JERUSALEM COLLEGE OF ENGINEERING
(An Autonomous Institution Affiliated to Anna University, Chennai)

VISION OF THE INSTITUTION

Jerusalem College of Engineering is committed in emerging as an international institution of excellence in imparting finest quality engineering, technology and management education rooted in ethical and societal values through various academic programmes, multi-disciplinary research, consultancy and entrepreneurship activities and hence to contribute towards social transformation and nation building.

MISSION OF THE INSTITUTION

- Generating abundant resources and making conducive policies, the management led by the Chief Executive Officer strives towards promoting globally competitive academic programmes augmented with value added courses, in-plant training activities, co-curricular activities and ambience that support intellectual growth and skill acquisition

- Promoting collaborative trans-border research programmes continuing education in synergy with academia, industries and research organizations leading to real time solutions and life-long learning

- Transforming young men and women into competent professionals and entrepreneurs motivated by a passion for professional excellence, driven by human values and proactively engage in the betterment of the society through innovative practices and academic excellence

- Facilitating effective interaction among faculty members and students and fostering network of alumni, industries, institutions and other stake-holders for successful career gain and placement

JERUSALEM COLLEGE OF ENGINEERING
(AN AUTONOMOUS INSTITUTION TO ANNA UNIVERSITY, CHENNAI)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

VISION OF THE DEPARTMENT

Department of Electrical and Electronics Engineering is committed to produce **high profile, competent** and **disciplined** Engineers with **technical knowledge**, **ethical leadership** and **entrepreneurship** quality to contribute towards social transformation and nation building.

MISSION OF THE DEPARTMENT

- To make our graduates **highly competent** and expert in practical problem solving with abstract thinking skills.
- To endow students with high quality **technical knowledge** of electrical sciences through innovative teaching and research practices.
- To empower students with leadership and **entrepreneurship** quality, capable of providing their professional mettle with excellent communication skills.
- To encourage **cross border research** with innovative ideas and to impart the quality of life-long learning based on ethical values.

JERUSALEM COLLEGE OF ENGINEERING
(AN AUTONOMOUS INSTITUTION TO ANNA UNIVERSITY, CHENNAI)

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAM OUTCOMES (POs)

PO1: **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences

PO3: **Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

PO4: **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

PO5: **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

PO6: **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues an
d the consequent responsibilities relevant to the professional engineering practice.

PO7: **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

PO8: **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

PO9: **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

PO11: **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO12: **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

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DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO1: Graduates use their broad knowledge of electrical engineering as a foundation for on-going learning, and to have realized some success early in their professional careers.

PEO2: Graduates use their creative and critical reasoning skills to solve technical problems, ethically and responsibly, in service to society.

PEO3: Graduates learn and adapt themselves to the constantly evolving technology by pursuing higher studies.

PEO4: Graduates within few year of graduation, should demonstrate leadership and initiative to organizational goals, facilitate the achievements of others and obtain substantive results.

PEO5: Graduates within few year of graduation, should demonstrate a commitment to teamwork while working with others of diverse cultural and interdisciplinary research.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO 1: Able to utilize the knowledge of Power Electronics and Drives in collaboration with power systems in innovative, dynamic and challenging environment, for the research based teamwork.

PSO 2: Can explore the scientific theories, ideas, methodologies in renewable energy engineering, and use this erudition in their professional envelopment and gain sufficient competence to solve the current and future energy problems universally.

PSO 3: Can **understand** the technologies like PLC, PMC, process controllers, transducers and HMI one can analyze, design electrical and electronics principles to install, test , maintain power system and applications.

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B.E. ELECTRICAL AND ELECTRONICS ENGINEERING

REGULATION 2019

CHOICE BASED CREDIT SYSTEM

I TO VIII SEMESTERS

CURRICULUM AND SYLLABUS

CREDIT SUMMARY

S.No.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	Percentage (%)
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	3	3	-	-	1	-	-	-	7	4.4%
2.	BS	10	6	3	3	-	-	-	-	22	13.7%
3.	ES	10	8	11	-	3	-	-	-	32	20%
4.	PC	-	5	8	13	8	10	10	-	54	33.7%
5.	PE	-	-	-	-	3	6	6	-	15	9.4%
6.	OE	-	-	-	3	3	3	3	-	12	7.5%
7.	EEC	-	-	-	1	-	3	4	10	18	11.3%
	Total	23	22	22	20	18	22	23	10	160	100%

JERUSALEM COLLEGE OF ENGINEERING
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B.E. ELECTRICAL AND ELECTRONICS ENGINEERING REGULATION 2019
CHOICE BASED CREDIT SYSTEM
I TO VIII SEMESTERS
CURRICULUM AND SYLLABUS

SEMESTER I

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JHS1121	Communicative English and Soft Skills I	HS	4	2	0	2	3
2	JMA1101	Matrices and Calculus	BS	4	2	2	0	3
3	JPH1101	Engineering Physics	BS	3	3	0	0	3
4	JCY1101	Engineering Chemistry	BS	3	3	0	0	3
5	JGE1101	Engineering Basics	ES	3	3	0	0	3
6	JGE1102	Programming in C	ES	3	3	0	0	3
PRACTICALS								
7	JPC1111	Physics and Chemistry Laboratory	BS	2	0	0	2	1
8	JGE1112	Programming in C Laboratory	ES	4	0	0	4	2
9	JGE1111	Design Appreciation Laboratory	ES	4	0	0	4	2
TOTAL				**30**	**16**	**2**	**12**	**23**

SEMESTER II

S.No	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS	L	T	P	C
THEORY								
1	JHS1221	Technical English and Soft Skills II	HS	4	2	0	2	3
2	JMA1201	Vector Calculus and Complex Analysis	BS	4	2	2	0	3
3	JBE1223	Applied Science for Electronics and Information Engineering	BS	4	2	0	2	3
4	JGE1201	Python Programming	ES	3	3	0	0	3
5	JEE1201	Circuit Theory	PC	4	2	2	0	3
6	JGE1202	Engineering Graphics & Design	ES	5	1	0	4	3
7	JNC1261	Environmental Science	NCM	3	3	0	0	0
PRACTICALS								
8	JEE1211	Electric Circuits Laboratory	PC	4	0	0	4	2
9	JGE1211	Python Programming Laboratory	ES	4	0	0	4	2
TOTAL				**35**	**15**	**4**	**16**	**22**

SEMESTER III

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JMA1302	Transforms and Partial Differential Equations	BS	4	2	2	0	3
2	JEC1301	Electronic Devices and Circuits	ES	3	3	0	0	3
3	JEE1301	Electromagnetic Theory	ES	4	2	2	0	3
4	JCS1321	Object Oriented Programming (Integrated)	ES	4	2	0	2	3
5	JEE1302	DC Machines and Transformers	PC	4	2	2	0	3
6	JEE1303	Digital Logic Circuits	PC	4	2	2	0	3
PRACTICALS								
7	JPT1001	Soft Skills and Aptitude I	EEC	2	0	0	2	*
8	JEC1311	Electronic Devices and Circuits Laboratory	ES	4	0	0	4	2
9	JEE1311	DC Machines and Transformers Laboratory	PC	4	0	0	4	2
TOTAL				**33**	**13**	**8**	**12**	**22**

* Only internal assessments will be conducted in the 3rd semester while the end semester examination will be conducted in the 4thsemester

SEMESTER IV

S.No	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS	L	T	P	C
THEORY								
1	JMA1401	Applied Probability and Numerical Methods	BS	4	2	2	0	3
2	JEE1401	Synchronous and Induction Machines	PC	4	2	2	0	3
3	JEE1402	Linear Integrated Circuits and its Applications	PC	3	3	0	0	3
4	JEE1403	Transmission, Distribution and Protection	PC	3	3	0	0	3
5	-	Open Elective I	OE	3	3	0	0	3
PRACTICALS								
6	JPT1001	Soft Skills and Aptitude II	EEC	2	0	0	2	1
7	JEE1411	Synchronous and Induction Machines Laboratory	PC	4	0	0	4	2
8	JEE1412	Linear and Digital Integrated Circuits Laboratory	PC	4	0	0	4	2
TOTAL				**27**	**13**	**4**	**10**	**20**

SEMESTER V

S.No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JEE1501	Micro processors and Micro controllers (Integrated)	ES	4	2	0	2	3
2	JEE1502	Control & Instrumentation	PC	4	2	2	0	3
3	JEE1503	Power Electronics	PC	3	3	0	0	3
4	-	Professional Elective I	PE	3	3	0	0	3
5	-	Open Elective II	OE	3	3	0	0	3
6	JNC1361	Essence of Indian Traditional Knowledge	NCM	2	2	0	0	0
PRACTICALS								
7	JHS1511	Professional Communication	HS	2	0	0	2	1
8	JEE1512	Control and Instrumentation Laboratory	PC	4	0	0	4	2
9	JPT1002	Technical Skills and Aptitude I	EEC	2	0	0	2	*
TOTAL				**27**	**15**	**2**	**10**	**18**

* Only internal assessments will be conducted in the 5th semester while the end semester examination will be conducted in the 6thsemester

SEMESTER VI

S.No	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS	L	T	P	C
THEORY								
1	JEE1601	Control of Electrical Drives	PC	3	3	0	0	3
2	JEE1602	Power System Analysis, Operation and Control	PC	4	2	2	0	3
3	-	Professional Elective II	PE	3	3	0	0	3
4	-	Professional Elective III	PE	3	3	0	0	3
5	-	Open Elective III	OE	3	3	0	0	3
PRACTICALS								
6	JEE1611	Power Electronics and Drives Laboratory	PC	4	0	0	4	2
7	JEE1612	Power System Simulation Laboratory	PC	4	0	0	4	2
8	JEE1621	Mini Project	EEC	2	0	0	2	1
9	JPT1002	Technical Skills and Aptitude II	EEC	2	0	0	2	1
10	JEE1641	Internship	EEC					1
TOTAL				**28**	**14**	**2**	**12**	**22**

SEMESTER VII

S. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1	JEE1701	E- Vehicle	PC	3	3	0	0	3
2	JEE1702	Power Electronics for Renewable Energy Systems	PC	3	3	0	0	3
3		Professional Elective IV	PE	3	3	0	0	3
4		Professional Elective V	PE	3	3	0	0	3
5		Open Elective IV	OE	3	3	0	0	3
PRACTICALS								
6	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
7	JEE1712	Renewable Energy Systems Laboratory	PC	4	0	0	4	2
8	JEE1711	Simulation and Hardware implementation laboratory	PC	4	0	0	4	2
9	JEE1731	Project Work –Phase I	EEC	6	0	0	6	3
TOTAL				**31**	**15**	**0**	**16**	**23**

SEMESTER VIII

S. No	COURSE CODE	COURSE TITLE	CATEGORY	PERIODS	L	T	P	C
THEORY								
1	JNC1861	Indian Constitution	NCM	2	2	0	0	0
PRACTICALS								
2	JEE1851	Comprehension and technical seminar	EEC	2	0	0	2	1
3	JEE1832	Project Work – Phase II	EEC	18	0	0	18	9
TOTAL				**22**	**2**	**0**	**20**	**10**

PROFESSIONAL ELECTIVE LIST

PROFESSIONAL ELECTIVE I (V SEMESTER) (MANAGEMENT)

1.	JBA1038	Principles of Management	PE	3	3	0	0	3
2.	JBA1039	Total Quality Management	PE	3	3	0	0	3
3.	JGE1001	Professional Ethics in Engineering	PE	3	3	0	0	3
4.	JGE1003	Human Rights	PE	3	3	0	0	3
5.	JEI1007	Product Design and Development	PE	3	3	0	0	3
6.	JGE1004	Intellectual Property Rights	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE II - SEMESTER VI (EMBEDDED SYSTEMS)

1.	JEE1001	Real Time Operating Systems	PE	3	3	0	0	3
2.	JEE1002	Micro Controller Based System Design	PE	3	3	0	0	3
3.	JEE1003	Embedded Systems	PE	3	3	0	0	3
4.	JEE1004	Sensors and Transducers	PE	3	3	0	0	3
5.	JEE1005	Smart System Design	PE	3	3	0	0	3
6.	JEE1006	Communication Engineering	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE III - SEMESTER VI (POWER SYSTEMS)

1.	JEI1002	Digital Signal Processing	PE	3	3	0	0	3
2.	JEE1007	Power System Transients	PE	3	3	0	0	3
3.	JEE1008	SMPS and UPS	PE	3	3	0	0	3
4.	JEE1009	Flexible AC Transmission Systems	PE	3	3	0	0	3
5.	JEE1010	Power Quality	PE	3	3	0	0	3
6.	JEE1011	High Voltage Direct Current Transmission	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE IV (SEMESTER VII)
(RECENT TRENDS IN ELECTRICAL)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JEE1012	Design Of Electrical Apparatus	PE	3	3	0	0	3
2	JEE1013	Distributed Generation and Microgrids	PE	3	3	0	0	3
3	JEE1014	Electric Energy Generation, Utilization and Conservation	PE	3	3	0	0	3
4	JEE1015	Energy Management	PE	3	3	0	0	3
5	JEE1016	Smart Grid	PE	3	3	0	0	3
6	JEE1017	Finite Element Analysis for Electrical Machines	PE	3	3	0	0	3

PROFESSIONAL ELECTIVE V (SEMESTER VII)
(CONTROL AND AUTOMATION)

1.	JEE1018	Advanced Control Systems	PE	3	3	0	0	3
2.	JEI1702	Industrial Automation	PE	3	3	0	0	3
3.	JEE1019	Sensors and Transducers	PE	3	3	0	0	3
4.	JEE1020	Special Electrical Machines	PE	3	3	0	0	3
5.	JEE1021	Advanced Integrated Automation	PE	3	3	0	0	3
6.	JEE1022	Applied Soft Computing Techniques	PE	3	3	0	0	3

OPEN ELECTIVES OFFERED BY EEE DEPARTMENT

IV SEMESTER									
1.	JEE9001	Electrical Safety Engineering	-	OE	3	3	0	0	3
2.	JEE9002	Design Estimation and Costing Of Electrical Systems	-	OE	3	3	0	0	3
3.	JEE9003	Electrical Machines and Drives	-	OE	3	3	0	0	3
V SEMESTER									
4.	JEE9004	Industrial Electronics	-	OE	3	3	0	0	3
5.	JEE9005	Measurement and Instrumentation	-	OE	3	3	0	0	3
6.	JEE9006	Analog Control Systems	-	OE	3	3	0	0	3
VI SEMESTER									
7.	JEE9007	Renewable Energy Systems	-	OE	3	3	0	0	3
8.	JEE9008	Intelligent Controllers	-	OE	3	3	0	0	3
9.	JEE9009	Introduction to SMPS and UPS	-	OE	3	3	0	0	3
VII SEMESTER									
10.	JEE9010	Introduction to E-Vehicles	-	OE	3	3	0	0	3
11.	JEE9011	Optical Fibers and Laser Technology	-	OE	3	3	0	0	3
12.	JEE9012	Energy Management and SCADA	-	OE	3	3	0	0	3

SEMESTER I

JHS1121	**COMMUNICATIVE ENGLISH & SOFT SKILS I (Common to all B.E/B.Tech Programmes)**	**L**	**T**	**P**	**C**
		2	**0**	**2**	**3**

COURSE OBJECTIVES:

- To enable the students of Engineering and Technology to develop their listening skill by learning the key techniques for comprehending information.
- To facilitate the learners to speak effectively while exchanging ideas in academic and social domains
- To develop their skills in reading and understanding texts through practice
- To expose them to the correct usage of language to develop their writing skill
- To train the students to use appropriate vocabulary in academic and technical writings

UNIT I BASIC GRAMMAR I AND READING FOR INFORMATION 9

Parts of speech - Sentence patterns – Tenses - Wh- questions - Yes/no questions –Countable and Uncountable nouns – Affixation – word formation; Reading short comprehension passages - practice in skimming and scanning for specific information and note - making, Critical reading – finding key information in a given text-shifting facts from opinions and paraphrasing.

SOFT SKILLS LAB 3

Listening to documentaries, inspiring speeches of great leaders, news bulletins, Ted talks, telephonic conversations

UNIT II BASIC GRAMMAR I AND SHARING INFORMATION 9

Pronouns – Adjectives – Adverbs – Imperatives – Direct and indirect questions-Compound words - Guessing meaning of words in contexts – one word substitutes; Auto biographical writing (writing about one's leisure time activities, hometown , favourite place and school life) – Biographical writing (place, people), Letter writing (informal letters)

SOFT SKILLS LAB 3

Self-introduction, peer introduction, picture description , JAM

UNIT III BASIC GRAMMAR III AND FREE WRITING I 9

Conjunctions–Prepositions -Articles-Degrees of comparison–Discourse markers-Reference words; Process description, Coherence and cohesion in writing cause and effect/ compare & contrast / narrative/ analytical paragraphs

SOFT SKILLS LAB 9

Language functions: Giving reasons, talking about future plans, comparing and contrasting, making suggestions

UNIT IV BASIC GRAMMAR IV AND LANGUAGE DEVELOPMENT 9

Subject - verb agreement - Modal verbs - Phrasal verbs - Single word substitutes – Use of abbreviations & acronyms - Cloze reading - Interpreting visual material, Jumbled sentences

SOFT SKILLS LAB 3

Interpersonal Skills: role play, group discussion, debate, conduct of meeting

UNIT V BASIC GRAMMARV AND FREE WRITING II 9

Clause - Direct and indirect speech – Correction of errors-Word association (connotations)- Lexical items (fixed / semi fixed expressions) - Essay writing – different types of essays, dialogue writing

SOFT SKILLS LAB 3

Creative writing and speaking skills: Poster making and description, project proposals

TOTAL: 60 PERIODS

COURSE OUTCOMES:

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

- Listen to different talks and lectures and understand them easily
- Communicate their thoughts confidently using communicative strategies
- Read and grasp different genres of texts effortlessly
- Write grammatically correct academic, business and technical texts
- Apply the language skills efficiently in all forms of communication

TEXTBOOKS:

1. Board of Editors, Department of English, Anna University, Chennai. Using English: A Course Book for Undergraduate Engineers and Technologists, Orient Black Swan: Chennai, 2017.
2. Dhanavel.S.P English and Communication Skills for Students of Science and Engineering. Orient Black Swan Publications, Chennai, 2011.
3. Raman, Meenakshi & Sangeetha Sharma, Technical Communication: English Skills for Engineers. Oxford University Press, New Delhi. 2011.

REFERENCE BOOKS:

1. Regional Institute of English. English for Engineers. Cambridge University Press, New Delhi. 2006
2. Rizvi M, Ashraf. Effective Technical Communication. Tata McGraw-Hill Publishing Company Limited, New Delhi, 2007.
3. Rutherford, Andrea J . Basic Communication Skills for Technology. Pearson Edition (II Edition), New Delhi, 2001.
4. Mandel, Steve. Effective Presentation Skills. New Delhi: Viva Books Pvt. Ltd., 2004.
5. Writing Cover Letters-Kilmet, Stephen. "Cover Letter, Enclosures and Attachments." In Writing for Design Professionals. New York.

WEBLINKS:

1. https://www.perfect-english-grammar.com
2. https://edu.gcfglobal.org/en/grammar
3. https://www.talkenglish.com/grammar/grammar.aspx
4. https://learnenglish.britishcouncil.org/skills
5. https://www.myenglishlanguage.com

EXTENSIVE READING:

1. Kalam, Abdul. The Wings of Fire, Universities Press, Hyderabad.1999

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	-	2
CO2	-	-	-	-	-	-	-	1	2	3	-	2
CO3	-	-	-	-	-	-	-	1	2	3	-	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2
CO5	-	-	-	-	-	-	-	1	2	3	-	2
AVG	-	-	-	-	-	-	-	1	2	3	-	2

JMA1101	MATRICES AND CALCULUS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the knowledge of matrices required for applications in engineering.
- To enable students to understand the concepts of multi variable functions and its calculus.
- To familiarize students on concepts of differential calculus and its applications.
- To introduce concepts of integral calculus as tools required for applications in engineering.
- To introduce ordinary differential equations which is widely used in problem solving and engineering applications.

UNIT I MATRICES 12

Eigen values and Eigenvectors of a real matrix – Characteristic equation – Properties of Eigen values and Eigen vectors – Cayley – Hamilton theorem–Diagonalization of matrices by similarity and orthogonal transformations–Reduction of a quadratic form to canonical form – Nature of quadratic forms.

UNIT II FUNCTIONS OF SEVERAL VARIABLES 12

Partial differentiation – Total derivative – Jacobians –Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.

UNIT III APPLICATIONS OF DIFFERENTIAL CALCULUS 12

Curvature and radius of curvature – Circle of curvature – Evolutes – Envelopes– Evolute as envelope of normals.

UNIT IV APPLICATIONS OF INTEGRAL CALCULUS 12

Multiple integrals: Double integrals– Change of order of integration– Change of variables– Area enclosed by plane curves – Triple integrals– Volume of solids.

Improper integrals: Beta and Gamma Integrals – Definitions and properties – Simple problems.

UNIT V ORDINARY DIFFERENTIAL EQUATIONS 12

Higher order linear differential equations with constant coefficients –Method of variation of parameters – Method of undetermined coefficients – Homogeneous equation of Euler's and Legendre's type – System of simultaneous first order linear differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- To understand applications of matrix theory in quadratic forms
- To use calculus for problems and applications dealing with functions of Several variables
- To apply differential calculus in practical problem solving in the area of geometry
- To gain insight on the applications of multiple integrals in area and volume problems
- To solve ordinary differential equations that occur in many physical and engineering applications

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. P.Anuradha and V.Sudhakar, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES

1.Anton, H, Bivens, IandDavis,S, "Calculus",Wiley,10th Edition,2016.

2.Jain R.K.and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rdEdition, 2007.

3.Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University

Press, 2015.
4. Weir, M.D and JoelHass,"ThomasCalculus",12thEdition,Pearson India,2016.

WEB REFERENCES

1. .https://nptel.ac.in/courses/111/108/111108157/
2. .https://nptel.ac.in/courses/111/107/111107108/
3. https://nptel.ac.in/courses/111/104/111104144/
4. https://nptel.ac.in/courses/111/105/111105122/
5. https://nptel.ac.in/courses/111/107/111107111/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JPH1101	ENGINEERING PHYSICS (Common to all B.E/B.Tech Programmes)	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To enable the students to understand the basics in crystals structure
- To enable the students to understand the basic concepts in properties of matter
- To impart knowledge in ultrasonic inspections
- To introduce the principles of quantum mechanics
- To impart knowledge of laser and fiber optic communication

UNIT I CRYSTAL PHYSICS 9

Single crystal, Polycrystalline and Amorphous materials – Single Crystals: Unit cell, Crystal systems, Bravais lattices, Directions and Planes in a crystal, Miller indices– Inter planar distances – Coordination number and Packing factor for SC, BCC, FCC, HCP and Diamond structures - Crystal imperfections: Point defects, Line defects– Burgers vector, Stacking faults

UNIT II PROPERTIES OF MATTER 9

Elasticity–Stress- strain diagram and its uses-factors affecting elastic moduli and tensile strength–torsional stress and deformations – twisting couple –torsion pendulum: theory and experiment-bending of beams – stress due to bending in beams-bending moment–cantilever :theory and experiment–uniform and non-uniform bending: theory and experiment

UNIT III ULTRA SONICS 9

Production of ultrasound by Magnetostriction effect and Piezo electric effect Detection of ultrasonic wave – Properties of ultrasonic wave–Acoustic grating-Industrial applications – Drilling, Welding, Soldering and Cleaning – SONAR - Non Destructive Testing – Pulse echo system through Transmission and Reflection modes- A, B and C– scan displays.

UNIT IV PHOTONICS AND FIBRE OPTICS 9

Spontaneous and stimulated emission-Population inversion-Einstein's A and B coefficients derivation–Laser Principle - Semiconductor lasers (homo junction & hetero junction)- Optical Fiber: types (material, refractive index, mode) - Propagation of light in optical fibers–Numerical aperture and Acceptance angle–attenuation, dispersion, bending -Fiber Optical Communication system (Block diagram) -Active and passive fiber sensors-Endoscope.

UNIT V QUANTUM PHYSICS 9

Black body radiation –Planck's theory (derivation) –Deduction of Wien's displacement law and Rayleigh–Jeans' Law from Planck's theory – Compton effect - theory–Properties of Matter waves –G.P Thomson experiment -Schrödinger's wave equation –Time independent and time dependent equations –Physical significance of wave function Particle in a one dimensional box – Scanning electron microscope – Transmission electron microscope

TOTAL: 45 PERIODS

OUTCOMES:

Students will be able

- To enhance knowledge on properties of matter
- To assess the properties of ultrasonics and imaging devices
- To understand and to compute problems in Quantum Physics.
- To learn the use of modern optical fiber communication systems and tools in real life applications.
- To gain more insight on the functioning of optical materials for opto electronics.

TEXTBOOKS:

1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K.& Gupta, S.L."Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Dr.Beula Shanthi John, Dr. P.mani,"Engineering Physics", Dhanam Publications, First Edition, 2019.

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1. Halliday, D.,Resnick ,R.&Walker,J."Principles of Physics" .Wiley, 2015.
2. Serway,R .A.&Jewett,J.W."Physics for Scientists and Engineers".Cengage Learning, 2010.
3. Tipler, P.A.&Mosca,G."Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007

4. Rajendran V, "Engineering Physics", Tata Mc Graw Hill, 2009.
5. John D.Cutnell, “Cutnell and Johnson Physics”, Willey Publications, 2018.

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5. https://nptel.ac.in/courses/108/104/108104113/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	1	-	-	1	-	1	-
CO2	2	1	1	-	-	1	-	-	1	-	1	-
CO3	2	1	1	-	-	1	-	-	1	-	1	-
CO4	2	1	1	-	-	1	-	-	1	-	1	-
CO5	2	1	1	-	-	1	-	-	1	-	1	-
AVG	2	1	1	--	-	1	-	-	1	-	1	-

JCY1101	ENGINEERING CHEMISTRY (Common to all B.E / B.Tech Programmes)	L	T	P	C
		3	0	0	3

COURSE OBJECTIVE

- To acquaint the student with concepts of photo chemistry and analytical techniques.
- To make the students conversant with boiler feed water and water treatment techniques.
- To make the students acquire sound knowledge in corrosion of materials.
- To understand polymer chemistry and the principle of energy in batteries.
- To impart knowledge on the basics of nano materials and engineering materials.

UNIT I PHOTO CHEMISTRY AND ANALYTICAL TECHNIQUES 9

Photo chemistry- Laws of photochemistry - Grotthuss–Draper law, Stark–Einstein law and Lambert-Beer Law (problems). Photo processes - Internal Conversion, Inter-system crossing, Fluorescence and its applications in medicine – Phosphorescence – Chemiluminescence and Photo - sensitization.
Analytical Techniques – UV-visible spectroscopy – principles – instrumentation (block diagram only) – Colorimetry – Principle - Instrumentation, estimation of iron by colorimetry – Flame photometry – principle – Instrumentation – estimation of sodium by Flame photometry.

UNIT II WATER TECHNOLOGY 9

Hardness - Units of Hardness- Temporary hardness – Permanent hardness-Estimation hardness by EDTA method – Alkalinity – Types – water quality parameters (pH, EC,TDS,DO, BOD, COD) –- Boiler feed water – requirements - boiler troubles (scale and sludge-caustic embrittlement-boiler corrosion - priming and foaming) - softening of hard water - external treatment (zeolite and

demineralization) – internal treatment (phosphate , calgon , carbonate , colloidal) - desalination of brackish water – reverse osmosis.

UNIT III ELECTRO CHEMISTRY AND CORROSION 9

Electro chemistry - Electro chemical cell – redox reaction, electrode potential – oxidation potential – reduction potential , measurement and applications – electro chemical series and its significance - Nernst equation (derivation and problems). Corrosion – causes – types - chemical, electro chemical corrosion – galvanic corrosion – differential aeration corrosion (pitting, waterline, wire fence, pipeline, crevice, stress corrosion),Factors influencing the rate of corrosion – corrosion control – materials election and design aspects –cathodic protection methods (sacrificial anode and impressed current cathodic methods)-Electro plating of Copper and electro less plating of nickel –corrosion inhibitors (anodic and cathodic inhibitors).

UNIT IV POLYMER, COMPOSITES AND ENERGY STORAGE DEVICES 9

Introduction- Classification of polymers – Natural and synthetic; Thermoplastic and Thermo setting. Functionality – Degree of polymerization. Biodegradable polymer – Types – synthetic methods – applications of biodegradable polymers. Polymer composites and its application.

Energy Storage Devices - Batteries and fuel cells: Types of batteries– primary battery (dry cell) secondary battery (lead acid battery, nickel-cadmium battery, lithium-ion-battery). Fuel cell–H_2-O_2 fuel cell – solid oxide fuel cell – polymer electrolyte membrane fuel cell (PEMFC) applications.

UNIT V ENGINEERING MATERIALS AND NANO CHEMISTRY 9

Engineering Materials- Refractories – classification – acidic, basic and neutral refractories – properties (refractoriness, refractoriness underload, dimensional stability, porosity, thermal spalling) – manufacture of alumina, magnesite and zirconia bricks. cement-manufacture and properties – setting and hardening of cement, special cement-water proof and white cement – properties and uses.

Nano chemistry – Introduction – distinction between molecules, nanoparticles and bulk materials; Synthesis: precipitation, thermolysis, hydrothermal, solvothermal, electrodeposition, chemical vapour deposition, laser ablation; Properties and applications.

TOTAL: 45 PERIODS

COURSE OUTCOMES

Students will be able to

- Understand laws of photo chemistry and principles of instrumentation and their applications in various fields.
- To understand the basic principle of water treatment and techniques involved in the purification process for future learning.
- Apply electro chemical reactions on the process of corrosion and its prevention methods.
- Gain knowledge on biodegradable polymers and understand the principle of batteries for development of new energy resources.
- Gain knowledge on engineering materials and understand the unique behavior of nano.

TEXTBOOKS:

1. Jain P.C.and Monica Jain,“Engineering Chemistry”, Dhanpat Rai Publishing Company(P)Ltd., New Delhi, 2010.
2. R.Gopalan, D.Venkayya, Sulochna Nagarajan,Textbook of Engineering Chemistry,

Vikas publishing pvt ltd, 4th edition, 2013.
3. Dr.N.John Jebarathinam Dr.R.Vaidyanathan Ms.A.U.Ajisha Dr.A.Ravikrishnan, Engineering Chemistry, Sri Krishna Publications, First edition 2019.

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1. O.G.Palanna, Engineering Chemistry, McGraw Hill,2017
2. Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2013.
3. GowarikerV.R. Viswanathan N.V. and Jayadev Sreedhar,"Polymer Science", New Age International P(Ltd.,), Chennai,2006.
4. Ozin G.A. and Arsenault A.C.,"Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
5. B.R.Puri, L.R.Sharma, Madan S.Pathana, Principle of physical chemistry, 47thedition, Vishal publishing Co, 2017.

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3. https://nptel.ac.in/courses/113/101/113101098/
4. https://nptel.ac.in/courses/112/107/112107221/
5. https://nptel.ac.in/courses/113/106/113106093/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	-	-	-	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	1	1	1	1	1	1	-	1	1	1	-
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	-	1	1	1	1
AVG	1	1	1	1	1	1	1	1	1	1	1	1

	ENGINEERING BASICS	L	T	P	C
JGE1101	(Common to all B.E / B. Tech Programmes)	3	0	0	3

COURSE OBJECTIVES

- To impart knowledge on the basics of Civil Engineering to the students.
- To impart knowledge on the basics of Mechanical Engineering to the students.
- To impart knowledge on the electric circuits and working principles of Electrical Machines.
- To impart knowledge on the Principles and characteristics of various electronic devices.
- To impart knowledge on the basics of various measuring instruments.

UNIT 1 BASICS OF CIVIL ENGINEERING 11

Introduction to Civil Engineering, Types of buildings, Components of a residential building, Building Materials, Types of slabs, beam, column, lintel, floor and foundation - Types of roofs. Surveying and Levelling - Linear and Angular Measurements - Introduction to transport system, role of transportation in society –Green Highway. Sources of water, Hydrological cycle, Irrigation Engineering, Rain water

harvesting, Environmental pollution, Green house gas emission, Ozone depletion, Global warming - Green building concepts.

UNIT 2 BASICS OF MECHANICAL ENGINEERING 11

Introduction to the concepts of Mechanization and Automation, Robotics-Manufacturing methods - casting, machining, forming operations, Introduction to IC Engine –Working principles of four stroke petrol and diesel engines, Types of power plants - Hydel power plant and thermal power plant, Steam generators - Fire tube boiler and water tube boiler, Thermal systems - Heat exchangers, Radiator and oil cooler, Design of ingenious mechanisms-Parts feeding mechanism.

UNIT 3 ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 7

Basic circuit components - Ohms Law - Kirchhoff's Law – Introduction to AC circuits Wave forms and RMS value- Power and power factor – Principles of operation and characteristics of DC machines Transformers - Three Phase and single Phase induction motors.

UNIT 4 ELECTRONIC DEVICES & CIRCUITS 7

Types of Materials - Silicon & Germanium - N type and P type materials -Construction and Characteristics: PN Junction diode - Zener Diode - Bipolar Junction Transistor - Field effect Transistors - IGBT - Introduction to operational amplifier –Inverting Amplifier -Non-inverting Amplifier.

UNIT 5 MEASUREMENTS & INSTRUMENTATION 9

Elements of generalized measurement system - Basic terminologies: Accuracy, precision, resolution, sensitivity, linearity, span and range – Errors in measurement - Standards of Measurement - calibration- Operating forces: Deflection force, controlling force , damping force - Classification of instruments.

TOTAL: 45 PERIODS

COURSE OUTCOMES

The students will be able to

- Gain knowledge on the various fields of Civil Engineering.
- Know the fundamentals of Mechanical Engineering.
- Understand the basic concepts of electric circuits and working principles of electrical machines.
- Gain knowledge on the basics of electronics and apply them in practical situations.
- Choose appropriate instruments for electrical measurement for a specific application.

TEXT BOOKS

1. Shanmugam G and Palanichamy M S,"Basic Civil and Mechanical Engineering", Tata McGrawHill publishing Co., 2016
2. Venugopal K.and Prahu Raja., Basic Mechanical Engineering, Anuradha Publishers, Kumbakonam, 2000.
3. D P Kothari and I.J Nagarath, Electrical Machines - Basic Electrical and Electronics Engineering, Mc Graw Hill Education (India) Private Limited, Third Reprint, 2016.

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1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. Ramamrutham S., Basic Civil Engineering, Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Thereja. B.L., Fundament also f Electrical Engineering and Electronics, S. Chand &Co.Ltd., 2008.
4. A.K.Sawhney, A Course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and Co, New Delhi, 2010.
5. H.S.Kalsi, Electronic Instrumentation, Tata Mc Graw-Hill,New Delhi,2010.

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2. https://nptel.ac.in/courses/105/102/105102088/

CO-PO Mapping

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	-	-	-	-	-	-	-
CO2	1	1	1	1	1	-	-	-	-	-	-	-
CO3	1	1	1	1	1	-	-	-	-	-	-	-
CO4	1	1	1	1	1	-	-	-	-	-	-	-
CO5	1	1	1	1	1	-	-	-	-	-	-	-
AVG	1	1	1	1	1	-	-	-	-	-	-	-

JGE1102	PROGRAMMING IN C	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To learn Fundamentals of computing
- To be able to use file operations in C
- To implement programs using basic features of C
- To learn to use C pointers and dynamically allocated memory techniques
- To learn advanced features of the C programming language

UNIT I INTRODUCTION TO PROBLEM SOLVING 9

Simple model of a Computer – Hardware – Software – Data Representation, Problem Solving Techniques – Bottom up design and top down design - applications, Introduction to Algorithms and Flow Chart-Notion of memory, addresses, variables, instructions, execution of instruction - Operating system commands, file editing, compiling, linking, executing a program.

UNIT II C PROGRAMMING 9

Introduction to ‘C’ programming – structure of a ‘C’ program – compilation and linking processes. Conversion of simple algorithm to program - Constants, Variables – Data Types – Expressions using operators in ‘C’ – Managing Input and Output operations – Decision Making and Branching – Looping statements – solving simple scientific and statistical problem

UNIT III ARRAYS AND STRINGS 9

Arrays – Initialization – Declaration – One dimensional and two dimensional arrays –String -String operations–Arrays of strings.

UNIT IV FUNCTIONS AND USER DEFINED DATA TYPES 9

Function – definition of function – Declaration of function – Pass by value - Pass by reference – Command Line Argument in C-- Recursion - Enumerators - Structures -Unions.

UNIT V POINTERS AND FILES 9

Macros - storage classes - Pointers- Definition – Initialization – Pointers arithmetic –Double Pointers, Basic file operations-Example problems.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Design and represent solutions to problems as algorithm and flow chart
- Write simple C Programs using loops and conditional statements
- Write simple C Programs using arrays
- Write simple C Programs using functions
- Write simple C codes using pointers, structures and union

TEXT BOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C", First Edition, Oxford University Press, 2018
2. Byron S Gott fried, “Programming with C”, Schaum’s Outlines, Third Edition, Mc Graw-Hill, 2010.

REFERENCES:

1. Kernighan, B.W and Ritchie,D.M, “The C Programming language”, Second Edition, Pearson Education, 2015.
2. Yashavant P.Kanetkar. “Let Us C”,B P B Publications,2011.
3. Paul J Deitel, Dr. Harvey M.Deitel,"C How to Program", Seventh Edition, Pearson Education, 2016.
4. E. Balagurusamy, “Computing Fundamentals and C Programming”, Mc Graw - Hill Publishing Company Limited, (2008).
5. Brian W.Kernighan and Rob Pike, “The Practice of Programming”(Chap1), Pearson Education, 2008

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2. https://www.geeksforgeeks.org/basics-file-handling-c/
3. https://www.studytonight.com/c/string-and-character-array.php
4. https://www.tutorialspoint.com/cprogramming/c_functions.htm
5. https://www.guru99.com/c-pointers.html

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	3	3	3	-	3
CO2	3	3	3	-	-	-	-	3	3	3	-	3
CO3	3	3	3	-	-	-	-	3	3	3	-	3
CO4	3	3	3	-	-	-	-	3	3	3	-	3
CO5	3	3	3	-	-	-	-	3	3	3	-	3
AVG	3	3	3	-	-	-	-	3	3	3	-	3

JPC1111	PHYSICS AND CHEMISTRY LABORATORY (Common to all B.E / B.Tech Programmes)	L	T	P	C
		0	0	2	1

OBJECTIVES:

To provide students the first hand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS: Physics

- Determination of Young's modulus for the given uniform bar by uniform bending method
- Determination of wave length of the diode laser and hence determine the size of the coated powder particle
- Determination of velocity of Ultrasound using Ultrasonic interferometer and also find the compressibility of the given liquid
- Determination of moment of inertia of the given circular disc and rigidity modulus of the metal wire using torsional pendulum
- Determination of Planck's constant using different color filters
- Determination of Wave length of spectral lines in mercury spectrum using spectrometer
- Analysis of I-V Characterization of Solar cell

TOTAL: 15 PERIODS

LIST OF EXPERIMENTS: CHEMISTRY

1. Estimation of HCl using Na_2CO_3 as primary standard and Determination of alkalinity in water samples.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler's method.
4. Determination of chloride content of water sample by argentometric method.
5. Estimation of copper in brass by Iodometry.
6. Determination of molecular weight of poly vinyl alcohol using Ostwald viscometer.

TOTAL: 15 PERIODS

OUTCOMES:

Students will be able

- Acquire experience in analyzing the elastic materials.

- Understand the acoustic properties of various liquids.
- Acquire knowledge in optical properties of solids.
- Make the student acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- Acquaint the students with the determination of molecular weight of a polymer by viscometry

REFERENCES:

1. Practical Fiber Optics, D.Bailey and E.Wright,2003
2. Jerrad H.G.and McNeil D.B.-Theoretical and Experimental Physics
3. FretterW.B.-Introduction to Experimental Physics, Blackiee
4. J.Mendham, RC Denney, JD Barnes, MJK Thomas, Textbook of quantitative chemical analysis, Vogel's,2008

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4. http://depthome.brooklyn.cuny.edu/physics/lab/phy2/newlabs/Diffraction-grating-ver-2.pdf
5. http://web.physics.ucsb.edu/~phys128/experiments/interferometry/measuring_wavelength.pdf

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	1	1	-	-	1	-	1	1
CO2	2	1	1	-	1	1	-	-	1	-	1	1
CO3	2	1	1	-	1	1	-	-	1	-	1	1
CO4	2	1	1	-	1	1	-	-	1	-	1	1
CO5	2	1	1	-	1	1	-	-	1	-	1	1
AVG	2	1	1	-	1	1	-	-	1	-	1	1

JGE1112	PROGRAMMING IN C LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

The students should be made to:

- To be exposed to the syntax of C
- To be familiar with programming in C
- To learn to use arrays, strings, functions, pointers, structures and union sin C.
- To Learn the fundamentals of File Programming in C
- To solve simple problems using C

LIST OF PROGRAMS

1. Usage of Basic Linux commands
2. C Programming using Simple statements and expressions
3. Scientific problem solving using decision making and looping.

