

**ANNA UNIVERSITY, CHENNAI**  
**AFFILIATED INSTITUTIONS**  
**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**  
**REGULATIONS – 2017**  
**CHOICE BASED CREDIT SYSTEM**

**Educational Objectives**

Bachelor of Electrical and Electronics Engineering curriculum is designed to prepare the graduates having attitude and knowledge to

1. Have successful technical and professional careers in their chosen fields such as circuit theory, Field theory, control theory and computational platforms.
2. Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and their applications in power engineering.

**Programme Outcomes**

The graduates will have the ability to

- a. Apply the Mathematical knowledge and the basics of Science and Engineering to solve the problems pertaining to Electronics and Instrumentation Engineering.
- b. Identify and formulate Electrical and Electronics Engineering problems from research literature and be able to analyze the problem using first principles of Mathematics and Engineering Sciences.
- c. Come out with solutions for the complex problems and to design system components or process that fulfill the particular needs taking into account public health and safety and the social, cultural and environmental issues.
- d. Draw well-founded conclusions applying the knowledge acquired from research and research methods including design of experiments, analysis and interpretation of data and synthesis of information and to arrive at significant conclusion.
- e. Form, select and apply relevant techniques, resources and Engineering and IT tools for Engineering activities like electronic prototyping, modeling and control of systems and also being conscious of the limitations.
- f. Understand the role and responsibility of the Professional Electrical and Electronics Engineer and to assess societal, health, safety issues based on the reasoning received from the contextual knowledge.
- g. Be aware of the impact of professional Engineering solutions in societal and environmental contexts and exhibit the knowledge and the need for Sustainable Development.
- h. Apply the principles of Professional Ethics to adhere to the norms of the engineering practice and to discharge ethical responsibilities.
- i. Function actively and efficiently as an individual or a member/leader of different teams and multidisciplinary projects.
- j. Communicate efficiently the engineering facts with a wide range of engineering community and others, to understand and prepare reports and design documents; to make effective presentations and to frame and follow instructions.
- k. Demonstrate the acquisition of the body of engineering knowledge and insight and Management Principles and to apply them as member / leader in teams and multidisciplinary environments.
- l. Recognize the need for self and life-long learning, keeping pace with technological challenges in the broadest sense.

PEO \ PO	a	b	c	d	e	f	g	h	i	j	k	l
1	✓	✓	✓	✓	✓	✓	✓					✓
2	✓	✓	✓	✓	✓	✓		✓		✓		

13.	EE8461	Linear and Digital Integrated Circuits Laboratory	PC	4	0	0	4	2
14.	EE8501	Power System Analysis	PC	3	3	0	0	3
15.	EE8551	Microprocessors and Microcontrollers	PC	3	3	0	0	3
16.	EE8552	Power Electronics	PC	3	3	0	0	3
17.	EE8591	Digital Signal Processing	PC	4	2	2	0	3
18.	EE8511	Control and Instrumentation Laboratory	PC	4	0	0	4	2
19.	EE8601	Solid State Drives	PC	3	3	0	0	3
20.	EE8602	Protection and Switchgear	PC	3	3	0	0	3
21.	EE8661	Power Electronics and Drives Laboratory	PC	4	0	0	4	2
22.	EE8681	Microprocessors and Microcontrollers Laboratory	PC	4	0	0	4	2
23.	EE8701	High Voltage Engineering	PC	3	3	0	0	3
24.	EE8702	Power System Operation and Control	PC	3	3	0	0	3
25.	EE8703	Renewable Energy Systems	PC	3	3	0	0	3
26.	EE8711	Power System Simulation Laboratory	PC	4	0	0	4	2
27.	EE8712	Renewable Energy Systems Laboratory	PC	4	0	0	4	2

### **EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	EE8412	Technical seminar	EEC	2	0	0	2	1
2.	HS8581	Professional Communication	EEC	2	0	0	2	1
3.	EE8611	Mini Project	EEC	4	0	0	4	2
4.	EE8811	Project work	EEC	20	0	0	20	10

