROCESSES</b>	<b>09</b>
Electrolysis – Electroplating – Electro deposition – Extraction of metals – Current, Efficiency - Batteries – types – Charging Methods.		
<b>UNIT V</b>	<b>ENERGY CONSERVATION AND AUDIT</b>	<b>09</b>
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.		
		<b>LECTURE    TUTORIAL    TOTAL</b>
		<b>45                    00                    45</b>
<b>TEXT BOOKS:</b>		
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.	
<b>REFERENCE BOOKS:</b>		
1.	S. L Uppal, “Electrical Power”, Khanna Publishers, 1988.	
2.	Suryanarayana, N.V., 'Utilisation of Electric Power', Wiley Eastern Ltd. 1993.	
<b>E REFERENCES</b>		
1.	<a href="http://nptel.ac.in/courses/108105058/">http://nptel.ac.in/courses/108105058/</a> Prof. S. Banerjee, IIT – Kharagpur.	
2.	<a href="https://www.youtube.com/watch?v=uy9lZCdkQIM">https://www.youtube.com/watch?v=uy9lZCdkQIM</a> 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
<b>CO 1</b>	2			2	1							2	1	1
<b>CO 2</b>	3	2	2	2	2							1	1	1
<b>CO 3</b>	2		2			2						1	1	1
<b>CO 4</b>	2	2		2		2						1	1	2
<b>CO 5</b>	2	2				2						1	1	2
<b>Total</b>	11	6	4	6	3	6	0	0	0	0	0	6	5	7
<b>Scaled to 0,1,2,3 scale</b>	3	2	1	2	1	2	0	0	0	0	0	2	1	1

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**POLLUTION PERFORMANCE ANALYSIS OF ELECTRICAL SYSTEMS**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
<b>E33</b>	<b>POLLUTION PERFORMANCE ANALYSIS OF ELECTRICAL SYSTEMS</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>UNIT-I</b>	<b>INTRODUCTION</b>					<b>09</b>
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.						
<b>UNIT-II</b>	<b>POLLUTION TESTING</b>					<b>09</b>
Artificial pollution testing–salt-fog method–solid layer method–monitoring of parameters– measurement of layer conductivity–field testing methods.						
<b>UNIT-III</b>	<b>POLLUTION PERFORMANCE OF INSULATORS</b>					<b>09</b>
Ceramic and non-ceramic insulators–mitigation of pollution induced flash over- design of shed profiles–rib factor effect in AC and DC insulators–modeling.						
<b>UNIT-IV</b>	<b>POLLUTION PERFORMANCE OF SURGE DIVERTERS</b>					<b>09</b>
External insulation–effect of pollution on the protective characteristics of gap and gapless arresters– modeling of surge diverters under polluted conditions.						

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT-VPOLLUTIONPERFORMANCEOFINDOOR EQUIPMENT</b>				<b>09</b>
Condensation and contamination of indoor switch gear – performance of organic insulator under polluted conditions – accelerated testing techniques.				
		<b>45</b>	<b>0</b>	<b>45</b>
<b>TEXTBOOKS</b>				
1.	Kuffel,E.,Zaengl,W.S.andKuffelJ.,“HighVoltageEngineeringFundamentals”,Elsvier IndiaPvt.Ltd,2005.			
2.	Ragaller,“SurgesinHighKlaus VoltageNetworks”, PlenumPress,New York,1980.			
3.	Looms,J.S.T.,“Insulatorsfor HighVoltages”,Peter Peregrinus.Ltd., London,1988.			
<b>REFERENCE BOOKS</b>				
1.	DieterKindandKurtFeser,“HighVoltageTestTechniques”,SecondEdition,SBAElectrical EngineeringSeries,New Delhi,1999.			
2.	2. Ravi S.Gorur,“Outdoor Insulators”,Inc.Phoenix,Arizona85044,USA,1999			
<b>E-REFERENCES</b>				
1.	E-learning course on Design and Testing on power apparatus , Dr.R.Sarathi, IIT-Chennai			

**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
<b>CO 1</b>	1	3		1				2		1		2	2	3
<b>CO 2</b>	1				1						1	1	2	3
<b>CO 3</b>	1		1				1			1		1	2	1
<b>CO 4</b>	1	2										1	2	3
<b>Total</b>	4	5				1			1	2		6	10	10
<b>Scaling</b>	1	1	1	1	1	1	1	2	1	1	1	2	2	2

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENERGY EFFICIENT BUILDING**

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

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E34</b>	<b>ENERGY EFFICIENT BUILDING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT-I</b>	<b>CLIMATE AND SHELTER</b>				<b>9</b>
Historic buildings–Modern architecture–Examples from different climate zones– Thermal comfort– Solar geometry and shading– Heating and cooling loads– Energy estimates and site planning– Integrative Modeling method and building simulation					
<b>UNIT-II</b>	<b>PRINCIPLES OF ENERGY CONSCIOUS BUILDING DESIGN</b>				<b>9</b>
Energy conservation in buildings – Day lighting – Water heating and photovoltaic systems– Advances in the thermal insulation– Heat gain/loss through building components – Solar architecture					
<b>UNIT-III</b>	<b>PASSIVE SOLAR HEATING</b>				<b>9</b>
Direct gain–thermal storage wall–Sun space–Convective air loop–Passive cooling–Ventilation–Radiation –Evaporation and Dehumidification–Mass effect–Design guidelines.					
<b>UNIT-IV</b>	<b>ENERGY CONSERVATION IN BUILDING</b>				<b>9</b>
Air conditioning – HVAC equipments – Computer packages for thermal design of buildings and performance prediction – Monitoring and instrumentation of passive buildings– Control systems for energy efficient buildings– Illustrative passive buildings– Intelligent building design principles					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT-V</b>	<b>EFFICIENT TECHNOLOGIES IN ELECTRICAL SYSTEMS</b>	<b>9</b>
Maximum demand controllers, automatic power factor controllers, energy efficient motors, soft starters and soft switches, light sensors.		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS:</b>		
1.	Mili Majumdar, “Energy-Efficient Buildings in India” Published by Tata Energy Research Institute, New Delhi, 2001	
2.	J.A. Clarke, “Energy Simulation in Building Design (2e)” Butterworth 2001.	
3.	J.K. Nayak and J.A. Prajapati Handbook on “Energy Conscious Buildings”, Solar Energy control MNES, 2006	
4.	J.R. Williams, “Passive Solar Heating”, Ann Arbor Science, 2000	
<b>REFERENCE BOOKS:</b>		
1.	Dorota Chwieduk - “Solar Energy in Buildings” Published by Pergamon Press, 2014	
2.	J.L. Threlkeld, “Thermal Environmental Engineering”, Prentice Hall, 1970.	
3.	“Energy conservation Building Codes”, Bureau of Energy Efficiency, 2006.	
4.	R.W. Jones, J.D. Balcomb, C. E. Kosiewicz, G. S. Lazarus, R.D. McFarland and W.O. Wray, “Passive Solar Design Handbook”, Vol. 3, Report of U.S. Department of Energy (DOE/CS-0127/3), 1982.	
<b>E-REFERENCES:</b>		
1.	www.terrin.org	

