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
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ELECTRONICS AND INSTRUMENTATION ENGINEERING

VISION OF THE DEPARTMENT

Department of Electronics and Instrumentation Engineering strives to bring out highly competent graduates with leadership qualities, social concerns and ethical standards to promote multi-disciplinary research and entrepreneurship for nation building.

MISSION OF THE DEPARTMENT

- Equip the students beyond hypothetical thinking to become highly competent graduates through innovative teaching-learning practices.
- Enhance core competency and leadership skills of the students to cater the industrialneeds and to engage in research endeavors through lifelong learning.
- Inculcate ethical values to serve the needs of the society, industry, government andscientific community.
- Train the students to be a successful entrepreneur by providing quality education andenhancing soft skills of the students.

JERUSALEM COLLEGE OF ENGINEERING

(An Autonomous Institution, Affiliated to Anna University, Chennai)

ELECTRONICS AND INSTRUMENTATION ENGINEERING

PROGRAM OUTCOMES (PO's)

PO-1: Engineering Knowledge: Understand and apply the knowledge of Mathematics, Science, Engineering Fundamentals, Analog and Digital Electronics, Measurement and Instrumentation Principles, Control and Automation to the solution of complex engineering problems in Electronics and Instrumentation Engineering.

PO-2: Problem Analysis: Identify, formulate, review research literature and analyze complexEngineering problems in measurement and Instrumentation Systems, Control and Automation Systems reaching substantiated conclusions using first principles of Mathematics, Natural Sciences and Engineering Sciences.

PO-3: Design/development of solutions: Design solutions for complex engineering problems and design system components or process that meet the specified needs with appropriate consideration for the public health, safety, cultural, societal, and environmental considerations. **PO-4 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.

PO-5 Modern tool usage: Create, select and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling, to complex Electronics and Instrumentation Engineering problems pertaining to Electronics systems, Measurements, Control, Robotics, VLSI, PLC's and automation with an understanding of the limitations.

PO-6: The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health. Safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.

PO-7: Environment and sustainability: Understand the impact of professional engineering work in the solution of societal and environmental contexts and demonstrate the knowledge ofneed for sustainable development.

PO-8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of engineering practice.

PO-9: Individual and team work: Function effectively as an individual, and as a member orleader in diverse teams and multidisciplinary settings.

PO-10: 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.

PO-11: Project management and finance: Demonstrate knowledge and understand engineering management principles and economic decision making and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

PO-12: Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and lifelong learning in the broadest context of technological change.

JERUSALEM COLLEGE OF ENGINEERING
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ELECTRONICS AND INSTRUMENTATION ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEO)

PEO-1: Have successful technical and professional careers in their chosen field such as Process Control, Electronics & Information Technology.

PEO-2: Engross in life long process of learning to keep themselves abreast of new developments in the field of Electronics and Instrumentation.

PEO-3: Facilitate the moral and ethical standards in Engineering to grow professionally asa dynamic entrepreneur and service oriented professional with strategic leadership qualities.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO-1: Able to establish their knowledge in design, implementation, measurement and evaluation of instrumentation systems in the field of Process control, Biomedical, Electrical, VLSI and Environmental Science.

PSO-2: To expand expertise in the field of Instrumentation and serve the society needs through research by applying the innovative cutting-edge technologies.

JERUSALEM COLLEGE OF ENGINEERING

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B.E., ELECTRONICS AND INSTRUMENTATION ENGINEERING

REGULATION 2019

CHOICE BASED CREDIT SYSTEM

SEMESTER I TO VIII CURRICULUM AND SYLLABUS

Credit Summary

S. No.	Category	Credits as per Semester								Total Credits	Percentage(%)
		1	2	3	4	5	6	7	8		
1	HS	3	3	-	-	1	-	-	-	7	4.37 %
2	BS	10	6	3	3	-	-	-	-	22	13.75%
3	ES	10	8	6	5	3	-	-	-	32	20%
4	PC	-	5	13	10	8	8	10	-	54	33.75%
5	PE	-	-	-	-	3	6	6	-	15	9.37%
6	OE	-	-	-	3	3	3	3	-	12	7.50%
7	EEC	-	-	-	1	-	3	4	10	18	11.26 %
TOTAL		**23**	**22**	**22**	**22**	**18**	**20**	**23**	**10**	**160**	**100 %**

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 and Design	ES	5	1	0	4	3
7	JNC1261	Environmental Science	NCM	3	3	0	0	0
Practicals								
8	JEE1211	Electric Circuit 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	JCS1321	Object Oriented Programming (Integrated)	ES	4	2	0	2	3
3	JEI1301	Electrical and Electronic Measurements	ES	3	3	0	0	3
4	JEC1301	Electronic Devices and Circuits	PC	3	3	0	0	3
5	JEE1303	Digital Logic Circuits	PC	4	2	2	0	3
6	JEI1302	Transducer Engineering	PC	3	3	0	0	3
Practicals								
6	JPT1001	Soft skills and Aptitude I	EEC	2	0	0	2	*
7	JEC1311	Electronic Devices and Circuits Laboratory	PC	4	0	0	4	2
8	JEI1311	Transducer and Measurements Laboratory	PC	4	0	0	4	2
TOTAL				**31**	**15**	**4**	**12**	**22**

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

SEMESTER-IV

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1	JMA1401	Applied Probability and Numerical Methods	BS	4	2	2	0	3
2	JEI1401	Electrical Machines	ES	4	2	2	0	3
3	JEE1402	Linear Integrated Circuits and its Applications	PC	3	3	0	0	3
4	JEI1402	Control Systems	PC	4	2	2	0	3
5	-	Open Elective 1	OE	3	3	0	0	3
Practicals								
6	JPT1001	Soft skills and Aptitude II	EEC	2	0	0	2	1
7	JEI1411	Electrical machines Laboratory	ES	4	0	0	4	2
8	JEE1412	Linear and Digital Integrated Circuits Laboratory	PC	4	0	0	4	2
9	JEI1412	Control Systems Laboratory	PC	4	0	0	4	2
			TOTAL	**32**	**2**	**6**	**14**	**22**

SEMESTER V

S.No.	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1	JEE1501	Microprocessors and Microcontrollers (Integrated)	ES	4	2	0	2	3
2	JEI1501	Industrial Instrumentation	PC	3	3	0	0	3
3	JEI1502	Analytical Instruments	PC	3	3	0	0	3
4	-	Professional Elective 1	PE	3	3	0	0	3
5	-	Open Elective 2	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	JEI1511	Industrial Instrumentation Laboratory	PC	4	0	0	4	2
9	JPT1002	Technical Skills and Aptitude I	EEC	2	0	0	2	*
TOTAL				**26**	**16**	**0**	**10**	**18**

* Only Internal Assessments

SEMESTER VI

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1	JEI1601	Process Control	PC	4	2	2	0	3
2	JEI1602	Industrial Instrumentation for Process Industries	PC	3	3	0	0	3
3	-	Professional Elective 2	PE	3	3	0	0	3
4	-	Professional Elective 3	PE	3	3	0	0	3
5	-	Open Elective 3	OE	3	3	0	0	3
Practicals								
6	JEI1611	Process Control Laboratory	PC	4	0	0	4	2
7	JEI1621	Mini Project	EEC	2	0	0	2	1
8	JPT1002	Technical Skills and Aptitude II	EEC	2	0	0	2	1**
9	JEI1641	Internship	EEC	-	-	-	2**	1***
TOTAL				**24**	**14**	**2**	**10**	**20**

** Internship of two weeks must be undertaken in Industry through semesters 3,4, 5 leading to award of 1 credit in Semester VI

SEMESTER VII

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1	JEI1701	Industrial Data Communication	PC	3	3	0	0	3
2	JEI1702	Industrial Automation	PC	3	3	0	0	3
3		Professional Elective - 4	PE	3	3	0	0	3
4		Professional Elective - 5	PE	3	3	0	0	3
5		Open Elective -4	OE	3	3	0	0	3
Practicals								
6	JBA1711	Entrepreneurship for Engineers	EEC	2	0	0	2	1
7	JEI1711	Instrumentation system design and Automation Laboratory	PC	4	0	0	4	2
8	JEI1712	Simulation Laboratory forElectronics& Instrumentation Engineers	PC	4	0	0	4	2
9	JEI1731	Project Work - Phase 1	EEC	6	0	0	6	3
TOTAL				**31**	**15**	**0**	**16**	**23**

SEMESTER VIII

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
Theory								
1	JNC1851	Indian Constitution	NCM	2	2	0	0	0
Practicals								
2	JEI1841	Comprehension and Technical Seminar	EEC	2	0	0	2	1
3	JEI1832	Project Work – Phase 2	EEC	18	0	0	18	9
TOTAL				**22**	**2**	**0**	**20**	**10**

Professional Elective - 1 (5th Semester)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
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	JCE1001	Disaster Management	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 – 2 (6th Semester)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JEI1001	Applied Thermodynamics and Fluid Dynamics	PE	3	3	0	0	3
2	JEI1002	Digital Signal Processing	PE	3	3	0	0	3
3	JEI1003	Computer Architecture	PE	3	3	0	0	3
4	JEI1004	Instrumentation Standards	PE	3	3	0	0	3
5	JEI1005	Virtual Instrumentation	PE	3	3	0	0	3
6	JEE1006	Communication Engineering	PE	3	3	0	0	3

Professional Elective - 3 (6th Semester)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JEI1008	Power plant Instrumentation	PE	3	3	0	0	3
2	JEI1009	Instrumentation for Biomedical Applications	PE	3	3	0	0	3
3	JEI1010	Instrumentation in Petrochemical Industries	PE	3	3	0	0	3
4	JEI1011	Aircraft Instrumentation	PE	3	3	0	0	3
5	JEI1012	Instrumentation for agriculture & food processing industries	PE	3	3	0	0	3
6	JEI1013	Fiber Optics and Laser Instrumentation	PE	3	3	0	0	3

Professional Elective - 4 (7th Semester)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JEI1014	Modern Electronic Instrumentation	PE	3	3	0	0	3
2	JEI1015	Micro Electromechanical Systems	PE	3	3	0	0	3
3	JEI1016	Robotics and Automation	PE	3	3	0	0	3
4	JEI1017	Building Automation	PE	3	3	0	0	3
5	JEI1018	Smart & Wireless Instrumentation	PE	3	3	0	0	3
6	JEI1019	Industrial Internet of Things	PE	3	3	0	0	3

Professional Elective - 5 (7th Semester)

S.No	Course Code	Course Title	Category	Contact Periods	L	T	P	C
1	JEI1020	System Identification and Adaptive Control	PE	3	3	0	0	3
2	JEI1021	Computer Control of Process	PE	3	3	0	0	3
3	JEE1002	Microcontroller Based System Design	PE	3	3	0	0	3
4	JEE 1003	Embedded Systems	PE	3	3	0	0	3
5	JEE1015	Energy Management	PE	3	3	0	0	3
6	JEI1022	Safety Instrumentation	PE	3	3	0	0	3

LIST OF OPEN ELECTIVES OFFERED BY EIE DEPARTMENT

S. No	Course Code	Name of the Open Electives
Open Elective I		
1.	JEI9001	Basics of Measurements and Instrumentation
2.	JEI9002	Sensors for Engineering Applications
3.	JEI9003	Instrumentation for Power Plant Engineering
Open Elective II		
1.	JEI9004	Opto Electronics and Laser Instrumentation
2.	JEI9005	Smart Sensors and its applications
3.	JEI9006	Industrial Safety Engineering
Open Elective III		
1.	JEI9007	Instrumentation for Environmental Pollution Monitoring and Control
2.	JEI9008	Power Supply systems for Computers
3.	JEI9009	Introduction to Analytical Instruments
Open Elective IV		
1.	JEI1910	Introduction to Robotics and Automation
2.	JEI1911	Smart Building Automation
3.	JEI1912	Introduction to PLC and DCS

SEMESTER I

JHS1121	COMMUNICATIVE ENGLISH & SOFT SKILLS 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; Autobiographical 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 Grammar V 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," and "Enclosures and Attachments." In Writing for Design Professionals. New York.

Web Links:

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:

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
C5	-	-	-	-	-	-	-	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 multivariable 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 Eigenvectors – 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

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, "Matrices and Calculus", Scitech Publications, 1st Edition, Chennai, 2019.

REFERENCES

1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
4. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, 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 ULTRASONICS 9

Production of ultrasound by Magnetostriction effect and Piezoelectric 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 (homojunction & heterojunction)- 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.

TEXT BOOKS:

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",DhanamPublications,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

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3. Tipler, P.A. &Mosca, G. “Physics for Scientists and Engineers with Modern Physics’.W.H.Freeman, 2007
4. Rajendran V, "Engineering Physics", Tata McGraw Hill, 2009.
5. John D.Cutnell, “Cutnell and Johnson Physics”, Willey Publications, 2018.

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2.https://nptel.ac.in/noc/courses/noc18/SEM2/noc18-ce18/
3.https://onlinecourses.nptel.ac.in/noc21_bt50/preview
4.https://nptel.ac.in/courses/115/104/115104096/
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 photochemistry and analytical techniques.To make the students conversant with boiler feed water and watertreatment 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: PHOTOCHEMISTRY AND ANALYTICAL TECHNIQUES 9

Photochemistry- 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 ELECTROCHEMISTRY AND CORROSION 9

Electrochemistry- Electrochemical cell - redox reaction, electrode potential- oxidation potential- reduction potential, measurement and applications - electrochemical series and its significance - Nernst equation (derivation and problems).

Corrosion- causes- types-chemical, electrochemical corrosion- galvanic corrosion-differential aeration corrosion (pitting, waterline, wire fence, pipeline, crevice, stress corrosion), Factors influencing the rate of corrosion- corrosion control - material selection and design aspects – cathodic protection methods (sacrificial anode and impressed current cathodic methods)- Electroplating of Copper and electroless 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 Thermosetting. 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 NANOCHEMISTRY 9

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

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

TOTAL: 45 PERIODS

COURSE OUTCOMES

Students will be able to

- Understand laws of photochemistry 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 electrochemical 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 nanomaterials.

TEXT BOOKS:

1. Jain P.C. and Monica Jain, "Engineering Chemistry", Dhanpat Rai Publishing Company (P) Ltd., New Delhi, 2010.
2. R.Gopalan, D.Venkayya, SulochnaNagarajan,Textbook of Engineering Chemistry, Vikas publishing pvt ltd, 4th edition, 2013.
3. Dr.N.JohnJebarathinamDr.R.VaidyanathanMs.A.U.AjishaDr.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. Gowariker V.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, 47th edition, Vishal publishing Co, 2017.

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2. https://www.samcotech.com/what-is-a-boiler-feed-water-treatment-system-how-does-it-work/
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

JGE1101	ENGINEERING BASICS (Common to all B.E /B.Tech Programmes)	L	T	P	C
		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 I 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, Greenhouse gas emission, Ozone depletion, Global warming - Green building concepts.

UNIT II 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 III ELECTRIC CIRCUITS AND ELECTRICAL MACHINES 7

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

UNIT IV 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 V 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.

TEXTBOOKS

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

REFERENCES:

1. Palanikumar, K. Basic Mechanical Engineering, ARS Publications, 2010.
2. RamamruthamS.,Basic Civil Engineering, Dhanpat Rai Publishing Co.(P) Ltd.1999.
3. Thereja .B.L., Fundamentals of 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 McGraw-Hill, New Delhi, 2010.

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2. https://nptel.ac.in/courses/105/102/105102088/
3. https://nptel.ac.in/courses/108/105/108105155/
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5. https://nptel.ac.in/courses/108/105/108105153/

CO-PO Mapping

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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. PradipDey, ManasGhosh, "Programming in C", First Edition, Oxford University Press, 2018
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- 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”, BPB 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”, McGraw-Hill Publishing Company Limited, (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 firsthand experience of verifying various concepts learnt in theory courses.

LIST OF EXPERIMENTS: Physics

1. Determination of Young’s modulus for the given uniform bar by uniform bending method
2. Determination of wavelength of the diode laser and hence determine the size of the coated powder particle

3. Determination of velocity of Ultrasound using Ultrasonic interferometer and also find the compressibility of the given liquid
4. Determination of moment of inertia of the given circular disc and rigidity modulus of the metal wire using torsional pendulum
5. Determination of Planck' constant using different color filters
6. Determination of Wavelength of spectral lines in mercury spectrum using spectrometer
7. 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 polyvinyl alcohol using Ostwald viscometer.

TOTAL:15 PERIODS

OUTCOMES:

Students will be able

1. Acquire experience in analyzing the elastic materials.
2. Understand the acoustic properties of various liquids.
3. Acquire knowledge in optical properties of solids.
4. Make the student acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
5. 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 Mc Neil D.B. -Theoretical and Experimental Physics
3. Fretter W.B. -Introduction to Experimental Physics, Blackiee
4. J.Mendham, RC Denney, JD Barnes, MJK Thomas, Text book of quantitative chemical analysis, Vogel's, 2008

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1. http://www.digimat.in/nptel/courses/video/105107176/L31.html
2. https://www.canterbury.ac.nz/media/documents/science-outreach/chloride_mohr.pdf
3. http://www.mgcub.ac.in/pdf/material/20200428101433e562a8b8e8.pd
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 unions in 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

TEXT BOOKS:

1. PradipDey, ManasGhosh, "Programming in C - As per the latest AICTE syllabus", First Edition, Oxford University Press, 2018
2. Byron S Gottfried, "Programming with C", Schaum's Outlines, Third Edition, McGraw- Hill, 2010

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1. https://www.javatpoint.com/first-c-program
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 subsystems 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.

Plumbing Works:

(a) Study of pipeline 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.

II 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)

III ELECTRICAL ENGINEERING PRACTICE 13

1. Residential house wiring using switches, fuse, indicator, lamp and energy meter.
2. Fluorescent lamp wiring.
3. Stair case 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.

IV ELECTRONICS ENGINEERING PRACTICE 16

1. Study of Electronic components and equipments - 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 woodworking tools 15 Sets
4. Models of industrial trusses, door joints, furniture joints 5 each
5. Power Tools:

(a) Rotary Hammer 2 Nos
(b) Demolition Hammer 2 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 1 each

ELECTRICAL

1. Assorted electrical components for house wiring 15 Sets
2. Electrical measuring instruments 10 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. Multimeters 10 Nos
5. Study purpose items: Telephone, FM radio, low-voltage power supply

Web site References:

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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

SEMESTER II

JHS1201	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

Soft Skills Lab 9

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 workplace contexts
- Face the future challenges confidently and successfully

Textbooks:

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 McGraw – 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 Longman 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.

Web Links:

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:

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 (without proof) - Properties – Harmonic conjugates – Construction of analytic functions – Conformal mapping – Mappings 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, 1st Edition, Chennai, 2019.

REFERENCES:

1. Bali N., Goyal M. and Watkins C., "Advanced Engineering Mathematics", Firewall Media (An imprint 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 SEMICONDUCTING MATERIAL 7

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

UNIT II MAGNETIC AND SUPERCONDUCTING MATERIALS 7

Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism – Domain theory – Hysteresis – Soft and Hard magnetic materials – Anti ferromagnetic materials – Ferrites and its applications - Superconductivity: properties – Type I and Type II superconductors – BCS theory of superconductivity (Qualitative) – High Tc superconductors.

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 (polyacetylene) -polyaniline - properties, applications.

UNIT V INSTRUMENTAL METHODS OF ANALYSIS 9

Thermal analysis techniques- Thermo gravimetric 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 (ANY 5)

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 photometer.
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 optoelectronics
- 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, McGraw, 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.

REFERENCES

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.SeshaMaheswaramma, MridulaChugh, Engineering chemistry, Pearson, 2016.
4. O.G.Palanna, Engineering Chemistry, McGraw Hill, 2017.
5. Gurdeep R.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, JD Barnes, 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, Gary 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.pdf

5.https://nptel.ac.in/courses/108/108/108108122/

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	-

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 2D concepts**.**

UNIT I 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: Pre defined 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, dictiona
CO5 : To Learn basic 2d graphics concepts in Python.