7	Computer (PSpice installed)	1	
<b>Consumabilitys (sufficient quantity)</b>			
1	IC 741/ IC NE555/566/565		
2	Digital IC types		
3	LED		
4	LM317		
5	LM723		
6	ICSG3524 / SG3525		
7	Transistor – 2N3391		
8	Diodes, IN4001,BY126		
9	Zener diodes		
10	Potentiometer		
11	Step-down transformer 230V/12-0-12V		
12	Capacitor		
13	Resistors 1/4 Watt Assorted		
14	Single Strand Wire		

**EE8412**

**TECHNICAL SEMINAR**

**LT P C  
0 0 2 1**

**OBJECTIVES:**

- To encourage the students to study advanced engineering developments
- To prepare and present technical reports.
- To encourage the students to use various teaching aids such as overhead projectors, power point presentation and demonstrative models.

**METHOD OF EVALUATION:**

During the seminar session each student is expected to prepare and present a topic on engineering/ technology, for a duration of about 8 to 10 minutes. In a session of three periods per week, 15 students are expected to present the seminar. Each student is expected to present atleast twice during the semester and the student is evaluated based on that. At the end of the semester, he / she can submit a report on his / her topic of seminar and marks are given based on the report. A Faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

**TOTAL: 30 PERIODS**

**OUTCOMES:**

- Ability to review, prepare and present technological developments
- Ability to face the placement interviews

**EE8501****POWER SYSTEM ANALYSIS**

L	T	P	C
3	0	0	3

**OBJECTIVES:**

- To model the power system under steady state operating condition
- To understand and apply iterative techniques for power flow analysis
- To model and carry out short circuit studies on power system
- To model and analyze stability problems in power system

**UNIT I POWER SYSTEM****9**

Need for system planning and operational studies - Power scenario in India - Power system components – Representation - Single line diagram - per unit quantities - p.u. impedance diagram - p.u. reactance diagram - Network graph, Bus incidence matrix, Primitive parameters, Bus admittance matrix from primitive parameters - Representation of off-nominal transformer - Formation of bus admittance matrix of large power network.

**UNIT II POWER FLOW ANALYSIS****9**

Bus classification - Formulation of Power Flow problem in polar coordinates - Power flow solution using Gauss Seidel method - Handling of Voltage controlled buses - Power Flow Solution by Newton Raphson method.

**UNIT III SYMMETRICAL FAULT ANALYSIS****9**

Assumptions in short circuit analysis - Symmetrical short circuit analysis using Thevenin's theorem - Bus Impedance matrix building algorithm (without mutual coupling) - Symmetrical fault analysis through bus impedance matrix - Post fault bus voltages - Fault level - Current limiting reactors.

**UNIT IV UNSYMMETRICAL FAULT ANALYSIS****9**

Symmetrical components - Sequence impedances - Sequence networks - Analysis of unsymmetrical faults at generator terminals: LG, LL and LLG - unsymmetrical fault occurring at any point in a power system - computation of post fault currents in symmetrical component and phasor domains.

**UNIT V STABILITY ANALYSIS****9**

Classification of power system stability – Rotor angle stability - Swing equation - Swing curve - Power-Angle equation - Equal area criterion - Critical clearing angle and time - Classical step-by-step solution of the swing equation – modified Euler method.

**TOTAL : 45 PERIODS****OUTCOMES:**

- Ability to model the power system under steady state operating condition
- Ability to understand and apply iterative techniques for power flow analysis
- Ability to model and carry out short circuit studies on power system
- Ability to model and analyze stability problems in power system

- 100gm weights – 10 nos  
 f) Flow measurement Trainer kit – 1 No.  
 (1/2 HP Motor, Water tank, Digital Milliammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter  
 Voltmeter Rheostat Stop watch  
 Connecting wires (3/20)
  12. IC Transistor kit – 1No.
  13. Instrumentation Amplifier kit-1 No
  14. Analog – Digital and Digital –Analog converters (ADC and DACs)- 1 No

**HS8581**

**PROFESSIONAL COMMUNICATION**

**L T P C**  
**0 0 2 1**

**OBJECTIVES: The course aims to:**

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employability Graduates
- Develop their confidence and help them attend interviews successfully.