4. Simple programming for one dimensional and two dimensional arrays.
5. Solving problems using Strings
6. C Programming using Pointers
7. C Programming using user defined functions (Pass by value and Pass by reference)
8. C Programming using Recursion
9. C Programming using structures and union
10. C Programming using enumerated data types
11. C Programming using macros and storage classes
12. C Programming using Files

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student should be able to:

- Write simple C Programs
- Able to solve scientific problems using C
- Gain knowledge on the use of functions and arrays
- Use structures, pointers and files in C Programs
- Develop modularized applications in C

TEXTBOOKS:

1. Pradip Dey, Manas Ghosh, "Programming in C – As per the latest AICTE syllabus", First Edition, Oxford University Press,2018
2. Byron S Gott fried, "Programming with C", Schaum's Outlines, Third Edition, Mc Graw-Hill, 2010

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2. https://www.w3resource.com/c-programming-exercises/
3. https://www.javatpoint.com/functions-in-c
4. https://www.programiz.com/c-programming/c-structures-pointers
5. https://www.sitesbay.com/cprogramming/c-applications

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	2	-	-	-	2	2	2		2
CO2	3	3	3	3	-	-	-	3	3	3		3
CO3	3	3	3	3	-	-	-	3	3	3		3
CO4	3	3	3	3	-	-	-	3	3	3		3
CO5	3	3	3	3	-	-	-	3	3	3		3
AVG	3	3	3	3	-	-	-	3	3	3		3

JGE1111	DESIGN APPRECIATION LABORATORY (Common to all B.E/B.Tech Programmes)	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To provide exposure to the students with hands-on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
- To kindle your own creativity, ideation and realize the importance of team working.
- To gain knowledge through experience in handling of engineering aggregates.
- To appreciate the use of various mechanisms involved in engineering products.
- To understand the interactions between its sub systems and their functionality.

GROUP A (CIVIL & MECHANICAL)

I CIVIL ENGINEERING PRACTICE 13

BUILDINGS:

(a) Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.

PLUMBINGWORKS:

(a) Study of pipe line joints, its location and functions: valves, taps, couplings, unions, reducers, elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise: Basic pipe connections - Mixed pipe material connection Pipe connections with different joining components.
(e) Demonstration of plumbing requirements of high – rise buildings.

CARPENTRY USING POWER TOOLS ONLY:

(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

I MECHANICAL ENGINEERING PRACTICE 18

WELDING:

(a) Preparation of but joints, lap joints and T-joints by Shielded metal arc welding.
(b) Gas welding practice

BASIC MACHINING:

(a) Simple Turning and Taper turning
(b) Drilling Practice

SHEET METAL WORK:

(a) Forming & Bending:

(b) Model making-Trays and funnels.

(c) Different type of joints.

MACHINE ASSEMBLY PRACTICE:

(a) Study of centrifugal pump

(b) Study of air conditioner

DEMONSTRATION ON:

(a) Smithy operations, upsetting, swaging, setting down and bending.
Example -Exercise-Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting - Exercises - Preparation of square fitting and V-fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

I ELECTRICAL ENGINEERING PRACTICE 13

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Staircase wiring
4. Measurement of electrical quantities -voltage, current, power & power factor in RLC circuit.
5. Measurement of energy using single phase energy meter.
6. Measurement of resistance to earth of electrical equipment.

I ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipment's - Resistor, colour coding measurement of AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Fabricate carpentry components and pipe connections including plumbing works.
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings.
- Carry out basic home electrical works and appliances.
- Measure the electrical quantities.
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings. 15 Sets
2. Carpentry vice (fitted to work bench) 15 Nos
3. Standard wood working tools 15 Sets
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:

(a) Rotary Hammer 2 Nos
(b) Demolition Hammer2 Nos
(c) Circular Saw 2 Nos
(d) Planer 2 Nos
(e) Hand Drilling Machine 2 Nos
(f) Jigsaw 2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders 5 Nos
2. Welding booth with exhaust facility 5 Nos
3. Welding accessories like welding shield, chipping hammer, wire brushetc.5 Sets
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.2 Nos
5. Centre lathe 2 Nos
6. Hearth furnace, anvil and smithy tools 2 Sets
7. Moulding table, foundry tools 2 Sets
8. Power Tool: Angle Grinder 2 Nos
9. Study – purpose items: centrifugal pump, air- conditioner 1each

ELECTRICAL

1. Assorted electrical components for house wiring15 Sets
2. Electrical measuring instruments10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp 1 each
4. Megger (250V/500V) 1 No
5. Power Tools:

(a) Range Finder 2 Nos
(b) Digital Live-wire detector 2 Nos

ELECTRONICS

1. Soldering guns 10 Nos
2. Assorted electronic components for making circuits 50 Nos
3. Small PCBs 10 Nos
4. Multi meters 10 Nos
5. Study purpose items: Telephone, FM radio, low-voltage power supply

WEBSITE REFERERENCE:

1. www.vikaspublishing.com/engineering-practices-lab
2. https://archieve.org/mechanicalengineeeringworkshoplaboratory

CO-OP MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	1	1	1	1	-	-	-	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	1	1	1	1	1	1	-	1	1	1	-
CO4	1	1	1	1	1	1	1	1	1	1	1	1
CO5	1	1	1	1	1	1	1	-	1	1	1	1
AVG	1	1	1	1	1	1	1	-	1	1	1	1

SEMESTER II

JHS1221	TECHNICAL ENGLISH & SOFT SKILLS II (Common to all B.E / B.Tech Programmes)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To make the students of engineering and technology enhance their ability to read and comprehend different texts
- To improve their creative and critical thinking so as to use in demanding contexts
- To equip the learners with the skills of writing convincing job applications and effective reports
- To develop their speaking skills to make technical presentations and participate in group discussions
- To facilitate them to hone their soft skills

UNIT I TECHNICAL WRITING AND VISUAL CONVERSION 9

Definitions, Purpose statements, Technical vocabulary, regular and irregular verbs – Process Description and Interpretation of Graphs and Charts

SOFT SKILLS LAB 3

Skimming and scanning, understanding logic and sequencing in reading, inferring the exact meaning of text, making out meaning of pictorial and graphical representations

UNIT II TECHNICAL WRITING AND GUIDELINES PREPARATION 9

Conditional clauses, Numerical adjectives, Collocation, verbal analogies - Instructions, Recommendations, Checklist

SOFT SKILLS LAB 12

Comprehensive listening: Listening to telephonic conversations, listening to native accents, short and long conversations from different domains, listening to various pre-recorded conversations and speeches

UNIT III 9

SOFT SKILLS LAB

Listening and speaking practice based on BEC, IELTS and TOEFL

UNIT IV TECHNICAL WRITING AND BUSINESS LETTERS 9

Cause and effect, impersonal passive voice, idioms and phrases, words used as nouns And verbs -- Letter writing – job application, business correspondence (letters) – calling for quotations, placing order, complaint letters, preparing a memo, notice and email – itinerary

SOFT SKILLS LAB 3

Group Discussions - Process, Skills, Guidelines, Evaluation, Oral Presentation – Planning, Preparing, Organizing, Presenting

UNIT V TECHNICAL WRITING AND REPORT WRITING 9

Degrees of comparison, editing, Email etiquette, Misspelled words -- Report writing: survey, feasibility, industrial visit ,reporting various incidents and accidents, Minutes of meeting

SOFT SKILLS LAB 3

Starting a Career – vision statement, preparing logo and tagline, making short term and long term goals, setting plans

TOTAL: 60 PERIODS

COURSE OUTCOMES:

On the completion of the course, students will be able to

- Read and understand general and technical texts
- Apply creative and critical thinking and communicate their ideas efficiently
- Participate in group discussions and deliver short speeches effectively
- Write effectively and persuasively in academic and work place contexts
- Face the future challenges confidently and successfully

TEXT BOOKS:

1. Department of English, Anna University, Chennai. Mindscapes: English for Technologists and Engineers. Orient Black Swan, Chennai, 2012.
2. Dhanavel, S.P. English and Communication Skills for Students of Science and Engineering Orient Black Swan Publications, Chennai, 2011.
3. Rizvi, M. Ashraf, "Effective Technical Communication", Tata Mc Graw – Hill, 2006.

REFERENCE BOOKS:

1. Ibbotson, Mark, "Cambridge English for Engineering", Cambridge University Press, 2008.
2. English, Laura M & Sarah Lynn, "Business Across Cultures: Effective Communication Strategies", Addison Wesley, 1995.
3. Richard Johnson- Sheehan, "Technical Communication Today" 4th Edition Books Long Man Publishing Group, 2011.
4. Porter, Patricia A., and Margaret Grant, "Communicating Effectively in English: Oral Communication for Non – Native Speakers", 2nd Edition, Wadsworth, 1992.
5. Gopalaswamy, Ramesh & Ramesh Mahadevan. ACE of Soft Skills: Attitude, Communication and Etiquette for Success, New Delhi: Pearson, 2010.

WEBLINKS:

1. https://learnenglish.britishcouncil.org/business-english
2. https://www.thebalancecareers.com
3. https://www.deakin.edu.au/students/studying/study-support/academic-skills/report-writing
4. https://www.englishclub.com
5. https://www.ielts.org

EXTENSIVE READING:

1. Wells,H.G. The Time Machine, Peacock, India, 2008.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	2	3	-	2
CO2	-	-	-	-	-	-	-	1	2	3	-	2
CO3	-	-	-	-	-	-	-	1	2	3	-	2
CO4	-	-	-	-	-	-	-	1	2	3	-	2
CO5	-	-	-	-	-	-	-	1	2	3	-	2
AVG	-	-	-	-	-	-	-	1	2	3	-	2

JMA1201	VECTOR CALCULUS AND COMPLEX ANALYSIS (Common to all B.E / B.Tech Programmes)	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To familiarize students with concepts of vector calculus and complex analysis in problem solving.
- To build concepts of Laplace transforms leading up to its applications on solving differential equations

UNIT I VECTOR CALCULUS 12

Vector Differentiation: Gradient and directional derivative – Divergence and curl – Vector identities– Irrotational and Solenoidal vector fields. Vector Integration: Line and surface integrals - Green's theorem – Gauss and Stoke's theorems –Verification and evaluation in simple problems.

UNIT II ANALYTIC FUNCTIONS 12

Analytic functions – Zeros and Singularities - Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates (with out proof) – Properties – Harmonic conjugates – Construction of analytic functions – Conformal mappings – Mapping by functions w = z +c,cz,1/z– Bilinear transformation.

UNIT III COMPLEX INTEGRATION 12

Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series -Types of Singularities and residues – Cauchy's Residue theorem –Application of residue theorem for evaluation of real integrals (Circular contour and semi-circular contour only).

UNIT IV LAPLACE TRANSFORMS 12

Definition - Existence conditions – Transforms of elementary functions – Transforms of unit step function and unit impulse function – Properties with proof – Initial and final value theorems – Transform of periodic functions – Convolution theorem with proof – Problems.

UNIT V INVERSE LAPLACE TRANSFORMS 12

Definition - Evaluation of Inverse Laplace transforms by using properties, partial fractions,

residues and convolution theorem - Applications to solution of linear second order ordinary differential equations with constant coefficients.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, students will be able

- To understand concepts of vector calculus and evaluate line and surface integrals
- To understand analyticity of complex valued functions, bilinear transformation and conformal mappings
- To evaluate complex integrals using Cauchy's integral and Cauchy's residue theorems
- To find Laplace transforms of functions using definition and properties
- To apply Laplace transform method in solving differential equations

TEXT BOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi,43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. P.Anuradha and V.Sudhakar, "Vector Calculus and Complex Analysis", Scitech Publications, 1stEdition, Chennai, 2019.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (Anim print of Lakshmi Publications Pvt.,Ltd.,), New Delhi, 7th Edition, 2009.
2. Jain R.K. and Iyengar S.R.K.," Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. O 'Neil, P.V.,"Advanced Engineering Mathematics", Cengage Learning India Pvt Ltd, New Delhi , 2007.
4. Sastry, S.S, Engineering Mathematics", Vol. I & II, PHI Learning Pvt. Ltd,4th Edition, New Delhi, 2014.
5. Wylie, R.C. and Barrett, L.C.," Advanced Engineering Mathematics "Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.

WEB REFERENCES

1.https://nptel.ac.in/courses/111/105/111105122/
2.https://nptel.ac.in/courses/111/106/111106141/
3.https://nptel.ac.in/courses/111/107/111107056/
4.https://nptel.ac.in/courses/111/106/111106139/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

JBE1223	APPLIED SCIENCE FOR ELECTRONICS AND INFORMATION ENGINEERING	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES

- To understand the essential principles of semiconductor device and Electron transport properties.
- To understand the essential principles of magnetic properties of materials.
- To understand the essential principles of optical properties of materials.
- To compare the basic concepts of hybridization with chemical bonding.
- To understand the principles in various analytical techniques.

UNIT I SEMI CONDUCTING MATERIAL 7

Intrinsic semiconductor – Carrier concentration – Fermi level – Variation of Fermi level with temperature – Electrical conductivity – Band gap determination – Compound semiconductors – Direct and Indirect bandgap –Carrier concentration in N-type and P - type semiconductor – Variation of Fermi level with temperature and Impurity concentration.

UNIT II MAGNETIC AND SUPER CONDUCTING MATERIALS 7

Origin of magnetic moment – Bohr magnet on – comparison of Dia, Para and Ferro magnetism– Domain theory – Hysteresis – Soft and Hard magnetic materials – Anti ferro magnetic materials– Ferrites and its applications – Super conductivity : properties – Type I and Type II superconductors BCS theory of super conductivity (Qualitative) – High Tc super conductors.

UNIT III OPTICAL PROPERTIES OF MATERIALS 7

Classification of Optical materials - metals, insulators and semiconductors) – Carrier generation and Recombination processes - Absorption emission and Scattering of light (concepts only) – Photo current in a P-N diode – Solar cell -LED–Organic LED.

UNIT IV CHEMICAL BONDING AND CONDUCTIVITY IN SOLIDS 11

Band theory - Salient feature - Application of band theory (conductor, semiconductor, insulator)- Semiconductor – Types (intrinsic and extrinsic) - Band energy levels for pure silicon crystal, band model of n-type and p-type semi conductance of silicon. Types - Non elemental semiconductor, Defect semiconductor, Chalcogen semiconductor (definition, properties). Preparation of Germanium - Fractional distillation and crystal growth methods. Fullerenes- preparation, properties and applications .Conducting polymer – Types – mechanism of conduction (poly acetylene) - polyaniline -properties, applications.

UNIT V INSTRUMENTAL METHODS OF ANALYSIS 9

Thermal analysis techniques- Thermogravimetric analysis and Differential thermal analysis- Principle, instrumentation and applications – Concept of chromatography – Principle, instrumentation and applications of Paper chromatography, Column chromatography, Thin layer chromatography and Gas chromatography. Principle and applications of Conductometric titrations , Potentiometric titrations and PH-metry.

PHYSICS LABORATORY

LIST OF EXPERIMENTS: (ANY 5)

1. Determination of dispersive power of the given solid prism using spectrometer
2. Determination of thickness of the given thin material by forming interference fringes using air – wedge setup
3. Analysis of I-V Characterization of Solar cell
4. Determination of energy gap of the given semiconductor by plotting the graph between current and temperature
5. Determination of acceptance angle of the given fiber cable.
6. Determination of Young's modulus for the given uniform bar by non-uniform bending method

10

CHEMISTRY LABORATORY

LIST OF EXPERIMENTS: (ANY5)

1. Determination of strength of hydrochloric acid using pH meter.
2. Determination of strength of acids in a mixture of acids using conductivity meters.
3. Conductometric titration of strong acid vs strong base.
4. Estimation of iron content using potentiometer.
5. Estimation of iron content of the water sample using spectrophotometer (thiocyanate method).
6. Estimation of sodium and potassium present in water using a flame photo meter.
7. Determination of SAP and FAV values of an oil.
8. Estimation of acetic acid adsorbed on charcoal

10

TOTAL: 60 PERIODS

COURSE OUTCOMES

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

- Acquire knowledge on basics of conductivity of solids, semiconductor physics and its applications in various devices,
- Get knowledge on magnetic properties of materials and their applications in data storage
- Have the necessary understanding on the functioning of optical materials for opto electronics
- Acquainted with hands-on knowledge in the quantitative chemical analysis through instrumental analysis
- Acquire practical knowledge on interference pattern, semiconductor devices, solar cells and instrumental analysis of acids, bases and heavy metals.

TEXT BOOKS

1. Kasap, S.O.-Principles of Electronic Materials and Devices, Mc Graw, Education, 2007.

2. Jasprit Singh, Semiconductor Devices: Basic Principles, Wiley 2012.
3. Kittel, C. Introduction to Solid State Physics. Wiley, 2005.
4. Umesh K Mishra & Jasprit Singh, "Semiconductor Device Physics and Design", Springer, a. 2008.
5. Jain P.C.and Monica Jain,"Engineering Chemistry",Dhanpat Rai Publishing Company (P) Ltd., New Delhi,2010.

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1. Garcia, N. & Damask,A."Physics for Computer Science Students".Springer-Verlag,2012
2. Wahab, M.A. "Solid State Physics: Structure and Properties of Materials".Narosa Publishing House, 2009.
3. K.Sesha Maheswaramma, Mridula Chugh, Engineering chemistry, Pearson, 2016.
4. O.G.Palanna, Engineering Chemistry, Mc Graw Hill, 2017.
5. GurdeepR.Chatwal, Sham K.Anand, Instrumental methods of chemical analysis, Himalaya Publishing House, 2007.
6. Practical Fiber Optics, D. Bailey and E .Wright, 2003.
7. J.Mendham, RC Denney, JDBarnes, MJK Thomas, Text book of quantitative chemical analysis, Vogel's, 2008.
8. Quantitative and qualitative analysis, U.Alexeyer, MIR publication, Moscow (1979).
9. Analytical Chemistry,G ary D.Christian, Wiley, 2005.

WEBSITE LINK

1. https://nptel.ac.in/courses/115/102/115102025/
2. https://www.youtube.com/watch?v=6QUFuZpCgGw
3. http://tiny.cc/0vhjuz
4. https://nptel.ac.in/content/storage2/courses/103108100/module7/module7.pdf5.
5. https://nptel.ac.in/courses/108/108/108108122

CO-PSO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	-	1	-	-	1	-	1	-
CO2	2	1	1	-	-	1	-	-	1	-	1	-
CO3	2	1	1	-	-	1	-	-	1	-	1	-
CO4	2	1	1	-	-	1	-	-	1	-	1	-
CO5	2	1	1	-	-	1	-	-	1	-	1	-
AVG	2	1	1	--	-	1	-	-	1	-	1	-

JGE1201	PYTHON PROGRAMMING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES

- To provide an introduction to Python Programming Language.
- To understand the decision making and looping concepts.
- To understand functions, strings and lists in Python.
- To understand tuples, dictionaries and files.
- To know the exception handling and 2 D concepts**.**

UNIT 1 INTRODUCTION TO PYTHON 9

History of Python, Features, Installing Python, Running Python Program, Interactive mode programming, Script Mode Programming, Identifiers, Reserved Words, Indentation, Comments, Variables, Data Types, Data Type Conversion

UNIT II DECISION MAKING AND LOOPI.NG 9

Python Operators, Operator Precedence, Decision Making: if Statement, if else Statement, if elif else Statement, nested if Statement, Loops: while loop, for loop, nested loops; Loop Control Statements: continue Statement, break Statement, pass Statement: Iterator and Generator

UNIT III FUNCTIONS, STRING, LIST 9

Functions: Predefined Functions, User defined Functions, Recursion, Lambda Function; String: Functions, methods, modules; Lists: Operations, pre-defined functions, advanced list processing; Packages

UNIT IV TUPLES, DICTIONARY, FILES 9

Tuples: Tuple Operations and methods, Dictionary: Dictionary Operations and methods; Files: Text Files, Reading and writing Files; Format Operator, Command line argument

UNIT V EXCEPTION HANDLING AND GRAPHICS 9

Date & Time Methods, Exception handling clauses, Raising an Exception, User Defined Exception; Simple graphics and image processing, simple 2d drawing-colors and shapes.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able

Co1 : To understand the evolution of Python and run basic python programs.

Co2: To structure simple python programs for solving programs.

Co3: To Decompose larger programs into functions.

Co4: To Understand compound structures like list, tuple, dictionary.

Co5: To Learn basic 2d graphics concepts in Python.

TEXT BOOKS:

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'' ,2 nd ēdition, Updated for Python 3, Shroff / O 'Reilly Publishers, 2016 (http : // greenteapress.com / wp / think python /)
2. Guidovan Rossum and Fred L.Drake Jr,"An Introduction to Python–Revised and updated for Python3.2,Network Theory Ltd., 2011.

REFERENCES:

1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press ,2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero," Introduction to Programming in Python: An Inter disciplinary Approach, Pearson India Education Services Pvt. Ltd.,2016.
3. Timothy A.Budd,"Exploring Python",Mc-Graw Hill Education (India) Private Ltd.,,2015.
4. Kenneth A. Lambert,"Fundamentals of Python: First Programs ",CENGAGE Learning, 2012.
5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem – Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Camp bell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

WEBSITE REFERENCES:

1. https://www.w3schools.com/python/python_reference.asp
2. https://www.pythonforbeginners.com/basics/python-websites-tutorials
3. https://www.programiz.com/python-programming/methods/built-in/list
4. https://www.geeksforgeeks.org/python-convert-dictionary-to-list-of-tuples/
5. https://www.javatpoint.com/python-exception-handling

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	-	-	-	-	-	-	-	-
CO2	3	3	3	-	-	-	-	-	-	-	-	-
CO3	3	3	3	-	-	-	-	-	-	-	-	-
CO4	3	3	3	-	-	-	-	-	-	-	-	-
CO5	3	3	3	-	-	-	-	-	-	-	-	-
AVG	3	3	3	-	-	-	-	-	-	-	-	-

JEE1201	CIRCUIT THEORY	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES

- To introduce electric circuits and solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits.
- To introduce Phasor diagrams and analysis of three phase circuits
- To educate on obtaining the transient response of circuits.
- To impart knowledge on two port network.

UNIT I BASIC CIRCUIT ANALYSIS AND NETWORK THEOREMS 12

Kirchhoff's laws – Mesh current and node voltage - methods of analysis- Network reduction: voltage and current division, source transformation–star delta conversion, Thevenin's and Norton's Theorems – Super position Theorem – Maximum power transfer theorem

UNIT II RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance – frequency response – Quality factor and Band width –Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits

UNIT III THREE PHASE CIRCUITS 12

A.C. circuits – Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT IV TRANSIENT RESPONSE ANALYSIS 12

Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. sinusoidal input.

UNIT V TWO PORT NETWORKS 12

Two port networks, Z parameters, Y parameters, Transmission (ABCD) parameters, Hybrid (H) Parameters, Interconnection of two port networks, Symmetrical properties of T and π networks.

TOTAL: 60 PERIODS

COURSE OUTCOMES

- Ability to analyze electrical circuits and to apply network theorems
- Ability to understand and apply the concept of resonance in coupled circuits
- Ability to analyze the three phase circuits
- Ability to analyze transients
- Ability to understand two port network

TEXTBOOKS:

1. William H.HaytJr, Jack E.Kemmerly and Steven M.Durbin,"Engineering Circuits Analysis", Mc Graw Hill publishers, edition, NewDelhi, 2013.
2. Charles K.Alexander, Mathew N.O.Sadiku, "Fundamentals of Electric Circuits", Second Edition, Mc Graw Hill, 2013.

3. Allan H.Robbins, Wilhelm C.Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, Mc Graw - Hill, New Delhi, 2010.
3. ME VanValkenburg,"Network Analysis", Prentice - Hall of India Pvt Ltd, New Delhi, 2015.
4. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", Mc Graw Hill, 2015.

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	1	1	-	-	-	-	1	2
CO2	3	3	3	3	1	1	-	-	-	-	1	2
CO3	3	3	3	3	1	1	-	-	-	-	1	2
CO4	3	3	3	3	1	-	-	-	-	-	1	-
CO5	3	3	3	3	1	-	-	-	-	-	1	-
AVG	3	3	3	3	1	1	-	-	-	-	1	1

JGE1202	ENGINEERING GRAPHICS & DESIGN (Common to all B.E / B.Tech Programmes)	L	T	P	C
		1	0	4	3

OBJECTIVES

- To understand the importance of graphics in engineering
- To develop skills in preparation of basic drawing
- To improve their technical communication skill in the form of communicative drawing
- To impart knowledge about the standard principle of orthographic projection of objects.
- To improve their visualization skills for developing new products.

UNIT I PLANE CURVES AND ORTHO GRAPHIC PROJECTION 15

Conics - Construction of ellipse, Parabola and hyper bola by eccentricity method – Construction of cycloid - construction of involutes of square and circle - Drawing of tangents and normal to the above curves. Representation of Three Dimensional objects - General principles of orthographic projection -Need for importance of multiple views and their placement - First angle projection – layout views - Developing visualization skills through free hand sketching of multiple views from pictorial views of objects.

UNIT II PROJECTION OF POINTS, LINES AND PLANE SURFACES 15

Projection of points and straight lines located in the first quadrant - Determination of true lengths and true inclinations - Projection of polygonal surface and circular lamina inclined to both reference planes.

UNIT III PROJECTION OF SOLIDS 15

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

UNIT IV SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES 15

Sectioning of above solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other –Obtaining true shape of section.

Development of lateral surfaces of simple and truncated solids -Prisms, pyramids, cylinders and cones - Development of lateral surfaces of solids with cylindrical cut- outs and square cut-outs, perpendicular to the axis.

UNIT V ISOMETRIC AND PERSPECTIVE PROJECTIONS 15

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Perspective projection of prisms, pyramids and cylinders by visual ray method.

TOTAL: 75 PERIODS

COURSE OUTCOMES:

On successful completion of this course, the student will be able to

- Familiarize with the fundamental and standards of engineering graphics.
- Perform free hand sketching of basic geometrical constructions and multiple views of object.
- Project orthographic projections of lines and plane surfaces.
- Draw projection of solids and development of surfaces.
- Interpret isometric and perspective view of objects.

TEXTBOOKS:

1. Natrajan K.V.,“A text book of Engineering Graphics ”, Dhana lakshmi Publishers, Chennai,2009.
2. VenugopalK and Prabhu RajaV.,“Engineering Graphics”,NewAge International (P) Limited, 2008.
3. Bhatt N.D. and Panchal V.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition, 2010.

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1. Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata Mc Graw Hill Publishing Company Limited, NewDelhi, 2008.
2. Gopala Krishna K.R., “Engineering Drawing” (Vol.I & II combined), Subhas Stores, Bangalore, 2007.

3. Luzzader,Warren .J and Duff, John M., "Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production", Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi, 2005.
4. NS Parthasarathy and Vela Murali,"Engineering Graphics", Oxford University, Press, New Delhi,2015.
5. Shah M.Band RanaB.C.,"Engineering Drawing",Pearson, 2nd Edition,2009.

PUBLICATION OF BUREAU OF INDIAN STANDARDS:

1. IS10711-2001: Technical products Documentation-Size and layout of drawing sheets.
2. IS9609 (Parts 0&1)-2001: Technical products Documentation - Lettering.
3. IS10714 (Part 20) - 2001 & SP46 -2003: Lines for technical drawings.
4. IS11669 -1986 & SP46 - 2003: Dimensioning of Technical Drawings.
5. IS15021 (Parts1to4) - 2001: Technical drawings – Projection Methods.

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1. www.pdfdrive.com/engineeringdrawing-books.html
2. https://freevideolectures.com
3. https://nptel.ac.in/courses
4. https://nptel.ac.in/courses/105/104/105104148/
5. https://nptel.ac.in/courses/112/103/112103019/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1	1	-	1	1	-	1	1	1	1	1
CO2	1	1	1	1	1	1	1	-	1	1	1	-
CO3	1	-	1	1	1	-	1	1	1	1	1	1
CO4	-	1	1	1	-	1	1	1	1	1	1	1
CO5	1	1	1	-	1	1	1	1	1	1	-	1
AVG	1	1	1	1	1	1	1	1	1	1	1	1

JNC1261	ENVIRONMENTAL SCIENCE	L	T	P	C
		3	0	0	0

COURSE OBJECTIVES:

- To study the inter relationship between living organisms and the environment.
- To find and implement scientific, technological and environmental problems due to pollution.
- To study the various natural resources and the responsibility of the individual to conserve it.
- To study the social issues over the environment.
- To get knowledge on population explosion, human rights and value education.

UNIT I ENVIRONMENT, ECO SYSTEMS AND BIO DIVERSITY 9

Definition, scope and importance of environment - need for public awareness - concept of an ecosystem - structure and function of an ecosystem - 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) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) –Introduction to biodiversity definition :genetic, species and ecosystem diversity - value of biodiversity - threats to biodiversity - conservation of biodiversity: In-situ and ex-situ conservation of bio diversity.

UNIT II ENVIRONMENTAL POLLUTION 9

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 -Solid waste management: causes, effects and control measures of municipal solid wastes – Role of an individual in prevention of pollution.

UNIT III NATURAL RESOURCES 9

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- effects of modern agriculture, fertilizer - pesticide problems, water logging, salinity. Energy resources: renewable and non renewable energy sources, Land resources: Land as a resource, land degradation, man induced land slides, soil erosion and desertification – role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Water conservation- water shed management - resettlement and rehabilitation of policy. – consumerism and waste products - environment production act - Air (Prevention and Control of Pollution) act -Water (Prevention and control of Pollution) act - Wildlife protection act – Forest conservation act -enforcement machinery involved in environmental legislation - central and state pollution control boards-Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 9

Human 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.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- Explain about ecosystems, their structure and function to conserve biodiversity.
- Recognize the level of environmental pollution and their control measures.
- Explain about the various types of natural resources and role of a human being in maintaining a clean sustainable environment for the future generations.
- Identify the social problems in the environment to reduce social issues.
- Understand environment and human health –human rights –value education, and the role of information technology in environment and human health.

TEXTBOOKS:

1. Erach Bharucha,-Text book of Environmental Studies, Universities Press (I) PVT, LTD, Hydrabad, 2015.
2. Benny Joseph, Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.

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1. Dharmendra S.Sengar, Environmental law', Prentice hall of India PVT LTD, New Delhi, 2007.
2. Rajagopalan, R, Environmental Studies-From Crisisto Cure', Oxford University Press, 2005.
3. Gilbert M. Masters, Introduction to Environmental Engineering and Science' , 2nd edition, Pearson Education, 2004.
4. G.Tyler Miller and Scott E. Spool man, -Environmental Science, Cengage Learning India PVT, LTD, Delhi, 2014.

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2. https://www.csindia.org/understanding-eia-383
3. https://nptel.ac.in/courses/120108004
4. https://nptel.ac.in/courses/107/103/107103081/
5. .https://nptel.ac.in/courses/109/104/109104045/

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	-	-	3	2	-	-	1	-
CO2	1	-	-	-	-	-	3	2	-	-	1	-
CO3	1	-	-	-	-	-	3	2	-	-	1	1
CO4	1	-	-	-	-	2	3	2	-	-	1	-
CO5	1	-	-	-	-	2	3	2	-	-	1	-
AVG	1	-	-	-	-	2	3	2	-	-	1	1

JEE1211	ELECTRIC CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To simulate various electric circuits using P spice/Mat lab
- To gain practical experience on electric circuits and verification of theorems.

LIST OF EXPERIMENTS

1. Simulation and experimental solving of electrical circuit problems using Kirchhoff's voltage and current laws.

2. Simulation and experimental solving of electrical circuit problems using Thevenin's theorem.
3. Simulation and experimental solving of electrical circuit problems using Norton's theorem.
4. Simulation and experimental solving of electrical circuit problems using Super position theorem.
5. Simulation and experimental verification of Maximum Power transfer Theorem.
6. Study of Analog and digital oscilloscopes and measurement of sinusoidal voltage, frequency and power factor.
7. Simulation and Experimental validation of R-C electric circuit transients.
8. Simulation and Experimental validation of frequency response of RLC electric circuit.
9. Design and Simulation of series resonance circuit.
10. Design and Simulation of parallel resonant circuits.
11. Simulation of three phase balanced and unbalanced star delta networks circuits.
12. Experimental verification of Two port network parameters.

TOTAL:60 PERIODS

COURSE OUTCOMES

- Understand and apply circuit theorems and concepts in engineering applications.
- Ability to Simulate electric circuits

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	1	-	1	3	-	1	2
CO2	3	3	3	3	3	1	-	1	3	-	1	2
AVG	3	3	3	3	3	1	-	1	3	-	1	2

JGE1211	PYTHON PROGRAMMING LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- To implement basic 2 D diagrams.

LIST OF PROGRAMS

1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton‘s method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Guess an integer number in a rang
6. Insert a card in a list of sorted cards.
7. Multiply matrices
8. Programs that take command line arguments (word count)
9. Find the most frequent words in a text read from a file
10. Create an User defined Exception
11. Draw a 2d circle and square

TOTAL: 60 PERIODS

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

COURSE OUTCOMES:

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

Co1: Write, test, and debug simple Python programs.
Co2: Implement Python programs with conditionals and loops.
Co3: Develop Python programs stepwise by defining functions and calling them.
Co4: Use Python lists, tuples, dictionaries for representing compound data.
Co5: Draw 2d graphic diagrams in Python.

WEBSITE REFERENCE:

1. https://www.programiz.com/python-programming/examples
2. https://www.javatpoint.com/python-condition-and-loops-programs
3. https://realpython.com/python-lists-tuples/
4. https://www.tutorialsteacher.com/python/python-user-defined-function
5. https://www.cdslab.org/python/notes/visualization/2d/2d.html

CO-PO MAPPING

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	-	3	-	-	3	3	3	-	3
CO2	3	3	3	-	3	-	-	3	3	3	-	3
CO3	3	3	3	-	3	-	-	3	3	3	-	3
CO4	3	3	3	-	3	-	-	3	3	3	-	3
CO5	3	3	3	-	3	-	-	3	3	3	-	3
AVG	3	3	3	-	3	-	-	3	3	3	-	3

SEMESTER III

JMA1302	TRANSFORMS AND PARTIAL DIFFERENTIAL EQUATIONS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To equip students with the knowledge of transforms theory which is used in signals and systems.
- To introduce methods of solving partial differential equations.
- To familiarize student sin the concepts of Fourier series and use it for solving boundary value problems.

UNIT I FOURIER SERIES 12

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Parseval's identity – Complex form of Fourier series – Harmonic analysis..

UNIT II FOURIER TRANSFORMS 12

Statement of Fourier integral theorem – Complex form of the Fourier integral – Fourier transform pair – Fourier sine and cosine transforms – Properties – Transforms of simple functions– Convolution theorem– Parseval's identity.

UNIT III Z-TRANSFORMS AND DIFFERENCE EQUATIONS 12

Z-transforms-Elementary properties–Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations– Solution of difference equations using Z –transform.

UNIT IV PARTIAL DIFFERENTIAL EQUATIONS 12

Formation of partial differential equations –Singular integrals-Solutions 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 of both homogeneous and non-homogeneous types.

UNIT V APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 12

Classification of PDEs – Fourier series solutions - one-dimensional wave and heat conduction equations– Steady state two-dimensional equation of heat conduction.

TOTAL(L:45+T:15):60PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To demonstrate efficient use of Fourier series which plays a vital role in engineering applications.

CO2: To understand problem solving in Fourier transforms and Fourier integral representation

CO3: To use Z transforms as a tool for solving difference equations.

CO4: To solve a given partial differential equation for singular and general solutions.

CO5: To model physical problems as boundary value problems and use Fourier series for solving them.

TEXTBOOKS:

1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, NewDelhi, 43rd Edition, 2014.
2. Kreyszig Erwin, "Advanced Engineering Mathematics", John Wiley and Sons, 10th Edition, New Delhi, 2016.
3. S.Manicavachagom Pillay.T.K and Ramanaiah.G" Advanced Mathematics for Engineering Students", Vol.II & III, S.Viswanathan Publishers Pvt. Ltd, Chennai, 1998.

REFERENCES:

1. Andrews, L.C and Shivamoggi,B, "Integral Transforms for Engineers "SPIE Press, 1999.
2. Bali.N.P and Manish Goyal, "A Text book of Engineering Mathematics" 9th Edition, Laxmi Publications Pvt. Ltd, 2014.
3. Ramana.B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, NewDelhi, 2016.
4. Wylie. R.C. and Barrett, L.C., "Advanced Engineering Mathematics "Tata Mc Graw Hill Education Pvt .Ltd, 6th Edition, New Delhi, 2012.
5. James,G.—Advanced Modern Engineering Mathematics, Pearson Education, 2007.

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

CO-PSO MAPPING:

CO\PSO	PSO 1	PSO2	PSO 3
CO1	2	-	-
CO2	2	-	-
CO3	2	-	-
CO4	2	-	-
CO5	1	-	-
AVG	2	-	-

JEC1301	ELECTRONIC DEVICES AND CIRCUITS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the students to the structure, operation and characteristics of various semiconductor diodes.
- To explain the types of rectifiers and power supply circuits.

- To impart knowledge on characteristics, different types of configurations and biasing circuits for Transistors and thyristors.
- To explore the characteristics of amplifier, gain and frequency response.
- To learn the required functionality of positive and negative feedback systems.

UNIT I SEMI CONDUCTOR DIODES 9

Structure, operation and characteristics of PN junction diode–Zener diode–Introduction to special diodes: Schottky diode – Tunnel diode – LED – Laser diode – Photodiode – Photo voltaic cell– TVS Diode– Varactor Diode

UNIT II RECTIFIERS AND POWER SUPPLIES 9

Single phase half-wave and full-wave rectifiers – Ripple factor, rectification efficiency, Transformer utilization factor and PIV–Performance of rectifiers with filters–Regulated Power Supply– Switched Mode Power Supplies.

UNIT III TRANSISTORS AND THYRISTORS 9

Structure, operation, characteristics and biasing of BJT, JFET, MOSFET – Use of heatsink– Structure and characteristics of IGBT, UJT, Photo Transistor, SCR, LASCR –Introduction to 3D Transistor.

UNIT IV AMPLIFIERS 9

Small signal model of BJT–Analysis of CE,CB, CC amplifiers–Small signal model of MOSFET– Analysis of CS Amplifier and Source follower – Cascade amplifier – single tuned amplifier– Gain and frequency response.

UNIT V FEEDBACK AMPLIFIERS AND OSCILLATORS 9

Advantages of negative feedback – voltage / current, series / Shunt feedback – positive feedback – Condition for oscillations – Operation and analysis of RC phase shift, Wien bridge, Hartley, Colpitts and Crystal oscillators

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able

CO1 To apply the knowledge of semiconductor device fundamentals to understand the operation of various diodes.

CO2: To design and adapt the required components to construct rectifier and power supply circuits.

CO3: To explain the working of various transistors and thyristors.

CO4: To design a given transistor amplifier and evaluate its performance with respect to gain impedance and b and width.

CO5: To assess the acquired knowledge in design and analysis of Feedback amplifiers and oscillators.

TEXTBOOKS:

1. Jacob Millman, Christos C. Halkias, SatyabrataJit, "Electronic Devices and Circuits", 3rdEdition, McGraw-Hill, 2011.
2. Sedha.R.S., A Text Book of Applied Electronics, 3rd Edition, S Chand Publishers,1999.
3. David A. Bell , "Electronic devices and circuits", Oxford University higher education, 5th edition 2008.

REFERENCES:

1. Sedra, Smith, "Micro electronic Circuits: Theory and Application "Oxford University Press, 7th edition, 2017.
2. Muhammad H.Rashid, "Electronic Devices and Circuits", Cengage Learning, 2nd edition, 2014.
3. BalbirKumar, Shail.B.Jain, "Electronic devices and circuits "PHI learning private limited, 2nd edition 2014.
4. Salivahanan, "Electronic devices and Circuits", Second edition, Tata McGraw Hill International, 2nd edition, 2011.
5. Thomas L.Floyd, "Electronic devices" Conventional current version, Pears on prentice hall, 10th Edition, 2017.
6. David A.Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.
7. S.Ramareddy, "Electronic Devices and Circuits", Narosa Publications, 1st Edition, 2011.

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1. https://nptel.ac.in/
2. https://www.allaboutcircuits.com/https://youtu.be/Rx43l-QpeWQ
3. https://youtu.be/5ZNeDxfgYAEhttps://youtu.be/36j6hCtL0E4

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	-	1	-	1	3
CO2	3	2	1	2	2	1	2	-	1	-	2	3
CO3	3	2	1	2	2	1	2	-	1	-	2	3
CO4	3	2	2	2	2	1	2	-	1	-	2	2
CO5	3	2	2	2	2	1	2	-	1	-	2	2
AVG	3	2	1	2	2	1	2	-	1	-	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	2	-	-
CO3	2	2	-
CO4	2	1	1
CO5	2	2	1
AVG	2	1	1

JEE1301	ELECTROMAGNETIC THEORY	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES

- To introduce the basic mathematical concepts related to electromagnetic vector fields.
- To impart basic Concepts of electrostatics, electrical potential, energy density and their applications.
- To impart basic Concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications.
- To impart basic Faraday's laws and their applications.
- To impart basic Concepts of electromagnetic waves and Poynting vector.