**COs versus POs mapping**

CO/PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12	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
<b>Total</b>	<b>15</b>	<b>9</b>	<b>10</b>	<b>6</b>	<b>5</b>		<b>4</b>		<b>3</b>	<b>2</b>	<b>1</b>	<b>5</b>	<b>12</b>	<b>7</b>
<b>Scaling</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>2</b>	<b>1</b>		<b>1</b>		<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>3</b>	<b>2</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SPECIAL ELECTRICAL MACHINES**

<b>Course Outcomes(E41):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Able to <i>define</i> and <i>explain</i> the construction, operation, types and their characteristics of synchronous reluctance motor.	Cognitive	Remembering Understanding
<b>CO2</b>	<i>Explain</i> the construction, working and types of stepping motor and <i>analyze</i> the linear and non-linear characteristics.	Cognitive	Understanding Analyzing
<b>CO3</b>	<i>Explain</i> the construction, operation and characteristics of switched reluctance motor and <i>Illustrate</i> the different types of power controllers.	Cognitive	Understanding
<b>CO4</b>	<i>Outline</i> the operation, characteristics of permanent magnet dc motor and <i>types</i> of power controller. <i>Formulate</i> the EMF and Torque equation and phasor diagram, <i>define</i> the commutation logic.	Cognitive	Understanding Understanding Remembering
<b>CO5</b>	<i>Explain</i> the operation and characteristics of permanent magnet synchronous motor and <i>Discuss</i> the phasor diagram. <i>Elaborate</i> the microprocessors based controller.	Cognitive	Understanding Creating Creating

<b>SUB CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E41</b>	<b>SPECIAL ELECTRICAL MACHINES</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT-I</b>	<b>SYNCHRONOUS RELUCTANCE MOTORS</b>	<b>09</b>			
Constructional features – types – axial and radial air gap motors – operating principle – reluctance – phasor diagram - characteristics – Vernier motor.					
<b>UNIT-II</b>	<b>STEPPING MOTORS</b>	<b>09</b>			
Constructional features – principle of operation – variable reluctance motor – Hybrid motor – single and Multi stack configurations – theory of torque predictions – linear and non-linear analysis – characteristics –closed loop control - drive circuits.					
<b>UNIT-III</b>	<b>SWITCHED RELUCTANCE MOTORS</b>	<b>09</b>			
Constructional features – principle of operation – torque prediction – power controllers – Nonlinear analysis – Microprocessor based control –closed loop control - characteristics.					
<b>UNIT-IV</b>	<b>PERMANENT MAGNET BRUSHLESS DC MOTORS</b>	<b>09</b>			
Principle of operation –EMF and Torque equations – Types of Power Controllers – Torque Speed characteristics – Commutation logic - Control.					
<b>UNIT-V</b>	<b>PERMANENT MAGNET SYNCHRONOUS MOTORS</b>	<b>09</b>			
. Principle of operation – EMF and torque equations – reactance – phasor diagram – power controllers - converter - volt-ampere requirements – torque speed characteristics - microprocessor based control.					
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
		<b>45</b>	<b>0</b>	<b>45</b>	

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**TEXT BOOKS:**

1.	Miller, T.J.E., ‘Brushless Permanent Magnet and Reluctance Motor Drives’, Clarendon Press, Oxford, 2002
2.	Aearnley, P.P., ‘Stepping Motors – A Guide to Motor Theory and Practice’, Peter Perengrinus, London, 1982.
3.	P.P. Aearnley, ‘Stepping Motors – A Guide to Motor Theory and Practice’, Peter Perengrinus, London, 2005.
4.	R.Krishnan, ‘Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application’, CRC Press, New York, 2001.

**REFERENCE BOOKS:**

1.	Kenjo, T., ‘Stepping Motors and their Microprocessor Controls’, Clarendon Press London, 2002.
2.	Kenjo, T., and Nagamori, S., ‘Permanent Magnet and Brushless DC Motors’, Clarendon Press, London, 1988.
3.	K. Dhayalini, ‘Special Electrical Machines’, Anuradha Publications.
4.	S.Albert Alexander,J.Gnanavadivel, “Special Electrical Machines”, Anuradha Publications.

**E REFERENCES :**

1.	NPTEL-Special Electrical Machines- Prof. P. Sasidhara Rao-IIT Madras.
2.	NPTEL-Special Electrical Machines- Prof. Dr. Krishna Vasudevan -IIT Madras.

**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	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
<b>Total</b>	<b>11</b>	<b>9</b>	<b>0</b>	<b>1</b>	<b>6</b>	<b>5</b>	<b>1</b>	<b>4</b>	<b>0</b>	<b>2</b>	<b>0</b>	<b>4</b>	<b>7</b>	<b>7</b>
<b>Scaling</b>	<b>2</b>	<b>2</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>0</b>	<b>1</b>	<b>2</b>	<b>2</b>

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENERGY MANAGEMENT AND AUDITING**

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

SUB.CODE			SUB NAME				L	T	P	C
E42			ENERGY MANAGEMENT AND AUDITING				3	0	0	3
C	P	A					L	T	P	H
3	0	0					3	0	0	3
UNIT 1		INTRODUCTION							09	
Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting- energy audit process.										
UNIT 2		ENERGY COST AND LOAD MANAGEMENT							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.										
UNIT 3		ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT							09	
Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines-Energy management in industrial drive.										
UNIT 4		METERING FOR ENERGY MANAGEMENT							09	
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.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT 5</b>	<b>LIGHTING SYSTEMS &amp; COGENERATION</b>	<b>09</b>
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		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, ‘Guide to Energy Management’, Fifth Edition, The Fairmont Press, Inc., 2006</li> <li>Eastop T.D &amp; Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific &amp; Technical, ISBN -0-582-03184, 1990.</li> </ol>		
<b>REFERENCES BOOKS</b>		
<ol style="list-style-type: none"> <li>IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 2011.</li> <li>Amit K. Tyagi, ‘ Handbook on Energy Audits and Management’, TERI, 2003</li> </ol>		
<b>E REFERENCES</b>		
<ol style="list-style-type: none"> <li>E-learning course on Energy audit and management, Dr..K.Shanti swarup , Indian Institute of Technology, Chennai.</li> </ol>		

**COs versus PO, PSO mapping**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRICAL SAFETY**

<b>Course Outcomes(E43):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Describe electrical hazards and safety equipment.	Cognitive	Understanding
<b>CO2</b>	Analyze and apply various grounding and bonding techniques.	Cognitive	Applying
<b>CO3</b>	Select appropriate safety method for low, medium and high voltage equipment.	Cognitive	knowledge
<b>CO4</b>	Participate in a safety team.	Cognitive	knowledge
<b>CO5</b>	Carry out proper maintenance of electrical equipment by understanding various standards.	Cognitive	knowledge