Textbooks :

1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition,Updated for Python 3, Shroff /O' Reilly Publishers,2016 (http://greenteapress.com/wp/thinkpython/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, 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 Interdisciplinary 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 Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

Web site 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 – Superposition Theorem – Maximum power transfer theorem

UNIT II RESONANCE AND COUPLED CIRCUITS 12

Series and parallel resonance – frequency response – Quality factor and Bandwidth – 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 analyse electrical circuits and to apply network theorems
- Ability to understand and apply the concept of resonance in coupled circuits
- Ability to analyse the three phase circuits
- Ability to analyse transients
- Ability to understand two port network

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering CircuitsAnalysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits",Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", CengageLearning India, 2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai &Sons, NewDelhi, 1999.
2. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
3. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi,2015.
4. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",McGraw 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 ORTHOGRAPHIC PROJECTION 15

Conics - Construction of ellipse, Parabola and hyperbola 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.

TEXT BOOKS:

1. Natrajan K.V., "A text book of Engineering Graphics", Dhanalakshmi Publishers, Chennai, 2009.
2. Venugopal K and Prabhu Raja V., "Engineering Graphics", New Age 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 McGraw Hill Publishing Company Limited, New Delhi, 2008.
2. Gopalakrishna 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. N S Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
5. Shah M.B and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:

1. IS 10711 - 2001: Technical products Documentation - Size and layout of drawing sheets.
2. IS 9609 (Parts 0 & 1) - 2001: Technical products Documentation - Lettering.
3. IS 10714 (Part 20) - 2001 & SP 46 - 2003: Lines for technical drawings.
4. IS 11669 - 1986 & SP 46 - 2003: Dimensioning of Technical Drawings.
5. IS 15021 (Parts 1 to 4) - 2001: Technical drawings - Projection Methods.

Web site References:

1. www.pdfdrive.com/engineering drawing-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 interrelationship 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, ECOSYSTEMS AND BIODIVERSITY 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 biodiversity.

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 landslides, soil erosion and desertification - role of an individual in conservation of natural resources.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 9

Water conservation- watershed 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.

TEXT BOOKS:

1. Erach Bharucha, - Textbook of Environmental Studies, Universities Press (I) PVT, LTD, Hydrabad, 2015.
2. Benny Joseph, nvironmental 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 Crisis to Cure‘, Oxford University Press, 2005.
3. Gilbert M. Masters, I ntroduction to Environmental Engineering and Science‘, 2nd edition, Pearson Education, 2004.

4. Tyler Miller and Scott E. Spoolman, - Environmental Science, Cengage Learning IndiaPVT, LTD, Delhi, 2014.

WEB SITE REFERENCES:

1. https://moef.gov.in/e-books/
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 Pspice/ Matlab
- 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 Superposition 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

GE1211	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 2D 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

PLATFORM NEEDED

Python 3 interpreter for Windows/Linux

Total : 60 Periods

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 DIFFERNTIAL 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 students in 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 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 equations – Steady state two-dimensional equation of heat conduction.

TOTAL : 60 PERIODS

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 representations.
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

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. S.ManicavachagomPillay.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 Textbook of Engineering Mathematics", 9th Edition,Laxmi Publications Pvt. Ltd,2014.
3. Ramana. B.V., "Higher Engineering Mathematics", McGraw Hill Education Pvt. Ltd, New Delhi,2016.
4. Wylie, R.C. and Barrett, L.C., “Advanced Engineering Mathematics “Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi,2012.
5. James, G. “Advanced Modern Engineering Mathematics”, Pearson Education,2007.

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	-	-
CO2	-	1
CO3	-	-
CO4	1	-
CO5	-	1
AVG	-	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 understand threads and generics classes
- To design and build simple Graphical User Interfaces using swing components.

UNIT I INTRODUCTION TO OOP AND JAVA FUNDAMENTALS 6

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 andconstructors.

UNIT II INHERITANCE AND INTERFACES 6

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 6

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 MULTITHREADING, GENERIC PROGRAMMING AND ADVANCED JAVA 6

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 6

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.

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.

(30 periods)

TOTAL : 60 PERIODS

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

CO1: Develop Java programs using OOP principles.

CO2: Develop Java programs with the concepts inheritance 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.

TEXT BOOKS:

1. Herbert Schildt, “Java The complete reference”, 10th Edition, McGraw Hill Education, 2017.
2. Cay S. Horstmann, Gary cornell, “Core Java Volume –I Fundamentals”, 9th Edition, Prentice Hall, 2013.

REFERENCE S:

1. Paul Deitel, Harvey Deitel, “Java SE 8 for programmers”, 3rd Edition, Pearson,2015
2. Steven Holzner, “Java 2 Black book”, Dreamtech press,2011.

WEBSITES :

https://www.tutorialspoint.com

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
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
AVG	1	-

JEI1301	ELECTRICAL AND ELECTRONIC MEASUREMENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the meters used to measure current, voltage, resistance, inductance and capacitance.
- To provide an adequate knowledge in the measurement techniques for power and energy.
- Elaborate discussion about potentiometer and to impart knowledge on various instrument transformers.
- To provide in-depth understanding and idea of analog and digital measuring instruments.
- To have a detailed study of display and recording devices.

UNIT I MEASUREMENT OFELECTRICAL PARAMETERS 9

Types of ammeters and voltmeters: PMMC Instruments, Moving Iron Instruments, Dynamometer type Instruments – Resistance measurement: Wheatstone bridge, Kelvin double bridge and direct deflection methods. Measurement of Inductance: Maxwell – Wein Bridge, Hay's bridge and Anderson Bridge – Measurement of Capacitance: Schering Bridge, Digital measurement of R, L and C.

UNIT II POWER AND ENERGY MEASUREMENTS 9

Electro-dynamic type wattmeter: Theory and its errors – LPF wattmeter – Phantom loading – Single phase Induction type energy meter: Theory and Adjustments – 3 phase induction energy meter and phase measurement – Net meter - Bidirectional meter – Smart meter– Calibration of wattmeter and Energy meters – Synchroscope.

UNIT III POTENTIOMETERS AND INSTRUMENT TRANSFORMERS 9

Potentiometers: Student type potentiometer, Precision potentiometer – A.C. Potentiometers: Polar and coordinate types – Applications – Instrument Transformer: Construction and theory of Current Transformers and Potential Transformers.

UNIT IV ELECTRONIC MEASUREMENTS 9

Wave analyzers – Signal and function generators – Measurement of period, time, frequency and phase difference – Distortion factor meter – Q meter–Digital voltmeter and Multi-meter – Digital wattmeter and Energy meter –Frequency measurement.

UNIT V DISPLAY AND RECORDING DEVICES 9

Cathode ray oscilloscope: Classification, Sampling and storage scopes – LED, LCD and dot matrix displays –Trends in display technologies – X-Y recorders –Digital Data Recording – Digital memory waveform recorder – Data loggers.

TOTAL : 45 PERIODS

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

CO1: To record current, voltage, resistance, inductance and capacitance; to compare the working principles, merits, demerits and errors of different types of electrical instruments.

CO2: To record power, energy and calibration of meters.

CO3: To demonstrate the measurements using potentiometric method and instrument transformers.
CO4: To apply knowledge of electronic instrumentation for measurement of electrical quantities.
CO5: To demonstrate the working of display and recording devices.

TEXT BOOKS:

1. Sawhney, A.K., "A Course in Electrical & Electronic Measurements & Instrumentation", Dhanpat Rai and Co., New Delhi,2010.
2. David A Bell, "Electronic Instrumentation and Measurements", Ox ford University Press, 2013.
3. Kalsi, H.S., "Electronic Instrumentation", Tata McGraw-Hill, New Delhi,2010

REFERENCES:

1. J.B.Gupta, "A Course in Electrical & Electronic Measurements & Instrumentation", S K Kataria andsons2013.
2. W.D.Cooper, "Modern Electronics Instrumentation and Measurement Techniques", Pearson Education2015.
3. Northrop, R.B., "Introduction to Instrumentation and Measurements", Taylor & Francis, New Delhi,2008.
4. Carr, J.J., "Elements of Electronic Instrumentation and Measurement", Pearson Education India,New Delhi,2011.
5. Bell, A.D., "Electronic Instrumentation and Measurements", 2nd Edition, Prentice Hall of India, NewDelhi, New Delhi,2003.
6. Bowens, A. J, "Digital Instrumentation", 4th Edition, Tata McGraw - Hill India Ltd., 19 97.
7. Bela G. Liptak, KristzaVenczel, " Measurement and Safety " ,Volume 1, Edition 5, CRC Press,2016.

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2. https://youtube.com/watch?v=3eYmFjhNn
3. https://youtube.com/watch?v=3eYmhnQjY
4. https://youtu.be/NuQqDFkhllU
5. https://www.isa.org/

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	1	1	2	3
CO2	3	3	2	2	1	2	1	1	1	1	2	3
CO3	3	2	2	2	1	2	2	1	1	1	2	3
CO4	3	2	2	2	2	2	2	-	-	1	2	3
CO5	3	2	2	2	2	3	2	-	-	1	2	3
AVG	3	2	2	2	2	3	2	-	-	1	2	3

CO-PSO MAPPING

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

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 SEMICONDUCTOR 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 heat sink– 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. 57

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 bandwidth.

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

TEXT BOOKS:

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

REFERENCE BOOKS:

1. Sedra, Smith, "Microelectronic Circuits: Theory and Application", Oxford University Press,2017.
2. Muhammad H.Rashid, "Electronic Devices and Circuits", Cengage Learning,2014.
3. Balbir Kumar, Shail.B.Jain, "Electronic devices and circuits", PHI learning private limited, 2nd edition2014.
4. Salivahanan, "Electronic devices and Circuits", Second edition, Tata McGraw Hill International,2011.
5. Thomas L.Floyd, "Electronic devices", Conventional current version, Pearson 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.

WEBSITES:

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
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	1	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 **6+6**

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 6+6

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

UNIT III SYNCHRONOUS SEQUENTIAL CIRCUITS 6+6

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 6+6

Analysis and design of asynchronous 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 6+6

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

TOTAL : 60 PERIODS

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 asynchronous sequential circuits and PLDs.
CO5: To review VHDL program for various logic circuits.

TEXT BOOKS:

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, 2013.
3. Comer “Digital Logic & State Machine Design”, Oxford,2012.

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1. Anand Kumar, "Fundamental Digital Circuits", PHI,2016.
2. Mandal, "Digital Electronics Principles & Application", McGraw Hill Edu,2013.
3. William Keitz, "Digital Electronics-A Practical Approach with VHDL", Pearson,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,2013.
6. D.P.Kothari, J.S.Dhillon, "Digital circuits and Design", Pearson Education,2016.

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1.https://nptel.ac.in/
2.https://www.allaboutcircuits.com/https://youtu.be/JvC-434_T5E
3.https://youtu.be/NytpDrESCV8
4.https://youtu.be/2xXErGeebQ
5. https://nptel.ac.in/ FPGA

CO-PO MAPPING

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	3	2	2	1	1	1	2	-	3

CO-PSO MAPPING

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

JEI1302	TRANSDUCER ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the science of measurements and characteristics of transducers.
- To get exposed to different types of resistive transducers and their applications.
- To acquire knowledge on capacitive and inductive transducers.
- To gain knowledge on various transducers and get introduced to MEMS and Smart transducers.
- To acquire knowledge about recent trends in sensor technologies.

UNIT I SCIENCE OF MEASUREMENTS AND CHARACTERISTICS OF TRANSDUCERS 9

Units and standards – Static calibration – Classification of errors –Error analysis – Statistical methods – Odds and uncertainty – Classification of transducers – Selection of transducers – Static and Dynamic Characteristics of Transducers – Mathematical model of Zero, I and II order transducers, Response to step and ramp inputs.

UNIT II VARIABLE RESISTANCE TRANSDUCERS 9

Principle of operation, construction details, characteristics and applications of Potentiometer – Strain gauge – Load Cell – Resistance thermometer, Thermistor – Photoconductive cell – Hot wire anemometer and Resistance Hygrometer.

UNIT III VARIABLE INDUCTANCE AND VARIABLE CAPACITANCE TRANSDUCERS 9

Inductive transducers: – Principle of operation, construction details, characteristics and applications of LVDT – Induction potentiometer – Eddy current gauge – Variable reluctance transducers – Principle of operation, construction details, characteristics of capacitive transducers – Applications – Capacitor microphone, Proximity sensor.

UNIT IV SPECIAL TRANSDUCERS 9

Piezoelectric transducer – Hall Effect transducer – Magneto elastic sensor – Digital transducers - Fiber optic sensors – Environmental Monitoring sensors (Water Quality & Air pollution, Soil monitoring) –Weather Monitoring sensors – Introduction to Smart transducers.

UNIT V RECENT TRENDS IN SENSOR TECHNOLOGIES 9

Thick and Thin Film sensors (Bio sensor & Chemical Sensor) – Electrochemical Sensors – RFIDs – Sensor arrays – Sensor network – Soft sensor – MEMS – Nano Sensors – Sensors used in the IoT Applications.

TOTAL: 45 PERIODS

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

CO1: To distinguish the principle of various transducers and to gain knowledge about characteristics of transducers.
CO2: To identify the resistive transducer for a given application.
CO3: To explain the inductive and capacitive transducer.
CO4: To explain the working of special transducers.
CO5: To review the recent trends in sensor technologies

TEXT BOOKS:

1. Doebelin E.O. and Manik D.N., "Measurement Systems", 6th Edition, McGraw-Hill Education Pvt. Ltd.,2011.
2. Neubert H.K.P., "Instrument Transducers – An Introduction to their Performance and Design", Oxford University Press, Cambridge,2003.
3. D. Patranabis, "Sensors and Transducers", 2nd edition, Prentice Hall of India,2010.

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1. Sawhney, A.K., "A Course in Electrical & Electronic Measurements Instrumentation", Dhanpat Rai and Co., New Delhi,2010.
2. Bela. G.Liptak, "Instrument Engineers Handbook, Process Measurement and Analysis", 4th Edition, Vol. 1, ISA/CRC Press,2003.
3. JohnP.Bentley,"PrinciplesofMeasurement Systems",IIIEdition,PearsonEducation, 2000.
4. W.Bolton, "Engineering Science", Elsevier Newnes, Fifth edition,2006.
5. Murthy, D.V.S., "Transducers and Instrumentation", 2nd Edition, Prentice Hall ofIndia, Pvt. Ltd., New Delhi,2010.
6. Ian Sinclair, "Sensors and Transducers", 3rd Edition, Elsevier,2012.

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1. https://nptel.ac.in/
2. https://www.allaboutinstruments.com/
3. https://youtube.com/watch?v=nSeW32Hr1A
4. https://youtube.com/watch?v=i1uPTyjxZzyo
5. https://youtube.com/watch?v=nE1C4ghfvac&list=PLgMDNELGJ1CbufZjqWa8uoSIQWKqVwPN7&index=1

CO-PO MAPPING

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

CO-PSO MAPPING

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

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 6

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

UNIT IV LOGICAL REASONING 6

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

UNIT V TECHNICAL APTITUDE IN C-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 to

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

TEXT BOOKS:

1. R.S Agrawal, "QuantitativeAptitude".
2. R. S. Agrawal, "VerbalReasoning".
3. R.S. Agrawal, " Non Verbalreasoning.
4. PradipDey, ManasGhosh, "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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1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://m4maths.com/placement-puzzles.php
3. https://www.youtube.com › watch/average
4. https://www.youtube.com › watch/coding and decoding
5. https://www.youtube.com › watch/c programs
6. https://www.youtube.com › watch/self confidence
7. https://www.youtube.com › watch/motivation

CO-PO MAPPING

	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
CO1	1	-
CO2	-	1
CO3	1	-
CO4	1	-
CO5	-	1
AVG	1	-

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 Zenerdiode.
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 waveforms.
5. Design and Frequency response characteristics of a Common Emitter amplifier.
6. Experimental Characteristics of photo diode and phototransistor.
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: 60 PERIODS

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.

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	-			2	3
AVG	3	3	2	2	1	1	1	-			2	3

CO-PSO MAPPING

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

JEI1311	TRANSDUCER AND MEASUREMENTS LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To be aware of basic concepts of measurement and operation of different types of transducers.
- To learn about static and dynamic characteristics of different types of transducers.
- To gain knowledge on calibration.

LIST OF EXPERIMENTS:

1. Displacement versus output voltage characteristics of a potentiometric transducer.
3. Characteristics of Strain gauge and Load cell. Characteristics of LVDT, Hall Effect transducer and photo electric tachometer.
4. Characteristics of LDR, thermistor and thermocouple.
5. Step response characteristic of RTD and thermocouple.
6. Temperature measurements using RTD with three leads.
7. Wheatstone and Kelvin's bridge for measurement of resistance.
8. Schering Bridge for capacitance measurement and Anderson Bridge for inductance measurement.
9. Measurement of Angular displacement using resistive and capacitive transducer.
10. Calibration of Single-phase Energy meter and wattmeter.
11. Calibration of Ammeter and Voltmeter.
12. Fiber optic temperature Measurement.

TOTAL: 60 PERIODS

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

CO1: To demonstrate the principle of operation and characteristics of different types of transducers.

CO2: To explain the characteristics of transducer.

WEBSITES:

https://www.allaboutinstruments.com/https://youtube.com/watch?v=i1uPTyjxZzyo

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	1	-	1	1	2	3

CO-PSO MAPPING

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

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 6+6

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

UNIT II TWO – DIMENSIONAL RANDOM VARIABLES 6+6

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 6+6

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 6+6

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 6+6

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: 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 solving 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.

TEXT BOOKS:

1. 1. Ibe, O.C., "Fundamentals of Applied Probability and Random Processes", 1st Indian Reprint, Elsevier,2007.
2. Johnson, R.A., Miller, I and Freund J., "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.

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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", Tata McGraw Hill Edition,2004.
3. Yates. R.D. and Goodman. D.J.,”Probability and Stochastic Processes", Wiley India Pvt. Ltd., Bangalore, 2nd Edition,2012.
4. Brian Bradie, "A Friendly Introduction to Numerical Analysis", Pearson Education, Asia, New Delhi,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

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

JEI1401	ELECTRICAL MACHINES	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To introduce the principles of operation of DC machines as motor and generator.
- To study the principles of operations of Transformers.
- To learn the principles of operations of Single and Three phase Induction motors.
- To impart knowledge on the principles of operations of Synchronous Machines.
- To introduce Special machines for various applications.

UNIT I D.C.MACHINES 6+6

D.C. Machines: Construction and working of generator and motor – Types – emf equation – torque equation – Starting and Speed control of D.C. Motor

TRANSFORMERS 6+6

UNIT II

Principle, Construction and Types of Transformer – EMF equation – Phasor diagrams – Efficiency and voltage regulation – All day efficiency – Equivalent circuit – Introduction to three phase transformer Connection.

UNIT III SYNCHRONOUS MACHINES 6+6

Alternator: Principle of Operation, types – EMF Equation and Phasor diagrams – Synchronous motor – Rotating Magnetic field – Starting Methods , Torque – V-Curves, inverted V-curves – Synchronous condenser.

UNIT IV INDUCTION MOTORS 6+6

Single phase Induction motor: Double field revolving theory – Types: Capacitor start capacitor run motors, Shaded pole motor. Three phase Induction motor – Working – Torque-slip characteristics – Starting methods – Speed control.

UNIT V SPECIAL MACHINES 6+6

Principle, Construction, Working and characteristics of Repulsion motor, Universal motor, Hysteresis motor, Switched Reluctance motor, Brushless DC motor, Servomotor, Stepper motor.

TOTAL : 60 PERIODS

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

CO1: To explain the working of DC Machines.
CO2: To distinguish the working of different types of Transformers.
CO3: To explain the working and types of Synchronous Machines.
CO4: To demonstrate the working and speed control of Single and Three phase Induction motors.
CO5: To explain the Special Electrical Machines.