UNIT I INTRODUCTION 12

Sources and effects of electromagnetic fields–Vector fields–Different co-ordinate systems-vector calculus–Gradient, Divergence and Curl –Divergence theorem –Stoke's theorem.

UNIT II ELECTROSTATICS 12

Coulomb's Law–Electric field intensity–Field due to point and continuous charges–Gauss's law and application – Electric potential – Electric field and equipotential plots – Electric field in free space, conductors, dielectric-Di electric strength-Electric field in multiple dielectrics –Boundary conditions, Poisson's and Laplace's equations–Capacitance- Energy density.

UNIT III MAGNETO STATICS 12

Lorentz Law of force, magnetic field intensity–Biot–savart Law-Ampere's Law–Magnetic field due to straight conductors, circular loop, infinite sheet of current–Magnetic flux density (B) – Bin free space, conductor, magnetic materials–Magnetization–Magnetic field in multiple media–Boundary conditions–Scalar and vector potential–Magnetic force–Torque –Inductance–Energy density– Magnetic circuits.

UNIT IV ELECTRO DYNAMIC FIELDS 12

Faraday's laws, induced emf – Transformer and motional EMF – Forces and Energy in quasi-stationary Electromagnetic Fields - Maxwell's equations (differential and integral forms) – Displacement current–Relation between field theory and circuit theory.

UNIT V ELECTRO MAGNETIC WAVES 12

Generation–Electro Magnetic Wave equations–Wave parameters; velocity, intrinsic impedance, propagation constant–Waves in free space, lossy and loss less dielectrics, conductors-skin depth, Poynting vector – Plane wave reflection and refraction – Transmission lines–Line equations–Input impedances–Standing wave ratio and power–Electromagnetic fielding generator and motor.

TOTAL (L:45+T:15): 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand and apply the basic mathematical concepts related to electro magnetic Vector fields.

CO2: To understand the basic Concepts of electro statics, electrical potential, energy density And their applications.

CO3: To understand the basic Concepts of magneto statics, magnetic flux density, scalar and Vector potential and its applications.

CO4: To understand the basic Faraday's laws, induced emf and their applications.

CO5: To understand the basic Concepts of electromagnetic waves and Poynting vector.

TEXTBOOKS:

1. Mathew N.O. Sadiku, 'Elements of Electro magnetics', Oxford University press Inc. First India edition, 2007.
2. Ashutosh Pramanik, 'Electro magnetism–Theory and Applications' Prentice-Hall of India Private Limited, New Delhi, 2006.

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1. Joseph. A.Edminister,'Theory and Problems of Electro magnetics' Second edition, Schaum Series,Tata McGraw Hill, 1993.
2. William .H.Hayt, 'Engineering Electro magnetics', Tata McGraw Hill , 6th edition, 2001.
3. Kraus and Fleish, 'Electro magnetic with Applications', McGraw Hill International Editions, Fifth Edition, 1999.
4. S.Ramareddy,'Electro magnetic Fields', Second Edition, Scitech Publication, 2016.

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2. https://www.youtube.com/watch?v=6FZusYyg0Po&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&index=4
3. https://www.youtube.com/watch?v=aaWG_6WCkTA&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&index=18
4. https://www.youtube.com/watch?v=deI8cJiCKEo&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&index=27
5. https://www.youtube.com/watch?v=n4in7z4NP7Y&list=PLl6m4jcR_DbOx6s2toprJQx1MORqPa9rG&index=32

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	1	1	1	-	-	1	1
CO2	3	1	1	2	2	1	1	1	1	1	1	1
CO3	1	2	2	2	2	1	1	1	-	-	1	1
CO4	3	2	2	3	1	1	1	1	1	1	1	1
CO5	2	2	2	2	2	1	1	1	-	-	1	1

AVG	2	2	2	2	2	1	1	1	1	1	1	1

CO-PSOMAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	-	1
CO3	1	1	1
CO4	1	-	1
CO5	1	1	1
AVG	1	1	1

JCS1321	OBJECT ORIENTED PROGRAMMING (INTEGRATED)	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To understand the basic concepts of Object Oriented Programming in Java
- To know the principles of inheritance and interfaces
- To define exceptions and use of I/O streams
- To learn the concepts of threads and generics classes
- To design and build simple Graphical User Interfaces using swing components

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 12

Object Oriented Programming–objects and classes–features of OOP-OOP in Java–Characteristics of Java –The Java Environment -Java Source File–Compilation. Fundamental Programming Structures in Java–constructors, methods–method overloading, access specifies

-static members-Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages, and Naming Conventions, Case study-simple program using objects, classes and constructors.

UNIT II INHERITANCE AND INTERFACES 12

Inheritance –Super classes-sub classes –Protected members –constructors in sub classes-the Object class –abstract classes and methods-final methods and classes –Interfaces –defining an interface, implementing interface, differences between classes and interfaces and extending interfaces-Object cloning-inner classes, Reflection, Array Lists–Strings, Case study-program using inheritance strings and array List.

UNIT III EXCEPTION HANDLING AND I/O 12

Exceptions-exception hierarchy-throwing and catching exceptions–built-in exceptions, creating own exceptions, Stack Trace Elements. Input/ Output Basics–Streams–Byte streams and Character streams–Reading and Writing Console–Reading and Writing Files, Case study-program using Exceptions and File Handling

UNIT IV MULTI THREADING, GENERIC PROGRAMMING AND ADVANCED JAVA 12

Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, Fibers, daemon threads, thread groups. Generic Programming –Generic classes – generic methods –Bounded Types –Restrictions and Limitations, Case study-program using Multithreading and Generic Programming.

UNIT V EVENT DRIVEN PROGRAMMING 12

Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images-Basics of event handling-event handlers-adapter classes-actions-mouse events. AWT event hierarchy-Introduction to Swing–layout management-Swing Components–Text Fields, Text Areas–Buttons-Check Boxes–Radio Buttons–Lists-choices-Scrollbars–Windows –Menus–Dialog Boxes, Case study-Program using AWT components and Swing Components.

TOTAL:60 PERIODS

LIST OF EXPERIMENTS:

1. Write a Java Program to capture the personal details of a person.
2. Develop an 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 inherited classes with 97% of BP as DA, 10% of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.
3. Write a program to perform string operations using Array List.
4. Write a program to do the arithmetic operations with required exceptions
5. Write a program to read a file and print on the console
6. Write a java program that implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print a value of cube of the number.
7. Write a java program to find the maximum value from the given type of elements using a generic function.
8. Design a login screen using JAVA AWT components.

COURSE OUTCOMES:

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

CO1: Develop Java programs using OOP principles
CO2: Develop Java programs with the concepts in heritance and interfaces
CO3: Build Java applications using exceptions, I/O streams and Java beans
CO4: Develop Java applications with threads and generic classes
CO5: Develop interactive applications using swings

TEXTBOOKS:

1. Herbert Schildt, “Java The complete reference”, Cay S. Horstmann, Gary cornell, “Core
2. Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCES:

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson, 2015
2. Steven Holzner, “Java 2 Black book”, Dream tech press, 2011
3. Herbert Schildt, “Java The complete reference”, Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

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1. https://www.w3schools.com/java/java_intro.asp
2. https://www.tutorialspoint.com/java/index.html
3. https://www.javatpoint.com/java-tutorial
4. https://developer.ibm.com/tutorials/j-introtojava1/

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3	-	-	-	1	-	-	3
CO2	3	1	3	2	3	-	-	-	1	-	-	3
CO3	3	1	3	2	3	-	-	-	1	-	-	3
CO4	3	1	3	2	3	-	-	-	2	-	-	3
CO5	3	2	3	2	3	-	-	-	2	-	-	3
AVG	3	1	3	2	3	-	-	-	1	-	-	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	-	1
CO3	1	1	1
CO4	1	-	1
CO5	1	1	1
AVG	1	1	1

JEE1302	**DC MACHINES AND TRANSFORMERS**	**L**	**T**	**P**	**C**
		2	**2**	**0**	**3**

COURSE OBJECTIVES:

To impart knowledge on the following topics

- Magnetic-circuit analysis and introduce magnetic materials
- Principle of operation, construction, basic testing methods of transformers and three phase transformer connections.
- Working principles of electro mechanical energy conversion of electrical machines and basics of Electrical Machines.
- Working principles construction and characteristics of DC Generator.
- Working principle, types and various testing methods of D.C. Motor

UNIT I MAGNETIC CIRCUITS AND MAGNETIC MATERIALS 12

Magnetic circuits –Laws governing magnetic circuits – Flux linkage, Inductance and energy – Statically and Dynamically induced EMF–Torque–Properties of magnetic materials, Hysteresis and Eddy Current losses – AC excitation, introduction to permanent magnets –Transformer as a magnetically coupled circuit.

UNIT II TRANSFORMERS 12

Construction–principle of operation–equivalent circuit parameters–phasor diagrams, losses –testing–efficiency and voltage regulation-all day efficiency-Sumpner's test, per unit representation – in rush current – three phase transformers-connections – Scott Connection – Phasing of transformer– parallel operation of three phase transformers –auto transformer – tap changing transformers-tertiary winding. Special Transformers-VFT-pulse transformer-high Frequency transformer, K-rated Transformer, Digital Distribution Transformer.

UNIT III ELECTRO MECHANICAL ENERGY CONVERSION AND CONCEPTS IN ROTATING MACHINES 12

Energy in magnetic system – Field energy and co energy-force and torque equations –singly and multiply excited magnetic field systems–mmf of distributed windings–Winding Inductances– magnetic fields in rotating machines – rotating mmf waves – magnetic saturation and leakage fluxes.

UNIT IV DC GENERATORS 12

Construction and components of DC Machine–Principle of operation–Lap and wave windings-EMF equations–circuit model–armature reaction–methods of excitation commutation–inter poles, compensating winding–characteristics of DC generators.

UNIT V DCMOTORS 12

Principle and operations–types of DC Motors–Speed Torque Characteristics of DC Motors–starting and speed control of DC motors –Plugging, dynamic and regenerative braking–testing and efficiency – Retardation test- Swinburne's test and Hopkinson's test – Permanent Magnet DC (PMDC) motors-Applications of DC motor.

TOTAL(L:45+T:15):60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To analyze the magnetic-circuits
CO2: To acquire the knowledge in constructional details of transformers.
CO3: To understand the concepts of electro mechanical energy conversion
CO4: To acquire the knowledge in working principles of DC Generator.
CO5: To acquire the knowledge in working principles and testing of DC Motor

TEXTBOOKS:

1. Stephen J. Chapman, 'Electric Machinery Fundamentals' 4th edition, McGraw Hill Education Pvt.Ltd, 2010.
2. P.C.Sen 'Principles of Electric Machines and Power Electronics' John Wiley & Sons; 3rd Edition 2013.
3. Nagrath, I.J. and Kothari.D.P., Electric Machines', McGraw-Hill Education, 3rd Edition, 2004

REFERENCES:

1. The odore Wildi,"Electrical Machines, Drives, and Power Systems", Pearson Education., 5th Edition, 2002.
4. B.R.Gupta, 'Fundamental of Electric Machines' New age International Publishers, 3rdEdition ,Reprint 2015.
5. S.K. Bhattacharya, 'Electrical Machines' McGraw-Hill Education, New Delhi, 3rdEdition, 2009.

6. Vincent Del Toro, 'Basic Electric Machines' Pearson India Education, 1st Edition, 2016.
7. Surinder Pal Bali, 'Electrical Technology Machines & Measurements, Vol.II, Pearson, 1stEdition, 2013.
8. Fitzgerald.A.E., Charles Kingsely Jr, Stephen D.Umans, 'Electric Machinery', Sixth edition, McGraw Hill Books Company, 2003.

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2. https://youtu.be/LPcQYXjPdIQ?list=PLp6ek2hDcoNCANsWM2mw3qi0387BhfLyV
3. https://www.youtube.com/playlist?list=PLMYtBmvT7X7QaLu0b0Jn1QQD4EOuT8lCA
4. https://www.youtube.com/playlist?list=PL59861DBF8EC85491
5. https://www.youtube.com/playlist?list=PLPpCFgQP7QKHUOFYvZhQ6ra5XrU3dN2dD
6. https://youtu.be/NkRk_xaRwjg?list=PLLQiBbMXygz5QqZ12mEAss8Vn5WKZoirq

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO11	PO12
CO1	3	3	3	3	1	2	2	-	-	-	2
CO2	3	3	3	3	1	2	2	-	-	-	2
CO3	3	3	3	3	1	2	2	-	-	-	2
CO4	3	3	3	3	1	2	2	-	-	-	2
CO5	3	3	3	3	1	2	2	-	-	-	2
AVG	3	3	3	3	1	2	2	-	-	-	2

CO-PSOMAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	1	1
CO3	1	2	1
CO4	3	3	1
CO5	3	3	1
AVG	2	2	1

JEE1303	DIGITAL LOGIC CIRCUITS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To study various number systems and simplify the logical expressions using Boolean functions.
- To study combinational circuits
- To design various synchronous sequential circuits.
- To introduce asynchronous sequential circuits and PLDs.
- To introduce digital simulation for development of application oriented logic circuits.

UNIT I NUMBER SYSTEMS AND DIGITAL LOGIC FAMILIES 12

Review of number systems, binary, Octal and Hexadecimal codes, error detection and correction codes (Parity and Hamming code) – Introduction to Digital Logic Families-RTL, DTL, TTL, ECL, MOS, LVCMOS, BiCMOS.

UNIT II COMBINATIONAL CIRCUITS 12

Combinational logic-representation of logic functions-SOP and POS forms, K-map representations- minimization using K maps – Quine-Mc Cluskey method -simplification and implementation of combinational logic–multiplexers and demultiplexers–code converters, adders, subtractors, Encoders and Decoders.

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 12

Sequential circuits–Flip flops: Triggering, types, excitation tables–Analysis and design procedures–Finite State Machine-State reduction and state assignment–Shift registers–Counters: MOD counters, up-down counter, Ring counters, Johnson counter.

UNIT IV ASYNCHRONOUS SEQUENTIAL CIRCUITS AND PROGRAMMABLE LOGIC DEVICES 12

Analysis and design of a synchronous sequential circuits–Reduction of state and flow tables – Race condition – Hazards-Free State assignment–Introduction to Programmable Logic Devices: PROM–PLA–PAL, CPLD, FPGA.

UNIT V VHDL 12

RTL Design – combinational logic – Sequential circuit – Operators – Introduction to Packages–Sub programs–Test bench. (Simulation/Tutorial Examples: adders, counters, flip flops, Multiplexers & Demultiplexers).

TOTAL(L:30+T:30) :60PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To label various number systems and simplify the logical expressions using Boolean functions.

CO2: To design combinational Circuits.

CO3: To design various synchronous sequential circuits.

CO4: To assess the knowledge about a synchronous sequential circuits and PLDs.
CO5: To review VHDL program for various logic circuits.

TEXTBOOKS:

1. James W.Bignel, Digital Electronics, Cengage learning, 5th Edition, 2007.
2. M.Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education, 6th Edition , 2013.
3. Comer "Digital Logic & State Machine Design, Oxford, 5th Edition, 2012.

REFERENCES:

1. Anand Kumar, "Fundamental Digital Circuits, PHI, 3rd Edition, 2016.
2. Mandal,"Digital Electronics Principles & Application, Mc Graw Hill Edu,1st Edition, 2013.
3. William Keitz, Digital Electronics-A Practical Approach with VHDL, Pearson, 9th Edition, 2013.
4. Thomas L.Floyd, 'Digital Fundamentals', 11th edition, Pearson Education, 2015.
5. Charles H. Roth, Jr.LizyLizy Kurian John, 'Digital System Design using VHDL, Cengage, 2nd Edition ,2013.
6. D.P.Kothari, J.S.Dhillon, 'Digital circuits and Design', Pearson Education, 1st Edition, 2016.

WEB SITE REFERENCES:

1. www.nptel.ac.in
2. https://youtu.be/RhS-AL2ZcyE
3. https://youtu.be/RO5alU6PpSU
4. https://youtu.be/n8Xs_70d850
5. https://youtu.be/kQ9WICIFWnU
6. https://youtu.be/BDq8-QDXmek

CO–POMAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	-	-	-	-	-	-	-	3	1	1
CO2	3	3	3	2	1	2	2	1	1	2	-	3
CO3	3	3	3	3	2	3	2	1	1	2	-	3
CO4	3	3	3	3	2	1	1	1	1	2	1	3
CO5	3	3	3	3	3	3	2	1	1	2	-	3
AVG	3	3	3	2	2	2	1	1	1	2	1	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	2	3
CO2	2	3	3
CO3	3	2	3
CO4	2	2	3
CO5	3	3	3
AVG	2	2	3

JPT1001	SOFT SKILLS AND APTITUDE I	L	T	P	C
		0	0	2	0

COURSE OBJECTIVES:

- To help students groom their personality and develop their skill of building social relationships
- To improve the personality traits of students and their creativity
- To help students gain knowledge in rational thinking and aptitude
- To make students think logically and judiciously
- To help student acquire technical skills in C programming language

UNIT I SOFT SKILLS AND APTITUDE-I 5

Self-Realization – Self Motivation – Relationship Building – Personality Enrichment – Personality Traits–Intra Personal Communication–Inter Personal Communication– Behavioral Based Perception– Attitude & Behavior – SWOT Analysis

UNIT II SOFT SKILLS AND APTITUDE –II 5

Dimensions of Personality – Self Confidence – Open Mindedness – Acceptance – Creativity -Strategies for developing creativity – Overcoming myths of creativity – Presence of Mind – Staying Focused– Self Acceptance – Self Growth

UNIT III QUANTITATIVE APTITUDE 8

Number system–Divisibility Rule–Simplification–Surds and Indices–Square root and Cube root–Averages–Percentage.

UNIT IV LOGICALREASONING 6

Number series–Alphabet series–Alphabet test–Word test– Letter Arrangement–Word Arrangement– Coding and Decoding– Analogy

UNIT V TECHNICALAPTITUDEINC-I 8

Technical aptitude in C: Program Structure – Data types – Variables – Constants – Operators –Decision Making - Switch statement –Looping statements – Functions – Call by reference-Recursive Arrays, single dimensional, Multi-dimensional

TOTAL:30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: Build better relationship with all in their social settings

CO2: Engage in creative activities focusing on their career

CO3: Solve the real time and complex problems in aptitude

CO4: Solve critical reasoning and real time application problems

CO5: Apply their knowledge in the basics of C programming

TEXTBOOKS:

1. R.SAgrawal, “Quantitative Aptitude”.
2. R.S.Agrawal, “Verbal Reasoning”.
3. R.S.Agrawal “Non Verbal reasoning.
4. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
5. Yashavant P.Kanetkar. “Let Us C”, BPB Publications, 2011.

WEBSITE REFERENCES:

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2. https://m4maths.com/placement-puzzles.php
3. https://www.youtube.com›watch/average
4. https://www.youtube.com›watch/codinganddecoding
5. https://www.youtube.com›watch/cprograms
6. https://www.youtube.com›watch/selfconfidence
7. https://www.youtube.com›watch/motivation

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	2	3	2	-	-	1	3	2	1	-	-
CO2	-	2	3	2	-	-	1	3	2	1	-	-
CO3	-	2	3	2	-	-	1	3	2	1	-	-
CO4	-	2	3	2	-	-	1	3	2	1	-	-
CO5	-	2	3	2	-	-	1	3	2	1	-	-
AVG	-	2	3	2	-	-	1	3	2	1	-	-

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	-	2	-
CO3	-	2	-
CO4	-	2	-
CO5	-	2	-
AVG	-	2	-

JEC1311	ELECTRONIC DEVICES AND CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn simulation for analog circuits.
- To enable the students to understand the behavior of semiconductor device based on

experimentation.

LIST OF EXPERIMENTS:

1. Simulation and Experimental Characterization of Semiconductor diode and Zener diode.
2. Simulation and Experimental Characterization of a NPN Transistor under common emitter and common base configurations.
3. Simulation and Experimental Characterization of JFET.
4. Simulation and Experimental Characterization of UJT and generation of saw tooth wave forms.
5. Design and Frequency response characteristics of a Common Emitter amplifier.
6. Experimental Characteristics of photo diode and photo transistor.
7. Design and testing of RC oscillators.
8. Design and testing of LC oscillators.
9. Simulation and Experimental Characterization of Single Phase half-wave rectifiers with filters.
10. Simulation and Experimental Characterization of Single Phase full wave rectifiers with filters.
11. Study of CRO for frequency and phase measurements.

TOTAL: 60PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To demonstrate the simulation tools for analog circuits.
CO2: To explain and analyze characteristics of semiconductor devices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Semiconductor devices like Diode, Zener Diode, NPN Transistors, JFET, UJT, Photo diode, Photo Transistor
2. Resistors, Capacitors and inductors
3. Necessary digital IC8
4. Function Generators 10
5. Regulated 3 output Power Supply 5, ± 15V 10
6. CRO 10
7. Storage Oscillo scope 1
8. Bread boards
9. Atleast one demo module each for the listed equipments.
10. Component data sheets to be provided
11. Computer 2

REFERENCES:

1. Muhammad H.Rashid, “Electronic Devices and Circuits”, Cengage Learning, 2014.
2. Salivahanan, “Electronic devices and Circuits”, Second edition, Tata McGraw Hill International, 2011.
3. DavidA.Bell, “Electronic Devices and Circuits”, 5th Edition, Oxford University Press, 2008.
4. S.Ramareddy, “Electronic Devices and Circuits”, Narosa Publications.

WEBSITES:

https://www.allaboutcircuits.com/

https://youtu.be/KFHPX1qCnCK

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	1	2	-	1	1	1	3
CO2	3	3	2	2	1	1	1	-	1	1	2	3
AVG	3	3	2	2	1	1	2	-	1	1	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
AVG	3	3	3

JEE1311	DC MACHINES AND TRANSFORMERS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES

- To analyze open circuit and load test on DC generator
- To analyze open circuit and short circuit tests on single phase transformer.
- To perform load test on single and three phase transformer
- To perform load test and speed control on DC motor
- To study different types of starters and 3-phase transformers connections

LIST OF EXPERIMENTS:

1. Open circuit and load characteristics of DC shunt generator
2. Load characteristics of DC compound generator with differential and cumulative connections.
3. Load test on DC shunt and compound motor.
4. Load test on DC series motor.
5. Swinburne’s test
6. Speed control of DC shunt motor.
7. Hopkinson’s test on DC motor–generator set.
8. Load test on single-phase transformer and three phase transformers.
9. Open circuit and short circuit tests on single phase transformer.
10. Sumpner’s test on single phase transformers.
11. Separation of no-load losses in single phase transformer.
12. Study of starters and 3-phase transformers connections
13. Simulation of Load test on separately excited DC motor using MATLAB

TOTAL: 60PERIODS

COURSE OUTCOMES:

- Ability to conduct the open circuit and load test on DC generator
- Ability to conduct open circuit and short circuit test on single phase transformer

- Ability to analyze performance parameters of single phase and three phase transformer by conducting load test.
- Ability to conduct load test and speed control of DC Motors.
- Understand the operation of different types of starters.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. DC Shunt Motor with Loading Arrangement–3 Nos
2. DC Shunt Motor Coupled with Three phase Alternator–1 No.
3. Single Phase Transformer –4 Nos
4. DC Series Motor with Loading Arrangement–1 No.
5. DC compound Motor with Loading Arrangement–1 No.
6. Three Phase Induction Motor with Loading Arrangement–2Nos
7. Single Phase Induction Motor with Loading Arrangement–1 No.
8. DC Shunt Motor Coupled With DC Compound Generator–2 Nos
9. DC Shunt Motor Coupled With DC Shunt Motor–1 No.
10. Tacho meter-Digital/Analog–8 Nos
11. Single Phase Auto Transformer–2 Nos
12. Three Phase Auto Transformer –1 No.
13. Single Phase Resistive Loading Bank–2 Nos
14. Three Phase Resistive Loading Bank.–2 Nos

REFERENCES:

1. NagrathI.J and Kothari D.P. 'Electric Machines', Fourth Edition,Tata McGraw Hill Publishing Company Ltd, 2010.
2. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009.

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	3	2	1	1	3	-	3	3	2	2
CO2	2	3	3	2	1	1	3	-	3	3	2	2
CO3	2	3	3	2	1	1	3	-	3	3	2	2
CO4	2	3	3	2	1	1	3	-	3	3	2	2
CO5	2	1	2	1	1	1	3	-	3	3	2	2
AVG	2	3	3	2	1	1	3	-	3	3	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	3	3	2
CO3	3	3	2
CO4	2	2	1
CO5	3	3	1
AVG	3	3	2

SEMESTER IV

JMA1401	APPLIED PROBABILITY AND NUMERICAL METHODS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To provide basic concepts of one dimensional, two random variables, standard probability distributions and testing of hypothesis.
- To introduce numerical techniques for solving system of equations and interpolation problems that arise in engineering applications.
- To acquaint the students with the understanding of numerical differentiation and integration.

UNIT I RANDOM VARIABLES 12

Discrete and continuous random variables–Moments–Moment generating functions–Binomial, Poisson, Exponential and Normal distributions.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES 12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and Regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 12

Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means - Tests based on t, Chi-square and F distributions for mean, variance and proportion-Contingency table -Goodness of fit.

UNIT IV SOLUTION OF EQUATIONS AND INTERPOLATION 12

Solution of algebraic and transcendental equations – Fixed point iteration method and Newton Raphson method–Solution of linear system of equations–Direct methods of Gauss elimination and Gauss Jordan – Iterative methods of Gauss-Jacobi and Gauss-Seidel – Interpolation with equal intervals – Newton's forward and backward difference formulae - Interpolation with unequal intervals –Lagrange interpolation and Newton's divided difference interpolation.

UNIT V NUMERICAL DIFFERENTIATION AND INTEGRATION 12

Approximation of derivatives using interpolation polynomials - Numerical integration using Trapezoidal, Simpson's 1/3 and 3/8 rule – Romberg's Method - Two point and three point Gaussian quadrature formulae – Evaluation of double integrals by Trapezoidal and Simpson's rules.

TOTAL (L:45+T:15):60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand random variables and use standard distributions in solvings real time problems.

CO2: To use joint density functions to perform correlation and

regression analysis.

CO3 : To apply hypothesis testing for making statistical inferences in large and small sample real life problems

CO4: To demonstrate efficient use of numerical techniques in solving system of equations And interpolation problems.

CO5: To solve problems of differentiation and integration through numerical methods.

TEXTBOOKS:

1. Ibe,O.C.,"Fundamentals of Applied Probability and Random Processes", 1st Indian Reprint, Elsevier, 2007.
2. Johnson,R.A.,Miller,I and FreundJ.,"Miller and Freund‘s Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
3. Burden, R.L and Faires, J.D, "Numerical Analysis", 9th Edition, Cengage Learning, 2016.
4. Grewal, B.S., and Grewal, J.S., "Numerical Methods in Engineering and Science", Khanna Publishers, 10th Edition, New Delhi, 2015.

REFERENCES:

1. Devore.J.L., "Probability and Statistics for Engineering and the Sciences”, Cengage Learning, New Delhi, 8th Edition, 2014.
2. Spiegel.M.R., Schiller. J.and Srinivasan, R.A.,"Schaum‘s Outline of Theory and Problems of Probability and Statistics", TataMcGraw Hill Edition, 2004.
3. Yates.R.D.and Goodman.D.J., ”Probability and Stochastic Processes", Wiley India Pvt.Ltd., Bangalore, 2nd Edition, 2012.
4. BrianBradie,"A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, NewDelhi, 2007.
5. Gerald.C.F.and Wheatley.P.O., "Applied Numerical Analysis", Pearson Education, Asia, 6th Edition, New Delhi, 2006.
6. Mathews,J.H. "Numerical Methods for Mathematics, Science and Engineering", 2nd Edition, Prentice Hall, 1992.

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	-	-	-	-	2	-	-	2
CO2	3	3	2	2	-	-	-	-	2	-	-	2
CO3	3	3	2	2	-	-	-	-	2	-	-	2
CO4	3	3	2	2	-	-	-	-	2	-	-	2
CO5	3	3	2	2	-	-	-	-	2	-	-	2
AVG	3	3	2	2	-	-	-	-	2	-	-	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	-	-	1
CO3	-	1	-
CO4	1	-	-
CO5	1	-	1
AVG	1	1	1

JEE1401	SYNCHRONOUS AND INDUCTION MACHINES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To impart knowledge on Construction and performance of salient and non–salient synchronous generator.
- To impart knowledge on Principle of operation and performance of synchronous s motor.
- To impart knowledge on Construction, principle of operation, and performance of three phase induction machine.
- To impart knowledge on starting and speed control of three phase induction motor.
- To impart knowledge on Construction, principle of operation and performance of Single phase induction motor and other special machines.

UNIT I SYNCHRONOUS GENERATOR 12

Constructional details– Types of rotors–winding factors-emf equation–Synchronous reactance – Armature reaction – Phasor diagrams of non-salient pole synchronous generator connected to infinite bus--Synchronizing and parallel operation – Synchronizing torque – Change of excitation and mechanical input-Voltage regulation–EMF,MMF,ZPF and A.S.A methods – steady state power- angle characteristics– Two reaction theory –slip test –short circuit transients – Capability Curves

UNIT II SYNCHRONOUS MOTOR 12

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted Vcurves – Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed-Hunting – natural frequency of oscillations– damper windings-synchronous condenser.

UNIT III THREE PHASE INDUCTION MOTOR 12

Constructional details–Types of rotors–-Principle of operation–Slip–cogging and crawling-Equivalent circuit–Torque-Slip characteristics- Condition for maximum torque–Losses and efficiency–Load test–No load and blocked rotor tests–Circle diagram–Separation of loses –Double cage induction motors–Induction generators –Synchronous induction motor.

UNIT IV STARTING AND SPEED CONTROL OF THREE PHASE INDUCTION MOTOR 12

Need for starting–Types of starters–DOL, Rotor resistance, Auto transformer and Star-delta starters – Speed control – Voltage control, Frequency control and pole changing – Cascaded connection-V/f control–Slip power recovery scheme-Braking of three phase induction motor: Plugging, dynamic braking and regenerative braking

UNIT V SINGLE PHASE INDUCTION MOTORS AND OTHER SPECIAL MACHINES 12

Constructional details of single phase induction motor – Double field revolving theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis– Starting methods of single-phase induction motors – Capacitor-start capacitor run Induction motor-Shaded pole induction motor–Linear induction motor–Introduction to BLDC, PMSM– A C series motor-Servo motors-Stepper motors–introduction to magnetic levitation systems

TOTAL(L:45+T:15):60PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the construction and working principle of Synchronous Generator

CO2: To acquire knowledge on Synchronous motor.

CO3: To understand the construction and working principle and performance analysis of Three phase Induction Motor

CO4: To acquire the knowledge in starting and speed control of three phase induction Motor.

CO5: To acquire the knowledge in working principles of single phase induction motor and other special machines.

TEXTBOOKS:

1. A.E .Fitzgerald, Charles Kingsley, Stephen. D.Umans, 'Electric Machinery' McGraw Hill publishing Company Ltd, 7th edition, 2013.
2. Vincent DelToro, 'Basic Electric Machines 'Pearson India Education, 1st Edition, 2016.
3. Stephen J. Chapman, 'Electric Machinery Fundamentals' 5th edition, Mc Graw Hill Education Pvt. Ltd, 2011.

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1. D.P.KothariandI.J.Nagrath, 'Electric Machines', McGraw Hill Publishing Company 4.An Ltd,5th edition, 2017.
2. P.S.Bhimbhra, 'Electrical Machinery', Khanna Publishers,7th Edition, 2009.
3. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi ,2009.
4. B.R.Gupta, 'Fundamental of Electric Machines 'New age International Publishers, 3rd Edition , Reprint 2015.
5. Murugesh Kumar, 'Electric Machines', Vikas Publishing House Pvt .Ltd, 2002.
6. Alexander S.Langsdorf, 'Theory of Alternating-Current Machinery', Mc Graw Hill Publications, 2nd edition, 2004

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3. https://youtu.be/IcoLbF5-4ws
4. https://youtu.be/TENIqjTT5TA
5. https://youtu.be/NRxo5aDGG8M
6. https://youtu.be/aoSRYJCykhg

CO–POMAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	2	2	1	1	-	2	1	3
CO2	3	3	2	2	2	2	1	1	-	2	1	3
CO3	3	3	2	2	2	2	1	1	-	2	1	3
CO4	3	3	3	3	2	3	1	1	-	2	2	3
CO5	3	3	3	3	3	3	1	1	-	2	2	3
AVG	3	3	2	2	2	2	1	1	-	2	1	3

CO-PSOMAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	1
CO2	3	1	1
CO3	3	3	1
CO4	3	2	1
CO5	3	2	1
AVG	3	2	1

JEE1402	LINEAR INTEGRATED CIRCUITS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the IC fabrication technology.
- To know the Op-amp characteristics and its basic applications.
- To study the applications of Op-Amp.
- To acquire knowledge on special IC's and learns the theory and applications of PLL.
- To study various application IC's.

UNIT I IC FABRICATION 9

IC classification, fundamental of monolithic IC technology, Basic Planar process: epitaxial growth, masking and etching, diffusion of impurities. Realization of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance, FETs–3DIC.

UNIT II CHARACTERISTICS OF OPAMP 9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – Inverting and Non-inverting

Amplifiers, summer, differentiator and integrator–V/I & I/V converters – Comparison IC741andLM358.

UNIT III APPLICATIONS OF OPAMP 9

Instrumentation amplifier and its applications, first and second order active filters, comparators, waveform generators, peak detector, S/H circuit, clipper, clamper, D/A converter (R-2R ladder and weighted resistor types), A/D converters using op-amps.

UNIT IV SPECIAL ICs 9

Functional block, characteristics of IC 555 Timer and its PWM application – IC566 voltage controlled oscillator, IC565-phase locked loop, AD633 Analog multiplier ICs–PLL and VCO Applications.

UNIT V APPLICATION ICs 9

IC voltage regulators–LM78XX, LM79XX; Fixed voltage regulators its application as Linear power supply–LM317, 723 Variable voltage regulators, switching regulator-SMPS–ICL8038 function generator IC.

TOTAL:45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able

- To demonstrate different steps involved in the process of fabrication of integrated circuit.
- To identify the characteristics and basic applications of Op-Amp.
- To demonstrate the applications of Op-amp.
- To assess knowledge about functional blocks and the applications of special I Cs like Timers, PLL circuits.
- To explain and acquire knowledge on Application IC's.

TEXTBOOKS

1. David A.Bell,'Op-amp & Linear ICs', Oxford, 2013.
2. D.Roy Chaudhary, Sheila B.Jani, 'Linear Integrated Circuits', IIedition, New Age, 2003.
3. Ramadan A.Gayakward,'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI. 2000.**:**

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1. B.S. Sonde, "Introduction to System Design using integrated circuits" New age, 2003.
2. AnFiore, "Op amps & Linear Integrated Circuits Concepts & applications", Cengage, 2010.
2. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson, 2013.
3. Jacob Millman, Christos C. Halkias, 'Integrated Electronics-Analog and Digital circuits system', McGrawHill, 2003.
4. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson, 6thedition, 2012.
5. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', Mc Graw Hill, 2016.
6. Muhammad H. Rashid, 'Micro electronic Circuits Analysis and Design' Cengage Learning, 2011.
7. Katsuyuki Sakuma, "3 D Integration in VLSI Circuits: Implementation technologies and Applications", CRC Press Tailor & Francis group 2018.
8. Hank Zumvahlel "Linear Circuit Design Hand book", Newness publications, 2008

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3.https://www.youtube.com/watch?v=kiiA6WTCQn0
4.https://www.youtube.com/watch?v=nqk714QpRos
5.https://www.youtube.com/watch?v=WkI7uYLRbwQ
6..https://www.youtube.com/watch?v=VfxKL4376_8

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	1	2	-	1	-	1	3
CO2	3	2	1	2	2	1	2	-	1	-	2	3
CO3	3	2	1	2	2	1	2	-	1	-	2	3
CO4	3	2	2	2	2	1	2	-	1	-	2	2
CO5	3	2	2	2	2	1	2	-	1	-	2	2
AVG	3	2	1	2	2	1	2	-	1	-	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	-	1
CO2	1	2	2
CO3	1	1	2
CO4	1	-	2
CO5	1	2	1
AVG	1	1	2

JEE1403	TRANSMISSION, DISTRIBUTION AND PROTECTION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the structure, transmission line parameters and equivalent circuits of the transmission lines
- To understand the mechanical design of transmission lines, insulator, cabilitys and insulator strings.
- To study about distribution systems, types of substations, methods of grounding EHVAC, HVDC and FACTS.
- To provide knowledge on different types of Circuit Breakers and Relays
- To impart knowledge on equipment protection

UNIT I POWER TRANSMISSION 9

Transmission Line Parameters-Structure of Power System –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

Modelling of Transmission Lines- Performance of Transmission lines - short line, medium line and long line – equivalent circuits, phasor diagram, attenuation constant, phase constant, surge impedance-transmission efficiency and voltage regulation

UNIT II OVERHEAD TRANSMISSION AND UNDER GROUND TRANSMISSION 9

Mechanical design of OH lines–Line Supports–Stress and Sag Calculation-Effects of Wind and Ice loading. Insulators: Types, voltage distribution in insulator string, improvement of string efficiency. Underground cabilitys – Construction of single core and 3 core Cabilitys - Insulation Resistance – Potential Gradient - Capacitance of Single-core and 3 core cabilitys-Grading of cabilitys

UNIT III DISTRIBUTION SYSTEMS 9

Distribution Systems–General Aspects–Kelvin's Law–AC and DC distributions-Techniques of Voltage Control and Power factor improvement–Types of Substations –Importance of earthing in substation-Methods of Grounding–Trends in Transmission and Distribution: EHVAC, HVDC and FACTS (Qualitative treatment only).

UNIT IV NEED FOR POWER SYSTEM PROTECTION 9

Protective Relays- Electro mechanical Relays- Static Relays- Comparison and duality of Amplitude and Phase comparators. Static over current, Differential Relay-Principle and Block diagram only, Microprocessor Based Relay-Block diagram and flow chart of over current Relay, Numerical Relay (Basics Only) Circuit breakers – principle of operation-formation of arc-Arc quenching theory, Restriking Voltage-Recovery voltage, RRRV. Interruption of Capacitive currents and current chopping ,Types of Circuit Breakers: Air blast CB– Oil CB– SF6 CB.

UNIT V PROTECTION OF EQUIPMENTS 9

Protection of alternator-Stator inter turn, Earth fault Protection and Differential protection, Protection of transformers-Percentage Differential Protection-Buchholz Relay. Protection of transmission lines-Differential Protection-carrier current protection

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the importance and the functioning of transmission line parameters and Also familiar with the modeling of transmission line
CO2: To acquire knowledge on Insulator and Underground Cabilitys
CO3: To understand the importance of distribution of the electric power in power system.
CO4: To acquire knowledge on different types of Circuit Breakers and Relays
CO5: To acquire knowledge on protection of equipment's

TEXTBOOKS:

1. D.P.Kothari, I.J.Nagarath,'Power System Engineering', Tata McGraw-Hill Publishing Company limited, NewDelhi, Second Edition, 2008.
2. C.L.Wadhwa, 'Electrical Power Systems',New Age International, Seventh Edition2017.
3. V.K.Mehta , Rohit Mehta, 'Principles of power system', S.Chand & Company Ltd, New Delhi, 3rd Edition, 2013
4. Sunil S.Rao, 'Switch gear and Protection', Khanna Publishers, New Delhi, 11th Edition reprint 3rd Edition,, 2008.
5. B.Rabindranath and M.Chander, 'Power System Protection and Switch gear', New Age International Pvt Ltd., Second Edition 2012.

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1. B.R.Gupta,'Power System Analysis and Design', S.Chand Publishing, New Delhi, Fifth Edition, 2008.
2. Luces M.Fualkenberry, Walter Coffer, 'Electrical Power Distribution and Transmission' ,Pearson Education, 2007.
3. J.Brian, Hardy and Colin R.Bayliss 'Transmission and Distribution in Electrical Engineering', Newnes; Fourth Edition, 2012.
4. BadriRam,B.H.Vishwakarma,'Power System Protection and Switchgear', TMH Publication Second Edition 2011.
5. Y.G.Paithankar and S.R.Bhide, 'Fundamentals of power system protection', Second Edition, Prentice Hall of India Pvt.Ltd., New Delhi, 2010.

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4. https://youtu.be/zZ4li_nzyOk
5. https://youtu.be/K1klGNZYLdc
6. https://youtu.be/TsDHce-k8d4

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	2	1	1	2	-	1	2
CO2	3	3	2	3	2	2	1	1	2	-	1	2
CO3	3	3	2	2	2	2	1	1	2	-	1	2
CO4	2	2	3	3	2	3	2	1	2	1	1	2
CO5	2	2	3	3	2	3	2	1	2	1	1	2
AVG	3	3	2	3	2	2	1	1	2	1	1	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	3	3	2
CO3	3	3	3
CO4	2	1	1
CO5	3	3	3
AVG	3	2	2

JPT1001	SOFT SKILLS AND APTITUDE II	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To help students learn various forms of writing and develop content
- To help students acquire time and stress management skills
- To facilitate students to gain required knowledge to understand practical concept sin aptitude
- To develop the thinking and analytical skills of students
- To gain knowledge in concepts of C programming language

UNIT I SOFT SKILLS AND APTITUDE - III 5

Communication–on Specific topics–both or a land written–Content development–various forms of writing and specific writing–Brain storming–Individual–Concept focusing–Public Speaking– Analytical writing.