**UNIT I**

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

**UNIT II**

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

**UNIT III**

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic -- questioning and clarifying –GD strategies- activities to improve GD skills

**UNIT IV**

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview & panel interview – FAQs related to job interviews

**UNIT V**

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes.

**TOTAL : 30 PERIODS**

**OUTCOMES: At the end of the course Learners will be able to:**

- Make effective presentations

- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace

### Recommended Software

1. **Globearena**
2. **Win English**

### REFERENCES:

1. Butterfield, Jeff **Soft Skills for Everyone**. Cengage Learning: New Delhi, 2015
2. **Interact** English Lab Manual for Undergraduate Students,. OrientBalckSwan: Hyderabad, 2016.
3. E. Suresh Kumar et al. **Communication for Professional Success**. Orient Blackswan: Hyderabad, 2015
4. Raman, Meenakshi and Sangeeta Sharma. **Professional Communication**. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. **Soft Skills**. MJP Publishers: Chennai, 2010.

CS8383

### OBJECT ORIENTED PROGRAMMING LABORATORY

LT P C  
0 0 4 2

### COURSE OBJECTIVES

- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

### List of experiments

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection(i.e domestic or commercial). Compute the bill amount using the following tariff. If the type of the EB connection is domestic, calculate the amount to be paid as follows:
  - First 100 units - Rs. 1 per unit
  - 101-200 units - Rs. 2.50 per unit
  - 201 -500 units - Rs. 4 per unit
  - > 501 units - Rs. 6 per unit
 If the type of the EB connection is commercial, calculate the amount to be paid as follows:
  - First 100 units - Rs. 2 per unit
  - 101-200 units - Rs. 4.50 per unit
  - 201 -500 units - Rs. 6 per unit
  - > 501 units - Rs. 7 per unit
2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.
3. Develop a java application with Employee class with Emp\_name, Emp\_id, Address, Mail\_id, Mobile\_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the

5.	8259 Interface boards	5
6.	8279 Keyboard / Display Interface boards	5
7.	8254 timer/ counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

**EE8611**

**MINI PROJECT**

**LT P C**  
**0 0 4 2**

**OBJECTIVES:**

- To develop their own innovative prototype of ideas.
- To train the students in preparing mini project reports and examination.

The students in a group of 5 to 6 works on a topic approved by the head of the department and prepares a comprehensive mini project report after completing the work to the satisfaction. The progress of the project is evaluated based on a minimum of two reviews. The review committee may be constituted by the Head of the Department. A mini project report is required at the end of the semester. The mini project work is evaluated based on oral presentation and the mini project report jointly by external and internal examiners constituted by the Head of the Department.

**TOTAL: 60 PERIODS**

**OUTCOMES:**

- On Completion of the mini project work students will be in a position to take up their final year project work and find solution by formulating proper methodology.

**EE8701**

**HIGH VOLTAGE ENGINEERING**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

To impart knowledge on the following Topics

- Various types of over voltages in power system and protection methods.
- Generation of over voltages in laboratories.
- Measurement of over voltages.
- Nature of Breakdown mechanism in solid, liquid and gaseous dielectrics.
- Testing of power apparatus and insulation coordination

**UNIT I OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9**

Causes of over voltages and its effects on power system – Lightning, switching surges and temporary over voltages, Corona and its effects – Bewley lattice diagram- Protection against over voltages.

Consumabilitys (Minimum of 5 Nos. each)			
8.	Potentiometer	5	-
9.	Step-down transformer	5	230V/12-0-12V
10	Component data sheets to be provided		

**EE8811**

**PROJECT WORK**

**L T P C**  
**0 0 20 10**

**OBJECTIVES:**

- To develop the ability to solve a specific problem right from its identification and literature review till the successful solution of the same. To train the students in preparing project reports and to face reviews and viva voce examination.