TEXT BOOKS:

1. Fitzgerald A.E, Kingsley C., Umans, S. and Umans S.D., "Electric Machinery",McGraw-Hill,2002.
2. Theraja, B.L., "A Text book of Electrical Technology", Vol.II, S.C Chand and Co., New Delhi,2007.
3. Nagrath I. J and Kothari D. P., "Electric Machines", Fourth Edition, McGraw HillEducation, 2010

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1. S.K.Bhattacharya, "Electrical Machines", McGraw Hill Education, 2017.
2. Abhijit Chakrabarti and Sudipta Debnath, "Electrical Machines", McGraw-Hill Education,2015.
3. Deshpande M. V., "Electrical Machines" PHI Learning Pvt. Ltd., New Delhi,2011.
   B.S.Guru and H.R.Hiziroglu, "Electric Machinery and Transformer", Oxford university Press 2007.
4. DelToro, V.,"ElectricalEngineeringFundamentals",PrenticeHallofIndia,NewDelhi, 1995.
   C.A.Gross, "Electric Machines", CRC Press2010.

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2. https://www.electronics-tutorials.ws/
3. https://youtu.be/PTwak1xL02c
4. https://youtu.be/mr90BZEtE7w
5. https://youtu.be/AWL-XQwxUdM

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	-
CO5	1	1
AVG	1	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 processes: epitaxial growth, masking and etching, diffusion of impurities, Realization of monolithic ICs and packaging, Fabrication of diodes, capacitance, resistance, FETs – 3D IC.

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 IC741 andLM358.

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 SPECIALICS 9

Functional block, characteristics of IC 555 Timer and its PWM application – IC566 voltage controlled oscillator, IC 565-phase locked loop, AD633 Analog multiplier ICs – PLL and VCO Applications.

UNIT V APPLICATIONICS 9

IC voltage regulators – LM78XX, LM79XX, Fixed voltage regulators its application as Linear power supply – LM317, LM723 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

CO1: To demonstrate different steps involved in the process of fabrication of integrated circuit.
CO2: To identify the characteristics and basic applications of Op- Amp.
CO3: To demonstrate the applications of Op-amp.
CO4: To assess knowledge about functional blocks and the applications of special ICs like Timers, PLL circuits.
CO5: To explain and acquire knowledge on Application IC's.

TEXT BOOKS:

1. David A. Bell, "Op-amp & Linear ICs", Oxford,2013.
2. D. Roy Choudhary, Sheil B. Jani, "Linear Integrated Circuits", II edition, New Age,2003.
3. Ramakant 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. Fiore, "Opamps& Linear Integrated Circuits Concepts & applications", Cengage,2010.
3. Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson,2013.
4. Jacob Millman, Christos C.Halkias, "Integrated Electronics - Analog and Digital circuits system", McGraw Hill,2003.
5. Robert F.Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", Pearson", 6th edition, 2012.
6. Sergio Franco, "Design with Operational Amplifiers and Analog Integrated Circuits", Mc Graw Hill,2016.
7. Muhammad H. Rashid, "Microelectronic Circuits Analysis and Design", Cengage Learning, 2011.
8. Katsuyuki Sakuma, "3D Integration in VLSI Circuits: Implementation technologies and Applications", CRC Press Tailor & Francis group2018.
9. Hank Zumvahlel "Linear Circuit Design Hand book", Newness publications,2008.

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https://youtu.be/EeYL6lJsNT8
https://youtu.be/L_HJWkM16KE

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	2	2	2	1	2	-	1	-	2	2

CO-PSO MAPPING

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

JEI1402	CONTROL SYSTEMS	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To study the use of transfer function models for analysis of physical systems.
- To provide adequate knowledge in the time response and steady state error analysis.
- To accord basic knowledge in frequency domain analysis and about stability.
- To introduce about the design of compensators.
- To learn state variable representation of physical systems.

UNIT I SYSTEMS AND REPRESENTATION 6+6

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

UNIT II TIME RESPONSE 6+6

Time response:–T ime domain specifications–Types of test input–I and II order system response – Error coefficients – Generalized error series – Steady state error – Concept of stability – Characteristics equation – Routh Hurwitz criterion – Root locus construction - Effect of additional zeros and poles – Effects of P, PI, PID modes of feedback control.

UNIT III FREQUENCY RESPONSE 6+6

Frequency response: Frequency domain specifications – Bode plot – Polar plot – Correlation between frequency domain and time domain specifications – Nyquist stability criterion.

UNIT IV COMPENSATOR DESIGN 6+6

Performance criteria – Effect of Lag, lead and lag-lead compensation on frequency response – Design of Lag, lead and lag lead compensator using bode plots.

UNIT V STATE VARIABLE ANALYSIS 6+6

Concept of state variables – State models for linear and time invariant Systems – Solution of state and output equation in controllable canonical form – Concepts of controllability and observability.

TOTAL : 60 PERIODS

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

CO1: To identify various transfer function model for analogous system.
CO2: To calculate time domain analysis for various systems.
CO3: To organize the different frequency domain specifications and perform stability analysis.
CO4: To design appropriate compensator for the given specifications.
CO5: To assess state space analysis.

TEXT BOOKS:

1. Nagarath, I.J. and Gopal, M., "Control Systems Engineering", New Age International Publishers,2017.
2. Benjamin C. Kuo, "Automatic Control Systems", Wiley,2014.
3. S.K.Bhattacharya, "Control System Engineering", 3rd Edition, Pearson,2013.

REFERENCES:

1. Katsuhiko Ogata, "Modern Control Engineering", Pearson, 2015.
2. Richard C.Dorf and Bishop, R.H., "Modern Control Systems", PearsonEducation,2009.
3. John J.D., Azzo Constantine, H. and HoupisSttuart, N Sheldon, "Linear ControlSystem Analysis and Design with MATLAB", CRC Taylor & Francis Reprint2009.
4. M.Gopal, "Control System: Principle and design", McGraw Hill Education,2012.
5. NPTEL Video Lecture Notes on "Control Engineering", by Prof. S. D. Agashe, IITBombay.

WEBSITES:

1. https://www.tutorialspoint.com
2. https://www.electronics-tutorial.net
3. https://youtube.com/watch?v=Cl23xQrvFhk&list=PLyqSpQzTE6M8-wda5vbgHkMQTmu-21hRK
4. https://youtube.com/watch?v=al9rbv04Ss&list=PLUMWjy5jgHK3j74Z5Tq6Tso1fSfVWZC8L
5. https://youtube.com/watch?v=al9rbrv04Ss&list-=PLgwJf8NK-2e43et6qbo4lqYSJCv-6kN90

CO-PO MAPPING

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

CO-PSO MAPPING

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

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 concepts in 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 oral and written – Content development – various forms of writing and specific writing – Brainstorming – 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 IN C-II 8

Strings - Storage Classes – Pointers – Preprocessor directives - Structures – Union. Type def – Input/Output – File I/O - Header Files – Type casting – Error handling – Command Line Arguments – Variable Arguments – Memory Management - Bitwise 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.S Agrawal, "QuantitativeAptitude".
2. R. S. Agrawal, "VerbalReasoning".
3. R.S. Agrawal "Non Verbalreasoning.
4. PradipDey, 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.

WEBSITES:

1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://m4maths.com/placement-puzzles.php
3. www.freshers world.com
4. https://www.youtube.com › watch>problems on ages
5. https://www.youtube.com › watch>blood relation
6. https://www.youtube.com › watch>content
7. https://www.youtube.com › watch>SMART
8. https://www.youtube.com › watch>strings in C

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
CO1	1	-
CO2	1	-
CO3	1	-
CO4	1	-
CO5	1	-
AVG	1	-

JEI1411	ELECTRICAL MACHINES LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To learn the basic operations of electrical machines and help them to develop experimental and simulation skills.
- To perform various test on machines.

LIST OF EXPERIMENTS:

1. Open circuit characteristics of D.C. shunt generator.
2. Load characteristics of D.C. shunt generator.
3. Load test on D.C. shunt motor.
4. Load test on D.C. series motor.
5. Speed control of D.C. shunt motor.
6. Load test on single phase transformer
7. Open circuit and short circuit tests on single phase transformer (Determination of equivalent circuit parameters).
8. Load test on single phase induction motor.
9. No load and blocked rotor tests on three phase induction motor
10. Load test on three phase induction motor.
11. Load test on BLDC motor.
12. Study of Starters.
13. Simulation of Swinburne'stest.
14. Simulation of Speed control of DC motor.

TOTAL : 60 PERIODS

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

CO1: To demonstrate the basic operations and characteristics of machines.
CO2: To review suitable machines for various applications.

WEBSITES:

1. https://vem-iitg.vlabs.ac.in/
2. https://ece.umd.edu/course-schedule/course/ENEE473

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	2	2	2	2	1	2	1	-	1	1	2	2
AVG	2	2	2	2	1	2	1	-	1	1	2	2

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
AVG	1	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 usingIC741.
4. Simulation and experimental verification of A stable and Monostable multi vibrator in IC555timer.
5. Study of VCO and PLLICs:
   i. Voltage to frequency characteristics of NE/SE 566IC.
   ii. Frequency Multiplication using NE/SE 565 PLLIC.
6. Verification of Logic gates and Implementation of Boolean Functions.
7. Verification of Adder and Subtractor 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

WEBSITES:

1. www.slideshare.net
2. 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	1	-	1	1	2	3

CO-PSO MAPPING

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

		L	T	P	C
JEI1412	**CONTROL SYSTEMS LABORATORY**	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- To provide knowledge on analysis and design of control system
- To learn MATLAB simulation for various systems.

LIST OF EXPERIMENTS:

1. Design of P, PI and PID controllers.
2. Stability Analysis of linear systems.
3. Transfer function of Self excited DC generator.
4. Transfer function of DC motor.
5. Design of Lag, Lead and Lag-Lead Compensators.
6. DC Position Control System.
7. Characteristics of Synchro-Transmitter-Receiver.
8. Frequency response of passive filters.
9. Digital Simulation of first order systems.
10. Digital Simulation of second order systems.
11. Determination of root locus for a transfer function.

TOTAL : 60 PERIODS

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

CO1: To design and analyze control system components.
CO2: To demonstrate MATLAB simulation for various systems.

WEBSITES:

www.iitk.ac.in
https://www2.ece.ohio-state.edu/~passino/ee758.html

CO-PO MAPPING

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

CO-PSO MAPPING

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

SEMESTER V

JEE1501	MICROPROCESSORS AND MICROCONTROLLERS	L	T	P	C
		2	0	2	3

COURSE OBJECTIVES:

- To impart knowledge on architecture and interrupt structure of µP8085
- To impart knowledge on addressing modes and ALP of 8085
- To study the architecture and programming of 8051 microcontroller
- To acquire knowledge about the features and functionalities of the peripheral devices interfacing
- To understand the concepts of developing microcontroller-based systems forvarious 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 – Subroutine instructions – stack- Introduction to 16-bit microprocessor.

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 - Waveform generation.

(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.
- Floating point operations, string manipulations, sorting and searching

8051 Experiments using kits

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

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)

COURSE 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 8051 microcontroller.
CO4: To gain knowledge about the features and functionalities of the peripheral devices and Interfacing.
CO5: To understand the concepts of developing microcontroller based systems for various Applications

TEXT BOOKS:

1. Sunil Mathur & Jeebananda Panda, "Microprocessor and Microcontrollers", PHI Learning Pvt. Ltd, 2016.
2. R.S. Gaonkar, "Microprocessor Architecture Programming and Application", with 8085, Wiley Eastern Ltd., New Delhi, 2013.
3. Krishna Kant, "Microprocessor and Microcontrollers, Architecture, Programming and System Design 8085, 8086, 8051", Second Edition, PHI Learning Private Limited, 2014.
4. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.
5. Rajkamal, "Microcontrollers - Architecture, Programming, Interfacing and System design, 2nd edition, Pearson, 2012.

REFERENCE BOOKS:

1. Krishna Kant, "Microprocessor and Microcontrollers", Eastern Company Edition, Prentice Hall of India, New Delhi, 2007.
2. B.RAM, "Computer Fundamentals Architecture and Organization" New age International Private Limited, Fifth edition, 2017.
3. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware", TMH,2016.
4. Kenneth J Ayala "The 8051 Microcontroller, Architecture, Programming and Applications" 2nd edition Penram International Publishing, 1996.
5. Muhammad H. Rashid, "The 8051 Microcontroller and Embedded Systems, Volume 1" Prentice Hall, 2000.
6. Barry B Brey, "The Intel Microprocessor Architecture Programming and Interfacing", Pearson Education, 4th Edition, 2006.
7. Soumitra Kumar Mandal, Microprocessor & Microcontroller Architecture, Programming & Interfacing using 8085,8086,8051,McGraw Hill Edu,2013.

WEBSITE REFERENCES:

1. https://www.digimat.in/nptel/courses/video/108105102/L01.html
2. http:// freevideolectures.com/courses/3018/microprocessors-and-microcontrollers
3. http://www.digimat.in/nptel/courses/video/108105102/L31.html
4. https:// youtu.be/myw7ycAgJYM

5. https://nptel.ac.in/courses/108107029/
6. https://www.iitk.ac.in/new/microprocessor-and-microcontroller-laboratory
7. http://209.211.220.205/vlabiitece/mi/labsMI.php

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
CO1	2	2
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	1
AVG	2	1

JEI1501	INDUSTRIAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the measurement techniques of force, torque and speed.
- To study the measurement techniques of acceleration, Vibration and density
- To introduce the measurement Viscosity, Humidity and moisture.
- To learn the temperature measurement techniques.
- To introduce the pressure measurement techniques.

UNIT I MEASUREMENT OF FORCE, TORQUE AND SPEED 8

Different types of load cells: Hydraulic, Pneumatic, Strain gauge, Magneto-elastic and Piezoelectric load cells - Different methods of torque measurement: Strain gauge, Relative

angular twist. Speed measurement: Revolution counter, Capacitive tacho, Drag cup type tacho, D.C and A.C tacho generators – Stroboscope - Strobotron.

UNIT II MEASUREMENT OF ACCELERATION, VIBRATION AND DENSITY 8

Accelerometers: LVDT, Piezoelectric, Strain gauge and Variable reluctance type accelerometers- seismic accelerometers, practical accelerometers, calibration– Gyroscope - Mechanical type vibration instruments – Vibration sensor -Calibration of vibration pickups - Units of density and specific gravity – Baume scale and API scale –Densitometers: Pressure, Float type, Ultrasonic and gas densitometer.

UNIT III MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE 8

Viscosity: Saybolt viscometer - Rotameter type and Torque type viscometers – Consistency Meters – Humidity: Dry and wet bulb psychrometers – Resistive and capacitive type hygrometers – Dew cell –Commercial type dew meter. Moisture: Different methods of moisture measurements –Thermal, Conductivity and Capacitive sensors, - Nucleonic gauge-Application of moisture measurement - Moisture measurement in solids-High performance moisture analyser**.**

UNIT IV TEMPERATURE MEASUREMENT 12

Definitions and standards – Primary and secondary fixed points – Different types of filled in system thermometers– Bimetallic thermometers – Thermocouples: Laws, types and compensation – Radiation methods of temperature measurement –Fundamentals, types of Pyrometers - Fiber optic and Infra-red based temperature measurement – Thermograph, Temperature switches and thermostat.

UNIT V PRESSURE MEASUREMENT 9

Units of pressure –Pressure Types - Manometers: Different types, Elastic type pressure gauges: Bourdon tube, Bellows, Diaphragms and Capsules - Electrical methods: Elastic elements with LVDT and strain gauges - Capacitive, Piezo resistive, Resonator type pressure sensor, Measurement of vacuum: McLeod gauge, Thermal conductivity gauge, lionization gauges – Pressure gauge selection, installation and calibration using dead weight tester.

TOTAL : 45 PERIODS

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

CO1: To understand the construction and working of instruments used for measurement of force, torque and speed.

CO2: To understand the construction and working of instruments used for measurement of acceleration, vibration and density.

CO3: To understand the construction and working of instruments used for measurement of viscosity, humidity and moisture.

CO4: To design signal conditioning circuits and compensation schemes for temperature measuring instruments.

CO5: To understand the working of instruments used for measurement of pressure.

TEXT BOOKS:

1. Doebelin, E.O. and Manik, D.N., "Measurement systems Application and Design", 6th McGraw-Hill Education Pvt. Ltd, 2011.
2. Jones, B.E., "Instrument Technology", Vol.2, Butterworth-Heinemann, International Edition, 2003.

REFERENCE BOOKS:

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.
2. Patranabis, D., "Principles of Industrial Instrumentation", 3rd Edition, McGraw-Hill Education, 2017.
3. Eckman D.P., "Industrial Instrumentation", Wiley Eastern Limited, 1990.
4. Singh,S.K., "Industrial Instrumentation and Control", Tata Mc-Graw-Hill Education Pvt. Ltd., New Delhi, 2009.
5. Alok Barua, "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Kharagpur.
6. Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.
7. A.K. Sawhney, "A Course in Electronic Measurements and Instrumentation", Dhanpat Rai & Co. (P) Limited, 2015.

WEBSITE REFERENCES:

1. https://www.isa.org/
2. www.nptel.ac.in
3. www.slideshare.net
4. www.vidhyarthiplus.com
5. https://control.com

CO-PO MAPPING

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

		L	T	P	C
JEI1502	**ANALYTICAL INSTRUMENTS**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To impart knowledge on the basic elements of analytical instruments and their analysis methods.
- To study the quantitative analysis of chemical substances by different types of spectroscopy.
- To impart fundamental knowledge on gas chromatography and liquid chromatography.
- To integrate the fundamental principles of physics as they relate to specific instrumentation used for gas analysers.
- To learn the working principle, types and applications of NMR, Mass spectroscopy and radiation detectors.

UNIT I INSTRUMENTAL ANALYSIS 9

Fundamentals of Analytical Instrumental: Elements, Signal Conditioning, Readout Devices, Methods of Analysis: Chemical Instrumental analysis, Spectral analysis, Electro analytical analysis, Instrumental methods of analysis: basic components and their classification - Ion selective electrodes - conductivity meters - pH meters.

UNIT II SPECTROPHOTOMETRY 9

Spectral methods of analysis – Beer-Lambert law – UV-Visible spectroscopy – IR Spectrophotometry - FTIR spectrophotometry – Atomic absorption spectrophotometry - Flame emission and atomic emission photometry – Construction, working principle, sources detectors and applications.

UNIT III CHROMATOGRAPHY 9

General principles – classification – chromatographic behavior of solutes – quantitative determination – Gas chromatography – Liquid chromatography – High-pressure liquid chromatography – Applications.

UNIT IV DISSOLVED COMPONENT AND GAS ANALYSIS 9

Dissolved oxygen analyser, sodium analyser, silica analyser, Moisture measurement, Oxygen analyser, CO monitor, NO_2 analyser, H_2S analyser, dust and smoke measurement, thermal conductivity type, thermal analyser, industrial analysers.

UNIT V NUCLEAR MAGNETIC RESO NANCE AND RADIATION TECHNIQUES 9

NMR spectrometers and its applications, Mass spectrophotometers and its applications, GM counter, Proportional counter, Scintillation counter, Detectors: Nuclear radiation detector, Solid state detector, X- ray spectroscopy.

TOTAL : 45 PERIODS

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

CO1: To understand the fundamental principles of analytical instruments.
CO2: To assess and suggest a suitable analytical method for a specific purpose, and evaluate sensitivity, important sources of interferences and errors, and also suggest alternative analytical methods for quality assurance.
CO3: To understand the working of gas chromatography and liquid chromatography.
CO4: To develop critical thinking for interpreting analytical data.
CO5: To understand the working principle, types and applications of NMR, Mass spectroscopy and radiation detectors.

TEXT BOOKS:

1. Willard, H.H., Merritt, L.L., Dean, J.A., Settle, F.A., "Instrumental methods of analysis", CBS publishing & distribution, 7th Edition, 2012.
2. Braun, R.D., "Introduction to Instrumental Analysis", Pharma Book Syndicate,Singapore, 2006.
3. Robert E. Sherman., "Analytical Instrumentation", Instruments Society of America, 1996.