UNIT II SOFT SKILLS AND APTITUDE-IV 5

Importance of Time–Time Management techniques–The art of prioritizing and scheduling–Stress – Positive and Negative Stress - Stress Management techniques – Concept of Goal setting–Importance of Goals – Dream vs Goal–Reasons for failure of Goals–SMART.

UNIT III QUANTITATIVE APTITUDE 6

Ratio and Proportions–Allegations and Mixtures–Problem on Ages–Profit and Loss and Discount

UNIT IV LOGICAL REASONING 6

Odd man out series–Blood Relation–Seating Arrangement –Number Ranking

UNIT V TECHNICAL APTITUDE INC-II 8

Strings-Storage Classes–Pointers–Preprocess or directives-Structures–Union. Typed ef– Input / Output – File I/O - Header Files – Type casting – Error handling – Command Line Arguments– Variable Arguments– Memory Management –Bit wise operators.

TOTAL:30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: Develop different types of content using the skills learnt
CO2: Manage time and stress competently
CO3: Find answers to real time application problems
CO4: Use logical reasoning skills to solve problems differently
CO5: Apply C programming concepts for coding

TEXT BOOKS:

1. R.SAgrawal, “Quantitative Aptitude”.
2. R.S.Agrawal, “Verba Reasoning”.
3. R.S.Agrawal “NonVerbal reasoning.
4. Pradip Dey, Manas Ghosh,“Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009
5. Yashavant P.Kanetkar. “Let Us C”, BPB Publications, 2011.

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3. www.freshersworld.com
4. https://www.youtube.com›watch>problemsonages
5. https://www.youtube.com›watch>bloodrelation
6. https://www.youtube.com›watch>content
7. https://www.youtube.com›watch>SMART
8. https://www.youtube.com›watch>stringsinC

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	1	-	3	-	-	1	2	2	3
CO2	3	3	1	1	-	3	-	-	1	2	2	3
CO3	3	3	1	1	-	3	-	-	1	2	2	3
CO4	3	3	1	1	-	3	-	-	1	2	2	3
CO5	3	3	1	1	-	3	-	-	1	2	2	3
AVG	3	3	1	1	-	3	-	-	1	2	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	2	-
CO2	-	2	-
CO3	-	2	-
CO4	-	2	-
CO5	-	2	-
AVG	-	2	-

JEE1411	SYNCHRONOUS AND INDUCTION MACHINES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To understand the concept of alternators
- To prepare the students to have a basic knowledge of single phase induction motors
- To prepare the students to have a basic knowledge of three phase induction motors
- Acquire knowledge about equivalent circuits of machines.
- Acquire knowledge about brushless DC motor.

LIST OF EXPERIMENTS:

1. Regulation of three phase alternator by EMF, MMF, ZPF, ASA methods
2. Regulation of three phase salient pole alternator by slip test
3. V and Inverted V curves of Three Phase Synchronous Motor
4. Load test on three-phase induction motor
5. No load and blocked rotor test on three-phase induction motor (Determination of equivalent circuit parameters)
6. Separation of No-load losses of three-phase induction motor
7. Load test on single-phase induction motor
8. No load and blocked rotor test on single-phase induction motor
9. Load test on BLDC Motor
10. Study of Induction motor Starters
11. Simulation of four quadrant operation of 3 phase induction motor using MATLAB

TOTAL: 60PERIODS

COURSE OUTCOMES:

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

- Ability to analyze the regulation of synchronous machines
- Ability to analyze the performance and characteristics of Synchronous Motor
- Ability to analyze characteristics of single phase induction machines.
- Ability to analyze characteristics of three phase induction n machines.
- Ability to analyze characteristics of brushless DC motor.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1. Synchronous Induction motor 3HP – 1 No.
2. DC Shunt Motor Coupled With Three phase Alternator–4 Nos
3. DC Shunt Motor Coupled With Three phase Slip ring Induction motor–1No.
4. Three Phase Induction Motor with Loading Arrangement–2 Nos
5. Single Phase Induction Motor with Loading Arrangement–2 Nos
6. Brushless DC Motor with Loading Arrangement–1.No
7. Tachometer-Digital/Analog–8 Nos
8. Single Phase Auto Transformer – 2 Nos
9. Three Phase Auto Transformer –3 Nos
10. Single Phase Resistive Loading Bank–2 Nos
11. Three Phase Resistive Loading Bank–2 Nos
12. Capacitor Bank –1 No.

REFERENCES:

1. Nagrath I. J and Kothari D. P. 'Electric Machines', Fourth Edition, Tata McGraw Hill Publishing Company Ltd, 2010.
2. M.N.Bandyopadhyay, Electrical Machines Theory and Practice, PHI Learning PVT LTD., New Delhi, 2009

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	2	1	1	2	3	2	2	3
CO2	3	3	3	3	2	1	1	2	3	2	2	3
CO3	3	3	3	3	2	1	1	2	3	2	2	3
CO4	3	3	3	3	2	1	1	2	3	2	2	3
CO5	3	3	3	3	3	2	1	2	3	2	2	3
AVG	3	3	3	3	2	1	1	2	3	2	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	3	3	2
CO3	3	3	2
CO4	2	2	1
CO5	3	3	1
AVG	3	3	1

JEE1412	LINEAR AND DIGITAL INTEGRATED CIRCUITS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn the basic concepts of analog and digital ICs
- To familiarize the characteristics of various analog circuits.
- To realize the digital circuits using logic gates
- To impart working practice in EDA tools

LIST OF EXPERIMENTS:

1. Experiment using Basic op-amp circuits (Inverting, Non-Inverting and Adder).
2. Design of Integrators and Differentiators.
3. Simulation and Experimental verification of Comparators using 741.
4. Simulation and experimental verification of Astable and Mono stable multivibrator in IC555 timer.
5. Study of VCO and PLL ICs:
   i. Voltage to frequency characteristics of NE/SE566 IC.
   ii. Frequency Multiplication using NE/SE 565 PLLIC.
6. Verification of Logic gates and Implementation of Boolean Functions
7. Verification of Adder and Sub tractor circuits.
8. Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa
9. Parity generator and parity checker
10. Encoders and Decoders
11. Design and implementation of 3-bit modulo counters.
12. Verification of multiplexer and demultiplexer
13. Coding of combinational/sequential circuits using HDL.

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1 To design and analyze linear and digital electronic circuits.
CO2 To explain the EDA tools

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

(3 per Batch)

S.No	Name of the equipments/Components	Quantity Required	Remarks
1	Dual, (0-30V) variability Power Supply	10	-
2	CRO	9	30MHz
3	Digital Multimeter	10	Digital
4	Function Generator	8	1MHz
5	IC Tester (Analog)	2	
6	Bread board	10	
7	Computer (PSPICE installed)	1	

CONSUMABILITYS (SUFFICIENT QUANTITY)

1 IC741/ ICNE555/566/565

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 Resistors1/4Watt Assorted
14 Single Strand Wire

REFERENCES:

1. Floyd, Buchla,"Fundamentals of Analog Circuits, Pearson, 2013.
2. Jacob Millman, Christos C. Halkias, 'Integrated Electronics– Analog and Digital circuits system', McGrawHill, 2003.
3. Robert F.Coughlin, Fredrick F.Driscoll, 'Op amp and Linear Ics', Pearson, 6th edition, 2012.
4. Sergio Franco, 'Design with Operational Amplifiers and Analog Integrated Circuits', McGraw Hill, 2016.
5. Muhammad H. Rashid,' Microelectronic Circuits Analysis and Design'Cengage Learning, 2011.

WEBSITES:

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www.epfl.ch›labs ›iclab

CO–PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	2	2	-	1	1	1	3
CO2	3	3	2	2	1	2	1	-	1	1	2	3
AVG	3	3	2	2	1	2	2	-	1	1	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	2	1
CO2	1	2	2
AVG	1	2	2

SEMESTER V

JEE1501	MICRO PROCESSORS AND MICRO CONTROLLERS (INTEGRATED)	L	T	P	C
		2	0	2	3

OBJECTIVES:

- To impart knowledge on architecture and interrupt structure of µP 8085
- To impart knowledge on addressing modes and ALP of 8085
- To study the architecture and programming of 8051 micro controller.
- To acquire knowledge about the features and functionalities of the peripheral devic and interfacing
- To understand the concepts of developing micro controller based systems for vario applications.

UNIT I THE 8085 MICROPROCESSOR 6

Hardware Architecture – Functional Building Blocks of Processor – Memory organization – I/O ports and data transfer concepts–Timing Diagram–Interrupts.

UNIT II PROGRAMMING OF 8085 PROCESSOR 6

Instruction -format and addressing modes – Assembly language format – Data transfer, data manipulation & control instructions–Programming: Loop structure with counting & Indexing–Sub routine instructions–stack- Introduction to16-bitmicroprocessor.

UNIT III 8051 MICRO CONTROLLERS 6

Architecture of 8051 – Special Function Registers (SFRs)- Interrupts –Timer and counter – Instruction set-Addressing modes-Simple assembly language programming

UNIT IV PERIPHERAL INTERFACING 6

Programmable Peripheral Interface (8255) -Keyboard/Display Controller (8279)- Programmable Timer/ Counter (8254) - Programmable Interrupt Controller (8259) – DMA Controller(8257)-Serial Communication Interface (8251)

UNIT V MICRO CONTROLLER PROGRAMMING AND APPLICATIONS 6

Simple programming exercises- key board and display interface –Control of servo motor-stepper motor control-Traffic Light control - ADC/DAC & Sensor Interfacing – Wave form generation.

(TOTAL: 30 PERIODS)

LIST OF EXPERIMENTS:

8085 PROGRAMS USING KITS

- Basic arithmetic and Logical operations

- Move a data block
- Programming with control instructions:
  (i) Ascending/Descending order, Maximum /Minimum of numbers.
  (ii) Programs using Rotate instructions.
  (iii) Code conversion, decimal arithmetic and matrix operations.
  (iv) Floating point operations, string manipulations, sorting and searching

8051 EXPERIMENTS USING KITS

- Basic arithmetic and logical operations
- Conditional jumps & looping
- Code conversion & calling subroutines

PERIPHERALS AND INTERFACING

- Traffic light control
- Stepper motor control
- Key board and Display
- Serial interface and Parallel interface
- A/D and D/A interface and Waveform Generation

8086 DEMONSTRATION USING SOFTWARE PACKAGE

(30 PERIODS)

(TOTAL -60 PERIODS)

OUTCOMES:

At the end of the course, the student should be able:

CO1: To understand about the architecture of 8085 microprocessor.
CO2: To acquire knowledge in addressing modes & instruction set of 8085 and write the assembly language programme.
CO3: To realize the architecture and programming of 8051micro controller.
CO4: To gain knowledge about the features and functionalities of the peripheral devices and interfacing
CO5: To understand the concepts of developing micro controller based systems for various applications.

TEXTBOOKS:

1. Sunil Mathur & Jeebananda Panda, "Micro processor and Micro controllers", PHI Learning Pvt.Ltd, 2016.
2. R.S. Gaonkar, 'Micro processor Architecture Programming and Application', with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. KrishnaKant, "Micro processor and Micro controllers, Architecture, Programming and System Design 8085, 8086, 8051", Second Edition, PHI Learning Private Limited, 2014.
4. Mohamed Ali Mazidi, Janice GillispieMazidi, RolinMcKinlay, "The 8051 Micro controller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.
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4. Kenneth J Ayala "The 8051 Microcontroller, Architecture, Programming and Applications "2nd edition Penram International Publishing, 1996.
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6. Barry B Brey, "The Intel Microprocessor Architecture Programming and Interfacing", Pearson Education, 4th Edition, 2006.
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4. https://youtu.be/myw7ycAgJYM
5. https://nptel.ac.in/courses/108107029/6.
6. https://www.iitk.ac.in/new/microprocessor-and-microcontroller laboratory
7. http://209.211.220.205/vlabiitece/mi/labsMI.php

LIST OF EQUIPMENT FORA BATCH OF 30 STUDENTS:

SL.NO	DESCRIPTION OF EQUIPMENT	QUANTITY REQUIRED
1.	8085 Micro processor Trainer with Power Supply	15
2.	8051Micro Controller Trainer Kit with power supply	15
3.	8255 Interface boards	5
4.	8251 Interface boards	5
5.	8259 Interface boards	5
6.	8279Keyboard/Display Interface boards	5
7.	8254timer/counters	5
8.	ADC and DAC cards	5
9.	AC & DC motor with Controller s	5
10.	Traffic Light Control Systems	5

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	2	1	-	-	-	-	-	-	1
CO2	3	-	-	2	1	-	-	-	-	-	-	1
CO3	3	-	-	2	1	-	-	-	-	-	-	1
CO4	3	-	-	2	1	-	-	-	-	-	-	1
CO5	3	-	-	2	1	-	-	-	-	-	-	1
AVG	3	-	-	2	1	-	-	-	-	-	-	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	2	1	1
CO3	2	1	1
CO4	2	1	1
CO5	2	1	1
AVG	2	1	1

JEE1502	CONTROL AND INSTRUMENTATION	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To provides an overview about the methods of representation of systems and to derive their transfer function models.
- To provide adequate knowledge in the time response of systems.
- To accord basic knowledge in obtaining the frequency responses of systems.
- To impart knowledge on basic functional elements of instrumentation and display devices
- To study about various measurement techniques and transducers

UNIT I SYSTEMS AND REPRESENTATION 12

Basic elements in control systems:–Open and closed loop systems–Electrical analogy of mechanical and thermal systems – Transfer function – AC and DC servomotors – Block diagram reduction techniques– Signal flow graphs.

UNIT II TIME RESPONSE 12

Time response: – Time domain specifications – Types of test input – I and II order system response–Error coefficients–Generalized error series–Steady state error–Root locus construction– Effects of P, PI, PID modes of feedback control–Time response analysis

UNIT III FREQUENCY RESPONSE AND STABILITY 12

Frequency response: – Bode plot – Polar plot – Determination of closed loop response from open loop response-Correlation between frequency domain and time domain specifications. Characteristics equation–Routh Hurwitz criterion–Nyquist stability criterion-Lag, lead and lag-lead compensation techniques

UNIT IV ELECTRICAL AND ELECTRONIC INSTRUMENTS, DISPLAY DEVICES 12

Functional elements of an instrument – Principle and types of analog and digital voltmeters, ammeters – Principle and types of multi meters – Single and three phase watt meters and energy meters–Instruments for measurement of frequency and phase-CRT display, digital CRO, LED, LCD

UNIT V COMPARATIVE METHODS OF MEASUREMENTS AND TRANSDUCERS 12

D.C potentiometers, D.C bridges – Wheatstone, Kelvin and Kelvin Double bridge - A.C bridges -Maxwell, Anderson and Schering bridges - self-balancing bridges. Classification of transducers –Selection of transducers – Resistive, capacitive and inductive Transducers – Piezoelectric, Hall effect, optical and digital transducers.

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To acquire knowledge on systems and their representation
CO2: To gain knowledge about time domain response of the system
CO3: To understand the knowledge of frequency response of the system
CO4: To acquire knowledge on basic functional elements and fundamentals of instrumentation and display devices
CO5: To understand various measurements techniques and concepts of transducers

TEXTBOOKS:

1. Nagarath,I.J. and GopalM.,"Control Systems Engineering", Fifth Edition, New Age International Publishers, 2017.
2. GopalM, "Control System: Principle and design", Fourth Edition, McGraw Hill Education, 2012.
3. Sawhney A.K.,"A Course in Electrical & Electronic Measurements & Instrumentation", Seventh Edition, Dhanpat Rai and Co.,2015.
4. GuptaJ.B, "A Course in Electronic and Electrical Measurements", S.K.Kataria & Sons, Delhi, 2013

REFERENCE BOOKS:

1. Katsuhiko Ogata,"Modern Control Engineering",Fifth Edition, Pearson, 2009.
2. Richard C. Dorf and Bishop R.H., "Modern Control Systems", Twelfth Edition, Pearson,2010.
3. JohnJ.D.,Azzo Constantine and Houpis Sttuart,"Linear Control System Analysis and Design with MATLAB", 6th Edition, CRC Press ,Taylor & Francis Group.
4. Rames C .Panda and Thyagarajan T. "An Introduction to Process Modelling Identification and Control of Engineers", Narosa Publishing House, 2017.
5. Gopal M.,"Control System: Principle and design", Third Edition, McGraw Hill Education, 2012.
6. KalsiH.S.,"Electronic Instrumentation", III Edition, McGrawHill, 2017.
7. Murthy D.V.S. 'Transducers and Instrumentation', Second Edition, Prentice Hall of India Pvt Ltd, 2015.
8. David Bell, "Electronic Instrumentation & Measurements", Third Edition, Oxford University Press, 2013.

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1. www.nptel.in
2. https://www.youtube.com/watch?v=ziu1OTwUrbw
3. https://ocw.mit.edu/resources/res-6-010-electronic-feedback-systems-spring-2013/course-videos/lecture-7-stability-via-frequency-response/
4. https://nptel.ac.in/courses/108/105/108105153/
5. https://www.youtube.com/watch?v=3c_uDCnnBXc
6. https://www.youtube.com/watch?v=I5k66ESHJHM

CO-PO MAPPING:

CO\PO	PO 1	PO 2	PO 3	PO4	PO 5	PO 6	PO 7	PO 8	PO 9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	2	1	2	2	1	2
CO2	3	3	3	2	1	1	2	1	2	2	1	2
CO3	3	3	3	2	1	1	2	1	2	2	1	2
CO4	2	2	2	2	1	2	3	3	3	2	3	-
CO5	1	-	1	-	1	2	3	3	3	2	2	-
AVG	2	2	2	2	1	1	2	2	2	2	2	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	3
CO2	3	3	3
CO3	3	3	3
CO4	2	1	1
CO5	2	1	1
AVG	2	2	2

JEE1503	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on various power semiconductor devices and their switching
- To study the operation, characteristics and performance parameters of controlled rectifiers
- To learn the operation, switching techniques and basics topologies of DC-DC switching regulators.
- To impart knowledge on different modulation techniques of pulse width modulated inverters,
- To study the operation of AC voltage controller and cycloconverters.

UNIT I POWER SEMI-CONDUCTOR DEVICES 9

Study of switching devices, SCR, TRIAC, GTO, BJT, MOSFET, IGBT and IGCT-Static characteristics: SCR, MOSFET and IGBT–Features of silicon carbide and gallium nitride devices –Triggering and commutation circuit for SCR- Introduction to Driver and snubber circuits.

UNIT II PHASE-CONTROLLED CONVERTERS 9

2-pulse,3-pulse and 6-pulse converters–performance parameters–Effect of source and load inductance—Firing Schemes for converter–Dual converters, Applications-light dimmer, Excitation system, Solar P V systems

UNIT III DC-DC CONVERTERS 9

Step-down and step-up chopper-control strategy– Introduction to types of choppers-A, B, C, D and E- Switched mode regulators-Buck, Boost, Buck-Boost regulator–Introduction to SEPIC, Fly back converters, Applications-Battery operated vehicles

UNIT IV INVERTERS 9

Single phase and three phase voltage source inverters (both 120 and 180 degree mode)-Voltage and harmonic control –PWM techniques: Multiple PWM, Sinusoidal PWM, modified sinusoidal PWM – Introduction to space vector modulation –Design on Inverters-Current source inverter, Applications-Induction heating, Design of UPS

UNIT V AC-AC CONVERTERS 9

Phase control, Integral cycle control-Single phase AC voltage controllers–Control strategy-Power Factor Control–Multi stage sequence control-single phase and three phase cycloconverters – Introduction to Single phase Matrix converters, Applications–welding.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To identify different types of power semiconductor devices and their switching Characteristics

CO2: To explain the operation, characteristics and performance parameters of controlled Rectifiers

CO3: To analyze the operation, switching techniques and basics topologies of DC-DC Switching regulators.

CO4: To explain different modulation techniques of pulse width modulated inverters.

CO5: To review the operation of AC voltage controller and cyclo converters

TEXTBOOKS:

1. Muhammad H.Rashid, “Power Electronics: Circuits, Devices and Applications”, Third Edition, Pearson Education, New Delhi, 2013.
2. Bimbra P.S.“Power Electronics”, Fifth Edition, Khanna Publishers, 2014

REFERENCE BOOKS:

1. Joseph Vithayathil, 'Power Electronics, Principles and Applications', 6th Reprint, McGraw Hill Series, 2013.
2. PhilipT.Krein, "Elements of Power Electronics" Oxford University Press, 2017 Edition.
3. Uman and L., "Power Electronics Essentials and Applications", Wiley, 2015.
4. Ned Mohan, Tore.M.Undel and William.P.Robbins, 'Power Electronics: Converters, Applications and Design', third edition, John Wiley and sons, 2009.
5. S.Rama Reddy, 'Fundamentals of Power Electronics', Narosa Publications, 2014.
6. Singh M.D. and Khan chandani K.B., "Power Electronics," second edition, McGraw Hill India, 2013.
7. Agarwal JP, "Power Electronic Systems: Theory and Design "First Edition , Pearson Education, 2002

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1. www.nptel.com
2. https://www.youtube.com/watch?v=fOZ8bUrFJGk
3. https://www.youtube.com/watch?v=P0MK7sWfs9k
4. https://www.youtube.com/watch?v=7CReXeMAXHA
5. https://www.youtube.com/watch?v=tMFFmmw3LTg

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	2	2	1	2	2	2	3
CO2	3	3	2	3	1	2	2	1	2	2	2	3
CO3	3	3	2	3	1	2	2	1	2	2	2	3
CO4	3	3	3	3	2	2	3	1	2	2	2	3
CO5	3	3	3	3	2	2	3	1	2	1	2	3
AVG	3	3	2	3	1	2	2	1	2	2	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2
AVG	3	3	2

JNC1361	ESSENCE OF INDIAN TRADITIONAL KNOWLEDGE	L	T	P	C
		2	0	0	0

COURSE OBJECTIVES:

- To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system.

UNIT I INTRODUCTION TO TRADITIONAL KNOWLEDGE 6

Define traditional knowledge (TK), nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal Knowledge

UNIT II PROTECTION OF TRADITIONAL KNOWLEDGE 6

The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK.

UNIT III LEGAL FRAME WORK AND TK 6

A: The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006, Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act);
B: The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016. Geographical indicators act 2003.

UNIT IV TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY 6

Systems of traditional knowledge protection, Legal concepts for the protection of traditional knowledge, Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FOR A for increasing protection of Indian Traditional Knowledge.

UNIT V TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS 6

Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To Understand the concept of Traditional knowledge and its importance
CO2: To Know the need and importance of protecting traditional knowledge.
CO3: To Know the various enactments related to the protection of traditional knowledge.
CO4: To Understand the concepts of Intellectual property to protect the traditional knowledge.
CO5: To Know the applications of traditional knowledge in various fields.

REFERENCE BOOKS:

1. Traditional Knowledge System in India, by Amit Jha, 2009.
2. Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin Kumar Singh, Pratibha Prakashan 2012.
3. Traditional Knowledge System in India by Amit Jha , Atlantic publishers, 2002 "Knowledge Traditions and Practices of India" Kapil Kapoor, Michel Danino

WEBSITE REFERENCES:

- https://www.youtube.com/watch?v=LZP1StpYEPM
- http://nptel.ac.in/courses/121106003/

CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	1	1	1	1	1	-	-	-	-	-
CO2	-	-	1	1	1	1	1	-	-	-	-	-
CO3	-	-	1	1	1	1	1	-	-	-	-	-
CO4	-	-	1	1	1	1	1	-	-	-	-	-
CO5	-	-	1	1	1	1	1	-	-	-	-	-
AVG	-	-	1	1	1	1	1	-	-	-	-	-

CO-PSO MAPPING

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	1	-	1
CO3	1	1	-
CO4	-	1	1
CO5	1	1	-
AVG	1	1	1

JHS1511	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To enable students to acquire a specialized knowledge of the essential professional skills
- To train them to make effective presentations on a variety of topics
- To help them participate in group discussions displaying team work skills

- To build their confidence and help them attend interviews winningly
- To groom them to become successful professionals

UNIT I EXPOSURE TO PROFESSIONAL SKILLS 6

Introduction to Skills: hard skills and soft skills – communication skills – interpersonal skills – employability and career skills – planning and prioritizing work – time management – stress management– emotional intelligence –SWOT analysis

UNIT II P REPARING AND PRESENTING INSPIRING TALKS 6

Key elements of effective presentation – non verbal communication – impressive self-introduction and short individual presentation – preparing outline – structuring and 93rganizing content –presenting– introducing topic –developing points– concluding– answering questions

UNIT III MEASURES TO CRACK GROUP DISCUSSION 6

Group discussion skills – team building – using key strategies – etiquette – content preparation –brain storming – out of box thinking – mind mapping – turn taking and turn giving – speaking persuasively– questioning and clarifying

UNIT IV INTERVIEW SKILLS TO GET HIRED 6

Interview skills – etiquette – body language – confidence – preparedness – types of interview – Frequently Asked Questions (FAQs)–mock interview– job application and resume writing

UNITV LANGUAGE SKILLS AND CAREER MAPPING 6

Listening skills–understanding different accents–reading skills–verbal ability–email writing – professional grooming –leadership qualities – fundamentals of entrepreneurship–career planning–goal setting–future challenges

TOTAL:30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To have sufficient knowledge of the skills required for professional development
CO2: To give formal and effective presentations
CO3: To participate actively in group discussions
CO4: To attend job interviews and answer questions confidently and effortlessly
CO5: To emerge as professionals ready for placement

RECOMMENDED SOFTWARE:

1. Globe arena
2. Win English

TEXTBOOK:

Inter act English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient Black Swan.

REFERENCE BOOKS:

1. Alex .K, 2019,Soft Skills: Know Yourself and Know the World, New Delhi: S.Chand & Company Limited.
2. Butter field, Jeff, 2015, Soft Skills for Everyone. New Delhi: Cengage Learning.
3. Kumar, Suresh Eetal, 2015, Communication for Professional Success, Hyderabad: Orient Black Swan.
4. Mitra, Barun K, 2016, Personality Development and Soft Skills, New Delhi : Oxford University Press.
5. Raman, Meenakshi and Sangeeta Sharma, 2014, Professional Communication, Oxford: Oxford University Press.
6. Rizvi, Ashraf, M, 2018, Effective Technical Communication, Chennai: McGraw-Hill Education.

WEBSITE REFERENCES:

- https://www.britishcouncil.in/english/online/resources-websites/moocs
- https://alison.com/courses/communications
- https://in.topresume.com/career-advice/15-free-resources-to-improve-your-presentation-and-speaking-skills
- http://www.washington.edu/doit/TeamN/present_tips.html
- https://www.softwaretestinghelp.com/how-to-crack-the-gd/
- http://www.oxforddictionaries.com/words/writing-job-applications
- http://www.mindtools.com/pages/article/newCDV_34.htm
- https://myinterviewpractice.com/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	2	-	3	3	3	1	2
CO2	-	-	-	-	2	-	-	1	-	3	-	-
CO3	-	-	-	-	-	-	-	3	3	3	-	-
CO4	-	-	-	-	-	-	-	3	2	3	-	2
CO5	-	-	-	-	-	-	-	2	3	-	2	2
AVG	-	-	-	-	1	1	-	2	2	3	1	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	-	-
CO2	-	-	-
CO3	3	-	-
CO4	2	-	-
CO5	3	-	-
AVG	2	-	-

JEE1512	CONTROL AND INSTRUMENTATION LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To impart knowledge on analysis and design of control systems
- To accord an adequate e knowledge and expertise to handle the instruments in industry

LIST OF EXPERIMENTS:

CONTROL SYSTEMS:

1. P,PI and PID controllers
2. Stability Analysis
3. Design of Lag, Lead and Lag-Lead Compensators
4. Position Control Systems
5. Synchro-Transmitter-Receiver and Characteristics
6. Simulation of Control Systems by Mathematical development tools.

INSTRUMENTATION:

7. AC Bridges
8. DC Bridges
9. Dynamics of Sensors/Transducers (a) Temperature (b) pressure (c) Displacement (d) Optical (e) Strain (f)Flow
10. Power and Energy Measurement
11. Signal Conditioning (a) Instrumentation Amplifier (b) Analog – Digital and Digital – Analog converters (ADC and DACs)
12. Simulation study of bridges and transducers

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student will be able

CO1: To experimentally measure the controller parameters and design compensators
CO2: To measure and analyze basic bridge networks.
CO3: To assess the basics of signal conditioning circuits and simulation package.
CO4: To analyze working of various transducers.
CO5: To assess simulation package and simulate basic circuits.

WEBSITE REFERENCES:

1. https://www.vlab.co.in/broad-area-electrical-engineering
2. http://sl-coep.vlabs.ac.in/List%20of%20experiments.html
3. http://sl-coep.vlabs.ac.in/StrainGuage/strainguage.htm
4. https://nationalmaglab.org/education/magnet-academy/watch-play/interactive/wheatstone- bridge
5. http://vlabs.iitkgp.ernet.in/asnm/exp11/index.html
6. http://vlabs.iitkgp.ernet.in/asnm/exp21/index.html
7. http://vlabs.iitkgp.ernet.in/asnm/exp7/js-simulator/power_web.html
8. http://vlabs.iitb.ac.in/vlabs-dev/vlab_bootcamp/bootcamp/electronerds/experiments/instrumentation-amplifier-pvg/simulation.html
9. http://vlabs.iitkgp.ernet.in/asnm/#

10. http://sl-coep.vlabs.ac.in/LinearVariableDifferntialTransformer/Simulator.html?domain=Electrical%2 0Engineering&lab=Sensor%20Lab

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS: CONTROL SYSTEMS:

1. PID controller simulation and learner kit–1 No.
2. Digital storage Oscillo scope for capturing transience-1 No
3. Personal Computer with control system simulation packages-5 Nos
4. CRO30MHz– 1 No.
5. 2MHz Function Generator –1 No.
6. Position Control Systems Kit (with manual)–1No.,Tacho Generator Coupling set
7. AC Synchro transmitter & receiver –1 No.
8. Sufficient number of Digital multimeters

INSTRUMENTATION:

9. R, L,C Bridge kit
10. a)Electric heater– 1No.Thermometer– 1No.Thermistor (silicon type) RTD nickel type– 1No.
    b) 30 psi Pressure chamber (complete set) – 1No. Current generator (0 – 20mA) Air foot pump– 1 No. (with necessary connecting tubes)
    c) LVDT 20 mm core length movability type –1No. CRO 30MHz– 1No.
    d) Optical sensor–1 No. Light source
    e) Strain Gauge Kit with Handy lever beam– 1No.72 100gm weights–10nos
    f) Flow measurement Trainer kit – 1 No. (1/2 HP Motor, Water tank, Digital milli ammeter, complete set)
11. Single phase Auto transformer – 1No. Watt-hour meter (energy meter) – 1No. Ammeter Voltmeter Rheostat Stop watch Connecting wires (3/20)
12. Instrumentation Amplifier kit-1No
13. Analog–Digital and Digital–Analog converters (ADC and DACs)-1No
14. Sufficient numbers of bread board

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	1	1	1	3	2	2	1
CO2	3	3	3	2	2	1	1	1	3	2	2	2
CO3	3	3	3	3	1	1	1	1	3	3	2	1
CO4	3	3	3	2	1	1	1	1	3	3	2	2
CO5	3	3	3	2	1	1	1	1	3	3	2	2
AVG	3	3	3	2	1	1	1	1	3	3	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	2	3
CO2	2	2	3
CO3	2	2	3
CO4	2	2	3
CO5	2	2	3
AVG	2	2	3

JPT1002	TECHNICAL SKILLS AND APTITUDE I	L	T	P	C
		0	0	2	*

COURSE OBJECTIVES:

- To make students analyze and solve problems in technical as well as quantitative aptitude.
- To enhance the Technical skills and basics of programming language
- To make students understand how to apply the practical knowledge with real time applications.
- To make students think and draw a conclusion from different scenarios.
- To help students understand python programming concepts

UNIT I OOPS CONCEPTS 6

What is object oriented programming?. Const and classes. Arrays and string arrays fundamentals. Arrays of object, string, The standard C++ String class. Operator overloading: Overloading unary operations. Concept of inheritance. Derived class and based class. Derived class constructors, member function, Virtual Function

UNIT II PYTHON I 6

Python interpreter and interactive mode; values and types: int, float, 97oolean, string, and list; variables, expressions, statements, tuple assignment, modules and functions.

UNIT III PYTHON II 6

Lists: list operations, list slices, list methods, list loop, mutability, aliasing, list parameters; Tuples: tuple assignment, Dictionaries: operations and methods; advanced list processing–list comprehension

UNIT IV QUANTITATIVE APTITUDE 6

Boats and streams–Time and work–Pipes and Cistern–Time and distance–Problems on Trains

UNIT V LOGICAL REASONING 6

Syllogism – Statement and Conclusion – Inequalities – Non Verbal Reasoning – Figure Analogy – Mirror and Water images – Paper cutting and Folding – Cubes and Dices – Pattern completion.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Apply OOPS concepts in applications
CO2: To enhance knowledge in python programming.
CO3: Gain knowledge in coding using the python programming.
CO4 : Solve complex arithmetic problems practically with real time applications.
CO5 : Think logically in solving problems, enhance decision making, for difficult situations.

TEXTBOOKS:

1. Dr. E. Balagurusamy, "Programming in C++" complete reference 8th Edition.
2. "THE COMPLETE REFERENCE PYTHON", Herbert schildt., McGraw Hill Education, 2011.
3. Python: The Complete Reference by Martin Brown and Martin C. Brown Published in 2014.

4. Python in a nut shell by Alex Martelli Revised in March 2013.
5. Dr.R.S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000.

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- https://www.indiabix.com/aptitude/questions-and-answers/
- https://m4maths.com/placement-puzzles.php
- www.freshersworld.com
- www.careerride.com
- www.youtube.com/watch/python
- www.youtube.com/watch/conceptsofpython
- https://stackoverflow.com/
- https://www.w3schools.com/
- https://www.geeksforgeeks.org/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	1	2	2	-	-	-	-	1
CO2	1	-	-	-	1	2	2	-	-	-	-	1
CO3	1	-	-	-	1	2	2	-	-	-	-	1
CO4	3	3	-	3	2	1	-	-	1	-	1	2
CO5	-	3	-	1	1	-	-	-	-	-	2	2
AVG	1	1	-	1	1	1	1	-	1	-	1	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	2	-	-
CO5	-	-	-
AVG	1	-	-

SEMESTER VI

JEE1601	CONTROL OF ELECTRICAL DRIVES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the steady state operation and transient dynamics of a motor load system.
- To study the operation of the converter/chopper fed dc drives, both qualitatively and quantitatively
- To impart knowledge on the operation and performance of Induction motor drives.
- To study the operation and performance of Synchronous motor drives.
  To accord knowledge on the controllers for DC drives

UNIT I DRIVE CHARACTERISTICS 9

Electric drive–Equations governing motor load dynamics–steady state stability–multi quadrant Dynamics: acceleration, deceleration, starting & stopping – typical load torque characteristics –Selection of motor-heating and cooling curves.

UNIT II CONVERTER/CHOPPER FED DC MOTOR DRIVE 9

Steady state analysis of the single and three phase converter fed separately excited DC motor drive–continuous conduction–Time ratio and current limit control – Type A, B, C, D chopper fed DC motor drives-4 quadrant operation of converter /chopper fed drive

UNIT III DESIGN OF CONTROLLERS FOR DRIVES 9

Transfer function for DC motor / load and converter – closed loop control with current and speed feedback–armature voltage control and field weakening mode – Design of controllers; current controller and speed controller-converter selection and characteristics

UNIT IV INDUCTION MOTOR DRIVES 9

Stator voltage control–v/f control– Voltage source inverter- current source inverter- Rotor resistance control–qualitative treatment of slip power recovery drives—closed loop control-vector control– Applications

UNIT V SYNCHRONOUS MOTOR DRIVES 9

V/f control and self-control of synchronous motor: Margin angle control and power factor control–Three phase voltage/current source fed synchronous motor-Applications

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To gain knowledge of steady state operation and transient dynamics of a motor load system.

CO2: To explain the operation of the converter/chopper fed dc drive

CO3: To understand the operation and performance of Induction motor drives

CO4: To understand the operation and performance of Synchronous motor drives
CO5: To understand design the controllers for DC drives

TEXTBOOKS:

1. Gopal K. Dubey, "Fundamentals of Electrical Drives", Second Edition, Narosa Publishing House,2010.
2. Bimal K.Bose., "Modern Power Electronics and AC Drives", First Edition, Pearson Education India, 2015.
3. Krishnan R., "Electric Motor & Drives: Modeling, Analysis and Control", First Edition, Pearson Education India, 2015

REFERENCE BOOKS:

1. Vedam Subramanyam, "Electric Drives Concepts and Applications", Second Edition, McGraw Hill, 2017.
2. Shaahin Felizadeh, "Electric Machines and Drives", First edition, CRC Press (Taylor and Francis Group), 2013.
3. John Hind marshand Alasda in Renfrew, "Electrical Machines and Drives System, "Elsevier 2012.
4. Theodore Wildi, "Electrical Machines, Drives and power systems, 6th edition, Pearson Education, 2015
5. DeN.K.., SENP.K. "Electric drives", PHI Learning, 2012.

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3. https://www.youtube.com/watch?v=9h2lEIpo74A
4. https://www.youtube.com/watch?v=96hvtQ8Qlvo
5. https://www.youtube.com/watch?v=5GuOQlNUgiw

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	1	1	-	2	1	3	2	1	2	3	2
CO2	1	2	3	2	1	3	1	-	2	2	1	1
CO3	2	2	1	1	3	1	2	3	2	1	3	2
CO4	2	-	3	3	-	2	2	1	1	3	2	2
CO5	1	3	2	1	2	1	1	3	3	-	1	-
AVG	2	2	2	1	2	2	2	2	2	2	2	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	2
CO2	1	3	-
CO3	3	-	3
CO4	1	2	1
CO5	-	2	2
AVG	1	2	2

JEE1602	POWER SYSTEM ANALYSIS, OPERATION AND CONTROL	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To learn the basic concept of power system and its components.
- To impart knowledge on balanced fault analysis
- To impart knowledge on unbalanced fault analysis
- To provide knowledge on Load Frequency Control
- To study about Economic Dispatch and Unit commitment

UNIT I POWER FLOW ANALYSIS-INTRODUCTION 12

Need for system planning and operational studies–basic components of a power system.– Single line diagram – per phase and per unit analysis – Generator – transformer – transmission line and load representation for different power system studies.-Primitive network–construction of Y-bus using inspection — Z-bus. Importance of power flow analysis in planning and operation of power systems –classification of buses – iterative solution using Gauss-Seidel method and Newton-Raphson method

UNIT II FAULT ANALYSIS—BALANCED FAULTS 12

Importance of short circuit analysis – assumptions in fault analysis – analysis using Thevenin's theorem – Z-bus building algorithm – fault analysis using Z-bus – computations of short circuit capacity, post fault voltage and currents

UNIT III FAULT ANALYSIS—UNBALANCED FAULTS 12

Introduction to symmetrical components – sequence impedances – sequence circuits of synchronous machine, transformer and transmission lines – sequence networks analysis of single line to ground, line to line and double line to ground faults using Thevenin's theorem and Z-bus matrix.

UNIT IV LOAD FREQUENCY CONTROL 12

An overview of power system operation and control–system load variation–load characteristics – load curves and load-duration curve – load factor – diversity factor – Importance of load forecasting and quadratic and exponential curve fitting techniques of forecasting – plant level and system level controls. Basics of speed governing mechanism and modeling–speed-load characteristics–load sharing between two synchronous machines

in parallel–control area concept– LFC control of a single-area system and two-area system

UNIT V UNIT COMMITMENT AND ECONOMIC DISPATCH 12

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

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand and analyze power system components
CO2: To analyze three phase fault using. Thevenins theorem and bus building algorithm
CO3: To analyze LG, LL and LLG fault using Thevenins theorem and Bus building algorithm
CO4: To understand Load Frequency Control of single and two area system
CO5: To gain knowledge on Economic Dispatch and Unit commitment

TEXT BOOKS:

1.John J. Grainger, William D. Stevenson, 'Power System Analysis' ,McGraw Hill Education (India) Private Limited, New Delhi, 2015.
2.Soni. M.L, P.V.Gupta, U.S. Bhatnagar, A. Chakrabarti, 'A Text Book on Power System Engineering', Dhanpat Rai & Co.,2013.
3. Kothari D.P. and Nagrath I.J., 'Power System Engineering', Second Edition,Tata McGraw-Hill Education, 2008.
4. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2016.
5.Abhijit Chakrabarti and Sunita Halder,'Power System Analysis Operation and Control', Third Edition, PHI learning Pvt. Ltd., New Delhi, 2010

REFERENCE BOOKS:

1. Hadi Saadat,'Power System Analysis', 21st reprint, McGraw Hill Education Pvt. Ltd., New Delhi, 2010
2. Wadhwa .C.L., 'Electrical Power Systems', 6th Edition, New Age International (P) Ltd.,2018
3. Duncan J. Glover, Mulukutla S .Sarma, Thomas J. Overbye, 'Power System Analysis & Design', Fifth Edition, Cengage Learning, 2012.
4. Gupta B.R., 'Power System-Analysis and Design', S. Chand Publishing, 2 014.
5. Metha.VK, 'Principles of Power Systems', 3rd Edition, S.Chand Publishing, 2005.