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>E43</b>	<b>ELECTRICAL SAFETY</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>					<b>09</b>
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.					
<b>UNIT II</b>					<b>09</b>
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.					
<b>UNIT III</b>					<b>09</b>
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					
<b>UNIT IV</b>					<b>09</b>
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					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>				<b>09</b>		
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.						
				<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
				<b>45</b>	<b>0</b>	<b>45</b>
<b>TEXT BOOKS</b>						
1. John Cadick, Mary Capelli-Schellpfeffer, Dennis Neitzel, Al Winfield , ‘Electrical Safety Handbook’, McGraw-Hill Education, 4thEdition, 2012.						
<b>REFERENCE BOOKS</b>						
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**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SUSTAINABLE ENERGY UTILIZATION**

<b>Course Outcomes(E44):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	<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
<b>CO2</b>	<i>Apply</i> heating/cooling load calculations for a single family residence.	Cognitive	Applying
<b>CO3</b>	<i>Describe</i> different types of heating systems, and assess their applicability.	Cognitive	Understanding
<b>CO4</b>	<i>Describe</i> the function of passive systems and discuss about alternative cooling processes.	Cognitive	Understanding
<b>CO5</b>	<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	T	P	C
<b>E44</b>	<b>SUSTAINABLE ENERGY UTILIZATION</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C:P:A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3:0:0</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>HEAT FLOW CALCULATIONS IN BUILDINGS</b>				<b>9</b>
Unsteady heat flows through walls, roof, windows etc. Direct heat gains through windows. Convective gains/losses, air exchange rates. Gains from people, appliances etc. Air conditioning load calculations.					
<b>UNIT II</b>	<b>NEED OF ENERGY IN BUILDINGS</b>				<b>9</b>
Role 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 - Environmental science of buildings - Study of Thermal environment and visual environment - Heat gain and heat loss phenomenon of buildings - Role of building enclosures, openings and materials in thermal environment - Energy efficient light design of buildings .					
<b>UNIT III</b>	<b>PASSIVE COOLING / HEATING CONCEPTS</b>				<b>9</b>
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					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV ENERGY EFFICIENT BUILDINGS</b>	<b>9</b>						
Introduction - Definition and concepts, Energy and Water as a resource - Criticality of resources and needs of modern living - Envelop heat loss and heat gain and its evaluation, Thermal Comport improvement methods, Optimum performance, other building comports, IAQ requirements.							
<b>UNIT V ELECTRICAL ENERGY CONVERSION</b>	<b>9</b>						
Opportunities and Techniques for energy conservation in Buildings - Adoption to sustainable resources, process and Technologies. Green Buildings, Intelligent Buildings, Rating of Buildings, Efficient Use of Buildings, Solar Passive Architecture, Eco-housing concepts and National and International norms.							
<table border="1"> <thead> <tr> <th><b>LECTURE</b></th> <th><b>TUTORIAL</b></th> <th><b>TOTAL</b></th> </tr> </thead> <tbody> <tr> <td style="text-align: center;"><b>45</b></td> <td style="text-align: center;"><b>00</b></td> <td style="text-align: center;"><b>45</b></td> </tr> </tbody> </table>		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	<b>45</b>	<b>00</b>	<b>45</b>
<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>					
<b>45</b>	<b>00</b>	<b>45</b>					
<b>TEXTBOOKS</b>							
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.						
5.	JR Williams, Passive Solar Heating, Ann Arbor Science, 1983.						
<b>REFERENCES</b>							
1.	RW Jones, JD Balcomb, CE Kosiewicz, GS Lazarus, RD McFarland and WOWray, Passive Solar Design Handbook, Vol 3, Report of US Department of Energy (DOE/CS-0127/3), 1982.						
2.	J Krieder and A Rabi, Heating and Cooling of Buildings: Design for Efficiency, McGraw-Hill, 1994.						
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, London, 1980.						

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**E REFERENCES**

1. <http://ocw.mit.edu/courses/nuclear-engineering/22-081j-introduction-to-sustainable-energy-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.

**COs versus PO, PSO mapping**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRIC VEHICLES AND POWER MANAGEMENT**

Course Outcomes (E51)		Domain	Level
<b>CO1</b>	<b>Explain</b> power system load characteristics and generation reserve requirements.	Cognitive	Understanding
<b>CO2</b>	<b>Demonstrate</b> and <b>Apply</b> the mathematical knowledge to model and analysis of power system for frequency control.	Cognitive	Understanding Applying
<b>CO3</b>	<b>Identify</b> fundamental aspects of reactive power and its effect on system voltage and <b>Select</b> the suitable voltage control method for the system operating condition.	Cognitive	Applying
<b>CO4</b>	<b>Formulate</b> economic dispatch and unit commitment problem and its solution.	Cognitive	Creating
<b>CO5</b>	<b>Apply</b> computer control methods for power system operation and control.	Cognitive	Applying

SUB. CODE			SUB NAME	L	T	P	C
<b>E51</b>			<b>ELECTRIC VEHICLES AND POWER MANAGEMENT</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C</b>	<b>P</b>	<b>A</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>		<b>3</b>	<b>2</b>	<b>0</b>	<b>5</b>
<b>UNIT I</b>				<b>INTRODUCTION</b>			
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.							
<b>UNIT II</b>			<b>REAL POWER - FREQUENCY CONTROL</b>				<b>09+06</b>
Basics of speed governing mechanism and modeling - speed-load characteristics – load sharing between 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-area system: modeling - static analysis of uncontrolled case - tie line with frequency bias control - state variable model							
<b>UNIT III</b>			<b>REACTIVE POWER–VOLTAGE CONTROL</b>				<b>09+06</b>
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.							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>UNIT COMMITMENT AND ECONOMIC DISPATCH</b>	<b>09+06</b>
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 <b>method and</b> $\lambda$ -iteration method - statement of unit commitment problem – priority-listmethod - forward dynamic programming.		
<b>UNIT V</b>	<b>COMPUTER CONTROL OF POWER SYSTEMS</b>	<b>09+06</b>
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.		
<b>Lecture = 45; Tutorial = 30; Lab = 0; Total =75 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Olle.I.Elgerd, ‘Electric Energy Systems theory - An introduction’, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 34th reprint, 2010.</li> <li>2. Allen. J. Wood and Bruce F. Wollenberg, ‘Power Generation, Operation and Control’, John Wiley &amp; Sons, Inc., 2003.</li> <li>3. Kundur P., ‘Power System Stability and Control, Tata McGraw Hill, New Delhi, 5th reprint, 2008.</li> </ol>		
<b>REFERENCE BOOKS:</b>		
<ol style="list-style-type: none"> <li>1. Nagrath I.J. and Kothari D.P., ‘Modern Power System Analysis’, Tata McGraw-Hill, Fourth Edition,2011.</li> <li>2. Hadi Saadat, ‘Power System Analysis’, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 21<sup>st</sup> reprint, 2010.</li> <li>3. Abhijit Chakrabarti, Sunita Halder, ‘Power System Analysis Operation and Control’, PHI learning Pvt. Ltd., New Delhi, Third Edition, 2010.</li> </ol>		
<b>E-REFERENCES:</b>		
1. NPTEL : <a href="http://nptel.ac.in/courses/108104052/">http://nptel.ac.in/courses/108104052/</a>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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
<b>CO1</b>	3	3	1	1	2	-	-	-	-	1	-	-	2	1
<b>CO2</b>	2	3	2	2	2	-	-	-	1	1	1	-	2	-
<b>CO3</b>	2	2	2	2	3	-	-	-	-	-	1	1	2	-
<b>CO4</b>	2	2	3	3	2	-	-	-	-	1	-	-	1	-
<b>CO5</b>	1	2	2	2	2	-	-	-	-	-	-	1	1	1
<b>Total</b>	<b>10</b>	<b>12</b>	<b>10</b>	<b>10</b>	<b>11</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>3</b>	<b>2</b>	<b>2</b>	<b>8</b>	<b>2</b>
<b>Scaling</b>	<b>2</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>0</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>2</b>	<b>1</b>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ADVANCED CONTROL SYSTEM ENGINEERING**