REFERENCE BOOKS:

1. Khandpur, R.S., "Handbook of Analytical Instruments", Tata McGraw-Hill publishingCo. Ltd.,2nd Edition 2007.
2. Ewing, G.W., "Instrumental Methods of Chemical Analysis", McGraw-Hill, 5th Editionreprint 1985.
3. Liptak, B.G., "Process Measurement and Analysis", CRC Press, 5th Edition, 2015.
4. Abirami., "Analytical Instruments", Anuradha Publications,3rd Edition.
5. Gillian McMahon., "Analytical Instrumentation", Wiley Publications, First Edition,2007.

WEBSITE REFERENCES:

1. https://www.nist.gov
2. https://www.isa.org/
3. https://www.labcompare.com/Laboratory-Analytical-Instruments
4. https://analyticalinstrument.com
5. https://www.spectro.com

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
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	2
AVG	1	1

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 Fores 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 FORA for increasing protection of Indian Traditional Knowledge.

UNIT V TRADITIONAL KNOWLEDGE IN DIFFERENT 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, MichelDanino.

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
CO1	1	1
CO2	1	1
CO3	1	1
CO4	1	1
CO5	1	1
AVG	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 teamwork 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 PREPARING AND PRESENTING INSPIRING TALKS 6

Key elements of effective presentation – nonverbal communication – impressive self-introduction and short individual presentation – preparing outline – structuring and organising 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 – brainstorming – 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

UNIT V 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. Globearena
2. Win English

TEXT BOOK:

1. Interact English Lab Manual for Undergraduate Students, 2016, Hyderabad: Orient BlackSwan.

REFERENCE BOOKS:

1. Alex, K, 2019, Soft Skills: Know Yourself and Know the World, New Delhi: S. Chand & Company Limited.
2. Butterfield, Jeff, 2015, Soft Skills for Everyone. New Delhi: Cengage Learning.
3. Kumar, Suresh E et al, 2015, Communication for Professional Success, Hyderabad: Orient BlackSwan.
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:

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

CO-PO MAPPING

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

CO-PSO MAPPING

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

		L	T	P	C
JEI1511	**INDUSTRIAL INSTRUMENTATION LABORATORY**	**0**	**0**	**4**	**2**

COURSE OBJECTIVES:

- To impart an adequate knowledge and expertise to handle equipments available inindustry.
- To make awareness about calibration of meters, sensors, transmitters and to analyzethe parameters.

LIST OF EXPERIMENTS:

1. Discharge coefficient of orifice plate
2. Calibration of pressure gauge
3. Viscosity measurement
4. Vacuum pressure measurement
5. Level measurement using d/p transmitter and capacitance-based level measurement.

6. UV – Visible spectrophotometer
7. pH meter standardization and measurement of pH values of solutions
8. Measurements of conductivity of test solutions.
9. ECG measurement
10. Pulse rate measurement
11. Linearization of Thermocouple
12. Cold junction compensation of Thermocouple

TOTAL: 45 PERIODS

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

CO1: To experimentally measure the industrial process parameters such as flow, level, temperature, pressure and viscosity.
CO2: To measure and analyze pH, conductivity, ECG and pulse rate.

WEBSITE REFERENCES:

1. http://vlabs.iitb.ac.in/vlab/electrical/exp10/index.html
2. https://sl-coep.vlabs.ac.in/List%20of%20experiments.html

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
AVG	1	-	-	1	1	-	-	-	-	-	1	1

CO-PSO MAPPING

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

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, boolean, 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 nutshell by Alex Martelli Revised in March 2013.
5. Dr. R.S Agrawal, "Quantitative Aptitude" and Non Verbal Reasoning published in 2000

WEB REFERENCES:

1. https://www.indiabix.com/aptitude/questions-and-answers/
2. https://m4maths.com/placement-puzzles.php
3. www.freshers world.com
4. www.careerride.com
5. www.youtube.com/watch/python
6. www.youtube.com/watch/concepts of python
7. https://www.geeksforgeeks.org/

CO-PO MAPPING

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

CO-PSO MAPPING

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

SEMESTER VI

JEI1601	PROCESS CONTROL	L	T	P	C
		2	2	0	3

COURSE OBJECTIVES:

- To introduce technical terms and nomenclature associated with Process control domain.
- To familiarize the students with characteristics, selection, sizing of control valves.
- To provide an overview of the features associated with Industrial type PID controller.
- To make the students to understand the various PID tuning methods.
- To elaborate different types of control schemes such as cascade control, feed forward control and Model Based control schemes.

UNIT I PROCESS MODELLING AND DYNAMICS 6+6

Need for process control – Elements of process control system, Mathematical Modeling of Processes**:** Level, Flow, Pressure and Thermal processes – Continuous and batch processes – Self regulation – Servo and regulatory operations – Lumped and Distributed parameter models – Heat exchanger – CSTR – CSTH.

UNIT II FINAL CONTROL ELEMENTS 6+6

Actuators: Pneumatic and electric actuators, Hydraulic actuators - Control Valve Terminology - Characteristic of Control Valves: Inherent and Installed characteristics – Control Valve types - Valve Positioner – Modeling of a Pneumatically Actuated Control Valve – Control Valve Sizing-Cavitation and flashing – Control Valve selection.

UNIT III CONTROL ACTIONS 6+6

Characteristic of ON-OFF, Proportional, Single speed floating, Integral and Derivative controllers– P+I, P+D and P+I+D control modes – Practical forms of PID Controller – PID Implementation Issues**:** Bumpless, Auto/manual Mode transfer, Anti-reset windup Techniques – Direct/reverse action - Selection of a controller for a particular process.

UNIT IV PID CONTROLLER TUNING 6+6

PID Controller Design Specifications**:** Criteria based on Time Response and Frequency Response - PID Controller Tuning**:** Z-N and Cohen-Coon methods, Continuous cycling method and Damped oscillation method, Auto tuning. Cascade control – Feed-forward control.

UNIT V MODEL BASED CONTROL SCHEMES 6+6

Internal Model Controller – IMC PID controller –Model predictive control –Adaptive control– Three element Boiler drum level control – Case Study of control schemes of binary distillation column - P&ID diagram.

TOTAL : 60 PERIODS

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

CO1: To understand technical terms and nomenclature associated with process control domain.
CO2: To build models using first principle approach as well as to analyze the models.
CO3: To design, tune and implement PID Controllers to achieve desired performance for various processes.
CO4: To identify and formulate various PID tuning methods.
CO5: To design and implement control Schemes for various Process.

TEXT BOOKS:

1. Seborg, D.E., Edgar, T.F. and Mellichamp, D.A., "Process Dynamics and Control", Wiley John and Sons, 2nd Edition, 2003.
2. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004.
3. Stephanopoulos, G., "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2005.

REFERENCE BOOKS:

1. Coughanowr, D.R., "Process Systems Analysis and Control", McGraw - Hill International Edition, 2004.
2. Curtis D. Johnson, "Process Control Instrumentation Technology", 8th Edition, Pearson, 2006.
3. Considine, D.M., Process Instruments and Controls Handbook, Second Edition, McGraw, 1999.
4. Bela.G.Liptak., "Process Control and Optimization"., Instrument Engineers' Handbook., volume 2, CRC press and ISA, 2005.
5. Ramesh C. Panda., T.Thyagarajan., "An Introduction to Process Modelling Identification and Control for Engineers" Narosa Publishing house Pvt. Ltd, 2017.

WEBSITE REFERENCES:

1. https://nptel.ac.in/
2. https://www.isa.org/
3. https://www.process-controls.com/
4. http://www.pc-education.mcmaster.ca
5. www.slideshare.com

CO-PO MAPPING

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

CO-PSO MAPPING

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

JEI1602	INDUSTRIAL INSTRUMENTATION FOR PROCESS INDUSTRIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce variable head type flow meters.
- To introduce quantity meters, area flow meters and mass flow meters.
- To educate on electrical type flow meters.
- To educate on the level measurement techniques.
- To impart knowledge on transmitters.

UNIT I VARIABLE HEAD TYPE FLOWMETERS 9

Expression for flow rate through restriction (compressible and incompressible flow) -Orifice plate**:** different types of orifice plates – Cd variation – pressure tappings – Venturi tube – Flow nozzle –Dall tube – Pitot tube**:** static pitot tube **-** combined pitot tube, averaging pitot tube – Installation and applications of head flow meters.

UNIT II QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS 9

Positive displacement flow meters**:** Nutating disc, Reciprocating piston and Oval gear flow meters – Inferential meter – Turbine flow meter – Variable Area flow meter: Rotameter – theory, characteristics, installation and applications – Mass flow meter – Angular momentum – Thermal, Coriolis type mass flow meters –Calibration of flow meters: – Dynamic weighing method.

UNIT III ELECTRICAL TYPE FLOW METERS 9

Principle and constructional details of Electromagnetic flow meter – Ultrasonic flow meters – Laser Doppler anemometer – Vortex shedding flow meter – Target flow meter – Guidelines for selection of flow meter – Open channel flow measurement – Solid flow rate measurement – Flowmeter Installation guidelines.

UNIT IV LEVEL MEASUREMENT 9

Level measurement**:** Units - Sight glass – dip stick- Float gauges - Displacer type – D/P methods -Bubbler system-Load cell –Electrical types – Conductivity sensors – Capacitive sensors – Nucleonic gauge – Ultrasonic gauge – Boiler drum level measurement – Differential pressure method and Hydra step method -Solid level measurement – Calibration of level measurement.

UNIT V TRANSMITTERS 9

Pneumatic transmitter: Operation - Electronic transmitter: Study of 2 wire and 4 wire transmitters - Smart transmitters– Principle of operation of flow, level, temperature and pressure transmitters – Installation and Calibration of smart and conventional transmitters – Industrial wireless transmitter.

TOTAL : 45 PERIODS

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

CO1: To understand the construction, installation and working of different variable head type flow meters.
CO2: To understand the construction, working and calibration of different flow meters.
CO3: To understand the electrical type flow meters.
CO4: To choose appropriate flow meters or level sensor for an application.
CO5: To gain knowledge about the construction, working and calibration of different type of transmitters.

TEXT BOOKS:

1. Doebellin, E.O. and Manik D.N., "Measurement systems Application and Design", 5th Edition, Tata McGraw-Hill Education Pvt. Ltd., 2007.
2. Patranabis, D., "Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2010.

REFERENCE BOOKS:

1. Liptak, B.G., "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.
2. Singh,S.K., "Industrial Instrumentation and Control", Tata McGraw Hill Education Pvt. Ltd., New Delhi, 2009.
3. Jain, R.K., "Mechanical and Industrial Measurements", Khanna Publishers, Delhi, 1999.
4. Jayashankar, V., "Lecture Notes on Industrial Instrumentation", NPTEL, E-Learning Course, IIT Madras.
3. D.P.Eckman, 'Industrial Instrumentation', Wiley Eastern Limited, 1975.

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1. https://www.isa.org/
2. www.nptel.ac.in
3. www.slideshare.net
4. www.vidhyarthiplus.com
5. https://control.com /

CO-PO MAPPING

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

CO-PSO MAPPING

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

JEI1611	PROCESS CONTROL LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To experimentally verify the selected concepts on process control loops.
- To impart theoretical and practical skills in process identification and PID controller tuning.

LIST OF EXPERIMENTS:

1. Study of Process Control Training Plant and Compact Flow Control Unit.
2. Characteristics of Pneumatically Actuated Control Valve (with and without positioner).
3. Control of Level using Process Control training plant.
4. Control of Pressure using Process Control Training Plant.
5. Design of ON/OFF Controller for the Temperature Process.
6. PID Implementation Issues (Reset Windup, Proportional kick).
7. Tuning of PID Controller for mathematically described processes
8. PID Enhancements – Simulation (Cascade and Feed-forward Control Schemes)
9. Design and Implementation of Multi-loop PI Controller on the Three-tank system.
10. Speed control of AC and DC motor using Variable Frequency Drive.
11. Study of pH Control Test Rig.
12. Auto-tuning of PID Controller (Simulation & Experiment)

TOTAL : 45 PERIODS

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

CO1: To understand and analyze process control engineering problem.
CO2: To work with real time control loops (flow/level/temperature/pressure).

WEBSITE REFERENCES:

1. http://vlabs.iitkgp.ac.in/cpd/
2. http://uorepc-nitk.vlabs.ac.in/

CO-PO MAPPING

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

CO-PSO MAPPING

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

JEI1621	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 and assessment by moderator in the following areas:

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

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

TOTAL : 30 PERIODS

CO-PO MAPPING

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

CO-PSO MAPPING

CO\PSO	PSO1	PSO2
CO1	1	1
CO2	1	1
CO3	1	1
AVG	1	1

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

COURSE 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- Interfaces –Strings.

UNIT III MATHEMATICAL AND ARITHMATIC PROBLEM SOLVING 6

Crpto arithmatic Problem Solving, Logarithms, Trigonometry, Mensuration, Probability, Permutations and Combinations.

UNIT IV LOGICAL REASONING - COGNITIVE 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

- Enhance their knowledge in JAVA concepts and Java Programming.
- Gain knowledge in coding using JAVA programming.
- Solve complex arithmetic problems practically with real time applications.
- 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, 2011.
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.
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2. https://m4maths.com/placement-puzzles.php
3. www.freshers world.com
4. www.careerride.com
5. www.youtube.com/watch/python
6. www.youtube.com/watch/concepts of python
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	-	-	1	-	1
CO2	-	-	-	-	1		1	-	-	1	-	1
CO3	-	-	-	-	1		1	-	-	1	-	1
CO4	-	-	-	-	1		1	-	-	1	-	1
CO5	-	-	-	-	1		1	-	-	1	-	1
AVG	-	-	-	-	1		1	-	-	1	-	1

CO-PSO MAPPING

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

SEMESTER 7

JEI1701	INDUSTRIAL DATA COMMUNICATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To educate on the basic concepts of data networks
- To introduce the basics of internetworking and serial communications
- To provide details on HART and Field buses
- To educate on MODBUS, PROFIBUS and other communication protocol
- To introduce industrial Ethernet and wireless communication

UNIT I DATA NETWORK FUNDAMENTALS 9

Networks hierarchy and switching – Open System Interconnection model of ISO, Modified OSI Model - Data link control protocol - Media access protocol - Command / response - Token passing -CSMA/CD, TCP/IP

UNIT II INTERNET WORKING and RS 232, RS485 9

Bridges - Routers - Gateways - Standard ETHERNET and ARCNET configuration special requirement for networks used for control - RS 232, RS 485 configuration Actuator Sensor (AS) – interface, Device net- Protocols – Device net & CAN , Device net & CIP - ControlNet.

UNIT III HART AND FIELD BUS 9

Introduction - Evolution of signal standard - HART communication protocol - HART networks HART commands - HART applications - Fieldbus - Introduction - General Fieldbus architecture - Basic requirements of Fieldbus standard - Fieldbus topology - Interoperability Interchangeability - Industrial Examples of Interoperability and Interchangeability.

UNIT IV MODBUS AND PROFIBUS PA/DP/FMS AND FF 9

MODBUS protocol structure - function codes – Modbus TCP/IP - troubleshooting Profibus, Introduction, Profibus protocol stack, Profibus communication model - communication objects - system operation troubleshooting - review of foundation fieldbus - Foundation Fieldbus H1 - Data Highway-Types of Data Highway.

UNIT V INDUSTRIAL ETHERNET AND WIRELESS COMMUNICATION 9

Industrial Ethernet, Introduction, 10 Mbps Ethernet, 100 Mbps Ethernet, Gigabit Ethernet - Radio and wireless communication, Introduction, components of radio link - radio spectrum and frequency allocation - radio MODEMs-Introduction to wireless HART and ISA100, Introduction to Wireless Sensor networks.

TOTAL: 45 PERIODS

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

- To define basic concepts of data networks
- To explain the various internetworking devices involved in industrial networks
- To illustrate, compare & explain the working of HART and Field bus used in process digital communication.
- To summarize the operation of MODBUS, PROFIBUS protocol & its applications.
- To explain and adopt the different Industrial Ethernet protocol and usage of wireless communication in process applications.

TEXT BOOKS:

1. Steve Mackay, Edwin Wrijut, Deon Reynders, John Park, Practical Industrial Data Networks Design, Installation and Troubleshooting' Newnes Publication, Elsevier, Fifth Edition, 2004.
2. William Buchanan, Computer Buses, CRC Press, 2000.
3. Behrouz Forouzan,, Data Communications & Networking ,6th edition, Tata McGraw hill,2013.
4. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall of India Pvt. Ltd., 6th Edition. 2021.

REFERENCES:

1. Lawrence M Thompson,: Industrial Data Communication, 5th edition , 2015.
2. S Rappaport, Wireless Communication: Principles and Practice, Prentice Hall of India 2nd Edition, 2001.
3. William Stallings, Wireless Communication & Networks, Prentice Hall of India, 2nd Edition, 2005.
4. Deon Reynders, Steve Mackay, Edwin Wright, : Practical Industrial Data Communications ,1st edition ELSEVEIR,2005.
5. Bowden,R., "HART Application Guide", HART Communication Foundation, 1999.

WEBSITES:

https://instrumentationforum.com

https://nptel.ac.in/courses/106105080

https://nptel.ac.in/courses/106105195

https://www.isa.org/

https://www.icpdas-usa.com

CO-PO -PSO MAPPING:

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O2
CO1	3	-	-	2	1	-	-	-	-	-	-	1	2	2
CO2	3	-	-	2	1	-	-	-	-	-	-	1	2	1
CO3	3	-	-	2	1	-	-	-	-	-	-	1	2	1
CO4	3	-	-	2	1	-	-	-	-	-	-	1	2	1
CO5	3	-	-	2	1	-	-	-	-	-	-	1	2	1
AVG	3	-	-	2	1	-	-	-	-	-	-	1	2	1

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.

WEBSITES:

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https://instrumentationtools.com
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

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. S S.Khanka, Entrepreneurial Development, Third Edition, S.Chand & company, New Delhi 2001.
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.

WEBSITES:

- https://ideadrop.co/innovation-management/top-five-favourite-idea-generationtechniques/
- 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.

JEI1711	INSTRUMENTATION SYSTEM DESIGN AND AUTOMATION LABORATORY	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To provide adequate knowledge in design of various signal conditioning circuits and instrumentation systems.
- To impart practical skills in programming of PLC and the interfacing techniques.

LIST OF EXPERIMENTS:

1. Design of active filters– LPF and HPF.
2. Design of linearizing circuits and cold–junction compensation circuit for thermocouples.
3. Design of PID controller (using operational amplifier and microprocessor)
4. Piping and Instrumentation Diagram – case study.
5. Study of PLC field device interface modules (AI, AO, DI, DO modules) and Installation &Configuration of I/O modules.
6. Programming Logic Gates Function in PLC
7. Implementing Mathematical Operations in PLC
8. Programming Jump-to-subroutine & return operations in PLC
9. PLC Exercises: - 1.) Traffic Light Control 2.) Filling/Draining Control Operation
10. PLC Exercises: 1.) Reversal of DC Motor Direction 2.) ON/OFF Controller for Thermal Process
11. PLC based control of Level and flow Process
12. Implementation of PLC program through SCADA.

TOTAL: 45 PERIODS

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

- To understand design of signal conditioning circuits and instrumentation systems.
- To design controllers and able to design and draw the piping diagram for industrial application projects.
- To understand the programming of PLC and SCADA

WEBSITES:

https://www.allaboutinstruments.com/
https://instrumentationtools.com/instrumentation-and-control-design/
http://sliet.ac.in/wp-content/uploads/2012/03/PGICE_Syllabus_2K7.pdf

CO-PO-PSO MAPPING

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	-	3	-	2	1	2	-	-	2	-	-	-	1	1
CO2	-	3	-	2	1	2	-	-	2	-	-	-	1	1
CO3	-	3	-	2	1	2	-	-	2	-	-	-	1	1
AVG	-	3	-	2	1	2	-	-	2	-	-	-	1	1

JEI1712	SIMULATION LABORATORY FOR ELECTRONICS & INSTRUMENTATION ENGINEERS	L	T	P	C
		0	0	4	2

COURSE OBJECTIVES:

- To obtain adequate knowledge in LABVIEW
- To impart practical knowledge about design of various process using LABVIEW.