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2. https://youtu.be/QrHUni0NJws
3. https://youtu.be/VPFfHcAhdm4
4. https://youtu.be/FTZNkooQkKI
5. https://youtu.be/s894N_KoTek
6. https://youtu.be/6M0t4f_5G20

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	1	1	-	-	-	1	1	1
CO2	2	3	2	2	1	2	1	1	1	1	2	1
CO3	3	2	2	2	1	1	1	1	1	1	2	2
CO4	3	3	3	3	3	2	2	1	1	1	3	2
CO5	2	2	2	1	3	1	3	2	2	2	3	2
AVG	3	3	2	2	2	1	1	1	1	1	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	2	1	1
CO3	2	1	2
CO4	3	2	3
CO5	3	2	3
AVG	2	1	2

JEE1611	POWER ELECTRONICS AND DRIVES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To impart theoretical and practical skills in switching characteristics various switches. To experimentally verify the performance of AC to DC converter circuits, DC to AC circuits and AC to AC converters

LIST OF EXPERIMENTS

1. Gate Pulse Generation using R, RC and UJT.
2. Characteristics of SCR and TRIAC
3. Characteristics of MOSFET and IGBT
4. Characteristics of GTO & IGCT.
5. AC to DC half controlled Converter
6. AC to DC fully controlled Converter
7. Step down and step up MOSFET based choppers
8. IGBT based single phase PWM inverter
9. IGBT based three phase PWM inverter
10. AC Voltage controller
11. Switched mode power converter.
12. Simulation of PE circuits (1 Ø & 3Ø semi converters, 1 Ø & 3 Ø full converters, DC-DC converters, AC voltage controllers)
13. Simulation of Stepper Motor.
14. Simulation of 3 ØA synchronous motor
15. Design of 1Ø inverter and UPS

TOTAL: 60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To acquire knowledge on simulation software
CO2: To experiment about switching characteristics various switches
CO3: To demonstrate about AC to DC converter circuits, DC to AC circuits and AC to AC Converters
CO4: To demonstrate about DC to AC circuits
CO5: To demonstrate about AC to AC converters.

WEBSITE REFERENCES:

1. www.nptel.com
2. http://vlabs.iitb.ac.in/vlabs-dev/labs/mit_bootcamp/power_electronics/labs/index.php
3. https://www.youtube.com/watch?v=odna3YR7oMs
4. https://vlsi-iitg.vlabs.ac.in/MOSFET_theory.html
5. https://www.iitg.ac.in/cseweb/vlab/vlsi/

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

Device characteristics (for SCR, MOSFET, TRIAC, GTO, IGCT and IGBT kit with built-in /discrete power supply and meters) -2 each

1. Single phase SCR based half controlled converter and fully controlled converter along with built-in/separate/firing circuit/module and meter–2 each
3. MOSFET based step up and stepdown choppers (Built in/Discrete) –1 each
4. IGBT based single phase PWM inverter module/Discrete Component–2
5. IGBT based three phase PWM inverter module/Discrete Component –2
6. Switched mode power converter module/Discrete Component–2

7. SCR&TRIAC based 1phaseA C controller along with lamp or rheostat load-2
8. Cycloconverter kit with firing module –1
9. Dual regulated DC power supply with common ground
10. Cathode ray Oscilloscope –10
11. Isolation Transformer–5
12. Single phase Auto transformer–3
13. Components (Inductance, Capacitance) 3 set for each
14. Multi meter– 5
15. LCR meter–3
16. Rheostats of various ranges–2 sets of 10 value
17. DC and AC meters of required ranges– 20

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	3	2	2	1	1	1	2	1
CO2	2	3	3	3	2	1	2	1	2	1	2	1
CO3	3	2	2	2	3	1	1	1	1	1	2	1
CO4	3	3	3	3	2	1	2	1	1	1	2	1
CO5	2	3	3	2	3	1	2	1	1	1	2	1
AVG	3	3	3	2	3	1	2	1	1	1	2	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	2
CO2	3	3	2
CO3	2	3	3
CO4	3	2	2
CO5	3	3	3
AVG	3	3	2

JEE1612	POWER SYSTEM SIMULATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To impart knowledge about the concepts of Power System, skills of using computer packages MATLAB coding in power system studies
- To get an exposure about Load frequency control and Economic dispatch in Power systems
- To impart skills of using ETAP software for load flow analysis, short circuit and stability analysis
- To get an overview about State Estimation and electromagnetic Transients in Power systems

LIST OF EXPERIMENTS

1. Computation of Transmission Line Parameters
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks
3. Power Flow Analysis using Gauss-Seidel Method
4. Power Flow Analysis using Newton Raphson Method
5. DC Load Flow Analysis
6. Symmetric fault analysis
7. Unsymmetrical fault analysis
8. Economic Dispatch in Power Systems
9. Load–Frequency Dynamics of Single-Area and Two-Area Power Systems
10. State estimation: Weighted least square estimation
11. Electromagnetic Transients in Power Systems :Transmission Line Energization

TOTAL:60 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the concepts of power system planning and operational studies
CO2: To acquire knowledge on Formation of Bus Admittance and Impedance Matrices and Solution of Networks
CO3: To Design and calculate Transmission line parameters
CO4: To Calculate and understand concept of economic dispatch
CO5: To analyze the load flow, short circuit and stability analysis using ETAP software

REFERENCE BOOKS:

1. Wadhwa.. C.L., 'Electrical Power Systems',6th Edition, NewAge International Ltd.,2018
2. Hadi Saadat, 'Power System Analysis', 21st reprint, Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2010.
3. NagrathI.J. and Kothari D.P., 'Modern Power System Analysis', Fourth Edition, Tata McGraw-Hill, 2011
4. Abhijit Chakrabarti and Sunita Halder, 'Power System Analysis Operation and Control',

Third Edition, PHI learning Pvt. Ltd., New Delhi, 2010

5. Metha..VK, 'Principles of Power Systems',3rd Edition, S.Chand Publishing, 2005

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4. https://youtu.be/VPFfHcAhdm4
5. https://youtu.be/FTZNkooQkKI
6. https://youtu.be/s894N_KoTek

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	1	1	1	2	2	2	1	1
CO2	2	3	2	2	2	1	-	-	-	2	1	1
CO3	2	3	3	3	2	2	1	-	-	1	1	2
CO4	2	3	2	2	1	2	2	1	1	2	1	1
CO5	2	3	3	3	3	3	2	2	2	1	2	3
AVG	2	3	2	2	2	2	1	1	1	2	1	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	1	3
CO2	2	2	2
CO3	2	3	3
CO4	3	3	3
CO5	3	2	3
AVG	3	2	3

JEE1621	MINI PROJECT	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To introduce the basic practical concepts of engineering projects.
- To provide students an opportunity to exercise their creative and innovative qualities in a group project environment.
- To excite the imagination of aspiring engineers, innovators and technopreneurs.

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.

METHOD OF EVALUATION:

The assessment of Mini Project consists of assessment by Guide (75%) and assessment by moderator (25%) in the following areas:

- Technical knowledge and Skills
- Project Report
- Oral Presentation
- Attendance and Participation
- Logbook/Interview
- Demonstration

TOTAL:30 PERIODS

COURSE OUTCOMES:

On completion of the mini project, the students will be able

CO1: In a position to take up their final year project work and find solution by formulating proper methodology.

CO2: To work on practical engineering projects.

CO3: To enhance the creativity and group activity and able to apply the practical concepts Into innovative ideas

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	3	3	3	3	3	2	2
CO2	3	3	3	2	1	3	3	3	3	3	2	2
CO3	3	3	3	3	2	1	3	3	3	1	2	2
AVG	3	3	3	2	1	2	3	3	3	2	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	3
AVG	3	3	2

JPT1002	TECHNICAL SKILLS AND APTITUDE II	L	T	P	C
		0	0	2	1

OBJECTIVES

- To make students analyze and solve problems in technical as well as quantitative aptitude. Enhance the technical skills and basics of programming language
- To make the students understand how to apply the practical knowledge in

real time applications.

- To make the students think and draw conclusions from different scenarios.
- To help the students understand JAVA programming concepts
- To help the students understand concepts and develop new applications in JAVA

UNIT I JAVA FUNDAMENTALS 6

OOP in Java–Characteristics of Java–Java Source-File-Structure–Compilation. Fundamental Programming Structures in Java.

UNIT II ADVANCED JAVA PROGRAMMING 6

Defining classes in Java–constructors, methods-access specifiers–static members-Data Types, Variables, Operators, Control Flow, Arrays, Inheritance–Super classes-sub classes–Protected members–constructors in sub classes- Inter faces–Strings.

UNIT III MATHEMATICAL AND ARITHMATIC PROBLEM SOLVING 6

Crypto arithmetic Problem Solving, Logarithms, Trigonometry, Mensuration, Probability, Permutations and Combinations.

UNIT IV LOGICAL REASONING- CO GNITIVE THINKING 6

Numerical Ability, English Ability, Gaming, Arrangements, Visual Reasoning, Flowcharts –Visual Reasoning–DI.

UNIT V LOGICAL REASONING- CRITICAL THINKING 6

Logical Sequence, Inferred Meaning, Agree Disagree Psychometric, Statement & Conclusions, Cubes and Cuboids.

TOTAL: 30 PERIODS

COURSE OUTCOMES:

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

CO1: Enhance their knowledge in JAVA concepts and Java Programming.

CO2: Gain knowledge in coding using JAVA programming.

CO3: Solve complex arithmetic problems practically with real time applications.

CO4: Think logically in solving problems, enhance decision making, for difficult situations

TEXT BOOKS:

1. Herbert Schildt, “Java The complete reference”, 8th Edition, McGraw Hill Education, 2 011.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.
3. Dr.R.S Agrawal, “Quantitative Aptitude” and Non Verbal Reasoning published in 2000.
4. S.Chand–A Modern Approach to Logical Reasoning Published in 2000.

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2. https://m4maths.com/placement-puzzles.php
3. www.freshersworld.com
4. www.careerride.com
5. www.youtube.com/watch/python
6. www.youtube.com/watch/conceptsofpython
7. https://stackoverflow.com/
8. https://www.w3schools.com/
9. https://www.geeksforgeeks.org/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	-	-	-	1	2	2	-	-	-	-	1
CO2	1	-	-	-	1	2	2	-	-	-	-	1
CO3	3	3	-	3	2	1	-	-	1	-	1	2
CO4	-	3	-	1	1	-	-	-	-	-	2	2
CO5	-	3	-	1	1	-	-	-	-	-	2	2
AVG	1	2	-	1	1	1	1	-	1	-	1	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	2	-	-
CO4	2	-	-
CO5	2	-	-
AVG	1	-	-

SEMESTER VII

JEE1701 E-VEHICLES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To introduce the fundamental concepts, principles of hybrid electric vehicles.
- To provide knowledge about various aspects of electric and hybrid drive train and their configuration
- To impart knowledge on the types of electrical machines used for propulsion applications
- To study the energy storage systems and energy management used for vehicle applications
- To learn about charging station required for electric vehicles.

UNIT I INTRODUCTION TO E-VEHICLE 9

Basics of vehicles mechanisms, history of Electric Vehicles (EV) and Hybrid Electric Vehicles (HEV), need and importance of EV and HEV, Power/Energy supplies requirements for EV/HEV applications, vehicle power source characterization, and transmission characteristics.

UNIT II DRIVE-TRAIN TOPOLOGIES 9

Review of electric traction, various electric drive-train topologies, basics of hybrid traction system, various hybrid drive-train topologies, power flow control in drive-train topologies, fuel efficiency analysis.

UNIT III DC AND AC MACHINES FOR PROPULSION APPLICATIONS 9

Electric system components for EV/HEV, suitability of DC and AC machines for EV/HEV applications, AC and DC Motor drives. Advanced permanent magnet and switch reluctance machines, configuration and control of drives.

UNIT IV ENERGY STORAGE AND MANAGEMENT IN EV/HEV 9

Requirements of energy supplies and storage in EV/HEV, Review of batteries, fuel cells, flywheels and ultra-capacitors as energy sources for EV/HEV, characteristics and comparison of energy sources for EV/HEV, hybridization of different energy sources.

Energy management: EV/HEV energy management strategies, classification and comparison of various energy management strategies, energy efficiency comparison for various EV and HEV variants.

UNIT V ELECTRIC VEHICLES CHARGING STATION 9

Electric Vehicles charging station, Components of charging station, Type of Charging station, Selection and Sizing of charging station, Single line diagram of charging station, Introduction to Electric Vehicle Charging Infrastructure .

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the basic concepts and principles of electric vehicles

- To gain knowledge on different topologies of drive trains.
- To acquire the knowledge on various machines used for propulsion applications
- To gain knowledge about energy storage systems and energy management
- To gain knowledge on Electric vehicle charging station.

TEXT BOOKS:

1.Babu.A.K, "Electric and Hybrid Vehicles ", Khanna Publishing Housing, Second Edition, 2022
2.Iqbal Hussain, "Electric and Hybrid Vehicles-Design Fundamentals", CRC Press, Second Edition, 2011.
3.Mehrdad Ehsani, YiminGao, and Ali Emadi, "Modern Electric, Hybrid and Fuel Cell Vehicles: Fundamentals", CRC Press,2010.

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1.Sunil.R.Pawar, “Electrical Vehicle Technology: The Future Towards Eco-Friendly Technology”, Notion Press,2021.
2.James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2003.
3.Sandeep Dhameja, “Electric Vehicle Battery Systems”, Newnes, 2000
4.Chris Mi, MA Masrur, and D W Gao, "Hybrid Electric Vehicles- Principles and Applications with Practical Perspectives", Wiley,2011.

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4. https://youtu.be/GFpEXekI-BM
5. https://youtu.be/Blo9vyV_QDE
6. https://youtu.be/LDRq-odYAbA

CO –PO& PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	2	3	1	1	-	1	1	-	1	1	-	2	2	1	-
CO2	2	2	1	1	-	1	1	-	1	1	-	1	2	1	-
CO3	2	2	1	1	-	1	1	-	1	1	-	1	2	2	-
CO4	2	2	1	1	-	1	1	-	1	1	-	2	2	1	-
CO5	2	2	1	1	-	1	1	-	1	1	-	1	2	1	-
AV G	2	2	1	1	-	1	1	-	1	1	-	1	2	1	-

JEE1702 POWER ELECTRONICS FOR RENEWABLE ENERGY SYSTEMS **L T P C**
3 0 0 3

COURSE OBJECTIVES:

- To study the various types of renewable energy systems
- To learn the principle of operation and working of machines used for renewable energy conversion
- To equip with required skills to derive the criteria for the design of power converters for renewable energy applications.
- To impart knowledge on the stand alone and grid connected renewable energy systems
- To introduce the concept of hybrid renewable energy system and MPPT techniques.

UNIT I INTRODUCTION TO RENEWABLE ENERGY SYSTEMS 9

Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9

Review of reference theory fundamentals-principle of operation and analysis: IG, PMSG, SCIG and DFIG

UNIT III POWER CONVERTERS 9

Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers- AC-DC-AC converters: uncontrolled rectifiers, PWM Inverters, Grid Interactive Inverters-matrix converters.

UNIT IV ANALYSIS OF WIND AND PV SYSTEM 9

Stand alone operation of fixed and variable speed wind energy conversion systems and solar system- Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system.

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9

Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV -Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To gain knowledge about the environmental aspects and impacts of renewable energy resources.
- To understand the concepts of various machines used for renewable energy conversion
- To design and understand the operation of various power converters.
- To acquire knowledge on the stand alone and grid connected renewable energy systems
- To pertain the knowledge on hybrid energy systems and concepts of various MPPT techniques

TEXT BOOKS:

1.KothariD.P. ,Singal K.C, Rakesh Ranjan , "Renewable Energy Sources and Emerging Technologies", PHI learning 2022

2. Bhadra S. N., Kastha D., BanerjeeS., "Wind Electrical Systems", Oxford University Press, 2005.

3.KhanB.H. Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi, 2017.

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3.Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.

4.Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.

5.Andrzej M. Trzynnadlowski, 'Introduction to Modern Power Electronics', Second edition, wiley India Pvt. Ltd, 2014

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2. https://youtu.be/44Wp3WE1AHs

3. https://youtu.be/DNPu_JcGeTY

4. https://youtu.be/xKxrkht7CpY

5. https://youtu.be/Tjm-Oa4GKW0

6. https://youtu.be/JSTDFJXAdNM

CO –PO & PSO MAPPING

CO\PO ,PSO	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 O1	PS O2	PS O3
CO1	2	3	-	1	-	1	1	-	-	1	-	2	2	2	1
CO2	2	2	-	1	-	1	1	-	-	1	-	1	2	1	1
CO3	2	2	-	1	-		1	-	-	1	-	1	2	2	1
CO4	2	2	-	1	-	1	1	-	-	1	-	2	2	2	1
CO5	2	2	-	1	-	1	1	-	-	1	-	1	2	1	1
AVG	2	2	-	1	-	1	1	-	-	1	-	1	2	2	1

JBA 1711 ENTREPRENEURSHIP FOR ENGINEERS

L	T	P	C
0	0	2	1

COURSEOBJECTIVES:

- To provide exposure on insight of entrepreneurship
- To investigate the feasibility study for the new venture.
- To identify the right process for successful business plan

Sl.No	LIST OF ACTIVITIES	No.of Periods
1	Insight of Entrepreneurship	1
2	Business Idea	1
3	Business sources	1
4	Business Plan	1
5	Financial Plan	1
6	Market Survey	2
7	Feasibility report	2
8	Case study	3
9	Entrepreneurship Que Card	2
10	Prevention of Sickness & Measures	1

TOTAL: 20 PERIODS

COURSE OUTCOMES:

Students will be able,

- To procure knowledge on setting up of new venture
- To draft and approval of financial plan and appraisal of new project
- To impart the knowledge of effectiveness of innovation in entrepreneurship

REFERENCES

1.Hisrich, RobertD.,Michael Peters and Dean Shepherded, Entrepreneurship,Tata Mc Graw Hill,2014.
2. SS.Khanka, Entrepreneurial Development,Third Edition,S.Chand&company,NewDelhi2001.
3. Srinivasan, Case Studies in marketing Indian context, sixth edition PHI learning private Limited 2014.
4. Lall, Madhurima, and Shikha Sahai, Entrepreneurship, Excel Book, NewDelhi. 2008.

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- https://www.bajajfinserv.in/what-are-the-sources-of-finance-for-entrepreneurs
- https://www.babson.edu/academics/undergraduate-school/core-experiences/foundations-of-management-and-entrepreneurship/
- https://www.businessgig.com/business-plan-preparation
- https://www.financierworldwide.com/the-impact-of-social-entrepreneurship-on-economic-growth

JEE1712 RENEWABLE ENERGY SYSTEMS LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To familiarize with Renewable Energy Sources and technologies
- To provide the adequate skills to perform the simulation study of various renewable energy conversion systems and controllers.
- To impart knowledge on the experimental verification of renewable energy systems.

LIST OF EXPERIMENTS

1. Simulation study on Solar PV Energy System
2. Simulation study of V-I characteristics of solar panel at various levels of insolation
3. Study of 1kW solar PV plant
4. Experiment on "VI-Characteristics and Efficiency of Solar PV System".
5. Experiment on "Shadowing effect &diode-based solution in Solar PV System".
6. Simulation study on Wind Energy Generator.
7. Simulation study on Hybrid (Solar-Wind) Power System.
8. Simulation study on Hydroelectric Generator.
9. Simulation on Performance Assessment of Fuel Cell.
10. Simulation study on Intelligent Controllers for solar PV Systems.

TOTAL :60 PERIODS

COURSE OUTCOMES: At the end of the course, the student will able

- To understand and analyze Renewable energy systems
- To attain adequate inputs on a variety of issues in harnessing Renewable Energy.
- To simulate various Renewable energy sources
- To acquire knowledge about hybrid system.
- To understand basics of Intelligent Controllers

WEBSITES:

1.www.nptel.ac.in
2. https://youtu.be/44Wp3WE1AHs
3. https://youtu.be/DNPu_JcGeTY
4. https://youtu.be/xKxrkht7CpY
5. https://youtu.be/Tjm-Oa4GKW0
6. https://youtu.be/JSTDFJXAdNM

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	2	3	-	1	-	1	1	-	-	1	-	2	2	2	1
CO2	2	2	-	1	-	1	1	-	-	1	-	1	2	1	1
CO3	2	2	-	1	-		1	-	-	1	-	1	2	2	1
CO4	2	2	-	1	-	1	1	-	-	1	-	2	2	2	1
CO5	2	2	-	1	-	1	1	-	-	1	-	1	2	1	1
AV G	2	2	-	1	-	1	1	-	-	1	-	1	2	2	1

JEE1711 SIMULATION AND HARDWARE IMPLEMENTATION LABORATORY

L	T	P	C
0	0	4	2

COURSE OBJECTIVES:

- To impart knowledge on simulation of various power electronic converters.
- To learn the pulse generation using microcontrollers
- To provide knowledge on hardware implementation of converter and inverter

LIST OF EXPERIMENTS

1. Simulation of Single Phase controlled Rectifiers with various filters.
2.Simulation of Single Phase square wave / PWM inverters
3.Simulation of Buck-Boost Converter
4. Simulation of Cuk Converter
5. Simulation of SEPIC Converter
6. Simulation of Three Phase square wave inverters
7.Implementation of Power Supply Circuit
8.Implementation of Driver Circuit using IR2110
9. Implementation of Driver Circuit using MCT2E (Opto Coupler)
10.Study of microcontroller programming
11.Implementation of Controller Circuit
12.Implementation of Boost Converter
13. Implementation of Single-Phase Rectifier
14. Implementation of Single-Phase Inverter

TOTAL :60 PERIODS

COURSE OUTCOMES: At the end of the course, the student will able

- To simulate various power electronic converters.
- To understand the working of power converter circuits.
- To analyze the performance of power converter circuits.
- To execute the program using micro controller circuits
- To design and realize the hardware implementation of control and power circuits.

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	2	3	2	2	2	1	-	-	-	2	1	1	1	1	1
CO2	1	3	3	3	2	2	1	-	-	1	1	-	2	1	1
CO3	2	3	2	2	1	2	2	-	-	2	1	1	2	-	1
CO4	1	2	2	2	1	2	2	-	-	1	-	1	3	1	-
CO5	2	3	3	3	2	1	2	-	-	1	1	1	2	2	-
AV G	2	3	2	2	2	2	2	-	-	1	1	1	2	1	1

JEE1731 PROJECT WORK -PHASE I

L	**T**	**P**	**C**
0	**0**	**6**	**3**

COURSE OBJECTIVES:

- To identify a specific problem for the present need of the society and collecting information related to the same through detailed literature survey.
- To develop the methodology to solve the identified problem.
- To design, analyze and simulate the chosen problem using the software package.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

METHOD OF EVALUATION:

The students in a group of 3 to 4 work on a topic approved by the Head of the Department under the guidance of a faculty member, prepare 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 is constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report, jointly by external and internal examiners.

TOTAL: 90 PERIODS

COURSE OUTCOMES:

On completion of the phase - 1 project work, the students will be able to

- Analyze and formulate the problem
- Identify the methodology needed to solve the problem.
- Identify the tools and techniques required to solve the problem.
- Work with team mates to acquire the required material needed to find solutions to the chosen problem.
- Effectively communicate the outcomes of the findings.

SEMESTER VIII

		L	T	P	C
JNC1861	**INDIAN CONSTITUTION**	**2**	**0**	**0**	**0**

COURSE OBJECTIVES:

- To understand the importance of Indian constitution, Administration, Concept and Development of Human Rights, election commission.

UNIT I INTRODUCTION TO INDIAN CONSTITUTION 6

Constitution' meaning of the term, Indian Constitution- Sources and constitutional history, Features- Citizenship, Preamble, Fundamental Rights and Duties, Directive Principles of State Policy

UNIT II UNION GOVERNMENT AND ITS ADMINISTRATION 6

Structure of the Indian Union: Federalism, Centre- State relationship, President: Role, power and position, PM and Council of ministers, Cabinet and Central Secretariat, Lok Sabha, Rajya Sabha, The Supreme Court and High Court: Powers and Functions; **State Government and its Administration** Governor: Role and Position, CM and Council of ministers, State Secretariat: Organization, Structure and Functions

UNIT III LOCAL ADMINISTRATION 6

A: Local Administration District's Administration head: Role and Importance, Municipalities: Introduction, Mayor and role of Elected Representative, CEO of Municipal Corporation,

B: Pachayati raj: Introduction, PRI: Zila Pachayat, Elected officials and their roles, CEO Zila Pachayat: Position and role, Block level: Organizational Hierarchy (Different departments), Village level: Role of Elected and Appointed officials, Importance of grass root democracy

UNIT IV CONCEPT AND DEVELOPMENT OF HUMAN RIGHTS 6

Meaning Scope and Development of Human Rights, United Nations and Human Rights – UNHCR, UDHR 1948, ICCPR 1996 and ICESCR 1966, Human Rights in India: Protection of Human Rights Act,1993 (NHRC and SHRC), First, Second and Third Generation Human Rights, Judicial Activism and Human Rights.

UNIT V ELECTION COMMISSION 6

Election Commission- Role and Functioning, Chief Election Commissioner and Election Commissioners, State Election Commission: Role and Functioning, Institute and Bodies for the welfare of SC/ST/OBC and women.

TOTAL:30 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able to:

- Know the sources, features and principles of Indian Constitution.
- Learn about Union Government, State government and its administration.
- Get acquainted with Local administration and Pachayati Raj.
- Be aware of basic concepts and developments of Human Rights.
- Gain knowledge on roles and functioning of Election Commission.

REFERENCES:

1. Durga Das Basu, Introduction to the Constitution of India, Prentice – Hall of India Pvt. Ltd. New Delhi
2. Subash Kashyap, Indian Constitution, National Book Trust
3. J.A. Siwach, Dynamics of Indian Government &Politics
4. D.C. Gupta, Indian Government and Politics
5. H.M.Sreevai, Constitutional Law of India, 4th edition in 3 volumes (Universal Law Publication)
6. J.C. Johari, Indian Government and Politics Hans
7. J. Raj Indian Government and Politics
8. M.V. Pylee, Indian Constitution Durga Das Basu, Human Rights in Constitutional Law, Prentice – Hall of India Pvt. Ltd. New Delhi
9. Noorani, A.G., (South Asia Human Rights Documentation Centre), Challenges to Civil Right), Challenges to Civil Rights Guarantees in India, Oxford University Press 2012

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4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

JEE1832	PROJECT WORK - PHASE - 2	L	T	P	C
		0	0	18	9

COURSE OBJECTIVES:

- To develop the ability to solve a specific problem related to their subject expertise.
- To develop the methodology to solve the identified problem.
- To design, analyze and implement the chosen problem using the hardware components.
- To validate the simulation, hardware results with the theoretical results.
- To train the students in preparing project reports and to face reviews and viva-voce examination.

METHOD OF EVALUATION:

The students in a group of 3 to 4 work on a topic approved by the Head of the Department under the guidance of a faculty member, prepare 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 is constituted by the Head of the Department. The project work is evaluated based on oral presentation and the project report, jointly by external and internal examiners.

TOTAL: 270 PERIODS

COURSE OUTCOMES:

On Completion of the project work, the student will be able to

- Apply the technical knowledge acquired for solving real world problems.
- Develop skills such as self learning, critical thinking, problem solving, project management and finance.
- Apply modern tools and techniques.
- Work with team mates and collectively work towards the success of the project.
- Communicate effectively to present the outcomes of the project both in written and oral forms.

JEE1851	COMPREHENSION & TECHNICAL SEMINAR	L	T	P	C
		0	0	2	1

COURSE OBJECTIVES:

- To revamp the knowledge gained in the semester and prepare the students to face interview both at the academic and the Industrial Sector
- To encourage the students to study about the recent developments in the field
- To prepare and present technical reports
- To encourage the students to use various teaching aids such as Power point presentation and Demonstrative models

METHOD OF EVALUATION:

COMPREHENSION:

One period is allotted for comprehension. During this period, a test with objective type questions from competitive exams is conducted in identified technical courses. The evaluation is purely internal. Average of all the test marks shall be calculated , a weightage of 50 marks is awarded to the comprehension component.

TECHNICAL SEMINAR:

Three periods are allotted for the technical seminar. During the seminar session each student is expected to prepare and present a technical topic for duration of 10 minutes.

Each student is expected to make presentation at least twice during the semester and the student is evaluated based on various parameters such as topic chosen, content delivery, communication skills and presentation. A faculty guide is allotted who shall guide and monitor the progress and attendance of all the students. Equal weightage is considered for the two seminar sessions for a total weightage of 50 marks.

The total mark awarded for the course shall be the sum of marks scored out of 50 each for the two components. Evaluation is purely internal.

TOTAL : 30 PERIODS

COURSE OUTCOMES:

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

- Consolidate all the engineering concepts acquired in the course of study.
- Enrich their technical knowledge.
- Prepare and present technological developments.
- Communicate effectively the concepts related to the various topics.
- Face the interviews with confidence during the placement drives

PROFESSIONAL ELECTIVE – 1

SEMESTER V

JBA1038	PRINCIPLES OF MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To infer the basic concepts of Management.
- To explain the importance of planning and decision-making.
- To assess organizational structure and human resource planning.
- To discuss the various component of leading function
- To explain the various techniques of controlling using computers.

UNIT I CONCEPT AND APPROACHES IN MANAGEMENT 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - Managerial roles and skills – Evolution of Management – Scientific, human relations, system and contingency approaches-Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques– Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization Structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization–Job Design - Human Resource Management–HR Planning, global Recruitment and selection, Training and Development, Performance Management, Career planning and management.

UNIT IV LEADING 9

Foundations of individual and group behaviour–motivation–motivation theories–motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication –effective communication–communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of Computers and IT in Management control –Productivity problems and management–control and performance– direct and preventive control.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: Discuss the concept to f manage rial functions.
CO2: Apply decision-making strategies for uncertainty situations.
CO3: Infer about Recruitment and selection process.

CO4: Demonstrate leadership quality and effective communication skill
CO5: Apply the skills to estimate productivity.

TEXT BOOKS:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management "Pearson Education, 9th Edition, , 2013.
2. Harold Koontz &Heinz Weihrich "Essentials of management" Tata Mc Graw Hill Education, 10thedition, 2015.

REFERENCE BOOKS:

1. Robert Kreitner & Mamata Mohapatra,"Management", Biztrantra, 2008.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert" Management", Pearson Education, 6th Edition, 2004.
3. Tripath P C& ReddyPN, "Principles of Management", Tata Mc Graw Hill, 5th edition, 2012.
4. P.C.TulIsian, "Business Management",Pearson India, 4th edition, 2013.
5. C.B.Gupta, "Management Concepts Practices", Sultan Chand, 9th edition, 2016.

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2. https://www.businessmanagementideas.com/planning/steps -involved-in-planning-process
3. https://www.ciesin.com.columbia.edu/decentralisation/differentforms.html
4. https://www.toppr.com/communicatio/barriers-in-communication
5. https://www.businessmanagementideas.com/management/controlling-process

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	1	-	1	-	1
CO3	-	-	-	-	-	-	-	1	-	1	-	1
CO4	-	-	-	-	-	-	-	1	-	1	-	1
CO5	-	-	-	-	-	-	-	1	-	1	-	1
AVG	-	-	-	-	-	-	-	1	-	1	-	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	-	-	-

JBA1039	TOTAL QUALITY MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To infer the core values of Total Quality Management
- To assess the quality philosophies in managerial perspective.
- To determine the quality management tools and techniques
- To explain the process control methodology.
- To evaluate the best practices for attainment of quality.

UNIT I BASIC CONCEPTS OF QUALITY MANAGEMENT 9

Introduction- Need for Quality - Definition of Quality - Quality statements – vision, mission and policy statements. Customer Focus – customer perception of quality, Translating needs into requirements, customer retention. Dimensions of product and service quality - Cost of quality-TQM framework, benefits, awareness and obstacles–overview of Lean Manufacturing

UNIT II TQM PRINCIPLES AND PHILOSOPHIES 9

Overview of the contributions of Deming, Juran Crosby, Masaaki Imai, Feigenbaum, Ishikawa, Taguchi techniques – introduction, loss function, parameter and tolerance design, signal to noise ratio –Concepts of Quality circle-Japanese 5S principles and 8D methodology.

UNIT III TQM TOOLS AND TECHNIQUE 9

The Seven Traditional tools of Quality – New Seven Management tools of Quality –Failure mode effect analysis (FMEA) – Bench marking-Process and reasons for Bench marking-POKAYOKE—Quality Function Deployment (QFD)

UNIT IV TQM PROCESS CONTROL METHODOLOGIES 9

Control Charts- Process Capability - Six Sigma- Concepts, Methodology, Applications to Manufacturing, Service sector including IT -Total productive maintenance (TPM) – Business process Improvement (BPI)

UNIT V QUALITY SYSTEMS 9

Introduction - quality management systems – Process of obtaining ISO certification – Quality Auditing -ISO 9001: 2015 certification. Malcolm Baldrige National Quality Award-TQM Implementation in manufacturing and service sectors-TQM culture-Quality council.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

CO1: Apply appropriate techniques in identifying customer needs
CO2: Apply quality philosophies for continuous improvement and ensure customer delight.
CO3: Apply the various tools in quality management
CO4: Measure the process effectiveness and identify the areas for improvement
CO5: Evaluate the performance excellence of an organization

TEXT BOOKS:

1. Dale H.Besterfield, Carol Besterfield Michna, Glen H. Besterfield, Mary Bester field – Sacre, Hermant–Urdhwareshe, Rashmi Urdhwareshe, Total Quality Management,

,Pearson Education, 4thEdition, 2015.
2. Shridhara Bhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, 2ndEdition 2010.

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1. Panneerselvam, R.and Sivasankaran,P.,Quality Management, PHI Learning, NewDelhi, 1st edition, 2014.
2. Douglas C.Montgomery, Introduction to Statistical Quality Control, 4th Edition, Wiley India Pvt Limited, 2020.
3. James R.Evans and William M.Lindsay, Managing for Quality and Performance Excellence, 9thEdition, Cengage Learning, 2012.
4. Poornima M.Charantimath, "Total Quality Management", Pearson Education, 2ndEdition, 2011.

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- https://quality-one.com/fmea/
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CO-PO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	1	-	1	-	1
CO3	-	-	-	-	-	-	-	1	-	1	-	1
CO4	-	-	-	-	-	-	-	1	-	1	-	1
CO5	-	-	-	-	-	-	-	1	-	1	-	1
AVG	-	-	-	-	-	-	-	1	-	1	-	1

CO-PSO MAPPING

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	-	-	-

JGE1001	PROFESSIONAL ETHICS IN ENGIEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To create an awareness on Human Values in Engineering Ethics.
- To enable the students to create an awareness on Engineering Ethics
- To instill the Engineering as Experimentation process.
- To impart knowledge on safety, responsibilities and rights of Engineers.
- To impart knowledge on global issues.

UNIT I HUMAN VALUES 10

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

UNIT II ENGINEERING ETHICS 9

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

UNIT III ENGINEERING ASSOCIAL EXPERIMENTATION 9

Engineering as Experimentation–Engineers as responsible Experimenters–Codes of Ethics –A Balanced Outlook on Law

UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9

Safety and Risk–Assessment of Safety and Risk–Risk Benefit Analysis and Reducing Risk-Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest –Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR)– Discrimination.

UNIT V GLOBAL ISSUES 8

Multinational Corporations–Environmental Ethics–Computer Ethics–Weapons Development–Engineers as Managers–Consulting Engineers–Engineers as Expert Witnesses and Advisors–Moral Leadership–Code of Conduct–Corporate Social Responsibility.

TOTAL:45 PERIODS

COURSE OUTCOMES:

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

CO1: Understand the concept of on Human Values
CO2: Understand about the Engineering Ethics concepts
CO3: Understand the concept of Moral and Social Values
CO4: Gain knowledge on safety, responsibilities and rights of Engineers.
CO5: Understand the concept of global issues.

TEXT BOOKS:

1. Mike W.Martin and Roland Schinzinger,"Ethics in Engineering", Tata McGraw Hill, New Delhi, 2003.

2. Govindarajan M, Natarajan S, Senthil Kumar V.S, “Engineering Ethics”, Prentice Hall of India, New Delhi, 2004.
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2. John R Boat right, “Ethics and the Conduct of Business”, Pearson Education, New Delhi,2003
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CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	1	-	1	-	1
CO3	-	-	-	-	-	-	-	1	-	1	-	1
CO4	-	-	-	-	-	-	-	1	-	1	-	1
CO5	-	-	-	-	-	-	-	1	-	1	-	1
AVG	-	-	-	-	-	-	-	1	-	1	-	1

CO- PSO MAPPING

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	-	-	-

JGE1003	HUMAN RIGHTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To infer about Human Rights and its classification
- To assess knowledge on the evolution of Human Rights
- To explain the theories of United Nation (UN) laws
- To discuss about Human Rights in India
- To explain about the Human Rights of disadvantaged people

UNIT I BASIC CONCEPTS IN HUMAN RIGHTS 9

Human Rights–Meaning, origin and Development. Notion and classification of Rights–Natural, Moral and Legal Rights.-Human Rights and Morality-Civil and Political Rights, Economic, Social and Cultural Rights; collective/ Solidarity Rights.

UNIT II EVOLUTION OF HUMAN RIGHTS 9

Evolution of the concept of Human Rights Magana carta–Geneva convention of 1864. niversal Declaration of Human Rights, 1948. Theories of Human Rights

UNIT III THEORIES OF UN-LAWS 9

Theories and perspectives of UN Laws–UN Agencies to monitor and compliance. The Universal Declaration of Human Rights (UDHR)-Implementation Mechanisms: Charter and Treaty Bodies

UNIT IV HUMAN RIGHTS IN INDIA 9

Human Rights in India–Constitutional Provisions/Guarantees

UNIT V HUMAN RIGHTS OF DISADVANTAGED PEOPLE 9

Human Rights of Disadvantaged People–Women, Children ,Displaced persons and Disable persons, including Aged and HIV Infected People. Implementation of Human Rights – National and State Human Rights Commission–Judiciary–Role of NGO's, Media, Educational Institutions, Social Movements

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Kapoor S.K., "Human Rights under International law and Indian Laws", Central Law Agency, Allahabad, 2014.
2. Chandra U.,"Human Rights", Allahabad Law Agency, Allahabad, 2014.
3. Upendra Baxi, The Future of Human Rights, Oxford University Press, New Delhi, 2012.
4. Manisha Priyam, Krishna Menon and Madhulika Banerjee, "Human Rights, Gender And The Environment", Pearson, 2009..
5. Baradat Sergio and Swaronjali Ghosh, "Teaching of Human rights", Dominant Publishers and distributors, New Delhi, 2009

REFERENCE BOOKS:

1. Debarati Halder and Shrut S. Brahmbhatt," Advancement of Human Rights in India Contemporary and Emerging Challenges", Sage, 2021.
2. Roy.A.N, "Human Rights Achievements and Challenges", Vista Publishing house, Delhi, 2005.
3. Velan.G ,"Human Rights and Development Issues", The Associated publishers,

Ambala Cantt. 2008.
4. Meena. P.K. ”Human Rights Theory and practice”, Murali Lal and sons, New Delhi ,2008
5. Ansari.M.R ,“Protecting Human Rights: Max Ford Books, New Delhi, 2006

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4. https://youtu.be/PJsrNS-Q4M4
5. https://youtube.com/playlist?list=PLh5Hcgb8LbU4EUBZhYcUHrIpfIoUs6JDH

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	1	-	1	-	1
CO3	-	-	-	-	-	-	-	1	-	1	-	1
CO4	-	-	-	-	-	-	-	1	-	1	-	1
CO5	-	-	-	-	-	-	-	1	-	1	-	1
AVG	-	-	-	-	-	-	-	1	-	1	-	1

CO-PSO MAPPING

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	-	-	-

JEI1007	PRODUCT DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide the basic concepts of product design.
- To impart knowledge on generation and selection.
- To study the basic concepts of product features and its architecture.
- To impart knowledge on basic concepts of industrial design.
- To impart knowledge on manufacturing and product development.

UNIT I INTRODUCTION TO PRODUCT DEVELOPMENT 9

Need for IPPD–strategic importance of product development–integration of customer, designer, material supplier and process planner, competitor and customer–behavior analysis. Understanding customer–prompting customer understanding–involve customer in development and managing requirements–organization–process management and

improvement–plan and establish product specifications**.**

UNIT II CONCEPT GENERATION AND SELECTION 9

Task–Structured approaches–clarification–search–externally and internally–explore systematically–reflect on the solutions and processes–concept selection–methodology–benefits**.**

UNIT III PRODUCT ARCHITECTURE 9

Implications–Productchange–variety–componentstandardization–product performance – manufacturability–product development management–establishing the architecture–creation–clustering–geometric layout development–fundamental and incidental interactions –related system level design issues–secondary systems–architecture of the chunks–creating detailed interface specifications.