Course 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

SUB.CODE			SUB NAME				L	T	P	C
<b>E52</b>			<b>ADVANCED CONTROL SYSTEM ENGINEERING</b>				<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I STATE VARIABLE ANALYSIS AND DESIGN</b>									<b>09</b>	
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.										
<b>UNIT II NONLINEAR SYSTEMS</b>									<b>09</b>	
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.										
<b>UNIT III OPTIMAL CONTROL</b>									<b>09</b>	
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.										
<b>UNIT IV DIGITAL CONTROL SYSTEM</b>									<b>09</b>	
Characteristics 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.										
<b>UNIT V</b>	<b>ALGORITHM AND STRATEGY FOR COMPUTER CONTROL</b>								<b>09</b>	
Scaling data - linearization of input data - arithmetical operations and functions - integration - control law algorithm - PID control law - self-tuning strategy.										
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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” 2<sup>nd</sup> 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)**

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**SMART GRIDS**

Course Outcomes (E53)		Domain	Level
<b>CO1</b>	<i>Explain</i> the paradigm shift between traditional power transmission and distribution and smart power grids verbally and in writing.	Cognitive	understanding
<b>CO2</b>	<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
<b>CO3</b>	Describe and <i>assess</i> smart grid technologies that enhance transmission and distribution systems.	Cognitive	Evaluating
<b>CO4</b>	<i>Appraise</i> current implementations of smart grid technologies and/or policies using regional data sources.	Cognitive	Evaluating
<b>CO5</b>	<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	T	P	C
<b>E53</b>			<b>SMART GRIDS</b>				<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>							<b>INTRODUCTION TO SMART GRID</b>			
Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, Concept of Resilient & Self-Healing Grid, Present development & International policies in Smart Grid, Diverse perspectives from experts and global Smart Grid initiatives										
<b>UNIT II</b>			<b>SMART GRID TECHNOLOGIES</b>				<b>09</b>			
Smart energy resources, Smart substations, Substation Automation, Feeder Automation, Transmission systems: EMS, FACTS and HVDC, Wide area monitoring, Protection and control, Distribution systems: DMS, Volt/VAR control, Fault Detection, Isolation and service restoration, Outage management, High-Efficiency Distribution Transformers, Phase Shifting Transformers, Plug in Hybrid Electric Vehicles (PHEV)..										
<b>UNIT III</b>			<b>SMART METERS AND ADVANCED METERING INFRASTRUCTURE</b>				<b>09</b>			
Introduction to Smart Meters, Advanced Metering infrastructure (AMI) drivers and benefits, AMI protocols, standards and initiatives, AMI needs in the smart grid, Phasor Measurement Unit (PMU), Intelligent Electronic Devices (IED) & their application for monitoring & protection.										
<b>UNIT IV</b>			<b>POWER QUALITY MANAGEMENT IN SMART GRID</b>				<b>09</b>			
Power Quality & EMC in Smart Grid, Power Quality issues of Grid connected Renewable Energy Sources, Power Quality Conditioners for Smart Grid, Web based Power Quality monitoring, Power Quality Audit.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS</b>	<b>09</b>
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.		
<b>Lecture = 45; Tutorial = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"><li>1. JanakaEkanayake, Nick Jenkins, KithsiriLiyanage, Jianzhong Wu, Akihiko Yokoyama, “Smart Grid: Technology and Applications”, Wiley</li><li>2. Stuart Borlase “Smart Grid :Infrastructure, Technology and Solutions”,CRC Press 2012.</li><li>3. Yang Xiao, Communication and Networking in Smart Grids, CRC press, 2012</li></ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"><li>1. NouredineHadjsaid and Jean-Claude SabonnadièreSmart, SmartGrids, ISTE Ltd. 2012.</li><li>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.</li><li>3. Xi Fang, SatyajayantMisra, GuoliangXue, and Dejun Yang “Smart Grid – The New and Improved Power Grid: A Survey” , IEEE Transaction on Smart Grids.</li></ol>		
<b>E REFERENCES</b>		
<ol style="list-style-type: none"><li>1. <a href="https://iit.edu/news/iittoday/?tag=smart-grid">https://iit.edu/news/iittoday/?tag=smart-grid</a></li><li>2. <a href="https://www.smartgrid.gov/the_smart_grid/">https://www.smartgrid.gov/the_smart_grid/</a></li></ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus PO, PSO mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**FUNDAMENTALS OF NANOSCIENCE**

Course 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

SUB.CODE			SUB NAME				L	T	P	C
E54			FUNDAMENTALS OF NANOSCIENCE				3	0	0	3
C	P	A					L	T	P	H
3	0	0					3	0	0	3
UNIT I		INTRODUCTION							09	
Scientific Revolution of nano technology-Feynman’s theory-Length of scale-Classification of nano structures and nano structured materials-Limitation of nanomaterials.										
UNIT II		PROPERTIES OF NANOMATERIALS							09	
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 Optical Properties, Resistivity, Permittivity and Breakdown Strength, Refractive Index.										
UNIT III		SYNTHESIZATION AND CHARACTERIZATION METHODS							09	
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.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>NANOMATERIALS</b>	<b>09</b>
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		
<b>UNIT V</b>	<b>APPLICATIONS</b>	<b>09</b>
NanoInfoTech: Information storage- nanocomputer, molecular switch, super chip, Nanocrystal. Nanobiotechnology: 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.		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. A.S. Edelstein and R.C. Cammearata, eds., 1996-Nanomaterials: Synthesis, Properties and Applications- Institute of Physics Publishing, Bristol and Philadelphia,</li> <li>2. P.M. Ajayan, L.S. Schadler, P.V. Braun, 2003 -Nanocomposite Science and Technology- WILEY-VCH Verlag GmbH Co. KGaA, Weinheim</li> <li>3. Nick Kanello Poulos, 2011-Nanoporous materials: Advance techniques for characterization, Modeling and Processing Edited by CRC press.</li> <li>4. Claudia Altavilla and Enrico Ciliberto, 2011, Inorganic nanoparticles : Synthesis, Application and Perspectives. Edited by CRC Press.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Elsevier Gary Wiederricht, 2010-Handbook of Nanofabrication.</li> <li>2. Ed. CR Rowe, CRC- Handbook of Thermo electrics.</li> <li>3. G Timp (Editor), 1999-Nanotechnology, AIP press/Springer.</li> <li>4. Akhlesh Lakhtakia (Editor)-The Hand Book of Nano Technology, Nanometer Structure, Theory, Modeling and Simulation. Prentice-Hall of India (P) Ltd, New Delhi</li> </ol>		
<b>E-REFERENCES</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://nptel.ac.in/courses/118102003/">http://nptel.ac.in/courses/118102003/</a> NPTEL, Nano structured Materials-Synthesis, Properties, Self Assembly and Applications Prof. Ashok k Ganguli Department of Chemistry Indian Institute of Technology, Delhi.</li> <li>2. <a href="http://nptel.ac.in/syllabus/118104008/NPTEL">http://nptel.ac.in/syllabus/118104008/NPTEL</a>, Nanostructures and Nanomaterials: Characterization and Properties Dr.Kantesh Balani, Dr.Anaandh Subramaniyam IIT Kanpur</li> </ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus PO, PSO mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**HIGH VOLTAGE ENGINEERING**