LIST OF EXPERIMENTS:

1. Creating virtual Instrumentation for simple application
2. Programming for loops and charts
3. Programming for clusters and graphs
4. Programming Exercises on case and sequence structures, file Input/output
5. Data Acquisition through Virtual Instrumentation
6. Simulating reactor control using Virtual Instrumentation.
7. Real time sequential control of any batch process
8. Real Time Temperature Control using Virtual Instrumentation
9. Creation of a CRO using Virtual Instrumentation
10. Developing Voltmeter using DAQ Card
11. Simulation of ECG signal.
12. Developing Signal Generator using DAQ Card

TOTAL: 45 PERIODS

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

- To understand the basic concepts of LABVIEW
- To design various process using LABVIEW

CO-PO -PSO MAPPING

CO\ PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	PSO1	PSO2
CO1	1	-	-	1	1	-	-	-	-	-	1	1	2	2
CO2	1	-	-	1	1	-	-	-	-	-	1	1	2	2
AVG	1	-	-	1	1	-	-	-	-	-	1	1	2	2

JEI1731	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 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners.

TOTAL :90 PERIODS

COURSE OUTCOMES: On completion of the phase I project work, the students will be

- Able to acquire clear idea of his/her area of project work
- Able to gain knowledge about report preparation.
- In a position to carry out the remaining phase II work in a systematic way.

SEMESTER 8

JNC1861	INDIAN CONSTITUTION	L	T	P	C
		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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2. nptel.ac.in/courses/109104045/
3. nptel.ac.in/courses/101104065/
4. www.hss.iitb.ac.in/en/lecture-details
5. www.iitb.ac.in/en/event/2nd-lecture-institute-lecture-series-indian-constitution.

JEI1841	COMPREHENSION AND 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 overhead projectors, Power point presentation and Demonstrative models

METHOD OF EVALUATION:

Take key topics important for placement perspective from each course and assess 100% internally through weekly test with objective type questions from competitive exams. During the seminar session each student is expected to prepare and present a topic on engineering/technology, for duration of about 8 to 10 minutes. In a session of three periods per week,15 students are expected to present the seminar. Each student is expected to present at least twice during the semester and the student is evaluated based on that. At the end of the semester, he/she should submit a report. A faculty guide is to be allotted and he/she will guide and monitor the progress of the student and maintain attendance also. Evaluation is 100% internal.

TOTAL: 30 PERIODS

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

- To solve real time technological problems
- To enrich their technical knowledge
- To face the placement interviews
- To acquire knowledge on report preparation
- To prepare and present technological developments

CO-PO -PSO MAPPING

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	-	-	-	-	1		1	-	-	1	-	1	1	1
CO2	-	-	-	-	1		1	-	-	1	-	1	-	-
CO3	-	-	-	-	1		1	-	-	1	-	1	-	-
CO4	-	-	-	-	1		1	-	-	1	-	1	-	-
CO5	-	-	-	-	1		1	-	-	1	-	1	-	-
AVG	-	-	-	-	1		1	-	-	1	-	1	-	-

JEI1832	PROJECT WORK –PHASE II	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 works on a topic approved by the head of the department under the guidance of a faculty member and prepares a comprehensive project report after completing the work to the satisfaction of the supervisor. The progress of the project is evaluated based on a minimum of three reviews. The review committee may be constituted by the Head of the Department. A project report is required at the end of the semester. The project work is evaluated based on oral presentation and the project report jointly by external and internal examiners.

TOTAL: 270 PERIODS

COURSE OUTCOMES:

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

- To take up any challenging practical problems and find solution by formulating proper methodology.

PROFESSIONAL ELECTIVE – 1(5th SEMESTER)

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 of managerial 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 McGraw Hill Education, 10th edition,2015.

REFERENCE BOOKS:

1. Robert Kreitner&MamataMohapatra, "Management", Biztrantra, 2008.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.
3. Tripathi PC & Reddy PN, "Principles of Management", Tata McGraw Hill,5th edition,2012.
4. P.C.Tulsian,"Business Management", Pearson India,4th edition,2013.
5. C.B.Gupta,"Management Concepts Practices", Sultan Chand,9th edition,2016.

WEBSITE REFERENCES:

1. https:// study.com/academy/lesson/types-of-business
2. https://www.businessmanagementideas.com/planning/steps -involved-in-planning-process
3. https://www.ciesin.com.columbia.edu/decentralisation/different forms.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
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.

UNITI BASIC CONCEPTS OF QUALITY MANAGMENT 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 Benchmarking- POKA YOKE - –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 Besterfield – Sacre, Hermant – Urdhwareshe, RashmiUrdhwareshe, Total Quality Management, , Pearson Education, 4th Edition ,2015.
2. ShridharaBhat K, Total Quality Management – Text and Cases, Himalaya Publishing House, 2ndEdition 2010.

REFERENCE BOOKS:

1. Panneerselvam R. and Sivasankaran P., Quality Management, PHI Learning, New Delhi,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, 9th Edition, Cengage Learning, 2012.
4. Poornima M.Charantimath, "Total Quality Management", Pearson Education, 2ndEdition, 2011.

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1. https://asq.org/quality-resources/total-quality-management/tqm-history
2. https://www.economicsdiscussion.net/quality-management/total-quality-management-principles/31865
3. https://quality-one.com/fmea/
4. https://leanfactories.com/tpm-and-six-sigma-basics/;https://quality-one.com/qfd/
5. https://www.iso.org/standard/28692;https://qualitymanagementsystem.com/what-is-iso/

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
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

JGE1001	PROFESSIONAL ETHICS IN ENGINEERING	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 – Self confidence – 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 AS SOCIAL 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.
3. Charles E. Harris, Michael S. Pritchard and Michael J. Rabins, "Engineering Ethics – Concepts and Cases", Cengage Learning, 2009.

REFERENCE BOOKS:

1. Charles B. Fleddermann, "Engineering Ethics", Pearson Prentice Hall, New Jersey, 2004.
2. John R Boat right, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 01.
4. Laura P. Hartman and Joe Desjardins, "Business Ethics: Decision Making for Personal Integrity and Social Responsibility" Mc Graw Hill education, India Pvt.Ltd., New Delhi, 2013.
5. World Community Service Centre, 'Value Education', Vethathiri publications, Erode, 2011.

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2. https://www.nspe.org/resources/ethics
3. https://www.slideshare.net/
4. https://www.tutorialspoint.com/engineering_ethics/engineering_ethics
5. https://sites.tufts.edu/

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
CO1	-	-
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

JCE1001	DISASTER MANAGEMENT	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an exposure to disasters, their significance and types.
- To understand the relationship between vulnerability, disasters, disaster prevention and risk reduction.
- To acquire knowledge on various approaches of Disaster Risk Reduction (DRR).
- To enhance technological innovations in Disaster Risk Reduction.
- To develop rudimentary ability to respond to their surroundings with potential disaster response.

UNIT I INTRODUCTION TO DISASTERS 9

Definition: Disaster, Hazard, Vulnerability, Resilience, Risks - Disasters: Types of disasters - Earthquake, Landslide, Flood, Drought, Fire etc - Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability - Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change - Dos and Don'ts during various types of Disasters.

UNIT II APPROACHES TO DISASTER RISK REDUCTION (DRR) 9

Disaster cycle - Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural - nonstructural measures, Roles and responsibilities of - community, Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stake - holders - Institutional Processes and Framework at State and Central Level - State Disaster Management Authority(SDMA) -National Disaster Management Authority (NDMA) - Early Warning System - Advisories from Appropriate Agencies.

UNIT III INTER-RELATIONSHIP BETWEEN DISASTERS AND DEVELOPMENT 9

Factors affecting Vulnerabilities, differential impacts, impact of Development projects such as dams, embankments, changes in Land-use etc.- Climate Change Adaptation - IPCC Scenario and Scenarios in the context of India - Relevance of indigenous knowledge, appropriate technology and local resources.

UNIT IV DISASTER RISK MANAGEMENT IN INDIA 9

Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy - Other related policies, plans, programmes and legislation - Role of Remote Sensing & GIS and Information Technology

Components in Preparedness, Risk Assessment, Response and Recovery Phases of Disaster - Disaster Damage Assessment - Aerial and satellite technology.

UNIT V DISASTER MANAGEMENT: APPLICATIONS AND FIELD WORKS 9

Landslide Hazard Zonation: Case Studies, Earthquake Vulnerability Assessment of Buildings and Infrastructure: Case Studies, Drought Assessment: Case Studies, Coastal Flooding: Storm Surge Assessment, Cyclone damage assessment - Floods: Fluvial and Pluvial Flooding: Case Studies; Forest Fire: Case Studies, Man Made disasters: Case Studies, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

TOTAL: 45 PERIODS

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

CO1: Illustrate various types of disasters and their significance.
CO2: Demonstrate the various approaches to disaster risk reduction.
CO3: Distinguish the relationship between vulnerability of development projects and disaster.
CO4: Explain the various disaster risk management.
CO5: Apply modern technology and field work of disaster management in various types of disaster.

TEXTBOOKS:

1. Singhal, J.P, "Disaster Management", Laxmi Publications, 2010.
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
3. Gupta A. K, Sreeja S. N, "Environmental Knowledge for Disaster Risk Management", NIDM, New Delhi, 2011.

REFERENCE BOOKS:

1. Govt. of India: Disaster Management Act, Government of India, New Delhi, 2005.
2. Government of India, National Disaster Management Policy, 2009.
3. Kapur Anu, "Vulnerable India: A Geographical Study of Disasters", IIAS and Sage Publishers, New Delhi, 2010.
4. Angus M. Gunn, "Encyclopedia of Disasters - Environmental Catastrophes and Human Tragedies", Vol. 1 & 2, Greenwood Press, 2008.
5. Parag Diwan "A Manual on Disaster Management" Pentagon Press, 2010.

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3. https://ocw.mit.edu/courses/urban-studies-and-planning/11-941-disaster-vulnerability-and-resilience-spring-2005/
4. https://reliefweb.int/sites/reliefweb.int/files/resources/102550-WP-P092217-P148868-OUO-9-Box394833B_0.pdf
5. http://healthindisasters.com/images/Books/Case_Studies_in_Disaster_Response_and_Emergency_Management.pdf

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
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 – Product change – variety – component standardization – 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 – Prototype basics – principles of prototyping – planning for prototypes – Economic Analysis – Understanding and representing tasks – baseline 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, CA 90274(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, New york, NY.
3. Thomke, Stefan, and Ashok Nimgade. "IDEO Product Development." Boston, MA: Harvard Business School Case 9-600-143, June 22, 2000.
4. Bowen, H. Kent, and Thomas Everett. "SweetWater." Boston, MA: Harvard Business School Case 9-695-026, November 1, 1994.
5. Anita Goyal, Karl T Ulrich, Steven D Eppinger, “Product Design and Development “, 4th Edition, 2009, Tata McGraw-Hill Education, ISBN-10-007-14679-9Kemnneth 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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2. www.electronicstutorial.net
3. www.slideshare.net
4. https://slideplayer.com
5. www.vidhyarthiplus.com

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
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 Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. PrabuddhaGanguli, "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, K V,"Intellectual Property Rights: Protection and Management", India, IN: Cengage Learning India Private Limited, 2019.
5. Neeraj, P., &Khusdeep. D. "Intellectual Property Rights. India", IN: PHI learning Private Limited, 2014.

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4. https://www.wipo.int/about-ip/en/
5. 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
CO1	1	1
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

PROFESSIONAL ELECTIVE – 2(6th SEMESTER)

JEI1001	APPLIED THERMODYNAMICS AND FLUID DYNAMICS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study various laws of thermodynamics.
- To impart knowledge on thermodynamics of refrigerators and pumps.
- To learn the concept of fluid mechanics and flow of fluids.
- To introduce the concept of dimensional and model analysis.
- To study the different types of pumps and turbines.

UNIT I LAWS OF THERMODYNAMICS AND BASIC IC ENGINE CYCLES 9

Systems zeroth law, first law of thermodynamics – concept of internal energy and enthalpy applications to closed and open systems – second law of thermodynamics – concept of entropy – clausius inequality and principles of increase in irreversible processes. Basic IC engine and gas turbine cycles.

UNIT II THERMODYNAMICS OF REFRIGERATORS AND PUMPS 9

Properties of steam – Ranking cycle—Boilers and its accessories– Basic thermodynamics of refrigerators - Vapor compression refrigeration system and its working principle - Heat pumps -Basics of Heat transfer.

UNIT III BASIC CONCEPT OF FLUID MECHANICS AND FLOW OF FLUIDS 9

Introduction – classification – types of fluids – properties – laws of pressure – atmospheric, gauge, absolute pressure, pressure measurement – manometers – mechanical gauges. Types of fluid flow –velocity – rate equation of continuity – energy of a liquid in motion – head of a liquid – Bernoulli's theorem.

UNIT IV DIMENSIONAL AND MODEL ANALYSIS 9

Introduction – dimensions – dimensional analyses – Rayleigh's and Buckingham's method-similitude- dimensionless numbers and their significance – similarity laws.

UNIT V PUMPS AND TURBINES 9

Introduction – types of pumps – reciprocating pump – construction details – centrifugal pump – classification – working principle – turbines– classification – working principle - Hydraulic turbines – Pelton wheel turbine, Francis turbine.

TOTAL : 45 PERIODS

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

CO1: To understand various laws of thermodynamics.
CO2: To acquire knowledge on thermodynamics of refrigerators and pumps.
CO3: To understand the basic concept of fluid mechanics and flow of fluids.
CO4: To understand the concept of dimensional and model analysis.
CO5: To understand the working of pumps and turbines.

TEXT BOOKS:

1. Nag, P.K., "Engineering Thermodynamics", Tata McGraw-Hill Co. Ltd., 2007.
2. BANSAL.R.K, 'Fluid Mechanics and Hydraulic Machines', Laxmi Publications' (P) Ltd, 2005.
3. Yunus A. Çengel, Michael A. Boles, "Thermodynamics: An Engineering Approach", McGr Hill Higher Education, 2006.

REFERENCE BOOKS:

1. Reynolds, Thermodynamics, Int. Student Edition, McGraw-Hill Co. Ltd., 1990.
2. Ramalingam. K.K." Thermodynamics", Sci-Tech Publications, 2006.
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4. Shames, I.H., 'Mechanics of fluids', Kogakusha, Tokyo, 1998.
5. Kumar, K.L., 'Fluid Mechanics', Eurasia publishers, 1990.

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3. https://www.linquip.com
4. https://www.sciencedirect.com
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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
CO1	1	1
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

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 radix 2 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 – Butterworth and Chebyshev approximations; IIR Filters, digital design using impulse invariant and bilinear transformation.

UNIT V DIGITAL SIGNAL PROCESSORS AND APPLICATIONS 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.

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3. Taan S. ElAli, 'Discrete Systems and Digital Signal Processing with Mat Lab', CRC Press, 2009.
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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
CO1	1	1
CO2	1	1
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

JEI1003	COMPUTER ARCHITECTURE	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basic structure and operation of digital computer.
- To familiarize the students with arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
- To expose the students to the concept of pipelining.
- To study parallel processing architectures.
- To familiarize the students with hierarchical memory system and different ways of communication with I/O devices.

UNIT I OVERVIEW AND INSTRUCTIONS 9

Eight ideas –Moore's law - Components of a computer system – Technology – Performance - Power wall –Uniprocessors to multiprocessors; Instructions – operations and operands – representing instructions– Logical operations – control operations – Addressing and addressing modes.

UNIT II ARITHMETIC OPERATIONS 9

ALU - Addition and subtraction – Multiplication – Division – Floating Point operations – IEEE 754 floating point standard – Fast Adders – Carry look ahead adders.

UNIT III PROCESSOR AND CONTROL UNIT 9

Basic MIPS implementation –MIPS Architecture- Building datapath – Control Implementation scheme – Pipelining –Pipelined datapath and control – Handling Data hazards & Control hazards – Exceptions.

UNIT IV PARALLELISM 9

Instruction-level-parallelism – Parallel processing challenges – Flynn's classification – Hardware multithreading – Multicore processors – Clusters – UMA & NUMA.

UNIT V MEMORY AND I/O SYSTEMS 9

Memory hierarchy - Memory technologies – Cache basics – Cache Levels – Measuring and improving cache performance - Virtual memory, TLBs - Input/output system, programmed I/O, DMA and interrupts, I/O processors.

TOTAL: 45 PERIODS

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

CO1: To understand the basic structure and operation of digital computer.
CO2: To design arithmetic and logic unit.
CO3: To design and analyze pipelined control units.
CO4: To understand parallel processing architectures.
CO5: To understand Memory technologies and different ways of communication with I/O devices.

TEXT BOOKS:

1. David A. Patterson and John L. Hennessey, "Computer organization and design', Morgan Kauffman / Elsevier, Fifth edition, 2014.
2.Miles J.Murdocca and Vincent P.Heuring, — "Computer Architecture and Organization: An Integrated approach"', Second edition, Wiley India Pvt Ltd, 2015.

REFERENCE BOOKS:

1.V.CarlHamacher, Zvonko G. Varanesic and Safat G. Zaky, "Computer Organisation",VI the edition, Mc
Graw-Hill Inc, 2012.
2.William Stallings "Computer Organization and Architecture", Seventh Edition , Pearson Education, 2006.
3.Vincent P. Heuring, Harry F. Jordan, "Computer System Architecture", Second Edition, Pearson Education, 2005.
4.Govindarajalu, "Computer Architecture and Organization, Design Principles and Applications", first edition, Tata McGraw Hill, New Delhi, 2005.
5. John P. Hayes, "Computer Architecture and Organization", Third Edition, Tata Mc Graw Hill,1998.

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CO -PO MAPPING

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

CO -PSO MAPPING

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

JEI1004	INSTRUMENTATION STANDARDS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To get introduced to the standards organization used in process measurement and instrumentation.
- To explore the various types of ISA standards.
- To get aware of basic concepts of ISA standards for control valve and Actuators.
- To impart knowledge on standards used in Nuclear and Fossil power plants.
- To make students familiarize with Instrumentation standards used for sensors and flow meters.

UNIT I STANDARDS ORGANIZATION 9

Standards: Introduction, International and National Standards organization, Process Measurement and Instrumentation (APIRP551), recommended practice for installation of the instruments – flow, level, temperature, pressure - Process Instrument and Control (API RP554): performance requirements and considerations for the selection.

UNIT II ISA STANDARDS 9

Documentation of Measurement and Control− Instruments and System (ISA 5): 5.1, 5.2, 5.3, 5.4, 5.5, 5.6, 5.7 − General Requirement for Electrical Equipment in Hazardous Location (ISA 12): 12.2, 12.4, 12.24, 12.29 Instrument Specification Forms (ISA20) − Measurement Transducers (ISA37)

UNIT III ISA STANDARDS - CONTROL VALVE AND ACTUATOR 9

Control Valve Standards (ISA75): 75.01, 75.04, 75.05, 75.7, 75.11, 75.13, 75.14, 75.23, 75.24, 75.26. − Valve Actuator (ISA 96): 96.01, 96.02, 96.03, 96.04.

UNIT IV ISA STANDARDS - FOSSIL AND NUCLEAR POWER PLANTS 9

Fossil Power Plant Standards (ISA 77): 77.14, 77.22, 77.30, 77.41, 77.42, 77.44, 77.60, 77.70 − Nuclear Power Plant Standards (ISA67): 67.01, 67.02, 67.03, 67.04, 67.06.