UNIT IV INDUSTRIAL DESIGN 9

Integrate process design–Managing costs–Robust design–Integrating CAE, CAD, CAM tools–Simulating product performance and manufacturing processes electronically–Need for industrial design – impact – design process – investigation of for industrial design–impact –design process–investigation of customer needs–conceptualization–refinement–management of the industrial design process–technology driven products–user–driven products– assessing the quality of industrial design.

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 9

Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs–Minimize system complexity– Proto type basics–principles of proto typing–planning for proto types–Economic Analysis–Understanding and representing asks –base line project planning– accelerating the project– project execution.

TOTAL : 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To design some products for the given set of applications.

CO2: To gain knowledge on generation and selection.

CO3: To understand the concepts of product features and its architecture.

CO4: To gain knowledge on concepts of industrial design.

CO5: To acquire knowledge on manufacturing and product development.

TEXT BOOKS:

1. Kari T. Ulrich and Steven D. Eppinger, “Product Design and Development”, McGraw-Hill International Edns. 1999.
2. Kemnneth Crow, “Concurrent Engg ./Integrated Product Development”, DRM Associates, 26/3, Via Olivera, Palos Verdes, CA90274(310) 377-569,Workshop Book.

REFERENCE BOOKS:

1. Stephen Rosenthal, “Effective Product Design and Development”, Business One Orwin, Homewood, 1992, ISBN 1-55623-603-4.
2. Staurt Pugh, “Tool Design –Integrated Methods for Successful Product Engineering”, Addison Wesley Publishing, Newyork, NY.
3. Thomke, Stefan, and Ashok Nimgade. "IDEO Product Development." Boston, MA:Harvard Business School Case9-600-143, June22, 2000.
4. Bowen, H. Kent, and Thomas Everett. "Sweet Water." Boston, MA: Harvard Business School Case 9-695-026, November1, 1994.
5. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development “, 4th Edition, 2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9 Kemnneth Crow, “Concurrent Engg./Integrated Product Development”, DRM Associates, 26/3, Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book.

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CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	-	-	-	-	-	-	1	-	1	-	1
CO2	-	-	-	-	-	-	-	1	-	1	-	1
CO3	-	-	-	-	-	-	-	1	-	1	-	1
CO4	-	-	-	-	-	-	-	1	-	1	-	1
CO5	-	-	-	-	-	-	-	1	-	1	-	1
AVG	-	-	-	-	-	-	-	1	-	1	-	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	-	-	-
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	-	-	-

JGE1004	INTELLECTUAL PROPERTY RIGHTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To infer an idea about IPR.
- To build the knowledge on registration and its enforcement.
- To discuss various agreements and legislations with respect to IPR
- To appraise digital products and law
- To infer an idea about enforcement of IPRS

UNIT I BASIC CONCEPTS IN IPR 9

Introduction to IPRs, Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad–Genesis and Development–the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations–Important examples of IPR.

UNIT II REGISTRATION OF IPRs 9

Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad 95

UNIT III AGREEMENTS AND LEGISLATIONS 9

International Treaties and Conventions on IPRs, TRIPS Agreement, PCT Agreement, Patent Act of India, Patent Amendment Act, Design Act, Trademark Act, Geographical Indication Act.

UNIT IV DIGITAL PRODUCTS AND LAW 9

Digital Innovations and Developments as Knowledge Assets–IP Laws, Cyber Law and Digital Content Protection–Unfair Competition–Meaning and Relationship between Unfair Competition and IP Laws– Case Studies.

UNIT V ENFORCEMENT OF IPRs 9

Infringement of IPRs, Enforcement Measures, Emerging issues–Case Studies.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To build an idea about IPR.

CO2: To evaluate the concept of registration and its enforcement.

CO3: To analyse various agreements and legislations.

CO4: To measure the concept of digital products and law.

CO5: To develop Intellectual Property portfolio to enhance the value of the firm.

TEXT BOOKS:

1. V.Scople Vinod, Managing Intellectual Property, Prentice Hall of India private Ltd, 2012
2. S.V.Satakar, “Intellectual Property Rights and Copy Rights, EssEss Publications, New Delhi 2002

REFERENCE BOOKS:

1. Deborah E.Bouchoux, “Intellectual Property: The Law of Trade marks, Copy rights,

Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Prabuddha Ganguli, "Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
3. Derek Bosworth and Elizabeth Webster, "The Management of Intellectual Property", Edward Elgar Publishing Ltd., 2013.
4. Nithyananda, KV. Intellectual Property Rights: Protection and Management. India, IN: Cengage Learning India Private Limited, 2019.
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- https://www.wipo.int/about-ip/en/
- http://www.ipindia.nic.in/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	-	2	1	-	-	-	-	-	-	1
CO2	2	-	-	2	1	-	-	-	-	-	-	1
CO3	1	-	-	2	1	-	-	-	-	-	-	1
CO4	1	-	-	2	1	-	-	-	-	-	-	1
CO5	1	-	-	2	1	-	-	-	-	-	-	1
AVG	1	-	-	2	1	-	-	-	-	-	-	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	1
CO2	-	-	-
CO3	-	-	-
CO4	-	-	-
CO5	-	-	-
AVG	1	1	1

PROFESSIONAL ELECTIVE - II

SEMESTER VI

JEE1001	REAL TIME OPERATING SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the fundamentals of interaction of OS with a computer and user computation.
- To learn the fundamental concepts about the creation of process and its control with OS
- To study the programming logic of modeling Process based on range of OS features
- To provide an over view about the various types and functionalities in commercial OS.
- To impart knowledge on the application development using RTOS and embedded OS

UNIT 1 REVIEW OF OPERATING SYSTEMS 9

Basic Principles - Operating System structures – System Calls–Files Processes–Design and Implementation of processes–Communication between processes–Introduction to Distributed operating system–Issues in distributed system: states, events, clocks-Distributed scheduling-Fault & recovery.

UNIT 2 OVER VIEW OF RTOS 9

RTOS: Structure of RTOS-Task and Task state–Multi tasking and Multithreaded systems – Scheduler-Pre emptive and Non Pre emptive-Process Synchronization-Message Queues – Mail boxes-Pipes–Critical section–Semaphores–Classical synchronization problem-Dead locks.

UNIT III REAL TIME MODELS AND LANGUAGES 9

Event Based– Process Based and Graph based Models – Real Time Languages – RTOST asks–RTOS scheduling-Interrupt processing–Synchronization–Control Blocks–Memory Requirements.

UNIT 4 REAL TIME KERNAL 9

Principles–Design issues–RTOS Porting to a Target–Comparison and Basic study of various RTOS like– VX works –Linux supportive RTOS–PSOS-C Executive.

UNIT 5 INTRODUCTION TO EMBEDDEDOS 9

RTOS Applications: RTOS in fault tolerance – RTOS for Control applications –RTOS for voice over IP - Introduction to Android Environment-The Stack–Android User Interface–Preferences, the File System, the Options Menu and Intents, with one Case study.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the interaction of OS with a computer and user computation.

CO2: To understand the fundamental concepts of real-time operating systems

CO3: To acquire knowledge on the programming logic of modeling Process base on range of OS features

CO4: To gain knowledge on various types and Functionalities in commercial OS, Application development using RTOS

CO5: To acquire knowledge on recent trends in embedded systems design.

TEXT BOOKS:

1. Silberschatz, Galvin, Gagne" Operating System Concepts, 6ed, John Wiley, 2003
2. Charles Crowley, "Operating Systems-A Design Oriented approach" McGrawHill,1997
3. RajKamal, "Embedded Systems-Architecture, Programming and Design" Tata McGraw Hill, 2006.
4. KarimYaghmour, Building Embedded Linux System", O' reilly Pub, 2003
5. C.M.Krishna, Kang, G.Shin, "Real Time Systems", Mc Graw Hill, 1997.

REFERENCE BOOKS:

1. Marko Gargenta, "Learning Android", O' reilly 2011.
2. Herma K., "Real Time Systems–Design for distributed Embedded Applications", Kluwer Academic, 1997.
3. Corbet Rubini, Kroah-Hartman, "Linux Device Drivers",O'reilly, 2016.

4 Mukesh Sighal and N G Shi "Advanced Concepts in Operating System", McGrawHill, 2000

5 D.M.Dhamdhere, "Operating Systems, A Concept-Based Approch, TMH, 2008

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2. https://swayam.gov.in/
3. https://www.udemy.com/
4. https://online-learning.harvard.edu/
5. https://www.coursera.org/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	-	1	1	-	2	1	-	2	1	2
CO2	3	2	-	1	1	-	2	1	1	2	2	2
CO3	3	2	-	1	1	-	2	1	1	2	3	2
CO4	3	2	-	1	1	-	2	1	1	2	2	2
CO5	3	2	-	1	1	-	2	1	1	2	3	2
AVG	3	2	-	1	1	-	2	1	1	2	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	2	3
CO2	3	2	2
CO3	3	3	2
CO4	2	3	3
CO5	3	3	3
AVG	3	3	3

JEE1002	MICRO CONTROLLER BASED SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the Architecture of PIC micro controller
- To impart knowledge on Interrupts structure and timers
- To study the Peripheral devices for data communication and transfer
- To impart knowledge on Functional blocks diagram of ARM processor
- To impart knowledge on Architecture of ARM processors

UNIT 1 INTRODUCTION TO PIC MICRO CONTROLLER 9

Introduction to PIC Microcontroller – PIC 16C6x and PIC16C7x Architecture – IC16cxx – Pipe lining - Program Memory considerations - RAM & ROM Allocation –Register File Structure- Instruction Set-Addressing modes –Operations using PIC micro controller.

UNIT 2 INTERRUPTS ANDTIMERS 9

PIC micro controller Interrupts- External Interrupts - Interrupt Programming – Loop time subroutine Timers – Hand shaking mechanism - Timer Programming – Front panel I/O – Soft Keys–State machines and key switches–Display of Constant and Variability strings.

UNIT 3 PERIPHERALS AND INTERFACING 9

I2C Bus for Peripherals Chip Access– Bus operation-Bus subroutines– Serial EEPROM— Analog to Digital Converter–UART-Baud rate selection–Data handling circuit–Initialization –LCD and keyboard Interfacing -ADC, DAC, and Sensor Interfacing.

UNIT 4 INTRODUCTION TO ARM PROCESSOR 9

Architecture–ARM programmer's model–ARM development tools – Memory Hierarchy – ARM assembly Language Programming–simple operations using ARM processor– Architectural Support for operating systems.

UNIT 5 ARM ORGANIZATION 9

3-Stage Pipeline ARM Organization–5-Stage Pipeline ARM Organization–ARM Instruction Execution – ARM Implementation – ARM Instruction Set–ARM coprocessor interface – Architectural support for High Level Languages–Applications of Embedded ARM processor.

TOTAL:45 PERIODS

COURSE OUTCOMES :

At the end of the course, the student will be able

CO1 To understand the concepts of Architecture of PIC microcontroller
CO2: To acquire knowledge on Interrupts and timers.
CO3: To understand the importance of Peripheral devices for data communication.
CO4: To acquire knowledge in Architecture of ARM processors
CO5: To gain knowledge on Architecture of ARM processors

TEXT BOOKS:

1 Silberschatz, Galvin,Gagne ”Operating System Concepts, 6ed, John Wiley, 2003
2 Charles Crowley, “Operating Systems-A Design Oriented approach” McGrawHill, 1997
3 RajKamal, “Embedded Systems-Architecture, Programming and Design” Tata McGraw Hill, 2006.
4 Karim Yaghmour, Building Embedded Linux System”,O’reilly Pub, 2003
5. C.M.Krishna, Kang, G.Shin,“Real Time Systems”, McGraw Hill, 1997.

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2. HermaK., “Real Time Systems–Design for distributed Embedded Applications”, Kluwer Academic,1997.
3. Corbet Rubini, Kroah-Hartman, “Linux Device Drivers”, O’reilly, 2016.
4. Ukesh Sighal and NGShi “Advanced Concepts in Operating System”, McGrawHill, 2000
5. D.M.Dhamdhere, ”Operating Systems, A Concept-Based Approch, TMH, 2008

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2. https://alison.com/
3. https://swayam.gov.in/
4. http://mooc.org/
5. https://www.edx.org/

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	-	2	3	3	3	2	1	-	2	2	3
CO2	3	1	2	2	2	2	1	-	-	2	2	2
CO3	1	2	1	1	3	2	-	-	2	1	2	2
CO4	2	-	1	2	2	2	-	-	-	-	2	3
CO5	3	2	3	3	3	3	2	2	3	3	3	2
AVG	2	1	2	2	3	2	1	1	1	2	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	3
CO2	3	2	3
CO3	3	2	3
CO4	2	2	3
CO5	2	3	3
AVG	2	2	3

JEE1003	EMBEDDED SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study and analyze Embedded systems.
- To impart knowledge about embedded firm ware development
- To learn about various Embedded Development Strategies
- To study about RTOS based embedded system design
- To provide overview on various embedded system applications

UNIT 1 INTRODUCTION TO EMBEDDED SYSTEMS 9

History of embedded systems, Classification of embedded systems based on generation and complexity – Structural Units in Embedded processor , Selection of processor & memory devices – DMA– Memory management methods – Timer and Counting devices, Watch dog Timer, Real Time Clock, Target Hardware Debugging.

UNIT 2 EMBEDDED NETWORKING 9

Embedded Networking: Introduction, I/O Device Ports & Buses – Serial Bus communication protocols RS232 standard–RS422–RS485-USB bus-CAN Bus-Serial Peripheral Interface (SPI)–Inter Integrated Circuits (I2C) – Blue tooth, Wi-Fi, ZigBee, GPRS, GSM.

UNIT 3 EMBEDDED FIRM WARE DEVELOPMENT ENVIRONMENT 9

Embedded firmware design approaches –super loop based approach – Embedded Product Development Life Cycle-objectives, different phases of EDLC, Modelling of EDLC; issues in Hardware-software Co- design, Data Flow Graph, State machine model, Sequential Program Model, Concurrent Model, Object oriented Model.

UNIT 4 RTOS BASED EMBEDDED SYSTEM DESIGN 9

Introduction to basic concepts of RTOS- Task, process & threads, interrupt routines in RTOS, Multitasking and Multithreaded system, Preemptive and non –preemptive scheduling, Task communication :shared memory-message passing-Inter process Communication– synchronization between processes- Semaphores, Mailbox, Pipes, priority inversion, priority in heritance.

UNIT 5 EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT 9

Case Study of Washing Machine – Automotive Application – Air pollution detector – Smart card System Application-Digital camera

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand and analyze embedded systems.

CO2 : To acquire knowledge about embedded firm ware development

CO3: To gain knowledge on various Embedded Development Strategies

CO4: To understand about RTOS based embedded system design

CO5: To acquire knowledge on various embedded system applications

TEXT BOOKS:

1. Peckol, "Embedded system Design", John Wiley & Sons, 2010
2. Lyla B Das, "Embedded Systems-An Integrated Approach", Pearson, 2013
3. Shibu.K.V, "Introduction to Embedded Systems", 2e, Mc Graw Hill, 2017.
4. Mazidi,"The8051 micro controller and embedded system: using Assembly and C", pearson, 2013.
5. XiaoCongFab,"Real-time Embedded systems Design Principles and Engineering Practices", Newnes, 2015.

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2. C.R.Sarma, "Embedded Systems Engineering", University Press (India) Pvt. Ltd, 2013.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Han-Way Huang, "Embedded system Design Using C8051", Cengage Learning, 2009.
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4. https://www.skillshare.com/
5. https://www.udemy.com

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	1	-	-	2	1	3
CO2	3	3	3	3	3	2	1	1	-	1	1	3
CO3	3	3	3	3	2	1	1	-	1	1	1	3
CO4	3	2	2	1	2	1	1	1	1	1	1	2
CO5	2	1	2	2	2	1	1	-	-	1	1	2

AVG	3	2	3	2	2	1	1	1	1	1	1	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	1	2	2
CO3	1	2	2
CO4	1	1	-
CO5	2	3	3
AVG	2	2	2

JEE1004	SENSORS AND TRANSDUCERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the characteristics of transducers and sensors
- To learn the various sensors used to measure various physical parameters.
- To learn the concepts of force, magnetic and heading sensors.
- To impart knowledge on optical, pressure and temperature sensors
- To provide an overview about data acquisition systems

UNIT I INTRODUCTION TO SENSORS AND TRANSDUCERS 9

Introduction to Sensors/Transducers – Principle -Classification – Static and dynamic characteristics of transducers–Performance measures of sensors–Sensor calibration techniques –Sensor Output Signal Types

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR)

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive–Hall Effect –Eddy Current sensor, Heading Sensors–Compass, Gyroscope, Inclinometers

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezo electric–Tactile sensors, Temperature–IC, Thermistor, RTD, Thermocouple. Acoustic Sensors– flow and level measurement, Radiation Sensors- Smart Sensors-Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V DATA ACQUISITION SYSTEMS 9

Signal Conditioning system, Amplification – Filtering – Integration and Differentiation-Sample and Hold circuits – Data Acquisition: Single channel and multichannel data acquisition – Data logging-Applications-Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring, Medical diagnosis

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To expertise in various calibration techniques and signal types of sensors
CO2: To understand the various sensors used to measure various physical parameters
CO3: To understand the concepts of force, magnetic and heading sensors
CO4: To gain knowledge on optical, pressure and temperature sensors
CO5: To acquire knowledge about data acquisition systems

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems–Applications and Design", Tata McGraw-Hill, 2009.
2. Sawney AK and Puneet Sawney," A Course in Mechanical Measurements and Instrumentation and Control", 12th"edition, Dhanpat Rai & Co, NewDelhi, 2013.
3. Patranabis D, "Sensors and Transducers" , 2nd Edition, PHI, New Delhi, 2013

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1. Jacob Fraden, "Hand book of Modern Sensors Physics, Designs, and Applications", Springer, 2016.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists",Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook "2nd edition, CRC Press, 2015.
4. Renganathan S., "Transducer Engineering" –Allied Publishers Limited, 2003.
5. D.V.S.Murty, "Transducers and Instrumentation", PHI learning, 2012

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4. https://youtube.com/playlist?list=PLwdnzlV3ogoXJLQ8lSGb1hsztt24l9kZZ
5. https://youtu.be/v-3TmN4HhLc

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	2	-	-	-	1	1	1	1	1	1
CO2	2	1	1	3	1	-	-	-	-	1	-	-
CO3	2	2	2	2	1	2	3	3	3	2	3	-
CO4	1	-	1	-	1	2	3	3	3	2	2	-
CO5	-	1	-	-	1	3	2	2	-	-	2	-
AVG	1	1	1	1	1	1	2	2	2	1	2	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	1	1	-
CO2	1	1	1

CO3	2	1	1
CO4	2	1	-
CO5	2	1	1
AVG	2	1	1

JEE1005	SMART SYSTEM DESIGN	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn about the smart system technologies and its role in real time applications
- To expose students to different open source platforms.
- To provide knowledge on Home automation systems.
- To familiarize the design of smart appliances and energy management techniques.
- To study about robots and controllers

UNIT I INTRODUCTION TO EMBEDDED SYSTEMS 9

Over view of smart system design and requirements-Hardware and software selection & co-design –Communications-smart sensors and actuators-Open-source resources for embedded system-Android 42 for embedded system-Embedded system for Ecommerce-Embedded system for Smart card design and development– Recent trends

UNIT II MOBILE EMBEDDED SYSTEM 9

Design requirements-Hardware platform-OS and Software development platform-Mobile Apps development – Applications: heart beat monitoring, blood pressure monitoring, mobile banking and appliances control

UNIT III HOME AUTOMATION 9

Home Automation System – Architecture-Essential Components-Linux and Raspberry Pi–design and real time implementation

UNIT IV SMART APPLIANCES AND ENERGY MANAGEMENT 9

Overview-functional requirements-Embedded and Integrated Platforms for Energy Management-Energy Measurement Techniques for Smart Metering-Smart Embedded Appliances Networks–Security Considerations

UNIT V ROBOTS AND CONTROLLERS 9

Robots and Controllers –components-Aerial Robotics-Mobile Robot Design –Three-Servo Ant Robot-Autonomous Hexa copter System

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the concepts of smart System design and its present developments.
CO2: To acquire knowledge on various embedded open source platforms
CO3: To analyze different effective techniques for developing solution for real time Applications
CO4: To acquire knowledge on smart appliances and energy management techniques

CO5: To understand about robots and controllers

TEXT BOOKS:

1. Thomas Bräunl, Embedded Robotics, Springer, 2003.
2. Grimm, Christoph, Neumann, Peter, Mahlknech and Stefan, Embedded Systems for Smart Appliances and Energy Management , Springer 2013.
3. RajKamal, Embedded Systems-Architecture, .Programming and Design", McGraw-Hill, 2008
4. Nilanjan Dey, Amartya Mukherjee, Embedded Systems and Robotics with Open Source Tools, CRC press, 2016.
5. Karim Yaghmour, Embedded Android, O'Reilly, 2013

REFERENCE BOOKS:

1. Steven Good win, Smart Home Automation with Linux and Raspberry Pi, A press, 2013
2. TohC.K., "Adhoc mobile wireless networks", Prentice Hall, Inc, 2002.
3. Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks Technology, Protocols, and Applications", John Wiley & Sons, 2007.
4. Anna Hác, "Wireless Sensor Network Designs", John Wiley & Sons Ltd, 2003.
5. Robert Faludi, "Wireless Sensor Networks", O' Reilly, 2011.

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4. https://youtu.be/rlWVYBR-W54
5. https://youtu.be/Yjf77P062BU
6. https://youtu.be/JUwIC73uiIw

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	1	-	-	2	1	3
CO2	3	3	3	3	3	2	1	1	-	1	1	3
CO3	3	3	3	3	2	1	1	-	1	1	1	3
CO4	3	2	2	1	2	1	1	1	1	1	1	2
CO5	2	1	2	2	2	1	1	-	-	1	1	2
AVG	3	2	3	2	2	1	1	1	1	1	1	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	1	2	2
CO3	1	2	2
CO4	1	1	-
CO5	2	3	3
AVG	1	2	2

JEE1006	COMMUNICATION ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the characteristics and model of transmission medium.
- To introduce the concepts of basic signals, analog modulation, demodulation and radio receivers.
- To learn the source digitization, digital multiplexing and modulation.
- To study the data communication system and techniques.
- To learn the basics of satellite and wireless communication systems.

UNIT I INTRODUCTION TO COMMUNICATION 9

Transmission lines – Types, equivalent circuit, losses, standing waves, impedance matching, band width; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, Path Loss, Gaussian white noise. Time and frequency domain representation of signals need for modulation.

UNIT II ANALOG MODULATION SYSTEMS 9

Amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Time Division multiplexing.

UNIT III DIGITAL COMMUNICATION 9

Pulse code modulation, digital T-carrier system. Digital radio system. Digital modulation: Amplitude Shift Key, Frequency and phase shift keying, Quadrature Phase Shift Key – Modulator and demodulator, bit error rate calculation.

UNIT IV DATA COMMUNICATION AND NETWORK PROTOCOL 9

Data Communication codes, error control, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

UNIT V SATELLITE AND WIRELESS COMMUNICATION 9

Introduction to satellite communication, and Cellular communication, Wireless Networking WI- MAX, Wireless devices, ZigBee, GSM, Types of Wireless Devices: Radio, Wireless Phones Serial Communication: RS-232, Bi-Directional Communications, Synchronous and Asynchronous Communications.

TOTAL: 45PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1 To understand the characteristics and model of transmission medium in Communication systems.

CO2 To understand basic signals, analog modulation, demodulation and radio receivers techniques.

CO3 To use source digitization, digital multiplexing and modulation for applications.

CO4 To understand data communication system and techniques.

CO5 To understand basics of satellite and wireless communication systems.

TEXT BOOKS:

1. Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, 3rd Edition, 2001.

2. Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2nd Edition, 2002.

REFERENCE BOOKS:

1. William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.

2. G.Kennedy, 'Electronic Communication Systems', McGrawHill, 4th edition, 2002.

3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003.

4. Simon Haykins, Communication systems, John Wiley, 4th Edition, 2001.

5. HPHsu, Schaum outline series-'Analog and Digital Communications', TMH2006

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4.https://youtu.be/T4OnKLm49w

5.https://youtu.be/Z0Ylnk8zXRolquality

CO-PO MAPPING:

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CO1	3	2	2	3	2	2	-	1	-	2	2	2
CO2	3	3	2	3	2	1	1	-	1	3	2	3
CO3	3	2	2	2	1	2	-	1	-	2	2	2
CO4	3	3	2	2	2	1	1	-	1	2	3	3
CO5	3	3	2	3	1	2	-	1	1	3	2	2
AVG	3	3	2	3	2	2	1	1	1	2	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	1	1
CO2	3	-	2
CO3	2	1	1
CO4	2	-	1
CO5	2	1	1
AVG	2	1	1

PROFESSIONAL ELECTIVE III
SEMESTER VI

JEI1002	**DIGITAL SIGNAL PROCESSING**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To classify signals and systems.
- To learn the discrete time systems.
- To study various discrete Fourier transformation techniques and their computation.
- To impart knowledge about filters and their design for digital implementation.
- To introduce about digital signal processor and its applications.

UNIT I INTRODUCTION TO SIGNALS AND SYSTEMS 9

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

UNIT II DISCRETE TIME SYSTEM ANALYSIS 9

Z-transform and its properties, inverse z-transforms; difference equation – Solution by Z transform, application to discrete systems-Stability analysis, frequency response– Convolution–Discrete Time Fourier transform.

UNIT III DISCRETE FOURIER TRANSFORM AND COMPUTATION 9

Discrete Fourier Transform-properties, magnitude and phase representation-Computation of DFT using FFT algorithm– DIT and DIF using radix2 FFT–Butterfly structure.

UNIT IV DESIGN OF DIGITAL FILTERS 9

FIR & IIR filter realization–Parallel & cascade forms. FIR design: Windowing Techniques – Need and choice of windows–Linear phase characteristics. Analog filter design–Butter worth and Che by shev approximations; IIR Filters, digital design using impulse in variant and bilinear transformation .

UNIT V DIGITAL SIGNAL PROCESSORS ANDAPPLICATIONS 9

Introduction, commercial Digital Signal Processor – Architecture – Features – Addressing Formats – Functional modes –Image processing techniques-Application of DSP in Image processing, Radar system.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand and apply signals and systems.

CO2: To gain knowledge about the discrete time systems.

CO3: To understand various discrete Fourier transformation techniques and their computation.

CO4: To acquire knowledge about filters and their design for digital implementation.
CO5: To understand digital signal processor and its applications.

TEXT BOOKS:

1. J.G.Proakis and D.G.Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, PHI.2003.
2. S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', McGraw Hill Edu, 2013.
3. Robert Schilling & Sandra L.Harris, 'Introduction to Digital Signal Processing using Matlab', Cengage Learning, 2014.

REFERENCE BOOKS:

1. Poorna Chandra S, Sasikala. B ,'Digital Signal Processing', Vijay Nicole/TMH,2013.
2. B.P.Lathi, 'Principles of Signal Processing and Linear Systems', Oxford UniversityPress,2010.
3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab',CRCPress, 2009.
4. Sen M.kuo, woonseng…s.gan, "Digital Signal Processors, Architecture,I mplementations & Applications, Pearson, 2013.
5. Dimitris G.Manolakis, Vinay K. Ingle, "Applied Digital Signal Processing", Cambridge,2012.
6. Lonnie C.Ludeman, "Fundamentals of Digital Signal Processing", Wiley, 2013

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CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	-	-	2	1	-	-	-	-	-	-	1
CO2	3	-	-	2	1	-	-	-	-	-	-	1
CO3	3	-	-	2	1	-	-	-	-	-	-	1
CO4	3	-	-	2	1	-	-	-	-	-	-	1
CO5	3	-	-	2	1	-	-	-	-	-	-	1
AVG	3	-	-	2	1	-	-	-	-	-	-	1

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	3	2	2
CO3	3	2	3
CO4	3	2	2
CO5	2	3	3
AVG	3	2	2

JEE1007	POWER SYSTEM TRANSIENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide overview the nature of power system transients and its effects on power system
- To comprehend the different issues related to resistance switching, capacitance switching and load switching
- To provide the knowledge about the lightning phenomena and various issues related to lightning and its protection methods
- To impart knowledge about the concept of travelling waves and its effects
- To impart knowledge of the load rejection and different software packages to analyze about transients

UNIT I INTRODUCTION TO TRANSIENTS 9

Review and importance of the study of transients – causes for transients. RL circuit transient with sine wave excitation-double frequency transients-basic transforms of the RLC circuit transients. Different types of power system transients – effect of transients on power systems – role of the study of transients in system planning

UNIT II SWITCHING TRANSIENTS 9

Over voltages due to switching transients – resistance switching and the equivalent circuit for interrupting the resistor current – load switching and equivalent circuit – waveforms for transient voltage across the load and the switch – normal and abnormal switching transients. Current suppression – current chopping- effective equivalent circuit. Capacitance switching – effect of source regulation – capacitance switching with a restrike, with multiple restrikes. Illustration for multiple restriking transients –Ferro resonance

UNIT III LIGHTNING TRANSIENTS 9

Review of the theories in the formation of clouds and charge formation – rate of charging of thunder clouds mechanism of lightning discharges and characteristics of lightning strokes – model for lightning stroke- factors contributing to good line design – protection using ground wires –tower footing resistance –Interaction between lightning and power system

UNIT IV TRAVELING WAVES ON TRANSMISSION LINE COMPUTATION OF TRANSIENTS 9

Computation of transients-transient response of systems with series and shunt lumped para meters and distributed lines. Traveling wave concept–step response- Bewely's lattice diagram–standing waves and natural frequencies –reflection and refraction of travelling waves

UNIT V TRANSIENTS IN INTEGRATED POWER SYSTEM 9

The short line and kilometric fault-distribution of voltages in a power system-Line dropping and load rejection-voltage transients on closing and reclosing lines-over voltage induced by faults–switching surges on integrated system Qualitative application of EMTP for transient computation-case studies on simulation of various types of transients using EMTP and insulation co-ordination

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand and analyze about power system transients

CO2: To gain knowledge about the generation of switching transients and their Control using Circuit

CO3: To understand the mechanism of lighting strokes and the production of lighting surges

CO4: To gain knowledge on the propagation, reflection and refraction of travelling waves

CO5: To acquire knowledge on the impact of voltage transients caused by faults, circuit breaker action, load rejection on integrated power system

TEXT BOOKS:

1. Allan Greenwood, 'Electrical Transients in Power Systems', 2nd Edition, Wiley Inter Science, New York, 1991.
2. Pritindra Chowdhari, "Electromagnetic transients in Power System", Second Edition, John Wiley and Sons Inc., 2009
3. J.L.Kirtley,"Electric Power Principles, Sources, Conversion, Distribution and use" First Edition, Wiley, 2010.

REFERENCE BOOKS:

1. Heydt.G.T., "Electric Power Quality",2nd Edition, Starsina Circle Publications,1994
2. Naidu. M.S and Kamaraju.V, 'High Voltage Engineering', Fifth Edition, Tata Mc Graw Hill, 2013.
3. Begamudre . R.D, 'Extra High Voltage AC Transmission Engineering', 4th Edition ,Newage International (P)Ltd., New Delhi, 2009
4. Hase.Y, Hand book of Power System Engineering, "Wiley India, 2012.
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4. https://youtu.be/gklhqNdxOsk
5. https://youtu.be/1L2uAFO7l1A
6. https://youtu.be/1jIH5_RT1Cw

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	2	1	1	1	1	1	1
CO2	2	2	2	2	3	2	2	-	-	1	2	1
CO3	2	2	2	2	3	3	3	-	-	1	2	2
CO4	3	3	3	3	2	1	2	1	1	1	2	1
CO5	2	3	3	3	3	2	2	1	1	2	3	3
AVG	2	3	3	2	2	2	2	1	1	1	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	2	1
CO2	3	2	2
CO3	3	2	3
CO4	3	2	2
CO5	2	3	3
AVG	3	2	3

JEE1008	SMPS AND UPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on DC-DC converters
- To study about switched mode power converters
- To impart knowledge Resonant converters
- To learn about knowledge inverters
- To impart knowledge power conditioning circuits and UPS

UNIT 1 DC-DC CONVERTERS 9

Principles of step down and step up converters – Analysis and state space modeling of Buck, Boost, Buck-Boost and Cuk converters, SEPIC converters, Battery charging, Battery Management System

UNIT 2 SWITCHED MODE POWER CONVERTERS 9

Analysis and state space modeling of fly back, Forward, Push pull, Luo, Half bridge and full bridge converters- control circuits and various PWM techniques, Space Vector Modulation.

UNIT 3 RESONANT CONVERTERS 9

Introduction- classification - basic concepts – soft switching strategy - Resonant switch- Load Resonant converters- ZVS, Clamped voltage topologies- DC link inverters with Zero Voltage Switching-Series and parallel Resonant inverters-Voltage control.

UNIT 4 DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various (sine PWM, SVPWM and PSPWM) techniques, various harmonic elimination techniques-Multilevel inverters-Concepts-Types: Diode clamped-Flying capacitor-Cascaded types –Applications.

UNIT 5 POWER CONDITIONERS, UPSANDFILTERS 9

Introduction- Power line disturbances- Power conditioners –UPS: offline UPS, Online UPS, Applications–Filters: Voltage filters, Series-parallel resonant filters, filter without series capacitors, filter for PWM VSI, current filter, DC filters–Design of inductor and transformer

for PE applications– Selection of capacitors.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1 : To analyze the state space model for DC – DC converters

CO2: To acquire knowledge on switched mode power converters.

CO3: To understand the importance of Resonant Converters

CO4: To analyze the PWM techniques for DC-AC converters

CO5: To acquire knowledge on Power conditioning circuit, filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva, "Power-Switching Converters", Third Edition, CRC Press, 2010.
2. Kjeld Thorborg, "Power Electronics–In theory and Practice", Overseas Press, First Indian Edition 2005.

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1 M.H.Rashid– Power Electronics hand book, Elsevier Publication, 2001

2. Philip T Krein, "Elements of Power Electronics", Oxford University Press

3. Ned Mohan, Tore. M. Undel and, William. P. Robbins, Power Electronics converters, Applications and design-Third Edition-John Wiley and Sons-2006124

4. M.H. Rashid–Power Electronics circuits, devices and applications-third edition Prentice Hall of India New Delhi, 2007.

5. Erickson, Robert W, "Fundamentals of Power Electronics", Springer, second edition, 2010.

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5. https://link.springer.com/chapter/10.1007/978-3-642-52454-7_6

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	3	1	2	2	1	2	2	2	3
CO2	3	3	2	3	1	2	2	1	2	2	2	3
CO3	3	3	2	3	1	2	2	1	2	2	2	3
CO4	3	3	3	3	2	2	3	1	2	2	2	3
CO5	3	3	3	3	2	2	3	1	2	1	2	3
AVG	3	3	2	3	2	2	2	1	2	2	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	2
CO2	3	3	2
CO3	3	3	2
CO4	3	3	2
CO5	3	3	2
AVG	3	3	2

JEE1009	FLEXIBLE AC TRANSMISSION SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To understand the concept of flexible AC transmission and the associated problems.
- To review the static devices for series and shunt control
- To study the operation of controllers for enhancing the transmission capability.
- To provide knowledge on voltage source converter based FACTS controller.
- To impart knowledge on Emerging FACTS controller and its coordination

UNIT I INTRODUCTION TO FACTS 9

Basic types of FACTS controllers, benefits from FACTS controllers - Real and reactive power control in electrical power transmission lines – loads & system compensation – Uncompensated transmission line– shunt and series compensation.

UNIT II STATIC VAR COMPENSATOR (SVC) AND APPLICATIONS 9

Voltage control by SVC – Advantages of slope in dynamic characteristics – Influence of SVC on system voltage – Design of SVC voltage regulator–TCR-FC-TCR-Modeling of SVC for power flow and fast transient stability– Applications: Enhancement of transient stability - Steady state power transfer–Enhancement of power system damping

UNIT III THYRIST OR CONTROLLED SERIES CAPACITOR (TCSC) AND APPLICATIONS 9

Operation of the TCSC–Different modes of operation–Modelling of TCSC, Variability reactance model– Modelling for Power Flow and stability studies. Applications: Improvement of the system stability limit–Enhancement of system damping

UNIT IV VOLTAGES OUR CE CONVERTER BASED FACTS CONTROLLERS 9

Static Synchronous Compensator (STATCOM)–Principle of operation–V-I Characteristics. Applications: Steady state power transfer-enhancement of transient stability-prevention of voltage instability. SSSC-operation of SSSC and the control of power flow–modeling of Sn SSC in load Flow and transient stability studies-Dynamic voltage restorer (DVR)

UNIT V ADVANCED FACTS CONTROLLERS AND CO-ORDINATION OF FACTS CONTROLLERS 9

Interline DVR (IDVR) - Unified Power flow controller (UPFC) - Interline power flow controller (IPFC) - Unified Power quality conditioner (UPQC). FACTs Controller interactions – SVC–SVC interaction-co-ordination of multiple controllers using linear control techniques

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand real and reactive power Control in electrical power transmission lines And the importance of FACTS devices

CO2: To analyze the operation, performance and applications of SVC

CO3: To understand the operation , modeling and applications of TCSC

CO4: To analyze the performance of VSC based FACTS devices

CO5: To acquire knowledge on advanced FACTS Controller, interactions and its Coordination

TEXT BOOKS:

1. Mohan Mathur, R., Rajiv. K. Varma, "Thyristor – Based Facts Controllers for Electrical Transmission Systems", IEEE press and John Wiley & Sons, Inc, 2002.
2. NarainG.Hingorani,Laszio.Gyugyl,"UnderstandingFACTSConceptsandTechnologyof Flexible AC Transmission System",StandardPublishers,Delhi2001
3. Miller.T.J.E,PowerElectronicsinpowersystems,FirstEdition,Newnes,2001

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1. John . A.T., "Flexible AC Transmission System", Institution of Electrical and Electronic Engineers (IEEE), 1999.
2. Padiyar. K.R.,"FACTS Controllers in Power Transmission and Distribution", New Age International (P) Limited, Publishers, New Delhi, 2008
3. Sood . V.K., HVDC and FACTS controllers–Applications of Static Converters in Power System, APRIL 2004, Kluwer Academic Publishers, 2004.
4. Singh, S.N., Electric Power Generation Transmission and Distribution, PHI, New Delhi, 2003.
5. Narain G. Hingorani, High power Electronics and Flexible AC Transmission Systems, IEEE High Power Engineering Review, 1998

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4. https://youtu.be/4JYxtQo1nKM
5. https://youtu.be/OgWdcBe5urE
6. https://youtu.be/VfZzaY2YC70

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CO3	3	3	3	3	1	2	-	-	-	2	2	2
CO4	2	3	3	3	1	2	-	-	-	2	2	2
CO5	2	2	2	2	2	3	1	1	1	1	3	3
AVG	2	2	3	2	1	2	1	1	1	1	2	2

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	3	2
CO2	3	2	3
CO3	3	2	3
CO4	3	2	3
CO5	3	3	3
AVG	3	2	3

JEE1010	POWER QUALITY	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge about Power Quality issues
- To study the concepts of Mitigation techniques of various PQ events.
- To learn the concepts of Harmonics
- To impart knowledge about passive filters, compensation techniques
- To study about DVR, STATCOM

UNIT I INTRODUCTION TO POWER QUALITY 9

Terms and definitions & Sources – Overloading, under voltage, over voltage - Concepts of transients - Short duration variations such as interruption - Long duration variation such as sustained interruption - Sags and swells - Voltage sag - Voltage swell - Voltage imbalance –Voltage fluctuations-Power frequency variations-Wave form Distortion-International standards of power quality– CBEMA & ITI curves

UNIT II VOLTAGE SAG AND SWELL 9

Estimating voltage sag performance – Thevenin's equivalent source - Analysis and calculation of various faulted condition-Estimation of the sag severity-Mitigation of voltage sag, Static transfer switches and fast transfer switches.-Motor-Starting Sags-Transient Over voltages-Capacitor switching–Lightning-Ferro resonance-Mitigation of voltage swell

UNIT III HARMONICS 9

Harmonic sources from commercial and industrial loads - Locating harmonic sources – Power system response characteristics- Harmonics Vs transients. Effect of harmonics – Harmonic distortion - Voltage and current distortions - Harmonic indices - Inter harmonics – Resonance Harmonic distortion evaluation, IEEE and IEC standards - Devices for Controlling Harmonic Distortion

UNIT IV PASSIVE POWER COMPENSATORS 9

Principle of Operation of Passive Shunt and Series Compensators-Analysis and Design of Passive Shunt Compensators - Simulation and Performance of Passive Power Filters - Limitations of Passive Filters -Parallel Resonance of Passive Filters with the Supply System and Its Mitigation –Fundamentals of load compensation–voltage regulation & power factor correction–Introduction to FACTS

UNIT V POWER QUALITY MONITORING AND CUSTOM POWER DEVICES 9

Monitoring considerations - Monitoring and diagnostic techniques for various power quality problems - Quality measurement equipment - Assessment of Power Quality Measurement Data -Harmonic / spectrum analyzer - Flicker meters Disturbance analyzer - Applications of expert systems for power quality monitoring. Principle & Working of DSTATCOM – DSTATCOM in Voltage control mode, current control mode, DVR Structure – Rectifier supported DVR – DC Capacitor supported DVR-Unified power quality conditioner

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand various sources, causes and effects of power quality issues, electrical Systems and their measures and mitigation

CO2: To analyze the causes & Mitigation techniques of various PQ events

CO3: To understand the concepts about Voltage and current distortions, harmonics

CO4: To analyze and design the passive filters, compensation techniques

CO5: To analyze and design DVR, STATCOM

TEXT BOOKS:

1. Roger.C .Dugan, Mark.F. Mc Granagham, Surya Santoso, H.Wayne Beaty, “Electrical Power Systems Quality”, McGrawHill, 2003
2. Jos Arrillaga, Neville R.Watson, “Power System Quality Assessment”, Wiley, 2003
3. 3.Bhim Singh, Ambrish Chandra, Kamal Al-Haddad,” Power Quality Problems & Mitigation Techniques” John Wiley & Sons, 2015

REFERENCE BOOKS:

1. G.T.Heydt, “Electric Power Quality”, 2nd Edition. (West Lafayette, IN, Starsina Circle Publications,1994
2. M.H.J Bollen, “Understanding Power Quality Problems: Voltage Sags
3. Alexander Kusko, "Power Quality in Electrical Systems", McGraw-Hill Publications,2007
4. Arindam Ghosh “Power Quality Enhancement Using Custom Power Devices”, Kluwer Academic Publishers, 2002
5. Derek A. Paice , “Power Electronics Converter Harmonics :Multipulse Methods for Clean Power”,Wiley,1999.
6. Ewald Fuchs, Mohammad A. S. Masoum, "Power Quality in Power Systems and Electrical Machines", Elseveir academic press publications, 2011

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4. https://www.youtube.com/watch?v=n46aDV2h-gs
5. https://www.youtube.com/watch?v=Sw-YoBMGMuQ

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	2	1	1	1	1	2	-	-	2	1	3
CO2	3	3	2	2	2	2	2	2	2	2	2	3
CO3	3	3	2	2	2	2	2	2	2	2	2	3
CO4	2	2	1	1	1	2	3	2	2	2	2	3
CO5	2	2	1	1	3	3	3	2	2	3	2	3
AVG	2	2	1	1	2	2	2	2	2	2	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	3	3	1
CO2	3	3	1
CO3	3	3	1
CO4	3	3	1
CO5	3	3	1
AVG	3	3	1

JEE1011	HIGH VOLTAGE DIRECT CURRENT TRANSMISSION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge about Planning of DC power transmission and comparison with AC power transmission.
- To study about HVDC converters.
- To impart knowledge about HVDC system control.
- To learn about Harmonics and design of filters.
- To impart knowledge about Power flow in HVDC system under steady state

UNIT I INTRODUCTION TO HVDC 9

DC Power transmission technology–Comparison of AC and DC transmission–Application of DC transmission–Description of DC transmission system–Planning for HVDC transmission–Modern trends in HVDC technology–DC breakers–Operating problems–HVDC transmission based on VSC –Types and applications of MTDC systems

UNIT II ANALYSIS OF HVDC CONVERTERS 9

Line commutated converter -Analysis of Graetz circuit with and without overlap -Pulse number–Choice of converter configuration – Converter bridge characteristics– Analysis of a 12 pulse converters–Analysis of VSC topologies and firing schemes

UNIT III CONVERTERANDHVDCSYSTEMCONTROL 9

Principles of DC link control–Converter control characteristics–System control hierarchy–Firing angle control–Current and extinction angle control–Starting and stopping of DC link–Power control –Higher level controllers –Control of VSC based HVDC link

UNIT IV REACTIVE POWER AND HARMONICS CONTROL 9

Reactive power requirements in steady state–Sources of reactive power–Static Var systems-Reactive power Control during transients-Generation of harmonics–Design of AC and DC filters–Carrier Frequency and RI noise

UNIT V POWER FLOW ANALYSIS IN AC/DC SYSTEMS 9

Modelling of DC links-Solution of DC load flow–Per UNIT System for DC quantities-Solution of AC-DC Power flow, Power flow analysis–case study

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the principles and types of HVDC system. To analyze and Understand the Concepts of HVDC converters

CO2: To acquire knowledge on DC link control

CO3: To understand the concepts of reactive power management, harmonics and power Flow analysis.