The students in a group of 3 to 4 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners constituted by the Head of the Department.

**TOTAL: 300 PERIODS**

**OUTCOMES:**

- On Completion of the project work students will be in a position to take up any challenging practical problems and find solution by formulating proper methodology.

**IC8651**

**ADVANCED CONTROL SYSTEM**

**L T P C**  
**2 2 0 3**

**OBJECTIVES:**

- To provide knowledge on design state feedback control and state observer.
- To provide knowledge in phase plane analysis.
- To give basic knowledge in describing function analysis.
- To study the design of optimal controller.
- To study the design of optimal estimator including Kalman Filter

**UNIT I STATE VARIABLE ANALYSIS**

**6+6**

Introduction- concepts of state variables and state model-State model for linear continuous time systems, Diagonalisation- solution of state equations- Concepts of controllability and observability.

**UNIT II STATE VARIABLE DESIGN**

**6+6**

Introduction to state model: Effect of state feedback - Pole placement design: Necessary and sufficient condition for arbitrary pole placement, State regulator design Design of state observers- Separation principle- Design of servo systems: State feedback with integral control.





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S.P.G.C.Nagar, K.Vellakulam - 625 701, (Near Virudhunagar), Madurai District.

**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**

**Regulation - 2020**

**AUTONOMOUS SYLLABUS**

**CHOICE BASED CREDIT SYSTEM (CBCS)**

**CURRICULUM AND SYLLABI**

**(III & IV)**

**VISION:**

To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

**MISSION:**

Department of Electrical and Electronics Engineering is committed to

1. Inculcate technical knowledge by providing well-balanced curriculum to the urban and unreachable rural student community through "Total Quality Education"
2. Induce leadership and entrepreneurial skills with high standard of ethics and moral values to the student community.
3. Impart innovative skills to the student community by effectively involving them in research activities.
4. Create a wholesome environment to promote effective interaction of students with the industry experts

**PROGRAM EDUCATION OBJECTIVES:**

Graduates of the programme will be able to

**1. Technical Knowledge:**

Apply Technical knowledge acquired in the field of Electrical and Electronics Engineering and allied areas for practical or industrial problems for a successful professional career

**2. Problem Solving:**

Develop and envisage appropriate solutions for real time technological problems faced by the industries and society.

**B.E. ELECTRICAL AND ELECTRONICS ENGINEERING**

Regulation - 2020

AUTONOMOUS SYLLABUS

CHOICE BASED CREDIT SYSTEM (CBCS)

CURRICULUM AND SYLLABI

(III & IV)

SEMESTER III

SI. No.	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS PER WEEK			TOTAL CONTACT PERIODS	CREDITS
				L	T	P		
<b>THEORY</b>								
1	MA1372	Transforms and Linear Algebra	BS	3	1	0	4	4
2	EE1301	DC Machines and Transformers	PC	3	1	0	4	4
3	EE1302	Transmission and Distribution	PC	3	0	0	3	3
4	EE1306	Power Plant Engineering	ES	3	0	0	3	3
5	EE1371	Electronic Devices and Circuits	ES	3	0	0	3	3
<b>PRACTICAL</b>								
6	EE1311	DC Machines and Transformers Laboratory	PC	0	0	4	4	2
7	EE1316	Electronic Devices and Circuits Laboratory	ES	0	0	4	4	2
8	HS1321	Interpersonal Skills - Listening and Speaking	EEC	0	0	2	2	1
<b>TOTAL</b>				<b>15</b>	<b>2</b>	<b>10</b>	<b>27</b>	<b>22</b>

**LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

S. No.	Description of Equipment	Quantity Required
1	Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor	-
2	Resistors, Capacitors and inductors	-
3	Necessary digital IC 8	-
4	Function Generators	10
5	Regulated 3 output Power Supply 5, $\pm 15V$	10
6	Storage Oscilloscope	1
7	CRO	10
8	Bread boards	10

**HS1321 INTERPERSONAL SKILLS - LISTENING AND SPEAKING**

L	T	P	C
0	0	2	1

**OBJECTIVES:**

The course will enable learners to

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- Improve general and academic listening skills
- Make effective presentations

**UNIT I LISTENING AS A KEY SKILL****6**

Listening as a key skill- its importance- speaking – give personal information – ask for personal

information – express ability – enquire about ability – ask for clarification - Improving pronunciation– pronunciation basics — stressing syllables and speaking clearly – intonation patterns – conversation starters: small talk.