UNIT V BS, ISO, IEC, & ANSI 9

Measurement of Fluid Flow by means of Orifice Plates (ISO 5167/ BSI042) IEC 61131-3 – Programmable Controller – Programming Languages – Specification for Industrial Platinum Resistance Thermometer Sensors (BSI904) – International Thermocouple Reference Tables (BS4937) – Temperature Measurement Thermocouple (ANSIC96.1).

TOTAL: 45 PERIODS

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

CO1: To understand the role of standards organization in process measurement.
CO2: To acquire knowledge on various types of ISA standards.
CO3: To understand and follow different standards while performing control valve sizing, actuator sizing and orifice sizing etc.
CO4: To interpret and follow different standards while carrying out monitoring and control of fossil fuel power plants and nuclear power plants.
CO5: To analyze the flow measurement standards.

TEXT BOOKS:

1. API Recommended Practice 551, "Process Measurement Instrumentation", American Petroleum Institute, Washington, D.C., 1st Edition, May 1993.
2. API Recommended Practice 554, "Process Instrumentation and Control – 3 parts", American Petroleum Institute, Washington, D.C., 1st Edition, October 2008.
3. Instrument Society of America Individual Standards: Instrumentation Symbols and Identification S5. 1 (Standards & practices for instrumentation & control), November 1985,Instrument Society of America (Author).

REFERENCE BOOKS:

1. ISA standard 5, "Documentation of Measurement and Control Instruments and Systems", ISA, North Carolina, USA.
2. ISA standard 12, "Electrical Equipment for Hazardous Locations", ISA, North Carolina, USA.
3. ISA standard 20, "Instrument Specification Forms", ISA, North Carolina, USA.
4. ISA standard 37, "Measurement Transducers", ISA, North Carolina, USA.
5. ISA standard 75, "Control Valve Standards", ISA, North Carolina, USA.
6. ISA standard 96, "Valve Actuator", ISA, North Carolina, USA.
7. ISA standard 77, "Fossil Power Plant Standards", ISA, North Carolina, USA.
8. ISA standard 67, "Nuclear Power Plant Standards", ISA, North Carolina, USA. BS EN 60584-1, "Thermocouples - EMF specifications and tolerances", British.

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2. www.vidyathriplus.net
3. www.slideshare.net
4. https://instrumentationtools.com/instrumentation-standards/
5. https://www.isa.org/standards-and-publications/isa-standards

CO -PO MAPPING:

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

CO -PSO MAPPING

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

JEI1005	VIRTUAL INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the basics of Lab VIEW.
- To learn the programming concepts of Lab VIEW
- To study important methods of data acquisition and control.
- To impart knowledge on Lab VIEW based advanced control system.
- To introduce the usage of Lab VIEW in automation technology

UNIT I INTRODUCTION TO LABVIEW 9

Programming paradigms- Virtual Instrumentation- Definition to Virtual Instrumentation (VI) – Lab VIEW software- Lab VIEW basics- Lab VIEW environment- Simple problems.

UNIT II VI USING LABVIEW 9

Creating, Editing and debugging a VI in LabVIEW- Creating a sub VI-Loops and charts – Case and sequence structures – File I/O – VI customization – Simple problems.

UNIT III - DATA ACQUISITION AND CONTROL IN VI 9

Plug-in DAQ boards- Organization of the DAQ VI System- Performing analog input and analog output - Scanning multiple analog channels - Driving the digital I/Os - Buffered data acquisition-Simple problems

UNIT IV - LAB VIEW FOR ADVANCED SYSTEMS 9

Bio-bench control and simulation using Lab VIEW- Integrated design Environment fordynamic systems Lab VIEW based fuzzy logic and genetic algorithms.

UNIT V - LAB VIEW AND AUTOMATIONTECHNOLOGY 9

Mathematics and simulation in Lab VIEW- Commercial communication applications- Fourier transform analysis- Time frequency analysis of signals- Designing digital filters- Quality, Reliability and maintenance of Lab VIEW programs

TOTAL : 45 PERIODS

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

CO1: To impart knowledge on the basic concepts of Lab VIEW.
CO2: To have adequate knowledge about the programming concepts in Lab VIEW.
CO3: To understand the methods of data acquisition and control in Lab VIEW.
CO4: To design the Lab VIEW based advanced control system.
CO5: To understand the methods of Lab VIEW in automation technology.

TEXT BOOKS:

1. Jerome J., Virtual Instrumentation using Lab VIEW, Prentice Hall India Private Ltd., New Delhi,2010.
2. Sanjay Gupta, Virtual Instrumentation using Lab view, Tata McGraw-Hill Education, 2010.
3. Jeffrey Y. Beyon (Author), Hands-On Exercise Manual for Lab VIEW Programming, Data Acquisition and Analysis (Virtual Instrumentation), National Instruments, August 2000.

REFERENCE BOOKS:

1. Rahman, and Herbert Pichlik, 'Lab VIEW – Applications and Solutions', NationalInstruments Release.
2. Lisa K. Wells Jeffrey Travis, 'Lab VIEW for Everyone', National Instruments Release.
3. Sensors and Transducer and Lab VIEW', National Instruments Release.
4. Roman Baican, Dan S. Necsulescu, "Applied Virtual Instrumentation", WIT, 2000 -Computers.
5. Jon B. Olansen (Author), Eric Rosow (Author), "Virtual Bio-Instrumentation: Biomedical, Clinical, and Healthcare Applications in Lab VIEW", December 2001.

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2. https://www.powershow.com/Virtual_Instrumentation_With_LabVIEW
3. https://edurev.in/studytube/Virtual-Instrumentation-With-LabVIEW
4. www.nptel.ac.in
5. www.vidyathriplus.net

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
CO1	2	2
CO2	2	2
CO3	2	1
CO4	2	1
CO5	1	1
AVG	2	1

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, bandwidth; 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 : 45 PERIODS

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', McGraw Hill, 4th edition, 2002.
3. Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003.
4. Simon Haykins, Communication systems, John Wiley,4th Edition,2001.
5. H P Hsu, Schaum outline series-'Analog and Digital Communications', TMH 2006.

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4. https:// youtu.be/T4OnKLm49w
5. https:// youtu.be/Z0Ylnk8zXRol quality

CO - PO MAPPING:

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

CO - PSO MAPPING:

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

PROFESSIONAL ELECTIVE – 3(6th SEMESTER)

JEI1008	POWER PLANT INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students familiarize about various power generation methods.
- To identify various parameters in power plant.
- To impart knowledge about various analysers in power plants.
- To familiarize the student with the control loops in boiler.
- To impart knowledge about the types and control of turbines.

UNIT I OVERVIEW OF POWER GENERATION 9

Survey of methods of power generation: – hydro, thermal, nuclear, tidel, geo thermal, solar and wind power – Importance of instrumentation in power generation – Thermal power plant – Building blocks - Combined Cycle System – Combined Heat and Power System – P&I Diagram.

UNIT II MEASUREMENTS IN POWER PLANTS 9

Electrical measurements: current, voltage, power, frequency, power factor – non electrical parameters: flow of feed water, fuel, air, steam pressure and steam temperature – smoke density measurement –Drum level measurement-Turbine speed and vibration measurement – pollution monitoring instruments.

UNIT III ANALYSERS IN POWER PLANTS 9

Flue gas oxygen analyser – analysis of impurities in feed water and steam – dissolved oxygen analyser – chromatography – PH meter – fuel analyser – pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER 9

Combustion control – air/fuel ratio control – furnace draft control – drum level control – main steam and reheat steam temperature control – superheater control – deaerator control – distributed control system in power plants – interlocks in boiler operation.

UNIT V CONTROL OF TURBINE 9

Types of steam turbines – impulse and reaction turbines – compounding – Turbine governing system – Speed and Load control – Transient speed rise – Free governor mode operation – Automatic Load Frequency Control – Turbine oil system – Oil pressure drop relay – Oil cooling system – Turbine run up system.

Total : 45 PERIODS

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

CO1: To understand various power generation process.
CO2: To identify important parameters to be monitored and controlled in power plant.
CO3: To gain knowledge about various analysers in power plants.
CO4: To understand various control loops in boiler.
CO5: To gain knowledge about the different types of turbines and its control.

TEXT BOOKS:

1. Sam G. Dukelow, The control of Boilers, instrument Society of America, 1991.
2. Modern Power Station Practice, Vol.6, Instrumentation, Controls and Testing, Pergamon Press, Oxford, 1971.

REFERENCES:

1. Krishnaswamy KM, Bala P, Bala MP, "Power Plant Instrumentation," Prentice Hall, 2013.
2. Elonka.S.M. and Kohal A.L., "Standard Boiler Operations", McGraw-Hill, New Delhi, 1994.
3. Jain R.K., "Mechanical and industrial Measurements", Khanna Publishers, New Delhi, 2008.
4. S.M. Elonka and A.L. Kohal, 'Standard Boiler Operations', Tata McGraw Hill, New Delhi,1994.
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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
CO1	2	2
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	1
AVG	2	1

JEI1009	INSTRUMENTATION FOR BIOMEDICAL APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce fundamentals of Biomedical Engineering.
- To study the non-electrical parameter measurements and diagnostic procedures.
- To learn the electrical parameter measurement.
- To study the basic principles in imaging techniques.
- To have a basic knowledge in life assisting and therapeutic devices.

UNIT I FUNDAMENTALS OF BIOMEDICAL ENGINEERING 9

Cell and its structure – Resting and Action Potential – Nervous system and its fundamentals - Basic components of a biomedical system- Cardiovascular systems- Respiratory systems – Kidney and blood flow - Biomechanics of bone - Biomechanics of soft tissues -Physiological signals and transducers – transducers selection criteria.

UNIT II NON-ELECTRICAL PARAMETERS MEASUREMENT AND DIAGNOSTIC PROCEDURES 9

Measurement of blood pressure - Cardiac output - Heart rate - Heart sound – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography Blood Gas analysers, pH of blood –measurement of blood pCO2, pO2, finger-tip oximeter ESR, GSR measurements.

UNIT III ELECTRICAL PARAMETERS ACQUISITION AND ANALYSIS 9

Electrodes – Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers, Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier - ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms - Electrical safety in medical environment, shock hazards leakage current-Instruments for checking safety parameters of biomedical equipment.

UNIT IV IMAGING MODALITIES AND ANALYSIS 9

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography –Different types of biotelemetry systems Retinal Imaging – Image Fusion – Digital Image Processing Techniques - Imaging application in Biometric systems.

UNIT V LIFE ASSISTING, THERAPEUTIC AND ROBOTIC DEVICES 9

Pacemakers – Defibrillators –Implants - Ventilators –Wearable health monitoring devices - Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy - ICCU patient monitoring system – Nano Robots - Robotic surgery – Orthopedic prostheses fixation.

TOTAL: 45 PERIODS

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

CO1: To understand the fundamentals of Biomedical Engineering.
CO2: To gain knowledge on non-electrical parameter measurements and diagnostic procedures.
CO3: To acquire knowledge on electrical parameter measurements.
CO4: To bring out the important and modern methods of imaging techniques and their analysis.
CO5: To explain the medical assistance/techniques, robotic and therapeutic equipments.

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. Khandpur R.S, Handbook of Biomedical Instrumentation, Tata McGraw-Hill, New Delhi,2nd edition, 2003.
3. Joseph J Carr and John M.Brown, Introduction to Biomedical Equipment Technology, John Wiley and sons, New York, 4th edition, 2012.

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2. Duane Knudson, Fundamentals of Biomechanics, Springer, 2nd Edition, 2007.
3. Suh, Sang, Gurupur, Varadraj P., Tanik, Murat M., Health Care Systems, Technology and Techniques, Springer, 1st Edition, 2011.
4. Ed. Joseph D. Bronzino, The Biomedical Engineering Hand Book, Third Edition, Boca Raton, CRC Press LLC, 2006.
5. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.

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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
CO1	2	2
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	1
AVG	2	1

JEI1010	INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce the method of oil recovery and the steps involved in oil gas production process.
- To impart knowledge on mathematical model of unit operations in petrochemical industry.
- To provide information about the most important derivatives obtained from petroleum products.
- To learn about control of selected petrochemicals production processes.
- To study the selection and maintenance of instruments in petrochemical industry.

UNIT I OIL EXTRACTION AND PROCESSING 9

Techniques used for oil discovery – methods of oil extraction - oil rig system - oil gas separation – control loops in oil gas separator - scrubber – coalesce - Gas treatment and compression – Control and safety systems

UNIT II IMPORTANT UNIT OPERATIONS IN REFINERY 9

Distillation Column – Thermal cracking – Catalytic Cracking – Catalytic reforming – polymerization - isomerization – alkylation - mathematical modeling and selection of appropriate control strategy.

UNIT III DERIVATIVES FROM PETROLEUM 9

Derivatives from methane – Methanol Production – Acetylene production - Derivatives from acetylene – Derivatives from ethylene – Derivatives from propylene.

UNIT IV CONTROL LOOPS IN PETROCHEMICAL INDUSTRY 9

Control of binary and fractional distillation columns - Control of catalytic and thermal crackers – control of catalytic reformer - control of alkylation process - Control of polyethylene production – Control of VCM and PVC production

UNIT V SAFETY IN INSTRUMENTATION SYSTEMS 9

Hazardous zone classification – Electrical and Intrinsic safety – Explosion suppression and Deluge systems – Flame, fire and smoke detectors – leak detectors – Guidelines and standards – General SIS Design Configurations – Hazard and Risk Assessment – Failure modes – Operation and Maintenance - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit.

TOTAL: 45 PERIODS

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

CO1: To gain knowledge on oil gas production process and important unit operations in a refinery

CO2: To develop and analyze mathematical model of selective processes.

CO3: To gain knowledge on the most important chemical derivatives obtained from petroleum products.

CO4: To develop, analyze and select appropriate control strategy for selective unit operations in a refinery.

CO5: To understand safety instrumentation in process industries.

TEXT BOOKS:

1. Waddams, A.L., “Chemicals from Petroleum”, Wiley, 1973. (digitized in 2007).
2. Balchen, J.G., and Mumme K.I., “Process Control Structures and Applications”, VonNostrand Reinhold Company, New York, 1988.

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1. Liptak, B.G., "Instrumentation in Process Industries", Chilton Book Company, 2005.
2. Austin, G.T. and Shreeves, A.G.T., "Chemical Process industries", McGraw-Hill, 2012.
3. HavardDevold, "Oil and Gas Production Handbook", ABB, 2006.
4. Paul Gruhn and Harry Cheddie, "Safety Instrumented Systems: Design, Analysis, and Justification", 2nd Edition, ISA Press, 2006.
5. Ram Prasad, Petroleum Refining Technology, Khanna Publishers, New Delhi,2000.

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2. www.electronicstutorial.net
3. https://www.slideshare.net/
4. https://worldwidescience.org
5. http://www.oil-gasportal.com/

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
CO1	2	2
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	1
AVG	2	1

JEI1011	AIRCRAFT INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To learn the basics of Aircraft Instrumentation.
- To introduce the operation of Air data instruments.
- To study the characteristics of Gyroscopic Instruments.
- To learn the characteristics of engine instruments.
- To study the characteristics of EFIS & AFCS.

UNIT I INTRODUCTION TO AIRCRAFT INSTRUMENTS 9

Basics of Aircraft – Aircraft instruments and their layout - Aircraft display types – Quantitative Displays – Qualitative Displays – Instrument Grouping – Panels – Glass cockpit.

UNIT II AIR DATA INSTRUMENTS 9

Static and pitot pressure source – Measurement of Altitude – Altimeter - Airspeed indicator – Machmeter – Mach Warning System – Vertical speed indicator – accelerometer – Central Air data computer.

UNIT III GYROSCOPIC INSTRUMENTS 9

Gyroscopic theory – Types of Gyroscopes – Mechanical Gyro and its properties - Directional gyro indicator – Gyro horizon - Turn and Bank indicator – Standby ADI – Advanced Direction Indicators - Direct reading magnetic components - Compass errors gyro magnetic compass.

UNIT IV ENGINE INSTRUMENTS 9

Engine Speed Measurement – Servo type RPM Indicators – Torque measurement – Pressure measurement – fuel quantity indicator – fuel flow rate indicator – rotating vane flow meter – Integrated flow meter - exhaust gas temperature measurement

UNIT V EFIS AND AFCS 9

Flight Director System – Horizontal Situation Indicator –Mode Controller – Annunciator Display Panel - Electronic Flight Instrument Systems (EFIS) – Autopilot – Automatic Flight Control System (AFCS)

TOTAL: 45 PERIODS

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

CO1: To develop basic knowledge on the behavior and the characteristics of Aircraft Instruments.

CO2: To acquire knowledge on the operation of Air data instruments.
CO3: To understand the usage of gyroscopic instruments in an aircraft.
CO4: To acquire knowledge on engine instruments.
CO5: To gain knowledge on EFIS and AFCS.

TEXT BOOKS:

1. Pallett, E.B.J, " Aircraft Instruments -Principles and applications", Pitman and sons, 1981.
2. "Aircraft Instrumentation and systems", S.Nagabhushana, L.K.Sudha. I.K. International Publishing House Pvt., Ltd., New Delhi.

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1. S. K. Singh, "Industrial Instrumentation & Control" 3rd Edition, Tata McGraw Hill, Reprint 2009.
2. R.K.Jain, "Mechanical & Industrial Measurements", Khanna Publishers, 11th Edition, 2004.
3. E. H. J. Pallett, "Aircraft Instruments and Integrated Systems", Longman , 1992
4. Chris Binns, "Aircraft Systems", Wiley ,2018
5. David Wyatt, Mike Tooley , "Aircraft Electrical and Electronic Systems" , Taylor & Francis , 2008
6. R.P.G.R.P.G. Collinson, "Introduction to Avionics Systems", Springer US , 1996

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3. https://www.flightliteracy.com/
4. https://www.flyaeroguard.com
5. https://www.aircraftsystemstech.com

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
CO1	2	2
CO2	1	1
CO3	1	1
CO4	-	-
CO5	-	-
AVG	1	1

JEI1012	INSTRUMENTATION FOR AGRICULTURE & FOOD PROCESSING INDUSTRIES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To provide an understanding on the need of instrumentation in agriculture and food processing sector.
- To study the food quality assessment and concepts of instruments used in food industry.
- To learn the agriculture associated activities and instruments used for agriculture management.
- To impart knowledge on instrumentation for agricultural processing unit.
- To provide knowledge in food processing equipments.

UNIT I INTRODUCTION 9

Necessity of instrumentation and control for food processing and agriculture - sensor requirement -remote sensing - biosensors in Agriculture - standards for food quality - Flow diagram of sugar plant - Oil extraction plant.

UNIT II INSTRUMENTATION FOR FOOD QUALITY ASSURANCE 9

Colour measurements of food - food composition analysis using infrared - microwave measurements of product variable – level, flow, pressure and temperature measurement in food process control - ultrasonic instrumentation in food industry.

UNIT III INSTRUMENTATION FOR AGRICULTURE 9

Comparison of different irrigation systems - soil moisture measurement methods - Application of SCADA for DAM parameters and control - Water distribution and management control - Auto-Drip irrigation system - Irrigation Canal management - upstream and downstream control concepts - supervisory control.

UNIT IV INSTRUMENTATION IN AGRICULTURAL PROCESSING UNIT 9

Ventilation - cooling and heating - wind speed measurement - temperature and humidity measurement - rain gauge - carbon dioxide enrichment measurement and control.

UNIT V DESIGN CONSIDERATIONS 9

Design of Food Processing equipments – dryers - design of dryers PHTC – RPEC - LSU - Drum Dryer - determination of heat and air requirement for drying grains.

TOTAL: 45 PERIODS

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

CO1: To understand the necessity of instrumentation in agriculture and food processing.
CO2: To impart knowledge with instrumentation requirement in food processing and assessment.
CO3: To analyze and design systems/instruments for agriculture management.
CO4: To gain knowledge on instrumentation involved in agricultural processing unit.
CO5: To acquire knowledge on food processing equipment.