Course 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 overvoltage	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	<i>Able</i> 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	<i>Recall</i> and <i>Illustrate</i> 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 CODE			SUB NAME				L	T	P	C
E61			HIGH VOLTAGE ENGINEERING				3	0	0	3
C	P	A					L	T	P	H
3	0	0					3	0	0	3
UNIT I			OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS						09	
Natural Causes of overvoltage-Lightning phenomena and its effects on power system – Over voltage due to switching surge-power frequency overvoltage-control of overvoltage due to switching – protection of transmission lines against overvoltage – Becoleys lattice diagram.										
UNIT II			ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS						09	
Gaseous breakdown in uniform and non-uniform fields - corona discharges - Vacuum breakdown - conduction and breakdown in pure and commercial liquids - Breakdown mechanisms in solid and composite dielectrics-Applications of insulating materials.										
UNIT III			GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS						09	
Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generators.										
UNIT IV			MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS						09	
Measurement of High direct current voltages – measurement of voltages: alternating and impulse voltages- Measurement of High currents: direct, alternating and impulse currents. Digital techniques in high voltage measurement.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS</b>	<b>09</b>
High voltage testing of electrical power apparatus – power frequency, impulse voltage and DC testing – International and Indian standards-Insulation co-ordination.		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. E. Kuffel and M. Abdullah, ‘High Voltage Engineering’, Pergamon press, Oxford,2010.</li> <li>2. M.S. Naidu and V. Kamaraju, ‘High Voltage Engineering’, Tata McGraw Hill,4<sup>th</sup> Edition, 2004.</li> <li>3. E. Kuffel and W.S. Zaengl, ‘High Voltage Engineering Fundamentals’, Pergamon Press, Oxford, London, 2012</li> <li>4. August F.Metraux. “Some problems and actual limits of test techniques at extra high voltages”,Haefely publications EIS 14.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. C.L.Wadhwa, ‘High Voltage Engineering’, New Age International (P) Ltd, 2<sup>nd</sup> Edition2006.</li> <li>2. Ravindra Arora, Wolfgang Mosch, “High Voltage Insulation Engineering”, New Age International (P) Limited, 2011.</li> <li>3. Chinnappa ,K.M., Need for next higher voltage level in India”, National seminar on high voltage AC and Dc Transmission,New delhi.</li> </ol>		
<b>E REFERENCES</b>		
<ol style="list-style-type: none"> <li>1. Web Content - <a href="http://www.library.dce.edu/e-resources/books/ee/">http://www.library.dce.edu/e-resources/books/ee/</a></li> <li>2. NPTEL-High Voltage Engineering, C.L. Wadhwa -IIT Madras.</li> </ol>		

**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
<b>CO1</b>	3	2	2	-	-	1	-	1	-	-	-	2	2	2
<b>CO2</b>	3	2	-	-	-	-	-	-	-	-	-	1	1	2
<b>CO3</b>	2	2	-	-	1	1	-	1	-	-	-	1	1	1
<b>CO4</b>	2	2	-	-	-	-	1	-	-	-	-	1	2	2
<b>CO5</b>	2	2	-	2	-	1	-	-	-	-	-	2	2	2
<b>Total</b>	12	10	2	2	1	3	1	2	0	0	0	7	8	9
<b>Scaling</b>	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**

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DISASTER MANAGEMENT**

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

SUB.CODE			SUB NAME				L	T	P	C
E62			DISASTER MANAGEMENT				3	0	0	3
C	P	A					L	T	P	H
3	0	0					3	0	0	3
<b>UNIT I</b>			<b>INTRODUCTION TO DISASTERS</b>						<b>06</b>	
Concepts, and definitions (Disaster, Hazard, Vulnerability, Resilience, Risks)										
<b>UNIT II</b>			<b>DISASTERS</b>						<b>12</b>	
Classification Causes, Impacts (including social, economic, political, environmental, health, psychosocial, etc.) Differential impacts- in terms of caste, class, gender, age, location, disability Global trends in disaster urban disasters, pandemics, complex emergencies, Climate change.										
<b>UNIT III</b>			<b>APPROACHES TO DISASTER RISK REDUCTION</b>						<b>09</b>	
Disaster cycle - its analysis, Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, roles and responsibilities of - community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), states, Centre, and other stakeholders.										
<b>UNIT IV</b>			<b>INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT</b>						<b>10</b>	
Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc. Climate Change Adaptation. Relevance of indigenous knowledge, appropriate technology and local resources.										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>DISASTER RISK MANAGEMENT IN INDIA</b>	<b>06</b>
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)		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Kapur, Anu &amp; others, 2005: Disasters in India Studies of grim reality, Rawat Publishers, Jaipur.</li> <li>2. Environment Engineering and Disaster Management, Sanjay K. Sharma, 2011</li> <li>3. Disaster Management, Dr. Mrinalini Pandey, WILEY INDIA PVT. LTD, 2010.</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000.</li> <li>2. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.</li> <li>3. Govt. of India: Disaster Management Act 2005, Government of India, New Delhi.</li> <li>4. Alexander David, Introduction in 'Confronting Catastrophe', Oxford University Press, 2000.</li> <li>5. Andharia J. Vulnerability in Disaster Discourse, JTCDM, Tata Institute of Social Sciences Working Paper no. 8, 2008.</li> </ol>		

**COs versus POs mapping**

CO/PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	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
<b>Total</b>	15	5	5	6	5				3				3	5
<b>Scaling</b>	3	1	1	1	1				1				1	1