CO4: To get knowledge about Planning of DC power transmission and comparison with AC Power transmission

CO5: To understand the importance of power flow in HVDC system under steady state

TEXT BOOKS:

1. Padiyar, K.R., "HVDC power transmission system", New Age International (P) Ltd. New Delhi, Second Edition,2010.
2. Jos Arrillaga, "High Voltage Direct Current Transmission", The Institution of Engineering and Technology, London, 2008.
3. Kamakshaiah.S, Kamaraju.V, "HVDC Transmission", Tata McGraw Hill Education Private Limited, New Delhi, 2011
4. Nilanjan Ray Chaudhuri, "Integrating Wind Energy to Weak Power Grids using High Voltage Direct Current Technology", Springer, 2019.
5. Dragan Jovcic, "High Voltage Direct Current Transmission Converters, Systems and DC Grids",John Wiley & Sons Ltd, 2019

REFERENCE BOOKS:

1. Kundur P., "Power System Stability and Control", McGraw-Hill,1993.
2. Colin Adamson and Hingorani NG, "High Voltage Direct Current Power Transmission", Garraway Limited, London, 1960
3. Edward Wilson Kimbark, "Direct Current Transmission", Vol.I, Wiley interscience, New York,London, Sydney,1971
4. Chan-KiKim, VijayK.Soodetal, "HVDC TRANSMISSION Power Conversion Applications in Power Systems", John Wiley & Sons Asia Pte.Ltd, 2009
5. Minxiao Hanand Aniruddha M.Gole,"Modeling and Simulation of HVDC Transmission", The Institution of Engineering and Technology, London, 2020

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2. https://youtube.com/playlist?list=PLHj96QRJ0kOiH_qQ0S_Ep8uAZyNeqOIxC
3. https://youtu.be/pRZ2ygbbyTg
4. https://youtu.be/k69WlxwmgyI
5. https://youtu.be/BszRwKj7rtc

CO-PO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	2	2	2	1	1	1	2	2	2
CO2	2	3	1	2	1	2	-	-	-	1	1	2
CO3	3	2	2	3	3	1	1	1	1	1	1	3
CO4	3	2	3	2	3	1	1	1	1	1	1	3
CO5	2	1	1	1	1	2	2	-	-	2	3	3
AVG	3	2	1	2	2	2	1	1	1	1	2	3

CO-PSO MAPPING:

CO\PSO	PSO1	PSO2	PSO3
CO1	2	3	2
CO2	2	2	1
CO3	3	2	3
CO4	3	2	3
CO5	2	3	3
AVG	2	2	2

PROFESSIONAL ELECTIVE IV
SEMESTER VII

JEE1012	**DESIGN OF ELECTRICAL APPARATUS**	**L**	**T**	**P**	**C**
		3	**0**	**0**	**3**

COURSE OBJECTIVES:

- To understand basics of design considerations for rotating and static electrical machines.
- To impart knowledge on the design of single phase and three phase transformers
- To study the design of rotating DC electrical machines
- To familiarize with the design of three phase Induction motors
- To learn the design of synchronous motors

UNIT I BASIC CONSIDERATION IN DESIGN **9**

Classification of Areas of Design, Electrical Engineering materials – conducting, insulating & magnetic materials, design limitations and specifications, modes of Heat dissipation, internal temperature, temperature gradient in cores &slots, thermal resistively of winding.

UNIT II TRANSFORMERS **9**

Output equation of single phase and three phase transformers–window space factor–overall dimensions -design of core and windings, design of tank with cooling tubes – core area factor.

UNIT III DESIGN OF DC MACHINES **9**

Magnetic circuit calculations – total gap contraction factor, net length of Iron, MMF for air gap, MMF for teeth, real and apparent flux densities. Output equation for DC machine, choice of specific loadings, selection of number of poles, separation of D and L, Armature Design – selection of number of slots, number of conductors, number of coils, Design of commutator and brushes.

UNIT IV DESIGN OF THREE PHASE INDUCTION MOTORS **9**

Output equation for induction motor – choice of specific loadings, separation of D and L, L/t criteria, Armature Design – selection of number of slots, number of conductors, determination of depth of core and other dimensions. Design of squirrel cage rotor, design of wound rotor.

UNIT V DESIGN OF SYNCHRONOUS MACHINES 9

Pole construction – run away speed – output equation, choice of specific loading, separation of D and L, design of armature – number of slots, number of conductors. Determination of depth of core and other dimensions, Estimation of air gap length, short circuit ratio–Design of field system.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To gain knowledge about the basics of design considerations for rotating and static electrical machines
- To design the single phase and three phase transformers
- To design the rotating DC electrical machines
- To design the three Phase Induction motors
- To design the Synchronous motors

TEXT BOOKS:

1. Sawhney, A.K. "A course in Electrical Machine Design" ,Dhanpat rai & sons,2019
2. Mittle V.M. and Mittle.A, "Design of Electrical Machines", Standard publishers Distribution, Fourthedition,2009
3. Rai, H.M. "Electrical Machine Design" ,SathiyaPrakashanPublications,Third edition,2009
4. Sen, S.K., "Principles of Electrical Machine Designs with Computer Programmes", Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, Second Edition, 2009

REFERENCES:

1. Clayton, A.E., Performance & Design of Direct current Machines, CBS Publishers And Distributors Pvt Ltd, 2018.

2.Say.M.G.,"ThePerformance&DesignofAlternatingcurrentMachines",IsaacPitman&sonsLtd., London,2005.

3.Deshpande M V "Design and Testing of Electrical Machines", PHI learning Pvt Lt, 2011

4.Shanmuga sundaram. A, Gangadharan .G, Palani.R "Electrical Machine Design Data Book", New Age International Pvt. Ltd., Reprint 2007

5.Rajini V, Nagarajan V.S, "Electrical Machine Design", Pearson, 2017

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4. https://youtu.be/jLJ3fJRLcOU

5. https://youtu.be/oVwprlyQwuU

6. https://youtu.be/X9wxjlxsoE4

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	2	2	2	-	-	-	1	1	2	2	3	1	2	1
CO2	2	3	3	2	-	-	-	-	1	2	1	2	2	1	-
CO3	2	2	3	2	-	-	-	-	1	2	1	2	1	1	-
CO4	3	1	2	3	-	-	-	1	1	3	1	2	1	1	-
CO5	3	1	2	3	-	-	-	-	1	3	1	2	1	2	1
AV G	3	2	2	2	-	-	-	1	1	2	1	2	1	1	1

		L	T	P	C
JEE1013	**DISTRIBUTED GENERATION AND MICROGRIDS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To provide an overview on the various conventional and non-conventional energy resources
- To illustrate the concept of distributed generation
- To accord the basic knowledge about the impact of grid integration.
- To study concept of micro grid and its configuration
- To learn the power quality issues in microgrids

UNIT I INTRODUCTION TO CONVENTIONAL AND NON-CONVENTIONAL ENERGY RESOURCES **9**

Conventional power generation: advantages and disadvantages, Energy crises, Non-conventional energy (NCE) resources: review of Solar PV, Wind Energy systems, Fuel Cells, micro-turbines, biomass, and tidal sources.

UNIT II DISTRIBUTED GENERATIONS (DG) **9**

Concept of distributed generations, topologies, selection of sources, regulatory standards/ frame work, Standards for interconnecting Distributed resources to electric power systems:IEEE1547.DG installation classes, security issues in DG implementations. Energy storage elements: Batteries, ultra-capacitors, fly wheels. Captive power plants.

UNIT III IMPACT OF GRID INTEGRATION **9**

Requirements for grid interconnection, limits on operational parameters, : voltage, frequency, THD, response to grid abnormal operating conditions, islanding issues. Impact of grid integration with NCE sources on existing power system: reliability, stability and power quality issues.

UNIT IV MICROGRIDS **9**

Concept and definition of micro grid, micro grid drivers and benefits, review of sources of micro grids, typical structure and configuration of a micro grid, AC and DC micro grids, Power Electronics interfaces in DC and AC micro grids, communication infrastructure, modes of operation and control of micro grid: grid connected and is landed mode, Active and reactive power control, protection issues, anti-islanding schemes: passive, active and communication-based techniques.

UNIT V POWER QUALITY ISSUES IN MICRO GRIDS 9

Power quality issues in micro grids- Modelling and Stability analysis of Micro grid, regulatory standards - IEEE519 standard, Micro grid economics, Introduction to smart micro grids.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To acquire knowledge on the various conventional and non-conventional energy resources
- To understand the concept of distributed generation
- To gain knowledge about the impact of grid integration.
- To understand the of micro grid and its configuration
- To explicate the quality issues in microgrids

TEXT BOOKS:

1.Tomás Gómez Román, José Pablo Chaves-Áila ,**"** Integration of Renewable and Distributed Energy Resources in Power Systems", Mdpi AG publisher 2020

2.Amirnaser Yezdani, and RezaIravani, "Voltage Source Converter sin Power Systems: Modeling, Control and Applications", IEEE John Wiley Publications, 2009.

3.Dorin Neacsu, "Power Switching Converters: Medium and High Power", CRC Press, Taylor &Francis,2006.

4.Chetan Singh Solanki, "Solar Photo Voltaics", PHI learningPvt.Ltd.,NewDelhi, Third Edition ,2015

REFERENCES:

1.Chowdhury.S, Chowdhury S.P. and Crossley P, "Microgrids and Active Distribution Networks" The Institution of Engineering and Technology, London, U.K, 2009

2.Manwell J.F,"Wind Energy Explained, theory design and applications, "J.G.Mc Gowan Wiley publication, 2009.

3.Hall D.D. and Grover R.P.,"Bio mass Regenerable Energy", John Wiley, NewYork,1987.

4.Nikos Hatziargyriou , "Micro grids: Architectures and Control", Wiley-IEEE Press, 2014

5.John T widel land Tony Weir, "Renewable Energy Resources" Tyalor and Francis Publications, 2005

6.God freyBoyle ,"Renewable Energy- Power for a sustainable future", third edition, Oxford University Press, 2013.

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5. https://youtu.be/4D2HzRBDg14

6. https://youtu.be/3DmThppGRv4

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	2	2	2	2	1	2	2	1	1	2	-	-	3	2	2
CO2	2	3	3	2	1	2	2	1	1	2	1	2	2	1	2
CO3	2	2	-	2	1	-	2	1	1	2	1	2	2	1	2
CO4	1	1	2	3	1	-	3	1	1	3	-	-	2	1	2
CO5	1	1	2	3	1	2	3	1	1	3	-	1	2	2	1
AV G	2	2	2	2	1	2	2	1	1	2	1	2	2	1	2

JEE1014 **ELECTRIC ENERGY GENERATION, UTILIZATION AND CONSERVATION**

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

COURSE OBJECTIVES:

- To study the principle, design of illumination systems and energy efficiency lamps**.**
- To impart knowledge on refrigeration and air conditioning
- To understand the different methods of electric heating and electric welding.
- To provide an overview on the electric traction systems and their performance.
- To introduce concepts of domestic wiring connection and Earthing.

UNIT I ILLUMINATION 9

Importance of lighting – properties of good lighting scheme – laws of illumination – photometry - types of lamps – lighting calculations – basic design of illumination schemes for residential, commercial, street lighting, factory lighting and flood lighting – LED lighting and energy efficient lamps. Case Study - Analysis of insufficient lighting in Substation, Replacement of conventional lights by led lights

UNIT II REFRIGERATION AND AIR CONDITIONING 9

Refrigeration-Domestic refrigerator and water coolers - Air-Conditioning-Various types of air-conditioning system and their applications, smart air conditioning units - Energy Efficient motors: Standard motor efficiency, need for efficient motors, Motor life cycle, Direct Savings and payback analysis, efficiency evaluation factor.

UNIT III HEATING AND WELDING 9

Role of electric heating for industrial applications – resistance heating – induction heating – dielectric heating - electric arc furnaces. Brief introduction to electric welding – welding generator, welding transformer and the characteristics.

UNIT IV ELECTRIC TRACTION 9

Merits of electric traction – requirements of electric traction system – supply systems – mechanics of train movement – traction motors and control – braking – recent trends in electric traction.

UNIT V DOMESTIC UTILIZATION OF ELECTRICAL ENERGY 9

Domestic utilization of electrical energy – House wiring. Induction based appliances, Online and

OFF line UPS, Batteries - Power quality aspects – nonlinear and domestic loads – Earthing – Domestic,

Industrial and Substation.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the principle, design of illumination systems and energy efficiency lamps.
- To gain knowledge on refrigeration and air conditioning
- To acquire knowledge on the methods of industrial heating and welding.
- To understand the electric traction systems and their performance.

- To evaluate domestic wiring connection and debug any faults occurred.

TEXT BOOKS:

1 Wadhwa, C.L. “Generation, Distribution and Utilization of Electrical Energy”, New Age International Pvt. Ltd, Seventh edition, 2016.
2. Dr. Uppal S.L. and Prof. S. Rao, 'Electrical Power Systems', Khanna Publishers, New Delhi, 15th Edition, 2014.
3. Energy Efficiency in Electric Utilities, BEE Guide Book, 2010

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1. Gupta.J.B, “Utilization of Electric Power and Electric Traction”, S.K. Kataria and Sons, 2018

2. Suryanarayana N V , “ Utilisation Of Electric Power Including Electric Drives And Electric Traction”, New Age International (P) Ltd., 2017.

3. Open shaw Taylor.E, “Utilization of Electrical Energy in SI Units”, Orient Longman Pvt. Ltd, 2003.

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3. https://youtu.be/GzEMdQk1QTk

4. **https://youtu.be/Fv0Di_a_JbY**

5. **https://youtu.be/TvNyBocu1do**

6. **https://youtu.be/cvQ5tss5sfA**

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	2	2	2	-	2	2	-	1	2	2	3	3	2	2
CO2	2	3	3	2	-	3	2	-	1	2	1	2	2	1	-
CO3	2	2	3	2	-	2	2	-	1	2	1	2	2	1	-
CO4	3	1	2	3	-	3	3	-	1	3	1	3	3	1	2
CO5	3	1	2	3	-	3	3	-	1	3	1	3	3	2	1
AV G	3	2	2	2	-	2	2	-	1	2	1	3	3	1	2

JEE1015 ENERGY MANAGEMENT **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To impart knowledge about the Energy Management.
- To study the concepts behind economic analysis and load management.
- To emphasize the energy management on various electrical equipment and metering.
- To Illustrate Energy Management for Motors and Systems
- To Illustrate the concept of lighting systems and cogeneration.

UNIT I INTRODUCTION TO ENERGY MANAGEMENT **9**

Need for energy management–energy basics–designing and starting an energy management program -energy accounting–energy monitoring, targeting and report in energy audit process.

UNIT II ENERGY COST AND LOAD MANAGEMENT **9**

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–economic justification.

UNIT III ENERGY MANAGEMENT FOR MOTORS, SYSTEMS, AND ELECTRICAL EQUIPMENT **9**

Energy management for systems and equipment – electric motors – transformers and reactors – capacitors and synchronous machines.

UNIT IV METERING FOR ENERGY MANAGEMENT **9**

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 – metering techniques and practical examples.

UNIT V LIGHTING SYSTEMS AND COGENERATION 9

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. Cogeneration: forms of cogeneration–feasibility of cogeneration–electrical inter connection.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand in depth knowledge about the Energy Management.
- To understand the concepts behind economic analysis and load management.
- To emphasize the energy management on various electrical equipment and metering.
- To emphasize the energy Management for Motors and Systems
- To understand the concept of lighting systems and cogeneration.

TEXT BOOKS:

1.Chaudari.M.A, Chaudari.S.M, ASARKAR.S.A, **"**Energy Conservation And Audit",NiraliPrakashan, 2019

2.Reay D.A.,"Industrial Energy Conservation",firstedition,Pergamon Press,1977.

3.IEEER e commended Practice for Energy Management in Industrial and Commercial Facilities, IEEE, 1996.

4. Eastop T.D and Croft D.R, "Energy Efficiency for Engineers and Technologists" ,Log man Scientific & Technical, 1990.

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4.Umesh Rathore., "Energy Management", S.K.Kataria& sons, 2013.

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WEB SITE REFERENCE:

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3. https://youtu.be/c36djYOAQuA

4. https://youtu.be/2mw2h7FMPh8

5. https://youtu.be/nlFM1q9QPJw

6. https://youtu.be/nITuv0ePq_k

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
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CO3	2	2	-	2	-	2	1	-	1	2	-	2	1	1	2
CO4	3	1	2	1	-	3	1	-	1	3	-	1	-	1	2
CO5	3	1	1	1	-	3	1	-	1	3	-	1	1	2	1
AV G	3	2	2	2	-	2	1	-	1	2	-	1	1	1	2

JEE1016 **SMART GRID** **L T P C**

3 0 0 3

COURSE OBJECTIVES:

- To provide an overview on the concepts of smart grid and its present developments.
- To study about smart grid technologies
- To familiarize with various smart meters and advanced metering infrastructure
- To learn the power quality management in smart grids
- To introduce the concepts about LAN, WAN and Cloud Computing for smart grid applications

UNIT I INTRODUCTION TO SMART GRID 9

Evolution of Electric Grid, Concept, Definitions and Need for Smart Grid, Smart grid drivers, functions, opportunities, challenges and benefits, Difference between conventional & Smart Grid, National and International Initiatives in Smart Grid**.**

UNIT II SMART GRID TECHNOLOGIES 9

Technology Drivers, 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, Plugin Hybrid Electric Vehicles(PHEV).

UNIT III SMART METERS AND ADVANCED METERING INFRASTRUCTURE 9

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.

UNIT IV POWER QUALITY MANAGEMENT IN SMART GRID 9

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.

UNIT V HIGH PERFORMANCE COMPUTING FOR SMART GRID APPLICATIONS 9

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

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the concepts of smart grid and its present developments.
- To acquire knowledge on smart grid technologies
- To gain knowledge about different smart meters and advanced metering infrastructure.
- To evaluate power quality management in Smart Grids
- To understand LAN, WAN and Cloud Computing for Smart Grid applications

TEXT BOOKS:

1. Shunmugalatha .A ,Chandrasekar.T , Ashok Kumar .B ,Rajeswari.J,"Smart Grids", Technical Publication , 2021
2. James Momoh, "Smart Grid– fundamentals of design and analysis", John Wiley and Sons,2012
3. .Janaka Ekanayake, "Smart Grid-Technology and Applications", John Wiley and Sons,2012
4. ClarkW.Gellings,"TheSmartGrid-Enabling energy efficiency and demand response" , CRC press, 2009.

REFERENCES:

1. FereidoonP.Sioshansi, "Smart grid-integrating renewable, distributed and efficient energy", Elsevier 2012

2.Stuart Borlase," Smart Grids, Infratructure, technology and solutions", CRC press ,2013

3.Vehbi C. Güngör ,DilanSahin, Taskin Kocak, Salih Ergüt, ConcettinaBuccella, Carlo Cecati, and Gerhard P. Hancke, "Smart Grid Technologies: Communication Technologies and Standards" IEEE Transactions On Industrial Informatics, Vol.7,No.4, November2011.

4.Xi Fang, SatyajayantMisra, Guoliang Xue, and DejunYang"SmartGrid –The New and Improved Power Grid: A Survey" ,IEEE Transaction on Smart Grids,vol.14,2012.

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3. https://youtu.be/JwRTpWZReJk

4. https://youtu.be/XVK6eseBcjQ

5. https://youtu.be/tbi8LyvN2CM

6. https://youtu.be/MX_9srBXj1w

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	2	2	2	2	1	2	2	1	1	2	-	-	3	2	2
CO2	2	3	3	2	1	2	2	1	1	2	1	2	2	1	2
CO3	2	2	-	2	1	-	2	1	1	2	1	2	2	1	2
CO4	1	1	2	3	1	-	3	1	1	3	-	-	2	1	2
CO5	1	1	2	3	1	2	3	1	1	3	-	1	2	2	1
AV G	2	2	2	2	1	2	2	1	1	2	1	2	2	1	2

JEE1017 FINITE ELEMENT ANALYSIS FOR ELECTRICAL MACHINES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To study the basic design considerations of electrical machines.
- To learn the concepts and solution techniques of finite element method
- To provide overview on CAD package for design of electrical machines
- To familiarize with the MAGNET software for model building
- To educate scientifically the new developments in software for designing the machines.

UNIT I BASIC DESIGN CONSIDERATIONS **9**

Introduction to CAD - Conventional design procedures: output equations- Specific loadings - Variation of output and losses with dimensions design criteria - Limitations of conventional methods of design – Engineering Optimization and Optimization Methodology- Need for field analysis based design.

UNIT II FINITE ELEMENT METHOD **9**

Introduction to finite element method and its Assumptions - Maxwell equations, - Finite difference method – Finite Element method –Variation method - 2D field problems-Discretisation-shape functions-

Stiffness matrix-Solution techniques –Computers in Finite Element Analysis- applications of FEA.

UNIT III CAD PACKAGE 9

Elements of a CAD system- Preprocessing- Modeling-Meshing – Material properties-Boundary conditions-Solver– Post processing- Consideration sin problem modeling: stator and rotor model, model replication-Air gap discretization and simulation of rotation-Calculations: Flux plots-Calculations: Flux linkages–Inductance and Co-energy.

UNIT IV INTRODUCTION TO MODEL BUILDING 9

Introduction to MagNet – model building - Modeling flowchart – geometric modeling- Drawing edges – creating surface - Creating components - Selecting edges surfaces and components - Positioning the constructionslice-Material, boundary condition and finite element mesh-Material, boundary condition and finite element mesh.

UNIT V DESIGN APPLICATIONS 9

Introduction to software packages of Finite Element analysis such as MagNet, Motor solve and its comparison – Design of C-core using software – Design of Inductance using software-Design of SRM motor with 6:4 slots using software – Design of 3-phase 6-pole BLDC Motor with 9-slots using software

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the basic design considerations of electrical machines
- To gain knowledge on the concepts and solution techniques of finite element method
- To acquire knowledge on the usage of CAD package for design of electrical machines.
- To pertain knowledge with the MAGNET software for model building
- To explicate the software for designing the machines

TEXT BOOKS:

1. Reddy. J.N ,"Introduction to Finite Elements in Electrical Engineers" McGraw Hill, Fourth Edition , 2020.
2. ChandrupaBelegundu ,"Introduction to Finite Elements in Electrical Engineers" PHI, 2018
3. Silvester and Ferrari,"Finite Elements for Electrical Engineers" Cambridge University press,1983.
4. Hoole S.R.H, “Computer - Aided, Analysis and Design of Electromagnetic Devices”, Elsevier, NewYork,Amsterdam,London,1989

REFERENCES:

1.Rao.S. Singiresu,"Finite Element Method in Engineering",Elsevier ,2019.

2.Trow bridge C.W,"An Introduction to Computer Aided Electro magnetic Analysis", Vector field ltd.,Infolyticacorporation,“MAGNET version 6.11.1Getting Started guide”.

3.Nicola Biyanchi , “Electrical Machine analysis using Finite Elements”, Taylor and Francis Group, CRC Publishers, 2005

4.Nathan Ida, Joao P.A.Bastos , “Electro magnetics and calculation of fields”, SpringerVerlage, 1992.

5.BinnsK.J, Lawrenson.P.J, Trowbridge.C.W, “The analytical and numerical solution of Electric and magnetic fields”, John Wiley & Sons, 1993.

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3.**https://youtu.be/LIgBWgR-z7w**

4.**https://youtu.be/3E8KryyEJ20**

5.**https://youtu.be/FYjcXyxZlVo**

6.**https://youtu.be/igW8V4WuEcE**

CO –PO & PSO MAPPING

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CO3	2	2	3	2	-	-	-	-	1	2	-	1	1	1	1
CO4	3	2	2	3	-	-	-	1	1	3	-	-	-	-	-
CO5	3	2	2	3	-	-	-	-	1	3	-	-	-	-	1
AV G	3	2	2	2	-	-	-	1	1	2	-	1	1	1	1

PROFESSIONAL ELECTIVE V
SEMESTER VII

JEE1018

ADVANCED CONTROL SYSTEMS	**L**	**T**	**P**	**C**
	2	**2**	**0**	**3**

COURSE OBJECTIVES:

- To impart knowledge on the state space modeling.
- To provide overview about the phase plane analysis.
- To learn the concept behind describing function analysis.
- To study the design of optimal controller.
- To educate in the design of optimal estimator including Kalman

UNIT I STATE VARIABLE DESIGN **9**

Introduction to state Model- effect of state Feedback- Necessary and Sufficient Condition for Arbitrary Pole-placement- pole placement Design- design of state Observers- separation principle- servo design: - State Feedback with integral control.

UNIT II PHASE PLANE ANALYSIS **9**

Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of linear and nonlinear control systems

UNIT III DESCRIBING FUNCTION ANALYSIS **9**

Basic concepts, derivation of describing functions for common non-linearities – Describing function analysis of non-linear systems – limit cycles – Stability of oscillations.

UNIT IV OPTIMAL CONTROL **9**

Introduction - Time varying optimal control – LQR steady state optimal control – Solution of Ricatti's equation – Application examples

UNIT V OPTIMAL ESTIMATION **9**

Optimal estimation – Kalman Bucy Filter-Solution by duality principle-Discrete systems- Kalman Filter Application examples...

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To design state feedback controller and state observer.
- To understand and analyze linear and nonlinear systems using phase plane method
- To understand and analyze nonlinear systems using describing function method.
- To understand and design optimal controller.
- To understand optimal estimator including Kalman Filter.

TEXT BOOKS:

1.Gopal.M, "Modern Control System Theory", New Age International Publishers, 2002
2.Richard dorf, "Modern Control system", Global Technical Publishers, 2017.
3.G. J. Thaler, " Automatic Control Systems", Jaico Publishing House, 1993.

REFERENCES:

1.Ogata. K, "Modern Control Engineering", 4th edition, PHI, New Delhi, 2015

2.Nagarath. I.JandGopal.M," Control Systems Engineering ", New Age International(P)Ltd., 2017

3.Ashish Tewari, "Modern Control Design with Matlab and Simulink", John Wiley, New Delhi, 2002.

4.William S Levine, "Control System Fundamentals," The Control Handbook, CRC Press, Tayler and Francies Group, 2011

5.Glad.Tand Ljung.L, "Control Theory –Multivariable and Non-Linear Methods", Taylor & Francis, 2002.

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4.https://youtu.be/dyDZSHU1zYY

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6.https://youtu.be/H-NR-wQ8ww0

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	2	2	2	-	-	-	-	1	-	-	1	-	-	2
CO2	2	3	3	2	-	-	-	-	1	-	-	2	-	1	-
CO3	2	2	3	2	-	-	-	-	1	-	-	2	-	-	-
CO4	3	1	2	3	-	-	-	-	1	-	-	1	-	1	2
CO5	3	1	2	3	-	-	-	-	1	-	-	2	-	-	1
AV G	3	2	2	2	-	-	-	-	1	-	-	2	-	1	2

JEI1702 INDUSTRIAL AUTOMATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To give an overview of the automation technologies such as PLCs, SCADA.
- To provide a fundamental understanding of the PLC Programming language.
- To provide overview of the different languages used for PLC Programming.
- To introduce to distributed control system and different communication protocols.
- To provide insight into some of the advanced principles those are evolving for present and future automation.

UNIT I PLC & SCADA 9

PLC: Evolutions of PLCs – Programmable Controllers – Architecture, I/O modules – Comparative study of Industrial PLCs. Basic building blocks of computer-controlled system, Data Acquisition System, SCADA: Remote terminal units- Master station - Communication architectures.

UNIT II BASICS OF PLC PROGRAMMING 9

Basics of PLC programming – Ladder Logic – Relay type instructions – Timer/Counter instructions – Program control instructions – Data manipulation and math instructions – Development and simulation of PLC programming with examples.

UNIT III PLC PROGRAMMING (OTHER LANGUAGES) 9

Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process Examples. Safety procedures of PLC – Installation procedures of PLC, Case studies: PLC

UNIT IV DISTRIBUTED CONTROL SYSTEM 9

DCS: Evolution & types – Hardware architecture – Field control station – Interfacing of conventional and smart field devices (HART and FF enabled) with DCS Controller – Communication modules – Operator and Engineering Human interface stations –Study of anyone DCS available in market.

UNIT V ADVANCED TOPICS IN AUTOMATION 9

Introduction to Robotics –Elements of Robots - Automation in Production systems: Principles, Strategies, Basic elements of Automated system-Networked Control systems – Plant wide control – Cloud based Automation – OLE for Process Control.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand all the important components such as PLC, SCADA their I/O modules and field devices of an industrial automation system.
- To develop PLC program using Ladder logic language.
- To develop different languages for industrial sequential applications.
- To understand the communication protocols in distributed control system.
- To gain knowledge on the recent developments in industrial automation.

TEXT BOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Sixth edition, 2022
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 13 December 2016.
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation' Marcel Dekker, Inc., New York ,1990.

REFERENCES:

1. Bhaskar Ghosh, Rajendra Prasad,Gayathri Pillail, "Automation Advantage : Embrace the future through AI", Kindle edition, January 2022.
2. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
3. Hughes, T.A., "Programmable Logic Controllers: Resources for Measurements and Control Series", 3rd Edition, ISA Press, 2004.
4. McMillan, G.K., "Process/Industrial Instrument and Controls Handbook", 5thEdition, McGraw- Hill handbook, New York, 1999.
5. Jamkar.R.G, " Industrial Automation Using PLC, SCADA & DCS",Global Education Linited.,Indai.ISBN:97881935799-2-3.January 2018.

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www.automationanywhere.com
https://zapier.com

https://automate.io

CO -PO -PSO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	3	-	2	-	2	-	-	-	-	-	-	-	2	2
CO2	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO3	3	-	2	-	2	-	-	-	-	-	-	-	2	2
CO4	3	-	2	-	2	-	-	-	-	-	-	-	-	-
CO5	3	-	2	-	2	-	-	-	-	-	-	-	1	1
AVG	3	-	2	-	2	-	-	-	-	-	-	-	1	1

JEE1019 SENSORS AND TRANSDUCERS L T P C

3 0 0 3

COURSE OBJECTIVES:

- To provide an overview of sensors and transducers.
- To learn about motion sensors, proximity sensor and range sensor for measuring various physical parameters.
- To study force, magnetic and heading sensors to measure various physical parameters.
- To learn the usage of optical, pressure and temperature sensors to measure physical parameters.
- To introduce the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I INTRODUCTION TO SENSORS AND TRANSDUCERS 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors –Sensor calibration techniques- Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT –RVDT – Synchro – Microsyn, Accelerometer.,– GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging , Reflective beacons, Laser Range Sensor(LIDAR).

UNIT III FORCE , MAGNETIC AND HEADING SENSORS 9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive– Hall Effect– Current sensor Heading Sensors– Compass, Gyroscope ,Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure –Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermo couple. Acoustic Sensors–flow and level measurement , Radiation Sensors-Smart Sensors-Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING AND DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multichannel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the characteristics and types of sensors and transducers..
- To gain knowledge on the usage of various motion sensors, proximity sensor and range sensor to to measure various physical parameters
- To acquire knowledge onforce, magnetic and heading sensors to measure various physical parameters.
- To understand the usage of optical, pressure and temperature sensors to measure physical parameters.
- To implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

1. Balamurugan Nachimuthu, SelvaperumalSundaramoorthy, " Principle of Sensors andTransducers", Lambert Academy Publishing, 2019
2. Ernest O Doebelin, "Measurement Systems–Applications and Design",Tata Mc Graw-Hill,2009.
3. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control",12th edition, DhanpatRai&Co, New Delhi, 2017.

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1. Patranabis D, "Sensors andTransducers",2nd Edition,PHI,NewDelhi,2021.

2.John Turner and Martyn Hill, Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.

3.Richard Zurawski,"Industrial Communication Technology Handbook "2nd edition, CRC Press,2015.

4.Gupta J. B, "A Course in Electronic and Electrical Measurements", S. K. Kataria& Sons, Delhi, 2013

5.Murthy.D.V.S, "Transducers and Instrumentation", Prentice Hall of India Pvt Ltd, 2015

6.Alan. S. Morris, "Principles of Measurements and Instrumentation", 2nd Edition, Prentice Hall of India, 2001.

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4.**https://youtu.be/HRj9YDva1rA**

5.**https://youtu.be/Y5YYtK-XYlc**

6.**https://youtu.be/HSHJXXFigz8**

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
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CO2	2	3	-	-	-	1	-	-	1	2	-	1	1	-	1
CO3	2	2	-	1	-	1	-	-	1	2	-	1	-	-	1
CO4	3	1	1	-	-	1	2	-	1	3	-	1	-	-	2
CO5	3	1	-	-	-	1	-	-	1	3	-	1	1	-	1
AV G	3	2	1	1	-	1	1	-	1	2	-	1	1	1	1

JEE1020 SPECIAL ELECTRICAL MACHINES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To review the fundamental concepts of permanent magnets and the operation of permanent magnet brushless DC motors.
- To introduce the concepts of permanent magnet synchronous motors and synchronous reluctance motors.
- To learn the control methods and operating principles of switched reluctance motors.
- To introduce the concepts of stepper motors and its applications.
- To study the basic concepts of other special machines.

UNIT I PERMANENT MAGNET BRUSHLESS DC MOTORS 9

Fundamentals of Permanent Magnets- Types- Principle of operation- Magnetic circuit analysis- EMF and Torque equations – Characteristics and control.

UNIT II PERMANENT MAGNET SYNCHROUNOUS MOTORS 9

Principle of operation – EMF and Torque equations – Phasor diagram – Power controllers–Torque speed characteristics – Digital controllers – Constructional features, operating principle and characteristics of synchronous reluctance motor.

UNIT III SWITCHED RELUCTANCE MOTORS 9

Constructional features–Principle of operation-Torque prediction–Characteristics Power controllers-Control of SRM drive-Sensor less operation of SRM– Applications.

UNIT IV STEPPER MOTORS 9

Constructional features– Principle of operation–Types– Torque predictions– Linear and Non-linear analysis–Characteristics–Drive circuits–Closed loop control–Applications.

UNIT V OTHER SPECIAL MACHINES 9

Principle of operation and characteristics of Hysteresis motor – AC series motors– Linear motor – Applications.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To acquire knowledge on construction and operation of permanent magnet brushless D.C. motors.
- To gain knowledge on characteristics of synchronous reluctance motor.
- To understand the construction , principle of operation of switched reluctance motors.
- To acquire the knowledge on construction and operation of stepper motor
- To identify a special Machine for a particular application.

TEXT BOOKS:

1. Saravanakumar R., Vinoth Kumar K, Umamaheshwari.R,“ Special Electrical Machines”,NiraliPrakashan Publisher, 2017.
2. Venkataratnam .K,“Special Electrical Machines” , Universities Press (India) Private Limited, 2008.
3. Kenjo.T“Stepping Motors and Their Microprocessor Controls”,Clarend on Press London,1984
4. Janardanan. E.G,“Special electrical machines”, PHI learning Private Limited, Delhi, 2014.

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1.Krishnan. R,“Switched Reluctance Motor Drives–Modeling, Simulation, Analysis, Design and Application”,CRC Press , New York, 2001.

2.Kenjo. T and Nagamori.S, “Permanent Magnet and Brushless DC Motors”, Clarendon Press, London,1988.

3.Miller.T.J.E, “Brushless Permanent – Magnet and Reluctance Motor Drives”,Oxford University Press,1989.

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1.**www.nptel.com**

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3.**https://youtu.be/NRxo5aDGG8M**

4.**https://youtu.be/3jeawRVCB_Q**

5.**https://youtu.be/eyqwLiowZiU**

6.**https://youtu.be/4MB4e9ai3ms**

CO –PO & PSO MAPPING

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CO4	-	1	1	1	-	1	3	-	1	3	-	1	-	1	1
CO5	-	1	1	1	-	1	3	-	1	3	-	2	-	1	1
AV G	2	2	1	1	-	2	2	-	1	2	1	2	-	1	1

JEE1021 ADVANCED INTEGRATED AUTOMATION

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To learn the components of totally integrated automation system.
- To provide an overview about the human machine interface system.
- To study the basic architecture of SCADA and report generation using it.
- To impart knowledge about communication protocols in an integrated system
- To familiarize with distributed control system and its applications

UNIT I TOTALLY INTEGRATED AUTOMATION 9

Need, components of TIA systems, advantages , Programmable Automation Controllers (PAC) , Vertical Integration structure.

UNIT II HUMAN MACHINE INTERFACE SYSTEMS 9

Necessity and Role in Industrial Automation , Need for Human Machine Interface (HMI) systems .Types of HMI-Text display-operator panels-Touch panels-Panel PCs-Integrated displays (PLC&HMI) .Check with PLC 502 and remove

UNIT III SUPERVISORY CONTROL AND DATA ACQUISITION (SCADA) 9

Overview – Developer and runtime packages – architecture – Tools – Tag – Internal &External graphics, Alarm logging – Tag logging – structured tags– Trends – history– Report generation, VB & CS cripts for SCADA application.