TEXT BOOKS:

1. P.J. Fellows, Food Processing Technology Principles and Practice, Wood head publishing, 3rd Edition, 2009.
2. SemiohOtles, Methods of analysis of food components and additives, CRC Press, Taylor and Francis group, 2nd Edition, 2012.
3. Erika Kress –Rogers and Christopher.J, B.Brimelew, Instrumentation and sensors for Food industry, CRC Wood head Publishing ltd, 2nd edition, 2015.

REFERENCES:

1. Mcmillan G. K., Considine D. M., "Process/Industrial Instruments and Controls Handbook", McGraw Hill International, 5th edition,1999.
2. Liptak B. G., "Instrument Engineers Handbook, Process Measurement Volume I and Process Control" Volume II, CRC press, 4th Edition, 2005.
3. Hall C. W., Olsen W. C., "The literature of Agriculture Engineering", Cornell University Press, 1992.
4. Sahu J. K., "Fundamentals of Food Process Engineering", Alpha Science Intl Ltd, 2016.
5. Y A. Y. Tamime, Richard Kenneth ,Rapid and On-Line Instrumentation for Food Quality Assurance", Elsevier Science, 2003.

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2. https://www.foodengineeringmag.com/keywords/instrumentation
3. https://edmontonglobal.ca/food-and-agriculture
4. www.nptel.ac.in
5. www.slideshare.net

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
CO1	2	2
CO2	2	1
CO3	2	1
CO4	2	1
CO5	2	1
AVG	2	1

		L	T	P	C
JEI1013	**FIBER OPTICS AND LASER INSTRUMENTATION**	**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 provide adequate knowledge about Industrial application of lasers.
- To provide adequate knowledge about holography and medical applications of Lasers.

UNIT I OPTICAL FIBRES AND THEIR PROPERTIES 9

Construction of optical fiber cable: Guiding mechanism in optical fiber and Basic component of optical fiber communication, –Principles of light propagation through a fiber: Total internal reflection, Acceptance angle (θa), Numerical aperture and Skew mode, –Different types of fibers and their

properties: Single and multimode fibers and Step index and graded index fibers,– fiber characteristics: Mechanical characteristics and Transmission characteristics, – Absorption losses – Scattering losses– Dispersion – Connectors and splicers –Fiber termination – Optical sources: Light Emitting Diode(LED), – Optical detectors: PIN Diode.

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)– Fiber optic instrumentation system: Measurement of attenuation (by cut back method), Optical domain reflectometers, Fiber Scattering loss Measurement, Fiber Absorption Measurement, Fiber dispersion measurements, End reflection method and Near field scanning techniques – Different types of modulators: Electro-optic modulator (EOM) –Interferometric method of measurement of length – Moire fringes – Measurement of pressure, temperature, current, voltage, liquid level and strain.

UNIT III LASER FUNDAMENTALS 9

Fundamental characteristics of lasers – Level Lasers: Two-Level Laser, Three Level Laser, Quasi Three and four level lasers – Properties of laser: Monochromaticity, Coherence, Divergence and Directionality and Brightness –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, Laser for measurement of length, Laser for measurement of velocity, Laser for measurement of acceleration, Laser for measurement of current, voltage and Laser for measurement of Atmospheric Effect: Types of LIDAR, Construction And Working, and LIDAR Applications – Material processing: Laser instrumentation for material processing, Powder Feeder, Laser Heating, Laser Welding, Laser Melting, Conduction Limited Melting and Key Hole Melting – Laser trimming of material: Process Of Laser Trimming, Types Of Trim, Construction And Working Advantages – Material Removal and vaporization: Process Of Material Removal

UNIT V HOLOGRAM AND MEDICAL APPLICATIONS 9

Holography: Basic Principle, Holography vs. photography, Principle Of Hologram Recording, Condition For Recording A Hologram, Reconstructing and viewing the holographic image– Holography for non-destructive testing – Holographic components – Medical applications of lasers, laser-Tissue Interactions Photochemical reactions, Thermalization, collisional relaxation, Types of Interactions and Selecting an Interaction Mechanism – Laser instruments for surgery, removal of tumors of vocal cards, brain surgery, plastic surgery, gynecology and oncology.

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. J.M. Senior, 'Optical Fiber Communication – Principles and Practice', Prentice Hall of India,1985.
2. J. Wilson and J.F.B. Hawkes, 'Introduction to Opto Electronics', Prentice Hall of India, 2001.
3. Eric Udd, William B., and Spillman, Jr., "Fiber Optic Sensors: An Introduction for Engineers and Scientists ", John Wiley & Sons, 2011.

REFERENCES:

1. G. Keiser, 'Optical Fiber Communication', McGraw Hill, 1995.
2. M. Arumugam, 'Optical Fiber Communication and Sensors', Anuradha Agencies, 2002.
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.
6. Keiser, G., "Optical Fiber Communication", McGraw-Hill, 3rd Edition, 2000.

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2. https://www.rp-photonics.com/optoelectronics.html
3. www.nptel.com
4. http://nptel.ac.in/courses/117101002/
5. www.slideshare .net

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
CO1	2	2
CO2	-	-
CO3	-	-
CO4	-	-
CO5	-	-
AVG	-	-

PROFESSIONAL ELECTIVE-5 (7th SEMESTER)

JEI 1020	SYSTEM IDENTIFICATION AND ADAPTIVE CONTROL	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To introduce Non parametric methods
- To impart knowledge on parameter estimation methods
- To learn about Recursive identification methods
- To impart knowledge on Adaptive control schemes
- To introduce stability, Robustness and Applications of adaptive control method

UNIT I NON -PARAMETRIC METHODS 9

Non parametric methods: Transient analysis–frequency analysis–Correlation analysis–Spectral analysis.

UNIT II PARAMETER ESTIMATION METHODS 9

Least square estimation – best linear unbiased estimation under linear constraints – updating the parameter estimates for linear regression models–prediction error methods: description of prediction methods – optimal prediction – relation between prediction error methods and other identification methods – theoretical analysis - Instrumental variable methods: Description of instrumental variable methods – Input signal design for identification.

UNIT III RECURSIVE IDENTIFICATION METHODS 9

The recursive least square method – the recursive instrumental variable methods- the recursive prediction error methods – Maximum likelihood. Identification of systems operating in closed loop: Identifiability considerations – direct identification – indirect identification.

UNIT IV ADAPTIVE CONTROL SCHEMES 9

Introduction – Types of adaptive control–Gain scheduling controller–Model reference adaptive control schemes–Self tuning controller–MRAC and STC: Approaches–The Gradient approach – Lyapunov functions – Passivity theory – pole placement method – Minimum variance control – Predictive control.

UNIT V ISSUES INADAPTIVE CONTROL AND APPLICATIONS 9

Stability – Convergence – Robustness –Applications of adaptive control.

TOTAL: 45 PERIODS

COURSE OUTCOMES:

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

- To gain in- depth knowledge to solve the problems in Non parametric methods
- To acquire knowledge on parameter estimation methods
- To understand Recursive identification methods
- To analyze on the Adaptive control schemes
- To solve the stability, Robustness and Applications of adaptive control method

TEXT BOOKS:

1. Astrom,K.J. and Wittenmark,B., "Adaptive Control", Pearson Education, Kindle Edition, 2019.
2. Soder storm T and Peter Stoica, System Identification, Prentice Hall International,1989.
3. Sastry,S. and Bodson, M.," Adaptive Control– Stability, Convergence and Robustness", Prentice Hall inc., New Jersey, 1989.

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1. Yiannis Boutalis (Author), Dimitrios Theodoridis (Author), Theodore Kottas System Identification and Adaptive Control: Theory and Applications of the Neuro fuzzy and Fuzzy Cognitive Network Models (Advances in Industrial Control) Paperback – Import, 3 September 2016.
2. William S.Levine, "Control Systems Advanced Methods, the Control Handbook, CRC Press2011.
3. Karl J. Astrom and Bjorn Witten mark, Adaptive Control, Pearson Education, Second edition, Fifth impression, 2009.
4. Bela.G.Liptak., "Process Control and Optimization"., Instrument Engineers' Handbook., volume 2, CRC press and ISA, 2005
5. Ljung L, System Identification: Theory for the user, Prentice Hall, Engle wood Cliffs,1987.

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2. **https://www.youtube.com/watch?v=Kd0sQUby_78**
3. **https://onlinecourses.nptel.ac.in/noc20_ee19/preview**
4. **www.slideshare.in**
5. **https://nptel.ac.in/courses/111102143**

CO-PO-PSO MAPPING:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	1	-	1	1	1	-	1	-	-	-	-	-	1	1
CO2	1	-	1	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	-	-	-	-	-	-	-

JEE1021	COMPUTER CONTROL OF PROCESSES	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To represent the linear time invariant System in discrete State Space form.
- To study the controllability, observability and stability of a Discrete time System.
- To learn the principle of advanced controller methods.
- To provide an overview of multiloop regulatory control
- To impart knowledge on multivariable controllers for multivariable system

UNIT I DISCRETE STATE-VARIABLE TECHNIQUE 9

State equation of discrete data system with sample and hold – State transition equation – Methods of computing the state transition matrix – Decomposition of discrete data transfer functions – State diagrams of discrete data systems – System with zero-order hold –Stability tests of discrete-data system-Jury's Stability Test.

UNIT II DIGITAL CONTROLLER DESIGN 9

Deadbeat Algorithm – Dahlin's method – Ringing – Kalman's approach – discrete equivalent to an analog Controller – design for load changes. PID Algorithms – tuning techniques. Selection of sampling time. Dead time Compensation – Smith Predictor Algorithm.

UNIT III ADVANCED CONTROLLER METHODS 9

Introduction: Adaptive control, Multi- Variable Control ,Model Predictive Control ,Fuzzy Control, Robust Control, Neural network based Control , Optimal Control, Availability of Advanced control strategies.

UNIT IV MULTI-LOOP REGULATORY CONTROL 9

Multi-loop Control - Introduction – Process Interaction – Pairing of Inputs and Outputs -The Relative Gain Array (RGA) – Properties and Application of RGA - Multi-loop PID Controller – Biggest Log Modulus Tuning Method –De-coupler.

UNIT V MULTIVARIABLE REGULATORY CONTROL 9

Introduction to Multivariable control–Multivariable PID Controller – Multivariable Dynamic Matrix Controller –Fuzzy Logic Controller – Case Study-Distillation Column, CSTR and Four-tank system.

TOTAL : 45 PERIODS

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

- To analyze the discrete time systems
- To understand the controllability, observability, and stability of a Discrete time System.
- To design and develop the advanced controller methods.
- To understand and design the multiloop regulatory controller.
- To design multivariable controller for multi-variable systems.

TEXT BOOKS:

1. Stephanopoulos, G., "Chemical Process Control-An Introduction to Theory and Practice", Prentice Hall of India, 2019.
2. Sigurd Skogestad, Ian Postlethwaite, "Multivariable Feedback Control: Analysis and Design", John Wiley and Sons, 2005
3. Soderstorm,T. and Stoica, P., "System Identification", Prentice Hall International Ltd., UK., 1989.

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1. Gopal, M., "Digital Control and State Variable Methods", Tata Mc Graw Hill, 2003.
2. Dale E. Seborg, Duncan A. Mellichamp, Thomas F. Edgar,"Process Dynamics and Control", Wiley John and Sons, 3rd Edition, 2010.
3. P. Albertos and A. Sala, "Multivariable Control Systems An Engineering Approach", Springer Verlag, 2006.
4. Bequette, B.W., "Process Control Modeling, Design and Simulation", Prentice Hall of India, 2008.
5. Thomas E. Marlin, Process Control – Designing Processes and Control systems for Dynamic Performance, Mc-Graw-Hill,2000.

WEBSITES:

1. www.nptel.ac.in
2. https://cse.iitkgp.ac.in/~dsamanta
3. **https://nptel.ac.in/courses/111102143**
4. **https://www.youtube.com/watch?v=wE9MhbZGCck**
5. **www.slideshare.in**

CO-PO -PSO MAPPING:

CO\PO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO2
CO1	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO2	1	1	1	-	-	-	-	-	-	-	-	-	1	1
CO3	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO4	1	1	1	-	-	-	-	-	-	-	-	-	-	-
CO5	1	1	1	-	-	-	-	-	-	-	-	-	-	-
AVG	1	1	1	-	-	-	-	-	-	-	-	-	-	-

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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1. Marko Gargenta, ”Learning Android“, O’reilly 2011.
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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4. http://mooc.org/
5. https://www.edx.org/

CO-PO-PSO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	2	1	1	1	2	1	-	-	2	1	2	2
CO2	1	1	2	2	2	2	1	-	-	2	2	2	1	2
CO3	1	2	1	1	-	2	-	-	2	1	2	2	1	2
CO4	2	-	1	2	2	2	-	-	-	-	2	1	2	2
CO5	1	2	1	1	1	1	2	2	1	1	1	2	2	1
AVG	1	1	2	2	1	2	1	-	-	0	2	2	1	2

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) – Bluetooth,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, Multi-tasking 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 – Smartcard 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 Priniciples and Engineering Practices", Newnes, 2015.

REFERENCE BOOKS:

1. RajKamal, ‘Embedded System-Architecture, Programming, Design’,McGraw Hill, 2013.
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.
5. Rajib Mall “Real-Time systems Theory and Practice” Pearson Education, 2007.

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3. https://www.coursera.org/
4. https://www.skillshare.com/
5. https://www.udemy.com

CO-PO-PSO MAPPING:

CO\PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1	2	-	2	1	1	1	2	1	-	-	2	1	2	2
CO2	1	1	2	2	2	2	1	-	-	2	2	2	1	2
CO3	1	2	1	1	-	2	-	-	2	1	2	2	1	2
CO4	2	-	1	2	2	2	-	-	-	-	2	1	2	2
CO5	1	2	1	1	1	1	2	2	1	1	1	2	2	1
AVG	1	1	2	2	1	2	1	-	-	0	2	2	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",Nirali Prakashan, 2019
2.Reay D.A.,"Industrial Energy Conservation",first edition,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.

REFERENCES:

1.Venkataseshaiah P., Sharma K.V.Energy Managementand conservation" ,Dream tech Press, 2020.
2.Barney L. Capehart, Wayne C.Turner, and William J. Kennedy, "Guideto Energy Management", Fifth Edition, The Fairmont Press,Inc.,2006.
3.Murphy W.R, McKay G., "Energy Management", Butter worths Publications, London,1982.
4.Umesh Rathore., "Energy Management", S.K.Kataria & sons, 2013.
5.Electricity in buildings good practice guide, McGraw-Hill Education, 2016

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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	PSO1	PSO2
CO1	3	2	-	2	-	2	1	-	1	2	-	1	1	2
CO2	2	3	2	2	-	3	1	-	1	2	-	2	-	1
CO3	2	2	-	2	-	2	1	-	1	2	-	2	1	1
CO4	3	1	2	1	-	3	1	-	1	3	-	1	-	1
CO5	3	1	1	1	-	3	1	-	1	3	-	1	1	2
AVG	3	2	2	2	-	2	1	-	1	2	-	1	1	1

JEI 1022	SAFETY INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students aware of basic concepts of safety instrumented system,
- To learn the protection layers and safety requirement specifications.
- To provide overview on safety integrity level.
- To impart knowledge on safety evaluation
- To make students conscious about safety instrumentation applications.

UNIT I INTRODUCTION TO SAFETY INSTRUMENTATION 9

Safety Instrumented System (SIS): need, features, components, difference between basic process control system and SIS - Risk: how to measure risk, risk tolerance, Safety integrity level, safety instrumented functions - Standards and Regulation – HSE-PES, AICHE-CCPS, IEC-61508,ANSI/ISA-84.00.01-2004 (IEC 61511 Mod) & ANSI/ISA – 84.01-1996, NFPA 85, API RP 556, API RP 14C, OSHA (29 CFR 1910.119 – Process Safety Management of Highly Hazardous Chemicals – SIS design cycle - Process Control vs Safety Control.

UNIT II PROTECTION LAYERS AND SAFETY REQUIREMENT SPECIFICATION 9

Prevention Layers: Process Plant Design, Process Control System, Alarm Systems, Procedures, Shutdown/Interlock/Instrumented Systems (Safety Instrumented Systems – SIS), Physical Protection - Mitigation Layers: Containment Systems, Scrubbers and Flares, Fire and Gas (F&G) Systems, Evacuation Procedures - Safety specification requirements as per standards, causes for deviation from the standards.

UNIT III SAFETY INTEGRITY LEVEL (SIL) 9

Evaluating Risk, Safety Integrity Levels, SIL Determination Method : As Low As Reasonably Practicable (ALARP), Risk matrix, Risk Graph, Layers Of Protection Analysis (LOPA) – Issues related to system size and complexity –Issues related to field device safety –Functional Testing.

UNIT IV SYSTEM EVALUATION 9

Failure Modes, Safe/Dangerous Failures, Detected/Undetected Failures, Metrics: Failure Rate,MTBF, and Life, Degree of Modelling Accuracy, Modelling Methods: Reliability Block Diagrams, Fault Trees, Markov Models - Consequence analysis: Characterization of potential events, dispersion, impacts, occupancy considerations, consequence analysis tools - Quantitative layer of protection analysis: multiple initiating events, estimating initiating event frequencies and IPL failure probabilities.

UNIT V CASE STUDY 9

SIS Design check list - Case Description: Furnace / Fired Heater Safety Shutdown System: Scope of Analysis, Define Target SILs, Develop Safety Requirement Specification (SRS),SIS Conceptual Design, Lifecycle Cost Analysis, Verify that the Conceptual Design Meets the SIL, Detailed Design, Installation, Commissioning and Pre-start-up Tests, Operation and Maintenance Procedures.

TOTAL : 45 PERIODS

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

- To understand the role of safety instrumented system in the industry.
- To gain knowledge on protection layers and safety requirement specifications.
- To select the safety integrity level for an application.
- To perform the system evaluation in industry.
- To apply the importance of safety in real life.

TEXT BOOKS:

1. Paul Gruhn and Harry L. Cheddie," Safety Instrumented systems: Design, Analysis and Justification", ISA, 2nd Edition, 2006.
2. Eric W. Scharpf, Heidi J. Hartmann, Harlod W. Thomas, "Practical SIL target selection: Risk analysis per the IEC 61511 safety Lifecycle", Exida, Kindle edition 2019.

REFERENCES:

1. William M. Goble and Harry Cheddie, "Safety Instrumented Systems Verification: Practical Probabilistic Calculations" ISA, 2005.
2. Edward Marszal, Eric W. Scharpf, "Safety Integrity Level Selection: Systematic Methods Including Layer of Protection Analysis", ISA, 2002.
3. Standard - ANSI/ISA-84.00.01-2004 Part 1 (IEC 61511-1 Mod) "Functional Safety: Safety
4. Instrumented Systems for the Process Industry Sector - Part 1: Framework, Definitions, System,Hardware and Software Requirements", ISA, 2004.
5. Chetan Prakashan,"Industrial Safety(Safety Management),2017.

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www.slideshare.net
https://nptel.ac.in/
https://www.isa.org
https://industrialsafety.com

CO-PO -PSO MAPPING:

CO\PO	PO1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO1 0	PO 11	PO 12	PS O1	PS O2
CO1	3	3	3	3	3	-	1	-	-	2	1	3	2	1
CO2	3	3	3	3	3	2	1	1	-	1	1	3	1	2
CO3	3	3	3	3	2	1	1	-	1	1	1	3	1	2
CO4	3	2	2	1	2	1	1	1	1	1	1	2	1	1
CO5	2	1	2	2	2	1	1	-	-	1	1	2	2	3
AVG	2	3	2	2	2	1	1	1	1	1	1	2	2	2

OPEN ELECTIVES I

JEI9001	BASICS OF MEASUREMENTS AND INSTRUMENTATION	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the fundamentals of measurements and instrumentation.
- To learn the working principle of analog instruments.To study the working principle of digital Instruments.
- To get exposed to storage and display devices.
- To familiarize with transducers and data Acquisition Systems.

UNIT I FUNDAMENTALS OF MESUREMENTS AND INSTRUMENTS 9

Measurements: Methods, Significance – Errors - Elements of a generalized measurement System – Instruments: Classification, Functional concepts, Characteristics – Standards – General Instrumentation System.