**UNIT II LISTEN TO A PROCESS INFORMATION 6**

Listen to a process information- give information, as part of a simple explanation — taking lecture notes – preparing to listen to a lecture – articulate a complete idea as opposed to producing fragmented utterances - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics

**UNIT III LEXICAL CHUNKING 6**

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk – greet – respond to greetings – describe health and symptoms – invite and offer –accept – decline – take leave – listen for and follow the gist- listen for detail

**UNIT IV GROUP DISCUSSION 6**

Being an active listener: giving verbal and non-verbal feedback – participating in a group discussion – summarizing academic readings and lectures conversational speech listening to and participating in conversations – persuade- negotiate disagreement in group work.

**UNIT V GROUP & PAIR PRESENTATIONS 6**

Formal and informal talk – listen to follow and respond to explanations, directions and instructions in academic and business contexts – strategies for presentations and interactive communication – group/pair presentations

**TOTAL: 30 PERIODS**

**COURSE OUTCOMES:**

At the end of the course, students will be able to

- CO1 Develop their communicative competence in English with specific reference to listening
- CO2 Prepare conversation with reasonable accuracy
- CO3 Apply lexical Chunking for accuracy in speaking
- CO4 Demonstrate their ability to communicate effectively in GDs.
- CO5 Explain directions and instructions in academic and business contexts

**TEXT BOOKS:**

1. Brooks, M, 2011, *Skills for Success. Listening and Speaking. Level 4*, Oxford, UK.: Oxford University Press.
2. Richards, C, Jack & David Bholke, 2010, *Speak Now. Level 3*, Oxford, UK.: Oxford University Press.

**REFERENCES:**

1. Bhatnagar, Nitin & Mamta Bhatnagar, 2010, *Communicative English for Engineers and Professionals*, Pearson, New Delhi.
2. Hughes, Glyn & Josephine Moate, 2014, *Practical English Classroom*, Oxford, UK.: Oxford University Press.
3. Vargo, Mari, 2013, *Speak Now Level 4*, Oxford, UK.: Oxford University Press.
4. Richards, C, Jack, 2006, *Person to Person (Starter)*, Oxford, UK.: Oxford University Press.
5. Ladousse, Gillian Porter, 2014, *Role Play*. Oxford, UK.: Oxford University Press.

**WEB RESOURCES:**

1. <https://www.cambridge.org/elt/blog/wp-content/uploads/2019/10/Learning-Language-in-Chunks.pdf>
2. <https://english.eagetutor.com/english/628-how-to-greet-your-boss-people-in-office.html>
3. <https://www.groupdiscussionideas.com/group-discussion-topics-with-answers/>
4. <https://www.bbc.co.uk/worldservice/learningenglish/business/talkingbusiness/unit3presentations/1opening.shtml>

**ANNA UNIVERSITY, CHENNAI**  
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**REGULATIONS – 2017**  
**CHOICE BASED CREDIT SYSTEM**  
**M.E. POWER SYSTEMS ENGINEERING**

**1. Program Educational Objectives (PEOs):**

- i. To prepare the students to have career in the electrical power industry/research organization/teaching.
- ii. To provide good foundation in mathematics and computational technology to analyze and solve problems encountered in electrical power industry.
- iii. Pursue lifelong learning and continuous improvement of their knowledge in the electrical power industry.
- iv. To understand the national and global issues related to the electrical power industry and to be considerate of the impact of these issues on the environment and within different cultures.
- v. Apply the highest professional and ethical standards to their activities in the electrical power industry.
- vi. To provide the students with knowledge to be involved with the technology advancements and future developments in power generation, control and management as well as with alternate and new energy resources.