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



**ELECTRICAL POWER QUALITY**

Course Outcomes (E63)		Domain	Level
CO1	<i>Infer</i> the electrical power quality terms, power quality events and causes for reduction in power quality.	Cognitive	Understanding
CO2	<i>Analyse</i> the voltage sag performance, mitigation of sag and effects on drives	Cognitive	Analyzing
CO3	<i>Find</i> the harmonics sources from commercial and industrial load. <i>Interpret</i> the Effect of harmonics and controlling harmonic distortion.	Cognitive	Remembering Understanding
CO4	<i>Construct</i> a Filter circuit for harmonics and power factor improvement. <i>Compare</i> the VAR compensators-SVC and STATCOM	Cognitive	Applying Understanding
CO5	<i>Inference</i> a mathematical simulation tools for monitoring and diagnostic techniques for various power quality power quality problems and Quality measurement equipment.	Cognitive	Analyzing

SUB.CODE			SUB NAME				L	T	P	C
E63			<b>ELECTRICAL POWER QUALITY</b>				<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>C</b>	<b>P</b>	<b>A</b>					<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
<b>3</b>	<b>0</b>	<b>0</b>					<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>
<b>UNIT I</b>	<b>INTRODUCTION</b>								<b>09</b>	
Definition of Electric Power Quality- Description of poor power quality events. Power Quality phenomena – Basic terminologies – various events in Power Quality – Causes for reduction in Power Quality — Power Quality Standards and power quality strategy.										
<b>UNIT II</b>	<b>VOLTAGE SAG</b>								<b>09</b>	
Sources of sags – estimating voltage sag performance, sag severities – voltage sag due to induction motor starting - mitigation of voltage sags - effect on adjustable AC Drives, DC drives, computers and consumer electronics										
<b>UNIT III</b>	<b>HARMONICS</b>								<b>09</b>	
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										
<b>UNIT IV</b>	<b>FILTERING AND POWER FACTOR IMPROVEMENT</b>								<b>09</b>	
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										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT V</b>	<b>POWER QUALITY MONITORING</b>	<b>09</b>
<p>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</p>		
<p style="text-align: center;"><b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b></p>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"><li>1. Roger. C. Dugan, Mark. F. McGranaghram, Surya Santoso, H.WayneBeaty, “Electrical Power Systems Quality” McGraw Hill,2003</li><li>2. C. Sankaran, “Power Quality” CRC Press, 2002.</li><li>3. Alexander Kusko “Power Quality in Electrical Systems” The McGraw-Hill Companies, Inc, 2007.</li><li>4. Ewald F. Fuchs and Mohammad A.S. Masoum” Power Quality in Power Systems and Electrical Machines”, 2011</li></ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"><li>1. Silvester and Ferrari, “Finite for Electrical Engineers”, Cambridge University Press, 1983</li><li>2. S.R.H.Hoole, Computer – Aided, Analysis and Design of Electromagnetic Devices, Elsevier, New York, Amsterdam, London, 1989</li><li>3. D.A.Lowther and P.P Silvester, “Computer Aided Design in Magnetics”, Springer Verlag, New York, 1956</li></ol>		
<b>E-REFERENCES</b>		
<ol style="list-style-type: none"><li>1. <a href="http://www.copper.org/applications/electrical/pq/issues.html">http://www.copper.org/applications/electrical/pq/issues.html</a></li></ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

CO/PO	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
<b>CO1</b>	3	1	3	1	1	-	1	-	1	1	-	1	3	2
<b>CO2</b>	3	3	1	2	1	-	1	-	-	1	-	1	1	-
<b>CO3</b>	3	2	1	1	1	-	1	-	1	-	-	1	2	1
<b>CO4</b>	3	2	1	2	1	-	1	-	1	-	-	1	1	1
<b>CO5</b>	2	1	1	-	1	-	1	-	-	-	-	1	2	1
<b>Total</b>	14	9	7	6	5	-	5		3	2		5	9	5
<b>Scaling</b>	3	2	2	2	1		1		1	1		1	2	1

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
(Under Sec. 3 of UGC Act, 1956) • NAAC Accredited  
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, hydraulics and electrical drives. <i>List</i> out the advantages, disadvantages and its application	Cognitive	Remembering Understanding
CO2	<b>Apply</b> 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>Illustrate</b> 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	<b>Outline</b> the overview of robotics and their application. <b>Apply</b> the knowledge of robotics programming	Cognitive	Understanding Applying

SUB.CODE			SUB NAME				L	T	P	C
OE1			Industrial Automation				3	0	0	3
C	P	A					L	T	P	H
2	0	0					3	0	0	3
<b>UNIT I</b>			<b>INTRODUCTION TO PNEUMATICS AUTOMATION</b>				<b>09</b>			
Introduction to Pneumatics- Overall structure- Electro pneumatic –hydraulics- Overall –structure – <b>Advantages and disadvantages – Application</b> -Electrical drives.										
<b>UNIT II</b>			<b>APPLICATIONS OF RELAYS</b>				<b>09</b>			
Essential qualities of relays- NO & NC contacts- <b>Electrical signal storage – Electrical Ladder diagram-Pneumatic system- Hydraulic system</b> -pressure and proximity switches- Intelligent Relays.										
<b>UNIT III</b>			<b>SMART SENSORS AND TIMERS IN CONTROLLERS</b>				<b>09</b>			
Introduction to sensors- characteristics- types of sensors-resistive - inductive-capacitive- magnetic-ultrasonic - photoelectric- nano sensors- timers-counters-types-applications.										
<b>UNIT IV</b>			<b>PROGRAMMABLE LOGIC CONTROLLERS</b>				<b>09</b>			
Evolution of PLC – Sequential and Programmable controllers – Architecture – Programming of PLC – Relay logic and Ladder logic – Functional blocks – PLC interface to pneumatics.										
<b>UNIT V</b>			<b>ROBOTICS</b>				<b>09</b>			
Introduction and overviews of Robotics – Terms and Definition, Historical development of robotics, classification and configuration of robots, Basic components - Drives, controller gripper, application-programming in Robotics.										
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>										

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**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, 3<sup>rd</sup> Edition, 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/>

**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	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
<b>Total</b>	<b>12</b>	<b>10</b>	<b>3</b>	<b>2</b>	<b>4</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>1</b>	<b>2</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>
<b>Scaling</b>	<b>3</b>	<b>2</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



**PERIYAR  
MANIAMMAI  
UNIVERSITY**  
:redited  
form

**ENERGY MANAGEMENT AND AUDITING**

Course Outcomes (OE2)		Domain	Level			
CO1	<i>Explain</i> the stages and process of energy management Program.	Cognitive	Understanding			
CO2	<i>Analyze</i> economic models of load management systems. <i>Explain</i> monitoring and control of energy management systems.	Cognitive	Analyzing Understanding			
CO3	<i>Compare</i> different energy management techniques for Electric loads and drives.	Cognitive	Understanding			
CO4	<i>Explain</i> the different metering arrangement and their Performance in a electrical system.	Cognitive	Understanding			
CO5	<i>Define</i> the lighting scheme and Standards for energy conservation. <i>Explain</i> the methods of improving the power quality.	Cognitive	Remembering Understanding			
<b>SUB.CODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>	
<b>OE 2</b>	<b>ENERGY MANAGEMENT AND AUDITING</b>	<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>C</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>	
<b>3</b>		<b>3</b>	<b>0</b>	<b>0</b>	<b>3</b>	
<b>UNIT 1</b>	<b>INTRODUCTION</b>					<b>09</b>
Need for energy management - energy basics- designing and starting an energy management program – energy accounting -energy monitoring, targeting and reporting- energy audit process.						
<b>UNIT 2</b>	<b>ENERGY COST AND LOAD MANAGEMENT</b>					<b>09</b>
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.						
<b>UNIT 3</b>	<b>ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT</b>					<b>09</b>
Systems and equipment- Electric motors-Transformers and reactors-Capacitors and synchronous machines-Energy management in industrial drive.						
<b>UNIT 4</b>	<b>METERING FOR ENERGY MANAGEMENT</b>					<b>09</b>
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.						