UNIT IV COMMUNICATION PROTOCOLS OF SCADA 9

Proprietary and open Protocols – OLE / OPC – DDE – Server / Client Configuration – Messaging–Recipe– User administration–Interfacing of SCADA with PLC , drive, and other field device.

UNIT V DISTRIBUTED CONTROL SYSTEMS (DCS) 9

DCS – architecture – local control unit- programming language – communication facilities – operator interface-engineering interfaces . APPLICATIONS OF DCS: Case studies of Machine automation , Process automation , Comparison between SCADA and DCS.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the components involved in totally integrated automation system
- To acquire Knowledge in HMI systems and to integrate it with other systems.
- To apply SCADA and usage of C programming for report generation
- To acquire information about the usage of communication protocols in an integrated system
- To design and develop automated control system using distributed control systems.

TEXT BOOKS:

1.John.W.Webb& Ronald A. Reis, "Programmable logic controllers: Principles and Applications ", Pearson ,2015.

2.Michael P. Lukas," Distributed Control systems ","Van Nostrand ReinfoldCompany"1995.

REFERENCES:

1.Popovic.D. and BhatkarV.P, "Distributed computer control for industrial Automation" Marcel Dekker,Inc., Newyork,2011.

2.Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems",Newnes,1stEdition,2004.

3.Mc Millan, G.K., "Process /Industrial Instrument and Controls Handbook", 5th Edition, McGraw-Hill hand book, New York, 1999

4.Mano.M and Ciletti, "Digital Design", 4th edition, Prentice Hall, 2007

5.WinCC SoftwareManual,Siemens,2003

6.RSVIEW32 Software Manual, Allen Bradly,2005

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1. **www.nptel.com**

2.**https://youtu.be/usQuFNUzobQ**

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5.**https://youtu.be/w5eCKv6iUIk**

6.**https://youtu.be/19BT4CtOCMk**

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	3	-	2	-	2	-	-	-	1	-	-	1	3	2	2
CO2	3	-	2	-	2	-	-	-	2	-	-	1	2	1	-
CO3	3	-	2	-	2	-	-	-	2	-	-	1	2	1	-
CO4	3	-	2	-	2	-	-	-	1	-	-	1	3	1	2
CO5	3	-	2	-	2	-	-	-	1	-	-	1	3	2	1
AV G	3	-	2	-	2	-	-	-	1	-	-	1	3	1	2

JEE1022 APPLIED SOFT COMPUTING TECHNIQUES

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks for control applications
- To provide an overview about the fuzzy systems
- To provide comprehensive knowledge of fuzzy logic control to real time systems.
- To familiarize with optimization technique using genetic algorithms, ACO and Tabu search

UNIT I ARCHITECTURES–ANN 9

Introduction – Biological neuron – Artificial neuron – Neuron model – Supervised and unsupervised Learning - Single layer – Multi layer feed forward network – Learning algorithm- Back propagation network.

UNIT II NEURAL NETWORKS FOR CONTROL 9

Feedback networks – Discrete time Hopfield networks – Transient response of continuous time system – Applications of artificial neural network - Process identification – Neuro controller for inverted pendulum.

UNIT III FUZZY SYSTEMS 9

Classical sets – Fuzzy sets – Fuzzy relations – Fuzzification – Defuzzification – Fuzzy rules – Membership function – Knowledge base – Decision-making logic – Introduction to neuro fuzzy system- Adaptive fuzzy system.

UNIT IV APPLICATION OF FUZZY LOGIC SYSTEMS 9

Fuzzy logic control: Home heating system - liquid level control - aircraft landing- inverted pendulum –fuzzy PID control , Fuzzy based motor control.

UNIT V GENETIC ALGORITHMS 9

Basic concept of Genetic algorithm and detail algorithmic steps-adjustment of free Parameters- Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand and apply computing platform using ANN.
- To gain knowledge about feedback neural networks and usage of these networks for control applications.
- To understand the computing platform and logic involved with fuzzy system.
- To identify and apply the fuzzy system for control applications.

- To apply and analyze optimization technique using genetic algorithms, ACO and Tabu search.

TEXT BOOKS:

1. Timothy J. Ross,'Fuzzy sets and Fuzzy Logic with Engineering Applications',Tata Mc Graw Hill,3rd Edition , 2021

2.Laurance Fausett, Englewood Cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education, 2004.

3.Sivanandam S.N and Deepa S.N, "Principles of Soft computing", Wiley India Edition, 3rd Edition,2018

REFERENCES:

1. Simon Haykin," Neural Networks and Learning machines", Pearson Education, 2016.

2.John Yen & Reza Langari, "Fuzzy Logic – Intelligence Control & Information", Pearson Education, New Delhi ,2003.

3.Gen. M and Cheng, R," Genetic algorithms and optimization" , Wiley Series in Engineering Design and Automation, 2000.

4.Hagan , Demuth, Beale, "Neural Network Design ",Cengage Learning, 2012.

5. N.P.Padhy, "Artificial Intelligence and Intelligent Systems ",Oxford ,2013.

6. William S. Levine,"Control System Advanced Methods,"The Control Handbook CRC Press 2011.

WEB SITE REFERENCE:

1. **www.nptel.com**

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3.**https://youtu.be/81B-ESqgCjs**

4.**https://youtu.be/oUWwLbYBJTg**

5.**https://youtu.be/1K7knjKP850**

6.**https://youtu.be/bBxUaHJTNNI**

CO –PO & PSO MAPPING

CO\ PO, PSO	PO1	PO2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO1 0	PO1 1	PO1 2	PS O1	PS O2	PS O3
CO1	1	1	-	-	2	2	2	-	1	-	-	3	-	-	2
CO2	1	1	-	-	2	3	2	-	1	-	-	2	-	1	2
CO3	1	1	-	-	2	2	2	-	1	-	-	2	-	1	1
CO4	1	1	-	-	2	3	3	-	1	-	-	3	-	1	2
CO5	1	1	-	-	2	3	3	-	1	-	-	3	-	-	1
AV G	1	1	-	-	2	2	2	-	1	-	-	3	-	1	2

OPEN ELECTIVE I

SEMESTER IV

		L	T	P	C
JEE9001	ELECTRICAL SAFETY ENGINEERING	3	0	0	3

COURSE OBJECTIVES:

- To expose the students to electrical hazards
- To impart knowledge on prevention of electrical shocks
- To create awareness about various first aid methods
- To impart knowledge on Electrical safety in hazardous areas
- To study about Electrical safety management

UNIT I INTRODUCTION 9

General Back ground-Objectives of safety and security measures-Hazards associated with electric current and voltage-principles of electrical safety- Approaches to Prevent Accidents-Fire Prevention and Fire Fighting-Objectives and scope of IE act and IE rules-General requirements for electrical safety as per IE rules

UNIT II ELECTRICAL SHOCKS AND THEIR PREVENTION 9

Primary and Secondary Electric Shocks-Occurrence of Electric Shock-Shocks Due to Flash overs/Spark-overs- Lightning Strokes on Overhead Transmission Lines and Outdoor Substations - Safety Precautions in Small LV Installations, Residential Buildings, Shops – Safety Procedures in Electrical Plant Installation and description of Earthing System-Equipment Earthing -Substation Earthing.

UNIT III FIRSTAID 9

Introduction- Removal of Contact with Live Conductor- First Principles of Actions after Electric Shock-Artificial Respiration-Schafer's Prone Pressure Method-Silvester's Method-Nielson's Arm-lift Back-pressure Method-Mouth to Mouth Method-Use of Artificial Resuscitator-External Cardiac Massage-Cardiac Pulmonary Resuscitation-First aid treatment of Heat Exhaustion and heat stroke.

UNIT IV ELECTRICAL SAFETY IN HAZARDOUS AREAS 9

Introduction-Classification of Hazardous zones-causes of sparks and flash overs in electrical plants and machines-functional requirements of electrical equipment and installations for hazardous area/zones-classification of equipment/enclosure for hazardous locations.

UNIT V ELECTRICAL SAFETY MANAGEMENT 9

Introduction-Principles of safety management-management's safety policy-safety organization-organization charts for construction phase of a project, maintenance mode of a plant and for safety department – safety auditing-training and supervision-annual reports – motivation to managers, supervisors and employees.

TOTAL:45PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand Electrical safety, IE act and IE rules.
CO2: To acquire knowledge on prevention of electrical shocks
CO3: To acquire knowledge about various first aid measures.
CO4: To Familiarize with electrical safety in hazardous areas.
CO5: To Know about safety management.

TEXT BOOKS:

1. S.Rao, R.K.Jain and H.L.Saluja, "Electrical Safety, Fire Safety and Safety Management", Khanna Publishers, Second Edition, 2012.
2. W.F.Cooper, "Electrical Safety Engineering", Butterworth and Company, London, Third Edition, 2013

REFERENCES:

1. J.Cadick, D.Neitzel and A.Winfield, "Electrical Safety Hand Book", Mc Graw Hill 1.An Education, Fourth Edition 2012.
2. J.Maxwell Adams, "Electrical Safety-A Guide to the Causes and Prevention of Electric Hazards", The Institution of Electric Engineers, First Edition 3rd Reprint, 2009.
3. Martha J. Boss and Gayle Nicoll, "Electrical Safety-Systems, Sustainability and Steward ship", CRC Press, First Edition, 2015.

JEE9002	DESIGN ESTIMATION AND COSTING OF ELECTRICAL SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To emphasize the estimation and costing aspects of all electrical equipment, installation and designs on the cost viability.
- To design and estimation of electrical installation for buildings and small industries
- To study transmission and distribution lines
- To study various types of substations
- To design illumination schemes

UNIT I DESIGN CONSIDERATIONS OFELECTRICAL INSTALLATIONS 9

Electric Supply System, Three phase four wire distribution system, Protection of Electric Installation against over load, short circuit and Earth fault, Earthing, General requirements of electrical installations, testing of installations, Indian Electricity rules, Neutral and Earth wire, Types of loads, Systems of wiring, Service connections, Service Mains, Sub-Circuits, Location of Outlets, Location of Control Switches, Location of Main Board and Distribution board, Guide lines for Installation of Fittings, Load Assessment, Permissible voltage drops and sizes of wires, estimating and costing of Electric installations.

UNIT II ELECTRICAL INSTALLATION FOR DIFFERENT TYPES OF BUILDINGS AND SMALL INDUSTRIES 9

Electrical installations for residential buildings–estimating and costing of material, Electrical installations for commercial buildings, Electrical installations for small industries.

UNIT III OVERHEAD AND UNDERGROUND TRANSMISSION AND DISTRIBUTION LINES 9

Introduction, Supports for transmission lines, Distribution lines–Materials used, Underground cables, Mechanical Design of overhead lines, Design of underground cables.

UNIT IV SUBSTATIONS 9

Introduction, Types of substations ,Outdoor substation–Pole mounted type, Indoor substations –Floor mounted type.

UNIT V DESIGN OF ILLUMINATIONS CHEMES 9

Introduction, Terminology in illumination, laws of illumination, various types of light sources, Practical lighting schemes LED, CFL and OCFL differences.

TOTAL: 45PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the design considerations of electrical installations.
CO2: To Design electrical installation for buildings and small industries.
CO3: To acquire knowledge of various transmission and distribution lines.
CO4: To understand various types of substations
CO5: To Identify and design the various types of light sources for different applications.

TEXT BOOKS:

1. K.B.Raina, S.K.Bhattacharya, "Electrical Design Estimating and Costing", New Age International Publisher, second edition, 2010.
2. Er.V.K.Jain, Er.Amitabh Bajaj, "Design of Electrical Installations", Laxmi Publications (P) Ltd, first edition, 01-Apr-2012

REFERENCES:

1. Code of practice for Electrical wiring installations, Indian Standard Institution, IS: 732-1983.
2. Guide for Electrical layout in residential buildings, Indian Standard Institution, IS:4648-1968.
3. Electrical Installation buildings Indian Standard Institution, IS:2032.
4. Code of Practice for selection, Installation of Maintenance off use (voltage not exceeding 650V), Indian Standard Institution,IS:3106-1966.
5. Code of Practice for earthling, Indian Standard Institution, IS:3043-1966.
6. Code of Practice for Installation and Maintenance of induction motors, Indian Standard Institution, IS: 900-1965.
7. Code of Practice for electrical wiring, Installations (system voltage not exceeding 650 Volts), Indian Standard Institution, IS: 2274-1963.
8. Gupta J. B., Katson, Ludhiana", "Electrical Installation, estimating and costing", S.K.Kataria and sons, 2013..

JEE9003	ELECTRICAL MACHINES AND DRIVES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

To impart knowledge on the following to pics

- Principle of operation, construction and working of DC machines and Transformers
- Principle of operation, construction and working of AC machines
- Characteristics and Speed control methods of motors
- Power electronic devices, Rectifiers, Choppers, Inverters, Cyclo converters and AC voltage regulators
- Electric drive characteristics, DC motor drives, Induction motor drive and Synchronous motor drive

UNIT I DC MACHINES AND TRANSFORMER 9

Introduction to Electrical Machines-Principle of Operation, Construction, Working, Types and Applications of DC Generator, DC motors and Transformer- EMF equation of DC Generator and Transformer-Torque equation of DC motor

UNIT II AC MACHINES 9

Principle of Operation, Construction, Working, Types and Applications of Three phase Induction Motor, Alternator, Synchronous motors and Single phase induction motors.

UNIT III SPEED CONTROL OF MOTORS 9

Torque/Speedcharacteristics,speedcontrolmethodsandStartersofDCmotors,Threephaseinduction motors and Synchronous motors

UNIT IV INTRODUCTION TO POWER ELECTRONICS 9

Power electronic devices–Power diode, SCR, IGBT, and Power MOSFET-Rectifiers-Choppers- Inverters-Cyclo converter-AC Voltage Regulator

UNIT V ELECTRIC DRIVES 9

Electric drive-Drive characteristics-Converter/Chopper fed DC motor drive-Induction motor drive-Synchronous motor drive

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To explain the Principle of operation, construction and working of DC machines and Transformers

CO2: To acquire the knowledge on Principle of operation, construction and working of AC Machines

CO3: To analyze the characteristics and speed control methods of motors

CO4: To understand Power electronic devices, Rectifiers, Choppers, Inverters, Cyclo converters and AC voltage regulators

CO5: To gain knowledge about electrical drives

TEXTBOOKS:

1. B.L.Theraja and A.KTheraja, "A Text book of Electrical Technology Volume-IIAC and DC Machines", 23rd edition, S Chand & Company Pvt.Ltd , 2013
2. Muhammad.H.Rahid, "Power Electronics Circuits, Devices and Applications",3rd edition, Pearson, 2012
3. G.K.Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House Pvt.Ltd., 2nd Edition, 2010
4. Bimal K.Bose "Modern Power Electronics and AC Drives", Prentice Hall of India, 2ndEdition, 2010

REFERENCES:

1. V.K.Mehta, "Principles of Electrical Machines", S Chand & Company Pvt. Ltd, 2nd
   3. An Edition, 2014
2. P.S.Bimbhra, "Power Electronics", 6th edition Khanna Publishers, 2013
3. Vedam Subramanyam, "Electric Drives Concepts and Applications", 2nd Edition, McGraw Hill, 2016
4. Theodore Wildi, "Electrical Machines, Drives and power systems, 6th edition, Pearson Education, 2015

OPEN ELECTIVE II

SEMESTER V

JEE9004	INDUSTRIAL ELECTRONICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To get an overview of various power semi-conductor devices and their switching characteristics.
- To introduce the operation and characteristics of controlled rectifiers.
- To study the operation and characteristics of DC-to-DC converters
- To learn the working of single and three phase inverters.
- To study the working of AC to AC converters

UNIT I POWERDEVICES 9

Layer diagram, switching characteristics of BJT, MOSFET and IGBT-Layer diagram, V-I characteristics, turn on and turn off mechanisms of SCR

UNIT II CONTROLLED RECTIFIERS 9

Introduction to full wave bridge rectifier–Operation and Characteristics of Single phase and three phase–Half controlled and fully controlled converters–Applications-light dimmer, Excitation system.

UNIT III DC-DC CONVERTERS 9

Principle, modes of operation, performance para meters and characteristics of Buck Regulator, Boost Regulator, Buck- Boost Regulator and Chopper classification – Class A, B, C, D, E Choppers, Applications-Battery operated vehicles.

UNIT IV INVERTERS 9

Voltage Source Inverter (VSI) –Single and three phase–Voltage Source Inverters (VSI) - Voltage control using PWM–Current Source Inverter (CSI)-Applications –UPS.

UNIT V AC-AC CONVERTERS 9

Phase control–Integral Cycle Control–working and characteristics of Single phase AC Chopper-working of Single phase and three phase cyclo converters-Applications – welding.

TOTAL: 45PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To acquire knowledge on power devices
CO2: To understand the operation and characteristics of various controlled rectifiers
CO3: To understand various modes of operation of DC-DC converters.
CO4: To gain knowledge about the working of inverters
CO5: To acquire knowledge on AC to AC converters

TEXT BOOKS:

1. G.K.Mithal, "Industrial Electronics", Khanna Publishers, Delhi, 2000.
2. David A.Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

REFERENCE BOOKS:

1. Salivahanan Electronic devices and Circuits, second edition, Tata McGraw Hill International, 2011.
2. G.M.Chute and R.D.Chute, "Electronics in Industry", McGraw Hill Ltd, Tokyo, 1995.
3. F.D.Petruzulla, "Industrial Electronics", McGrawHill ,Singapore,1996.
4. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi,2007.
5. Erickson, RobertW, "Fundament als of Power Electronics", Springer, second edition, 2010.

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2. https://www.sciencedirect.com/topics/engineering/d-c-to-d-c-converter
3. https://learnabout-electronics.org/PSU/psu30.php
4. https://www.electronics-tutorials.ws/power/switch-mode-power-supply.html
5. https://link.springer.com/chapter/10.1007/978-3-642-52454-7_6

JEE9005	MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the basic functional elements of instrumentation
- To learn the fundamentals of electrical and electronic instruments
- To educate on the comparison between various measurement techniques
- To impart various storage and display devices
- To get an overview about various transducers and the data acquisition systems

UNIT I INTRODUCTION 9

Functional elements of an instrument–Errors in measurement–-Statistical evaluation of measurement data-Standards and calibration-Principle and types of analog and digital voltmeters, ammeters

UNIT II ELECTRICAL AND ELECTRONICS INSTRUMENTS 9

Principle and types of multimeters–Construction and principle of Single and three phase watt meters and energy meters – Magnetic measurements – Determination of B-H curve and measurements of iron loss –Instrument transformers

UNIT III COMPARATIVE METHODS OF MEASUREMENTS 9

D.C & A.C potentiometers, DC bridges – Wheat stone, Kelvin's Double bridge, AC bridges -Maxwell, Anderson and Schering bridges. Interference and screening –Electrostatic and electromagnetic interference

UNIT IV STORAGE AND DISPLAY DEVICES 9

Magnetic disk and tape–Recorders, digital plotters and printers, CRT display, digital CRO, LED, LCD– Data Loggers

UNIT V TRANSDUCERS 9

Classification and Selection of transducers–Resistive, capacitive and inductive transducers– Piezoelectric, optical and digital transducers– Smart sensors.

TOTAL: 45 PERIODS

COURSE OUTCOMES

At the end of the course, the student will be able

CO1: To acquire knowledge on Basic functional elements of instrumentation
CO2: To understand the concepts of Fundamentals of electrical and electronic instruments
CO3: To distinguish between various measurement techniques
CO4: To gain knowledge on Various storage and display devices
CO5: To understand the concepts Various transducers and the data acquisition systems

TEXT BOOKS:

1. Sawhney A.K.,"A Course in Electrical & Electronic Measurements & Instrumentation", Seventh Edition, Dhanpat Rai and Co., 2015.
2. Gupta J.B.,"A Course in Electronic and Electrical Measurements", S.K. Kataria & Sons, Delhi ,2013
3. Doebelin E.O.and Manik D.N., "Measurement Systems –Applications and Design", Special Indian Edition, Tata McGraw Hill Education Pvt.Ltd.,2007

REFERENCE BOOKS:

1. Kalsi H.S., "Electronic Instrumentation", III Edition,McGrawHill,2017.
2. Murthy D.V.S., "Transducers and Instrumentation" ,Second Edition, Prentice Hall of India Pvt Ltd, 2015.
3. David Bell, "Electronic Instrumentation & Measurements", Third Edition, Oxford University Press, 2013.
4. Martin Reissland, "Electrical Measurements", First edition, New Age International (P) Ltd., Delhi, 2001.
5. Alan S.Morris, Principles of Measurements and Instrumentation, Third Edition, Butterworth-Heinemann, 2003

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1. https://www.youtube.com/watch?v=3eYmFjHnQjY
2. https://www.youtube.com/watch?v=11cWFio3h4U
3. https://www.youtube.com/watch?v=3c_uDCnnBXc
4. https://www.youtube.com/watch?v=I5k66ESHJHM
5. https://nptel.ac.in/courses/108/105/108105153/

JEE9006	ANALOG CONTROL SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provides an overview about the methods of representation of systems and to derive their transfer function models.
- To provide adequate knowledge in the time response of systems.
- To accord basic knowledge in obtaining the frequency responses of systems.
- To learn the concept of stability of control system.
- To study the three various ways of designing compensation for a control system

UNIT I SYSTEMS AND THEIR REPRESENTATION 9

Introduction to open and closed loop systems–Electrical analogy of mechanical systems– Transfer function —Block diagram reduction techniques – Signal flow graphs

UNIT II ELEMENTS AND TIME RESPONSE 9

Basic elements in control systems-Synchros–AC and DC servo motors, Time response–Time domain specifications–Types of test input–I and II order system response–P, PI, PID controllers.

UNIT III FREQUENCY RESPONSE 9

Frequency response–Bode plot–Polar plot – Determination of closed loop response from open loop response– Correlation between frequency domain and time domain specifications

UNIT IV STABILITY OF CONTROL SYSTEM 9

Characteristics equation–Location of roots in S plane for stability–Routh Hurwitz criterion Root locus construction–Gain margin and phase margin–Nyquist stability criterion

UNIT V COMPENSATOR DESIGN 9

Performance criteria–Lag, lead and lag-lead networks –Compensator design using bode plots

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To acquire knowledge on systems and their representation
CO2: To perform time response analysis
CO3: To understand the frequency response
CO4: To gain the knowledge on the stability of control system
CO5: To acquire knowledge on compensator design

TEXT BOOKS:

1. I.J.Nagrath and M.Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C.Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

REFERENCE BOOKS:

1. Dorf R.C. and Bishop R.H., "Modern Control systems", Addison–Wesley, 1995
2. Norman S.Nise,Control Systems Engineering, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M.Gopal, 'Control Systems, Principles and Design', TMH, New Delhi, 2002
5. K.Ogata, 'Modern Control Engineering', 4th edition, PHI, NewDelhi, 2002.

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1.https://nptel.ac.in/courses/107/106/107106081/
2. https://freevideolectures.com/course/3116/control-engineering-i
3. https://www.udemy.com/course/control-systems-engineering/
4. 4.https://www.electrical4u.com/control-engineering-historical-review-and-types-of-control- engineering/
5.https://www.youtube.com/watch?v=XMfH2P2Fc6Q

OPEN ELECTIVE III

SEMESTER VI

JEE9007	RENEWABLE ENERGY SYSTEMS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To impart knowledge on current and future role of renewable energy sources.
- To study about wind energy potential, wind power plants and grid connectivity
- To accord basic knowledge on solar thermal and solar PV systems
- To learn about biomass and its economic aspects, geothermal energy resources
- To introduce concepts of various ocean energy technologies

UNIT I RENEWABLE ENERGY SOURCES 9

Environmental consequences of fossil fuel use, Importance of renewable sources of energy, Sustainable Design and development, Types of RE sources, Limitations of RE sources, Present Indian and international energy scenario of conventional and RE sources

UNIT II WIND ENERGY 9

Power in the Wind – wind energy potential - performance characteristics-Types of Wind Power Plants (WPPs)–horizontal and vertical axis wind mills-Components of WPPs-Working of WPPs–Site selection of WPPs-Grid integration issues of WPPs

UNIT III SOLAR THERMAL SYSTEMS 9

Solar Radiation, Radiation Measurement, Solar Thermal Power Plant, Central Receiver Power Plants, Solar Ponds -Thermal Energy storage system with PCM

UNIT IV SOLAR PV SYSTEMS 9

Solar Photo voltaic systems: Basic Principle of SPV conversion – Types of PV
Systems- Types of Solar Cells –Photo voltaic cell concepts-IV Characteristics, Efficiency and Quality of the Cell, Series and parallel connections-maximum power point tracking, Aplications.

UNIT V OTHER ENERGY SOURCES 9

Bio mass resources –Energy from Bio mass: conversion processes-Types of Biomass Plants –Geothermal Energy: Basics, Direct Us-Tidal Energy: Energy from the tides, Barrage and Non Barrage Tidal power systems. Wave Energy: Energy from waves, wave power devices. Ocean Thermal Energy Conversion (OTEC)- Fuel cell :Principle of working- various types and construction.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To recognize current and possible future role of renewable energy sources
CO2: To assess the wind energy potential and understand the wind energy systems
CO3: To gain knowledge on solar thermal and solar PV systems
CO4: To acquire knowledge on biomass and Geothermal energy
CO5: To identify various ocean energy technologies and opportunities

TEXT BOOKS:

1. Twidell & Wier, “Renewable Energy Resources”, CRC Press (Taylor & Francis), 2011
2. D.P. Kothari, K.C Singal, Rakesh Ranjan,“Renewable Energy Sources and Emerging Technologies”, PHI Learning Pvt. Ltd, New Delhi, 2013.
3. Scott Grinnell, “Renewable Energy & Sustainable Design”, CENGAGE Learning, 2016.
4. Rai G.D.- “Non-Conventional Energy Sources”-Khanna Publishers-2010

REFERENCE BOOKS:

1. Tiwari and Ghosal, “Renewable energy resources”, Narosa Publishing House, 2007
2. Ramesh R & Kumar K.U, “Renewable Energy Technologies”, Narosa Publishing House, 2004
3. Mittal K M, “Non, Conventional Energy Systems”, Wheeler Publishing Co.Ltd, 2003
4. Chetan Singh Solanki, "Solar Photo voltaic Fundamentals, Technologies and Application”, PHI Learning Pvt.,Ltd., 2009.
5. Jha.A.R, “Solar Cell Technology and Applications”, CRC Press, 2010

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3. https://www.youtube.com/channel/UCMV3aTOwUtG5vwfH9_rzb2w
3.4.https://www.youtube.com/watch?v=-HhdR9YRGxI
5.https://www.youtube.com/watch?v=9tfLJ4taTKI

JEE9008	INTELLIGENT CONTROLLERS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the concepts of feed forward neural networks.
- To provide adequate knowledge about feedback neural networks
- To provide adequate knowledge about fuzzy and neuro-fuzzy systems
- To provide comprehensive knowledge of fuzzy logic control to real time systems.
- To provide adequate knowledge of genetic algorithms and its application to economic dispatch and unit commitment problems.

UNIT I ARCHITECTURES –ANN 9

Introduction–Biological neuron–Artificial neuron–Neuron model–Supervised and unsupervised learning-Single layer–Multi layer feed forward network–Learning algorithm-Back Propagation network.

UNIT II NEURAL NETWORKS FOR CONTROL 9

Feedback networks–Discrete time Hop field networks–Transient response of continuous time system–Applications of artificial neural network-Process identification–Neuro controller for Inverted pendulum.

UNIT III FUZZY SYSTEMS 9

Classical sets–Fuzzy sets–Fuzzy relations–Fuzzification– Defuzzification–Fuzzy rules Membership function–Knowledge base–Decision-making logic–Introduction to neuro fuzzy system- Adaptive fuzzy system.

UNIT IV APPLICATION OF FUZZY LOGIC SYSTEMS 9

Fuzzy logic control: Home heating system-liquid level control-aircraft landing-inverted pendulum– fuzzy PID control, Fuzzy based motor control.

UNIT V GENETICAL GORITHMS 9

Basic concept of Genetic algorithm and detail algorithmic steps - adjustment of free Parameters -Solution of typical control problems using genetic algorithm- Concept on some other search techniques like tabu search and ant colony search techniques for solving optimization problems.

TOTAL:45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the over view of artificial neural network and training algorithms.
CO2: To analyze problems to formulate models and develop control Schemes using Neuro controller systems
CO3: To design fuzzy controller for non-linear systems.
CO4: To apply genetic algorithm for optimization applications.
CO5: To use modern IT tool boxes to simulate case studies

TEXT BOOKS:

1. Laurance Fausett, Engle wood Cliffs, N.J., 'Fundamentals of Neural Networks', Pearson Education,1992.
2. TimothyJ.Ross,'Fuzzy Logic with Engineering Applications', Tata McGraw Hill, 3rd Edition 2010..
3. S.N.Sivanandam and S.N.Deepa, Principles of Soft computing, Wiley India Edition, 2ndEdition, 2013

REFERENCE BOOKS:

1. Simon Haykin, 'Neural Networks', Pearson Education, 2003.
2. JohnYen & Reza Langari, 'Fuzzy Logic–Intelligence Control & Information', Pearson Education, NewDelhi, 2003.
3. M.Genand R,Cheng, Genetic algorithms and optimization, Wiley Series in Engineering Design and Automation, 2000.
4. Hagan, Demuth, Beale, "Neural Network Design", Cengage Learning, 2012.
5. N.P.Padhy, "Artificial Intelligence and Intelligent Systems", Oxford, 2013.
6. William S.Levine, "Control System Advanced Methods, "The Control H and book CRC Press 2011.

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JEE9009	INTODUCTION TO SMPS AND UPS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To familiarize with the operation and characteristics of power semiconductor devices.
- To study about various modes of operation of DC-DC Converters.
- To learn the operation of Switched Mode Power Supply
- To accord knowledge about working and control of inverters
- To impart knowledge on power conditioning circuits and UPS

UNIT I POWER SEMI CONDUCTOR DEVICES 9

Layer diagram, Static and switching characteristics of BJT, MOSFET and IGBT - Layer diagram, V-I characteristics, turn on and turn off mechanisms of SCR.

UNIT II DC-DC CONVERTERS 9

Principle, modes of operation, performance parameters and characteristics of Buck Regulator, Boost Regulator, Buck-Boost Regulator and Resonant Converters

UNIT III SWITCHED MODE POWER CONVERTERS 9

Principle, modes of operation and characteristics of Fly back Converter, Forward Converter, Bridge converters, Push-Pull Converter and SMPS with multiple outputs

UNIT IV DC-AC CONVERTERS 9

Single phase and three phase inverters, control using various techniques,-Introduction to multilevel inverter concept.

UNIT V POWER CONDITIONERS, UPS AND FILTERS 9

Introduction-Power line disturbances-Power conditioners–UPS: off line UPS, Online UPS– Filters: Voltage filters, Series-parallel resonant filters, filter for PWM VSI, current filter, DC filters

TOTAL: 45 PERIODS

COURSE OUTCOMES:

At the end of the course, the student will be able

CO1: To understand the operations and characteristics of various power semi conductor devices
CO2: To understand various modes of operation of DC-DC converters
CO3: To gain knowledge about SMPS system
CO4: To understand the working and control of inverters
CO5: To acquire knowledge on Power conditioning circuit, filters and UPS

TEXT BOOKS:

1. Simon Ang, Alejandro Oliva," Power-Switching Converters", Third Edition, CRC Press, 2010.
2. Kjeld Thorborg, "Power Electronics– In theory and Practice", Overseas Press, First Indian Edition 2005

REFERENCE BOOKS:

1 M.H. Rashid– Power Electronics hand book, Elsevier Publication, 2001
2. Philip T Krein, "Elements of Power Electronics", Oxford University Press
3. NedMohan, Tore.M. Undeland, William. P.Robbins, Power Electronics converters,
Applications and design-Third Edition-John Wiley and Sons-2006124
4. M.H. Rashid – Power Electronics circuits, devices and applications- third edition Prentice Hall of India New Delhi, 2007.
5. Erickson, Robert W, "Fundamentals of Power Electronics", Springer, second edition, 2010

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2. https://www.sciencedirect.com/topics/engineering/d-c-to-d-c-converter
3. https://learnabout-electronics.org/PSU/psu30.php
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OPEN ELECTIVE IV
SEMESTER VII

JEE9010	INTRODUCTION TO E-VEHICLES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the fundamental concepts, principles of electric vehicles.
- To provide knowledge about various aspects of electric and hybrid drive train and their configuration
- To learn different types of machines used for E-vehicle applications.
- To study the operation of drives for electric vehicles
- To comprehend proper energy storage systems for vehicle applications

UNIT I ELECTRIC VEHICLES AND VEHICLE MECHANICS 9

Electric Vehicles (EV), Hybrid Electric Vehicles (HEV), Engine ratings, Comparisons of EV with internal combustion Engine vehicles, Fundamentals of vehicle mechanics.

UNIT II ARCHITECTURE OF EV's AND POWER TRAIN COMPONENTS 9

Architecture of EV's and HEV's – Plug-n Hybrid Electric Vehicles (PHEV)- Power train components and sizing, Gears, Clutches, Transmission and Brakes.

UNIT III ELECTRIC MACHINES FOR E VEHICLE APPLICATIONS 9

DC machines, induction machines, permanent magnet synchronous machines, switched reluctance machines and synchronous reluctance machines- configuration, control and application in E-Vehicle.

UNIT IV CONTROL OF DC AND AC DRIVES 9

DC/DC chopper based four quadrant operations of DC drives – Inverter based V/f Operation (motoring and braking) of induction motor drive system – Induction motor and permanent motor-based vector control operation – Switched reluctance motor (SRM) drives.

UNIT V BATTERY ENERGY STORAGE SYSTEM 9

Battery Basics, Different types, Battery Parameters, Battery modeling, Traction Batteries, Fuel cell – Characteristics- Types, hydrogen Storage Systems and Ultra capacitors.

TOTAL : 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

- To understand the fundamental concepts, principles of electric vehicles
- To gain knowledge about various topologies of drive trains.
- To acquire knowledge on different types of machine used for E-vehicle applications
- To identify and apply the drives for electric vehicles
- To understand the battery energy storage systems for E- vehicles

TEXT BOOKS:

1.Iqbal Hussain, "Electric and Hybrid Vehicles-Design Fundamentals", CRC Press, Third Edition, 2021.
2.MehrdadEhsani, YiminGao, and Ali Emadi, "Modern Electric, Hybrid and Fuel Cell Vehicles: Fundamentals", CRC Press,2019.

REFERENCES:

1. James Larminie, “Electric Vehicle Technology Explained”, John Wiley & Sons, 2015.
2. Sandeep Dhameja, “Electric Vehicle Battery Systems”, Newnes, 2012
3. Chris Mi, MA Masrur, and D W Gao, "Hybrid Electric Vehicles- Principles and Applications with Practical Perspectives", Wiley,2017.

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JEE9011 OPTICAL FIBERS AND LASER TECHNOLOGY

L	T	P	C
3	0	0	3

COURSE OBJECTIVES:

- To expose the students to the basic concepts of optical fibers and their properties.
- To provide adequate knowledge about the Industrial applications of optical fibers.
- To expose the students to the Laser fundamentals.
- To study about Industrial application of lasers.
- To impart knowledge on holography and medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

Introduction to optical fibers - Numerical aperture - Dispersion - Different types of fibers and their properties - Light Sources for fiber optics, coupling, splicing and connectors.

UNIT II INDUSTRIAL APPLICATION OF OPTICAL FIBERS 9

Fiber optic sensors: Types of fiber optics sensor, Intrinsic sensor- Temperature/ Pressure sensor, Extrinsic sensors, Phase Modulated Fiber Optic Sensor and Displacement sensor (Extrinsic Sensor)– Different types of modulators: Electro-optic modulator (EOM) – Interferometric method of measurement of length – Moire fringes

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers –Laser modes – Resonator configuration – Q-switching and mode locking – Cavity damping – Types of lasers; – Gas lasers, solid lasers, liquid lasers and semiconductor lasers.

UNIT IV INDUSTRIAL APPLICATION OF LASERS 9

Laser for measurement of distance, length, velocity, acceleration, Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications –Laser Heating, Laser Welding, Laser Melting.

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording,– Holography for non-destructive testing –Medical applications of lasers, Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery.

TOTAL: 45 PERIODS

COURSE OUTCOMES: At the end of the course, the student will be able

CO1: To understand the principle, transmission, dispersion and attenuation characteristics of optical fibers.

CO2: To apply the gained knowledge on optical fibers for its use as communication medium and as sensor as well which have important applications in production, manufacturing industrial and biomedical applications.

CO3: To understand laser theory and laser generation system.
CO4: To gain knowledge of laser theory for the selection of lasers for a specific Industrial application.
CO5: To acquire knowledge about holography and medical applications of Lasers.

TEXT BOOKS:

1. Singal.T.L, 'Optical Fiber Communication', Cambridge University Press, 2017
2. Senior J.M., 'Optical Fiber Communication – Principles and Practice', Prentice Hall of India,2010.
3. Wilson.J, and Hawkes J.F.B., 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
4. Eric Udd, William .B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists ", John Wiley & Sons, 2011.

REFERENCES:

1. Keiser.G, 'Optical Fiber Communication', McGraw Hill, 2017.
2. ArumugamM, 'Optical Fiber Communication and Sensors', Anuradha Agencies, 2012.
3. John F. Ready, "Industrial Applications of Lasers", Academic Press, Digitized in 2008.
4. Monte Ross, 'Laser Applications', McGraw Hill, 1968.
5. John and Harry, "Industrial lasers and their application", McGraw-Hill, 2002.

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www.slideshare .net

JEE9012	ENERGY MANAGEMENT AND SCADA	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an overview about energy management functions.
- To study the methods to perform the economic analysis of energy management.
- To enhance the knowledge in lighting and cogeneration.
- To learn the concept of supervisory control and data acquisition.
- To interpret the application of SCADA in power systems

UNIT I ENERGY MANAGEMENT FUNCTIONS 9

Need for energy management – energy management program - Energy accounting – Energy monitoring-Targeting and Reporting – Energy audit process-Energy Management Centers and their Functions- Architectures of Centers and their Functions-Energy performance assessment of HVAC system

UNIT II ECONOMIC ANALYSIS 9

Important concepts in an economic analysis, Electricity tariff - Electrical Load Management and Maximum Demand Control - Systems and equipment, Electric motors, Transformers - Capacitors - Energy efficiency analysis on electrical power system, motor and transformer.

UNIT III LIGHTING AND COGENERATION 9

Concept of lighting systems – the task and the working space - Light sources – ballasts –luminaries - Lighting controls - Optimizing lighting energy, lighting and energy standards - Forms of cogeneration – Feasibility of cogeneration - Energy performance analysis of lighting and cogeneration.

UNIT IV SUPERVISORY CONTROL AND DATA ACQUISITION 9

SCADA - Functional requirements and Components - General features, Functions and Applications, Benefits - Various SCADA architectures - SCADA Communication: various industrial communication technologies.

UNIT V SCADA APPLICATIONS 9

SCADA Applications: Utility Applications - Transmission and distribution sector-Operations, Monitoring, Analysis and improvement - Substation automation structure - Substation automation architecture - Introduction to wide area protection.

TOTAL: 45 PERIODS

COURSEOUTCOMES:

- To understand the fundamentals of energy management functions
- To gain knowledge and apply the economic analysis for energy consumption calculations
- To acquire knowledge on lighting and cogeneration.
- To understand the working and operation of supervisory control and data acquisition.
- To familiarize the application of SCADA in powersystems

TEXT BOOKS:

1. Chaudari.M.A, Chaudari.S.M, ASARKAR.S.A, "Energy Conservation And Audit", NiraliPrakashan, 2019
2. WayneC.Turner,SteveDoty"Energy Management Handbook", The Fairmont Press,6thEdition,2007.
3. Amit K. Tyagi, "Handbook on Energy Audits and Management", Tata Energy Research Institute,2ndreprint,2003.
4. Stuart A. Boyer:"SCADA Supervisory Control and Data Acquisition", Instrument Society of America Publications, USA, The Instrumentation system and Automation Society, 4th Edition,2010.

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1. Venkataseshaiah P., Sharma K.V. Energy Management and conservation" , Dream tech Press, 2020.
2. Gordon Clarke, Deon Reynders" Practical Modern SCADA Protocols: DNP3, 60870.5 and Related Systems", Newnes An imprint of Elsevier Publications,1st Edition,2004.
3. Mini S Thomas, John Douglas McDonald, " Power system SCADA and smart grid" CRC Press, 2015.
4. Murphy W.R, McKay G., "Energy Management", Butterworths Publications, London,1982.
5. Trivedi P.R., Jolka B.R., "Energy Management", Common Wealth Publishers, New Delhi, 1997.
6. Loulou. R, Shukla. P R and Kanudia. A, "Energy and Environment Policies for a sustainable Future", Allied Publishers Ltd, New Delhi, 1997

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5. **https://youtu.be/nlFM1q9QPJw**
6. **https://youtu.be/nITuv0ePq_k**