**2. Program Outcomes (PO):**

On successful completion of the programme,

1. Graduates will be able to demonstrate the principles and practices of the electrical power industry regarding generation, transmission, distribution and electrical machines and their controls.
2. Graduates will be able to apply their knowledge of electrical power principles, as well as mathematics and scientific principles, to new applications in electrical power.
3. Graduates will be able to perform, analyze, and apply the results of experiments to electrical power application improvements.
4. Graduates will be able to look at all options in design and development projects and creativity and choose the most appropriate option for the current project.
5. Graduates will function effectively as a member of a project team.
6. Graduates will be able to identify problems in electrical power systems, analyze the problems, and solve them using all of the required and available resources.
7. Graduates will be able to effectively communicate technical project information in writing or in personal presentation and conversation.
8. Graduates will be engaged in continuously learning the new practices, principles, and techniques of the electrical power industry.
9. Graduates will work on application software packages for power system analysis and design.
10. Graduates will develop indigenous software packages for power system planning and operational problems of utilities.

		Interference and Compatibility						
6.	PX5091	Control System Design for Power Electronics	PE		3	0	0	3
7.	PS5004	Principles of Electric Power Transmission	PE		3	0	0	3
8.	PS5005	Advanced Power System Dynamics	PE		3	0	0	3
9.	PS5006	Design of Substations	PE		3	0	0	3

**\*Professional Electives are grouped according to elective number as was done previously.**

**EMPLOYABILITY ENHANCEMENT COURSES (EEC)**

S.No	Course Code	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	PS5212	Technical Seminar	EEC	2	0	0	2	1
2.	PS5311	Project Work Phase I	EEC	12	0	0	12	6
3.	PS5411	Project Work Phase II	EEC	24	0	0	24	12



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## Department of Electrical and Electronics Engineering

### M.E. Power Systems Engineering

### (Regulations 2020 – Autonomous)

#### **Vision of the Department:**

To make the Department of Electrical and Electronics Engineering of this Institution the unique of its kind in the field of Research and Development activities in this part of the world.

#### **Mission of the Department:**

To impart highly innovative and technical knowledge in the field of Electrical and Electronics Engineering to the urban and unreachable rural student folks through Total Quality Education.

#### **Program Educational Objectives (PEOs):**

**PEO 1:** Graduates of the programme will have an enlightening career in core field of Power Systems Engineering.

**PEO 2:** Graduates of the programme will demonstrate their practical skills by undergoing innovative research in recent trends of Power Systems Engineering.

**PEO 3:** Graduates of the programme will practice ethics and exhibit project management skills to work in collaborative and multi-disciplinary tasks.

**PEO 4:** Graduates of the programme will demonstrate lifelong independent learning skills and thereby pursue higher studies in reputed institutions.

#### **Program Specific Outcomes (PSOs):**

**PSO 1:** Ability to apply the various principles of Power Systems Engineering to analyze and solve real time problems existing in the power industry.

**PSO 2:** Ability to acquire abreast knowledge in the emerging technologies of Power Systems Engineering and demonstrate the skills acquired in developing quality products in scientific and business applications.



**Employability Enhancement Courses (EEC)**

S. No.	Course Code	Course Name	Category	Contact Periods	Credits			
					L	T	P	C
1.	PS1221	Technical Paper Writing and Patent Filing	EEC	3	1	0	2	2
2.	PS1321	Project Work Phase I	EEC	12	0	0	12	6
3.	PS1421	Project Work Phase II	EEC	24	0	0	24	12

S. No.	Course Code	Course Name	Credits			
			L	T	P	C
1.	PS1221	Technical Paper Writing and Patent Filing	1	0	2	2
2.	PS1321	Project Work Phase I	0	0	12	6
3.	PS1421	Project Work Phase II	0	0	24	12