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT 5</b>	<b>LIGHTING SYSTEMS &amp; COGENERATION</b>	<b>09</b>
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		
<b>Lecture = 45; Tutorial = 0; Lab = 0; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>Barney L. Capehart, Wayne C. Turner, and William J. Kennedy, ‘Guide to Energy Management’, Fifth Edition, The Fairmont Press, Inc., 2006</li> <li>Eastop T.D &amp; Croft D.R, Energy Efficiency for Engineers and Technologists, Logman Scientific &amp; Technical, ISBN -0-582-03184, 1990.</li> </ol>		
<b>REFERENCES BOOKS</b>		
<ol style="list-style-type: none"> <li>IEEE Recommended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 2011.</li> <li>Amit K. Tyagi, ‘ Handbook on Energy Audits and Management’, TERI,2003</li> </ol>		
<b>E REFERENCES</b>		
<ol style="list-style-type: none"> <li>E-learning course on Energy audit and management, Dr.K.Shanti swarup , Indian Institute of Technology, Chennai.</li> </ol>		

**COs versus PO, PSO mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**OE3 RENEWABLE ENERGY TECHNOLOGY**

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

SUB.CODE			SUB NAME	L	T	P	C
OE 3			RENEWABLE ENERGY TECHNOLOGY	3	0	0	3
C	P	A		L	T	P	H
3	0	0		3	0	0	3
UNIT I			INTRODUCTION				09
Primary energy sources, Renewable Vs non-renewable primary energy sources, Renewable energy resources in India, Current usage of renewable energy sources in India, future potential of renewable energy in power production and development of renewable energy technologies.							
UNIT II			SOLAR ENERGY				09
Solar Radiation and its measurements, Solar Thermal Energy Conversion from Flat- plate Solar Collectors, Concentrating Collectors and its Types, Efficiency and performance of collectors, Direct Solar Electricity Conversion from Photovoltaics- types of solar cells and its application of battery charger, Recent Advances in PV Applications- Building Integrated PV, Grid Connected PV Systems.							
UNIT III			WIND ENERGY				09
Wind energy principles, wind site and its resource assessment, wind assessment, Factors influencing wind, wind turbine components, wind energy conversion systems(WECS), Classification of WECS devices, Hybrid systems - safety and environmental aspects, economic aspects.							

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

<b>UNIT IV</b>	<b>BIO-ENERGY</b>	<b>09</b>
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.		
<b>UNIT V</b>	<b>OTHER TYPES OF ENERGY</b>	<b>09</b>
Energy conversion from Hydrogen and Fuel cells, Geo thermal energy Resources, Potential in India. Tidal and wave energy.		
<b>Lecture = 45; Tutorial = 00; Total = 45 Hours</b>		
<b>TEXT BOOKS</b>		
<ol style="list-style-type: none"> <li>1. G.D. Rai, Non-Conventional Energy Sources- Khanna Publishers.</li> <li>2. Twidell &amp; Wier, Renewable Energy Resources –CRC Press (Taylor &amp; Francis).</li> <li>3. D.P.Kothari, K.C.Singha , Renewable energy sources and emerging technologies - P.H.I</li> <li>4. Mukund R.Patel, 1999.Wind And Solar Power Systems- CRC Press ,Florida,</li> </ol>		
<b>REFERENCE BOOKS</b>		
<ol style="list-style-type: none"> <li>1. Tiwari and Ghosal Narosa- Renewable energy resources,</li> <li>2. Ramesh &amp; Kumar ,Narosa -Renewable Energy Technologies ,</li> <li>3. K Mittal ,Wheeler, Non-Conventional Energy Systems ,</li> <li>4. Volker Quaschnig , 2005-Understanding the Renewable Energy Systems,- Earth Scan,London,UK,</li> </ol>		
<b>E-REFERENCES</b>		
<ol style="list-style-type: none"> <li>1. <a href="http://www.nptelvideos.in/2012/11/energy-resources-and-technology.html">http://www.nptelvideos.in/2012/11/energy-resources-and-technology.html</a> NPTEL, Lecture Series on Energy Resources and Technology, Prof.S.Banerjee,Department of Electrical Engineering, IIT Kharagpur.</li> <li>2. <a href="http://freevideolectures.com/Course/2352/Power-System-Generation-Transmission-and-Distribution/6">http://freevideolectures.com/Course/2352/Power-System-Generation-Transmission-and-Distribution/6</a> NPTEL, Renewable Energy Technology, Prof. D.P.Kothari IIT Delhi Course.</li> <li>3. <a href="http://textofvideo.nptel.iitm.ac.in/112105051/lec43.pdf">http://textofvideo.nptel.iitm.ac.in/112105051/lec43.pdf</a>NPTEL, Renewable Energy Technology,Prof. V. V. Satyamurty Department of Mechanical Engineering Indian Institute of Technology, Kharagpur.</li> </ol>		

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus PO, PSO mapping**

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

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ELECTRICAL SAFETY**

<b>Course Outcomes(XEEOC1):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Describe electrical hazards and safety equipment.	Cognitive	Understanding
<b>CO2</b>	Analyze and apply various grounding and bonding techniques.	Cognitive	Applying
<b>CO3</b>	Select appropriate safety method for low, medium and high voltage equipment.	Cognitive	knowledge

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEEOC1</b>	<b>ELECTRICAL SAFETY</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

**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.

<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
<b>15</b>	<b>0</b>	<b>15</b>

**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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

CO/PO	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			
CO2	2	1									2			
CO3	2	1									1			
<b>Total</b>	<b>6</b>	<b>2</b>									<b>5</b>			
<b>Scaling</b>	<b>3</b>	<b>2</b>									<b>2</b>			

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**MICROGRIDS**

<b>Course Outcomes(XEEOC2):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Understand concept of microgrid and implementation issues.	Cognitive	Understanding
<b>CO2</b>	Understand issues related to power electronics interface.	Cognitive	Understanding
<b>CO3</b>	Acquire knowledge about modelling and stability analysis of solving power quality issues in Microgrid.	Cognitive	knowledge

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEEOC2</b>	<b>MICROGRIDS</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

**UNIT I MICROGRIDS AND THEIR POWER QUALITY ISSUES** **15**

Concept and definition of microgrid, review of sources of microgrids, typical structure and configuration of a microgrid: AC and DC microgrids, Power Electronics interfaces in DC and AC microgrids, modes of operation and control of microgrid: grid connected and islanded mode, Power quality issues in microgrids- Modeling and Stability analysis of Microgrid, regulatory standards, Microgrid economics.