S. No.	Category of Courses	I	II	III	IV	Credits
1.	<b>Foundation Courses (FC)</b>	4	-	-	-	<b>4</b>
2.	<b>Professional Core Courses (PC)</b>	14	15	-	-	<b>29</b>
3.	<b>Professional Elective Courses (PE)</b>	3	3	6	-	<b>12</b>
4.	<b>Open Elective Courses (OE)</b>	-	-	3	-	<b>3</b>
5.	<b>Employability Enhancement Courses (EEC)</b>	-	2	6	12	<b>20</b>
6.	<b>Online Courses (OL)</b>	-	3	-	-	<b>3</b>
<b>Semester wise Credits</b>		<b>21</b>	<b>23</b>	<b>15</b>	<b>12</b>	<b>-</b>
<b>Total Credits</b>						<b>71</b>

## 11. Computation of Locational Marginal Pricing (LMP) in Restructured power systems

**TOTAL: 60 PERIODS**

### OUTCOMES:

Upon successful completion of this course, students will be able to

CO1: Analyze stability analysis on single machine and multi machine configuration.

CO2: Calculate Available Transfer Capacity and Locational marginal pricing for Deregulated power system.

CO3: Design active filter to mitigate and compute harmonic indices.

CO4: Demonstrate the operation of power system under dynamic conditions.

### LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

S. No.	Description of Equipment	Quantity Required
1.	Personal Computers (Intel Core i3, 250 GB, 1 GB RAM)	30
2.	Printer	1
3.	Server (Intel Core i3, 4 GB RAM) (High Speed Processor)	1
4.	Software: EMTP / ETAP / CYME / MIPOWER / Matlab/ any Power system simulation software	5 User Licenses
5.	Compilers: C / C++	30 users

<b>PS1221</b>	<b>TECHNICAL PAPER WRITING AND PATENT FILING</b>	<b>L</b>	<b>T</b>	<b>P</b>	<b>C</b>
		<b>1</b>	<b>0</b>	<b>2</b>	<b>2</b>

### OBJECTIVES:

- To impart knowledge and skills required for research
- To understand the problem formulation, analysis and solutions
- To familiarize in technical paper writing/presentation without violating professional ethics
- To give an idea about IPR, registration and its enforcement
- To give an knowledge about IPR Laws

#### UNIT I RESEARCH PROBLEM FORMULATION 3

Meaning of research problem- Sources of research problem, criteria characteristics of a good research problem, errors in selecting a research problem, scope and objectives of research problem.

#### UNIT II LITERATURE REVIEW 3

Importance of literature review in defining a problem, literature review, critical literature review, identifying gap areas from literature and research database. Use of tools / techniques for Research like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.

**UNIT III TECHNICAL WRITING /PRESENTATION 3**

Effective technical writing, how to write report, paper, developing a research proposal, format of research proposal, a presentation and assessment by a review committee.

**UNIT IV INTRODUCTION TO INTELLECTUAL PROPERTY RIGHTS 3**

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad –Patent Agents.

**UNIT V REGISTRATION OF IPRs 3**

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Patent Drafting.

**TOTAL: 15+30=45 PERIODS**

**OUTCOMES:**

Upon Successful Completion of this course, the students will be able to

- CO1: Construct problem formulation for a typical research work.
- CO2: Examine the contribution of various researchers in the research topic identified.
- CO3: Prepare an article / proposal based on research findings.
- CO4: Outline the basic concepts involved in IPR and copyrights.
- CO5: Describe the process of patent filing and registration.

**REFERENCES:**

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3. Khanna, J.K., 1985. *Knowledge: Evolution, Structure & Research Methodology*. Ess Ess Publications.
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5. Wadehra, B.L., 2006. *Law Relating to Patents, Trade Marks, Copyright Designs and Geographical Indications: Including Semiconductor Integrated Circuits and Layout-design; Protection of Plant Varieties & TRIPS*. Universal Law Publishing Company.
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9. Ganguli, P., 2001. *Intellectual Property Rights: Unleashing the Knowledge Economy*. Tata McGraw-Hill Publishing Company.
10. Frey, C.B., 2013. *Intellectual property rights and the financing of technological innovation: public policy and the efficiency of capital markets*. Edward Elgar Publishing.