	<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
	<b>15</b>	<b>0</b>	<b>15</b>

**TEXT BOOKS**

1. John Twidell and Tony Weir, “Renewable Energy Resources” Tylor 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**

<b>CO/PO</b>	<b>PO 1</b>	<b>PO 2</b>	<b>PO 3</b>	<b>PO 4</b>	<b>PO 5</b>	<b>PO 6</b>	<b>PO 7</b>	<b>PO 8</b>	<b>PO 9</b>	<b>PO 10</b>	<b>PO 11</b>	<b>PO 12</b>	<b>PSO 1</b>	<b>PSO 2</b>
<b>CO1</b>	2										2			
<b>CO2</b>	2	1									2			
<b>CO3</b>	2	1									1			
<b>Total</b>	<b>6</b>	<b>2</b>									<b>5</b>			
<b>Scaling</b>	<b>3</b>	<b>2</b>									<b>2</b>			

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**DISTRIBUTED GENERATION**

<b>Course Outcomes(XEEOC3):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Understand the units of energy, energy demand, energy efficiency, and distributed generation concepts.	Cognitive	Understanding
<b>CO2</b>	Understand the principles and technology of different types of energy sources: fuel cell, Photovoltaic, and wind Power generation	Cognitive	Understanding
<b>CO3</b>	Understand the concept of energy storage and various types of storage elements.	Cognitive	Understanding

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEEOC3</b>	<b>DISTRIBUTED GENERATION</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>UNIT I- INTRODUCTION</b>					<b>6</b>
Recent trends in energy consumption - World energy scenario - Energy sources and their availability - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems - need to develop new energy technologies.					
<b>UNIT II DISTRIBUTED GENERATIONS (DG)</b>					<b>6</b>
Concept of distributed generations, topologies, selection of sources - DG installation classes - security issues in DG implementations.					
<b>UNIT III ENERGY STORAGE</b>					<b>3</b>
Need for Energy storage Systems- Batteries, ultra-capacitors, and flywheels. - Captive power plants.					
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
		<b>15</b>	<b>0</b>	<b>15</b>	
<b>TEXT BOOKS</b>					
1. Electric Energy: An Introduction, Mohamed A. El-Sharkawi , CRC Press , 3 <sup>rd</sup> Edition, 2012.					
<b>REFERENCE BOOKS</b>					
1. Distributed Power Generation, Planning & Evaluation by H. Lee Willis & Walter G. Scott, 3 <sup>rd</sup> Edition, CRC Press Taylor & Francis Group, 2000.					
2. Control of Power Inverters in Renewable Energy and Smart Grid Integration by Quing-Chang Zhong, Wiley, IEEE Press, 2013.					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

CO/PO	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			
CO2	2	1									2			
CO3	2	1									2			
<b>Total</b>	<b>6</b>	<b>2</b>									<b>6</b>			
<b>Scaling</b>	<b>3</b>	<b>2</b>									<b>3</b>			

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**ENERGY AUDITING**

<b>Course Outcomes(XEEOC4):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Understand the importance of energy auditing & energy management.	Cognitive	Understanding
<b>CO2</b>	Apply their own ideas in optimizing the energy requirements to overcome the demand.	Cognitive	Applying
<b>CO3</b>	Acquire knowledge about energy monitoring and targeting to improve the energy efficiency.	Cognitive	knowledge

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEEOC4</b>	<b>ENERGY AUDITING</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>

**UNIT I ENERGY MANAGEMENT & 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.

	<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>
	<b>15</b>	<b>0</b>	<b>15</b>

**TEXT BOOKS**

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.

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

CO/PO	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			
CO2	2	1									2			
CO3	2										2			
<b>Total</b>	<b>6</b>	<b>1</b>									<b>6</b>			
<b>Scaling</b>	<b>3</b>	<b>1</b>									<b>3</b>			

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**PERSONALITY DEVELOPMENT**

<b>Course Outcomes(XEEOC5):</b>		<b>Domain</b>	<b>Level</b>
<b>CO1</b>	Have inter personal skills and be an effective goal oriented team player.	Cognitive	Understanding
<b>CO2</b>	Be professionals with idealistic, practical and moral values.	Cognitive	Applying
<b>CO3</b>	Have communication and problem solving skills.	Cognitive	knowledge
<b>CO4</b>	Have engineer attitude and understand its influence on behavior.	Cognitive	knowledge

<b>SUBCODE</b>	<b>SUB NAME</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
<b>XEEOC5</b>	<b>PERSONALITY DEVELOPMENT</b>	<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>C:P:A = 3:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		<b>1</b>	<b>0</b>	<b>0</b>	<b>1</b>
<b>UNIT I SOFT SKILLS</b>					<b>15</b>
Self Analysis – Creativity: Out of box thinking, Lateral Thinking - Attitude - Motivation: Factors of motivation, Self talk, Intrinsic & Extrinsic Motivators - Goal Setting -Interpersonal Skills- Gratitude - Team Work- Leadership- Stress Management- Conflict Resolution: Conflicts in Human Relations – Reasons Case Studies, Approaches to conflict resolution – Decision Making: : Importance and necessity of Decision Making, Process and practical way of Decision Making, Weighing Positives & Negatives.					
		<b>LECTURE</b>	<b>TUTORIAL</b>	<b>TOTAL</b>	
		<b>15</b>	<b>0</b>	<b>15</b>	
<b>TEXT BOOKS</b>					
1. SOFT SKILLS, 2015, Career Development Centre, Green Pearl Publications. 2. Covey Sean, Seven Habits of Highly Effective Teens, New York, Fireside Publishers, 1998.					
<b>REFERENCE BOOKS</b>					
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					

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**COs versus POs mapping**

CO/PO	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		3	3	3	3			
CO2						3		3	3	3	3			
CO3						3		3	3	3	3			
CO4						3		3	3	3	3			
<b>Total</b>						<b>12</b>		<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>			
<b>Scaling</b>						<b>3</b>		<b>3</b>	<b>3</b>	<b>3</b>	<b>3</b>			

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

**DEPARTMENT OF ELECTRICAL AND  
ELECTRONICS ENGINEERING**

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



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

**INDUSTRIAL LECTURES**

SUBCODE	SUB NAME	L	T	P	C
XEEOC6	INDUSTRIAL LECTURES	1	0	0	1
<b>C:P:A = 0:0:0</b>		<b>L</b>	<b>T</b>	<b>P</b>	<b>H</b>
		1	0	0	1

A minimum of five lectures of two hours duration each by industry experts will be arranged by the Department. The evaluation methodology, will in general, be based on quizzes at the end of each lecture.

	LECTURE	TUTORIAL	TOTAL
	15	0	15

**COs versus POs mapping**

CO/PO	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		3	3	3	3			
Scaling						1		1	1	1	1			

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