UNIT II ANALOG INSTRUMENTS

Introduction – Classification – Principles of Operation – Operating Forces – Constructional Details: Types of support, Torque/Weight Ratio – Deflecting System – Control System – Damping system – Pointers and scales – Recording and Integrating Instruments - Applications.

UNIT III DIGITAL INSTRUMENTS 9

Introduction – Types of tools used - Digital Instruments: voltmeter, ammeter, multimeter, energy meter, Frequency meter, frequency counter, phase difference between two signal, pulse generator – Signal and function generators – Microprocessor based digital measurements– Applications.

UNIT IV STORAGE AND DISPLAY DEVICES 9

Storage devices: Strip chart Recorders, X-Y Recorders – Display devices: CRT display, Oscilloscopes: Dual Trace and Digital Storage Oscilloscope, dot matrix display, digital plotters and printers – Data Loggers.

UNIT V TRANSDUCERS AND DATA ACQUISITION SYSTEMS 9

Classification and selection of transducers: Resistive, capacitive and inductive transducers – optical and digital transducers – Elements of Analog data acquisition system – Digital Data Acquisition Systems.

TOTAL : 45 PERIODS

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

CO1: To label the fundamentals of measurements and instruments.
CO2: To explain about the various analog instruments.
CO3: To acquire knowledge on digital instruments.
CO4: To identify the working of various storage and display devices.
CO5: To explain about transducers and data acquisition systems.

TEXT BOOKS:

1. Sawhney A. K., "Electrical and Electronics Measurements and Instruments", Dhanpat Rai and Co., New Delhi,2010.
2. W. D. Cooper &A. D. Helfrick, "Electronic Instrumentation and Measurement Techniques", PHI, 4th e/d,1987.
3. KlaasB.Klaassen, "Electronic Measurement and Instrumentation",Cambridge UniversityPress,1996.

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1. David Bell, "Electronic Instrumentation and Measurements", PHI, 2nd edition.
2. Anand M. M. S., "Electronic Instruments and Instrumentation Technology",PHI, 2004.
3. Kalsi H. S., "Electronic Instrumentation", TMH, 2nd or 3rd e/d, 2004/2010.
4. Martin Reissland,"ElectricalMeasurements",NewageInternational(p)Ltd.,Delhi.5.
5. BouwensA. J., "Digital Instrumentation", Tata Mc Graw Hill,1997.
6. Uday .A.Bakshi and Ajay.V.Bakshi , "Measurements & Instrumentation", Technical Publications, Pune.

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JEI9002	SENSORS FOR ENGINEERING APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To know the principle of sensors and their characteristics.
- To impart the concepts of Mechanical and electro mechanical sensors.
- To learn about thermal, Radiation and magnetic sensors.
- To study the various electro-analytical sensors and get introduced to smart sensors.
- To get exposed to the recent trends in sensors and their applications in various fields.

UNIT I SENSORS AND THEIR CHARACTERISTICS 9

Sensors - Principle, Classification, Parameters, Static Characteristics and Dynamic characteristics - Characterization: Electrical, Mechanical, Thermal, Optical and Chemical.

UNIT II MECHANICAL AND ELECTROMECHANICAL SENSORS 9

Construction and working of Piezoelectric Sensors – Force/stress sensor – Ultrasonic sensors – Resistive Sensors: Potentiometer, Stain Gauges- Inductive sensors: Ferromagnetic type, Transformer type – Capacitive Sensors: Parallel plate type, Variable permittivity type.

UNIT III THERMAL, RADIATION AND MAGNETIC SENSORS 9

Construction and working of Thermal Sensors – Gas Thermometric sensors, Thermal expansion sensors – Radiation Sensors – Photo resistors, Photovoltaic cells, Fibre Optic Sensors – Magnetic Sensors – Hall Effect sensor, Eddy Current sensors.

UNIT IV ELECTRO ANALYTICAL AND SMART SENSORS 9

Construction and working of Analytical sensors – Standard Hydrogen Electrodes, Reference Electrodes – Smart Sensors – Introduction – Primary sensors, Excitation, Amplification, Filters, Converters, Compensation, Information Processing.

UNIT V RECENT TRENDS IN SENSORS 9

Basic concepts of Film Sensors, Micro Electro Mechanical Systems (MEMS), Nano Sensors – Applications: On-board Automobile sensors – Environmental monitoring sensors – Temperature and Pressure Sensors used in IoT applications – RFID sensors – Biometric sensors.

TOTAL: 45 PERIODS

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

CO1: To explain the static and dynamic characteristics of a sensor.

CO2: To review the basic concepts behind mechanical and electromechanical sensors.
CO3: To apply and gain knowledge about thermal, radiation and magnetic sensors.
CO4: To demonstrate about the electro analytical sensors and smart sensors.
CO5: To assess the recent trends in sensor technology and their applications in various fields.

TEXT BOOKS:

1. Patranabis .D, "Sensors and Actuators", Prentice Hall of India (Pvt) Ltd.,2005.
2. Rengananthan.S, "Transducer Engineering", Allied Publishers (P) Ltd,2003.
3. Neubert H.K.P., " Instrument Transducers – An Introduction to their Performance and Design", Oxford University Press, Cambridge,2003.

REFERENCES:

1. Bela. G.Liptak, "Instrument Engineers, Handbook, Process Measurement and Analysis", 4th Edition, Vol. 1, ISA/CRC Press,2003.
2. Doebelin E.O. and Manik D.N., "Measurement Systems Application and Design", International student Edition, 6th Edition, McGraw-Hill Education Pvt. Ltd.,2011.
3. John P. Bentley, "Principles of Measurement Systems", III Edition, Pearson Education, 2000.
4. Bradley.D.A and Dawson,Burd and Loader, "Mechatronics", Thomson Press India Ltd,2004.
5. Murthy, D.V.S., "Transducers and Instrumentation", 2nd Edition, Prentice Hall of India, Pvt. Ltd., New Delhi,2010.
6. Ian Sinclair, "Sensors and Transducers", 3rd Edition, Elsevier,2012.

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JEI9002	SENSORS FOR ENGINEERING APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To make the students familiarize about various power generation methods.
- To identify various electrical and non-electrical parameters in power plant
- To impart knowledge about the different types of analyzers used in power plant.
- To familiarize with the different control loops in boiler.
- To educate on turbine control techniques

UNIT I OVERVIEW OF POWER GENERATION 9

Survey of methods of power generation: hydro, thermal, nuclear, solar and wind power – Importance of instrumentation in power plant.

UNIT II MEASUREMENTS IN POWER PLANTS 9

Electrical parameters: current, voltage, power, frequency, Non electrical parameters: flow of feed water, fuel, air, steam pressure and steam temperature – Turbine speed and vibration measurement.

UNIT III ANALYZERS IN POWER PLANTS 9

Flue gas oxygen analyzer – CO_2 analyzer – dissolved oxygen analyzer – chromatography – pH meter – fuel analyzer – smoke detector – dust monitor – CCTV – Pollution monitoring instruments.

UNIT IV CONTROL LOOPS IN BOILER 9

Basic control loops – Steam Temperature control – Steam Pressure control – combustion control – air & fuel control – furnace draft control – drum level measurement and control – soot blowing.

UNIT V CONTROL OF TURBINE 9

Turbine governing system – Speed and Load control – Free governor mode operation – Automatic Load Frequency Control – Turbo-alternator cooling system.

TOTAL : 45 PERIODS

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

CO1: To explain various power generation process.
CO2: To distinguish the electrical and non electrical parameters in power plant.
CO3: To identify the purpose of analyzers in power plant.
CO4: To assess and gain knowledge about various control loops in boiler.
CO5: To explain the various turbine control techniques.

TEXT BOOKS:

1. Sam G. Dukelow, "The control of Boilers", instrument Society of America,1991.
2. Krishnaswamy KM, Bala P, BalaMP, "Power Plant Instrumentation", Prentice Hall,2013
3. Modern Power Station Practice, Vol.6, "Instrumentation, Controls and Testing", Pergamon Press,Oxford,1971.

REFERENCES:

1. Elonka.S.M.andKohal A.L., "Standard Boiler Operations", McGraw-Hill, New Delhi,1994.
2. Jain R.K., "Mechanical and industrial Measurements", Khanna Publishers, New Delhi,2008.
3. Tamilmani, "Power plant instrumentation", Sams Publishers,2011.
4. NagP.K.,"PowerplantEngineering",TataMcGraw-HillEducation,3rd edition,2007.
5. Liptak B.G., "Instrumentation in Process Industries", Chilton Book Company,2005.

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OPEN ELECTIVE II

JEI9004	OPTO ELECTRONICS AND LASER INSTRUMENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To get exposed to the basic concepts of optical fibers.
- To study about Industrial application of optical fibers.
- To learn the basic concepts of laser instrumentation.
- To familiarize the students with display devices and detectors.
- To provide an overview about medical applications of laser.

UNIT I OPTICAL FIBER 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 LASER FUNDAMENTALS AND FIBER OPTIC SENSOR 9

Laser characteristics - population inversion: two, three and four level system. Resonator configurations - Q switching and mode locking, cavity dumping - Types of lasers –Fiber optic measurements: Interferometer method of measurement of length, Moire fringes and Measurement of pressure, Temperature, Liquid level.

UNIT III LASER INSTRUMENTATION 9

Industrial applications of lasers: Laser heating, welding, melting and trimming of materials - Holography: Principle, Methods, Holographic Interferometers and applications.

UNIT IV OPTO-ELECTRONIC DISPLAY AND DETECTORS 9

Types of Displays: Photo-Luminescence, Cathode-Luminescence, Electro-Luminescence, Detectors: Laser Diode, PIN Diode, Avalanche Photo Diode, Photo detector- Modulators: Electro optic - Magneto optic – Acousto optic Modulators.

UNIT V MEDICAL APPLICATIONS 9

Lasers and tissue interaction - Laser instruments for surgery - Removal of tumors in vocal cords - Plastic surgery-Brain surgery – Dermatology- oncology and gynecology.

TOTAL: 45 PERIODS

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

CO1: To understand the basic concepts of fiber and their properties
CO2: To gain knowledge about the Industrial application of optical fibers.
CO3: To pertain the knowledge of laser instrumentation system.
CO4: To understand the basic concepts of display devices and detectors.
CO5: To acquire knowledge on the applications of lasers in medical field.

TEXT BOOKS:

1. R.P. Khare, Fiber Optics and Optoelectronics, Oxford university press, 2008.
2. J. Wilson and J.F.B. Hawkes, Introduction to Opto Electronics, Prentice Hall of India, 2001.
3. Ghatak A.K and Thiyagarajar K, Optical Electronics Foundation Book, Tata Mc Graw Hill, New Delhi, 2012.

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1. Asu Ram Jha, "Fiber Optic Technology Applications to commercial, Industrial, Military and Space Optical systems", PHI learning Private limited, 2009.
2. M. Arumugam, "Optical Fiber Communication and Sensors", Anuradha Agencies, 2002.
3. John F. Read, "Industrial Applications of Lasers", Academic Press, 1978.
4. Bhattacharya P, "Semiconductor Optoelectronics", Second Edition, Pearson Education, 1998.
5. Balraj.B, "Fiber optics and laser Instruments", ARS Publications.

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JEI9005	SMART SENSORS AND ITS APPLICATIONS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To study the basic concepts of smart sensors
- To get exposed about the data acquisition through sensor.
- To learn the methods of communication for smart sensors.
- To impart knowledge about wireless communication technology for smart sensors.
- To introduce the knowledge on inbuilt sensors in smart devices.

UNIT I INTRODUCTION TO SMART SENSORS 9

Introduction to Smart Sensors - Nature of Smart Sensor – Evolution – Components – General Architecture.

UNIT II DATA ACQUISTION THROUGH SENSOR 9

Amplification and Signal Conditioning: Instrumentation amplifier – Rail to Rail operational amplifier – 4-20ma Signal transmitter – Digital conversion – MCU control and sensor interface – Techniques and system integration: Linearization.

UNIT III COMMUNICATION FOR SMART SENSORS 9

Overview of communication: Organization and standards – Automotive protocols: CAN- LIN- Media Oriented Systems Transport - Industrial usage of CAN- MCU with integrated CAN – Lon Talk Protocol – MI bus.

UNIT IV WIRELESS SENSING 9

Introduction to RF and Spread spectrum - Wireless data communication; Zigbee - ANT+ - 6LoWPAN – NFC – RF Sensing: Surface acoustics – RADAR – LIDAR – GPS – Remote emission sensing: RFID- Telemetry.

UNIT V SMART SENSOR DEVICES 9

Case Study: Sensors in Mobile Phones - Sensors in Automotive Vehicles - Sensors in Wearable devices-Smart Meters-Smart sensor technology for IoT.

TOTAL: 45 PERIODS

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

CO1: Explicate the structure of smart sensors.
CO2: Identify the data acquisition techniques in smart sensors.
CO3: Understand the various communication protocols used in data processing.
CO4: Gain knowledge about the wireless technology used in smart sensors.
CO5: Pertain knowledge on the sensors used in various smart devices.

TEXT BOOKS:

1. Randy Frank, "Understanding Smart Sensors"3rd Edition, CRC Press, 2014.
2. Krzysztof Iniewski, "Smart Sensors for Industrial Applications" CRC Press, 2013.
3. Bob Tucker, "Hand book of Smart Actuators and Smart sensors", NY Research Press, 2015.

REFERENCE BOOKS:

1. Kevin Yallup "Technologies for smart sensors and smart fusion" CRC Press, 2014.
2. Gerard Meijer, Kofi Makinwa, MichielPertijis "Smart Sensor Systems: Emerging Technologies and applications" John Wiley and Sons Ltd, 2014.
3. S.C.Mukhopandhyay, G.S.Gupta "Smart Sensors and Sensing Technology" Springer 2008.
4. Youn- LongLin, "Smart Sensors and Systems", 1st Edition, Springer, 2015.
5. StayonNintiaanov and Antonia Luque "Smart Sensors and MEMS", Elsevier Science and Technology, World Head Publishing series.

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1. http://www.intersil.com/applications/Industrial /smart-sensor.html.
2. http://www.smartsensors.com
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JEI9006	INDUSTRIAL SAFETY ENGINEERING	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To develop and understand the principles of safety Policy.
- To impart knowledge on accident prevention and its theories.
- To inculcate safety management techniques.
- To understand the theory and practice of occupational health- ergonomics and hygiene.
- To learn the principle of fire protection in industries.

UNIT I DEVELOPMENT OF SAFETY MOVEMENT 9

Need for safety-safety and productivity-planning for safety planning procedure-safety policy-form safety policy-safety budget-role and qualification of safety professional-safety committees-need-functions of committees safety organizations.

UNIT II ACCIDENT PREVENTION 9

Basic philosophy of accident prevention-nature and causes of accidents -accident proneness-cost of accident prevention methods-Domino theory-safety education and training-training methods-motiv communicating safety-personal protective equipments.

UNIT III SAFETY MANAGEMENT TECHNIQUES 9

Safety inspection-Safety sampling technique-Safety audit -Safety survey-Incident recall technique-analysis-Damage control-Risk management. Involvement in safety: - Role of management-role of su role of workmen- role of unions-role of government.

UNIT IV OCCUPATIONAL HEALTH AND HYGIENE 9

Functional units and activities of occupational health and hygiene-types of industrial hazards chemical- mechanical- electrical- social- biological- ergonomic and environmental hazards-factors safety-housekeeping-hearing conservation programme.

UNIT V INDUSTRIAL FIRE PROTECTION 9

Fire chemistry-classification of fires-fire prevention activities-fire risks-fire load -contributing industrial fires-fire detection-industrial fire protection systems.

TOTAL: 45 PERIODS

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

CO1: To acquire knowledge on the importance of safety and safety movemen

CO2: To understand accident prevention techniques.

CO3: To gain knowledge on safety management techniques.

CO4: To monitor occupational health and hygiene in the work place.

CO5: To acquire knowledge on industrial fire protection.

TEXT BOOKS:

1. Frank P Lees, 'Loss prevention in process industries', Vol I, II, III, Butterworth, London, 1980.
2. R.P.Blake, "Industrial Safety", Prentice Hall of India, New Delhi.
3. Heinrich H.W, 'Industrial accident prevention', McGraw Hill Company, New York, 1980.

REFERENCE BOOKS:

1. "Accident prevention manual for Industrial Operations", National Safety Council, Chicago,1989.
2. Brown D.B, "System Analysis and Design for safety", Prentice Hall,NewJercy.
3. Chetan Prakashan, "Industrial Safety(Safety Management)",2017.
4. David L Goetsch, "Occupational Safety and Health for Technologists", Engineers and Managers.
5. Richard Chitty, Jeremy Fraser Mitchell, "Fire safety :A reference Guide", BRE Publications, 2003

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OPEN ELECTIVE III

		L	T	P	C
JEI9007	INSTRUMENTATION FOR ENVIRONMENTAL POLLUTION MONITORING AND CONTROL	3	0	0	3

COURSE OBJECTIVES:

- To familiarize with the basics of instrumentation used in environmental analysis.
- To impart knowledge about water quality monitoring instruments.
- To study about waste water monitoring instruments.
- To impart knowledge about air pollution monitoring instruments.
- To introduce the concepts of instruments used in Ground water monitoring and weather station.

UNIT I INTRODUCTION TO INSTRUMENTATION SYSTEMS 9

Necessity of Instrumentation & Control for environment - sensor requirement-methodologies: Ultraviolet analyzers, Total hydrocarbon analyzers - Analysis Methods: Gas chromatography, Photo ionization method.

UNIT II WATER QUALITY MONITORING 9

Standards of raw & treated water - sources of water – Quality of water - Water quality parameters: Thermal conductivity detectors, Opacity monitors, pH analyzers & their applications, conductivity analyzers & their applications.

UNIT III WASTE WATER MONITORING AND CONTROL 9

Automatic waste water sampling - optimum waste water sampling locations - waste water measurement techniques - open channel waste water flow measurement – Instrumentation set up for waste water treatment plant - Latest methods of waste water treatment plants.

UNIT IV AIR POLLUTION MONITORING 9

Measurement of ambient air quality - Flue gas analysis for pollution control – CO_2 analyzer - dust monitor - smoke detection - Electron capture detector – High pressure liquid chromatography (HPLC): Instrumentation and Applications.

UNIT V GROUND WATER AND WEATHER MONITORING 9

Ground water monitoring: Level measurement in ground water monitoring wells – Instruments in Weather station: Barometer, Rain gauge, Ceilometer

TOTAL: 45 PERIODS

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

CO1: To understand about instruments used in environmental analysis.

CO2: To acquire knowledge on the water quality monitoring instruments.

CO3: To understand about waste water monitoring instruments.

CO4: To gain knowledge on the air pollution monitoring instruments.

CO5: To acquire knowledge on instruments used in ground water monitoring and weather station.

TEXT BOOKS:

1. Randy D. Down, Jay H. Lehr, "Environmental Instrumentation & Analysis Handbook", John -Sons
2. Skoog, D.A. F. James Holler, and Stanky, R.Crouch "Instrumental Methods of Analysis",Learning, 2007.
3. R.S. Khandpur, "Handbook of Analytical Instruments", Tata McGraw Hill publishing Co. Ltd., 22006.

REFERENCE BOOKS:

1. Sherman, R.E., Rhodes L.J, "Analytical Instrumentation", ISA Press, New York, 1996.
2. Ewing,G.W, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw-Hill, 1985.
3. Considine D.M, "Process / Industrial Instruments and Controls", Handbook by, 4th Edition,McGraw Hill, 1993.
4. Willard, Hobart, et al., "Instrumental Methods of Analysis", 7th Edition, CBS, 1986.
5. Braun, Robert D, "Introduction to Instrumental Analysis", Pharma Book Syndicate, 1987.

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JEI9008	POWER SUPPLY SYSTEMS FOR COMPUTERS	L	T	P	C
		2	2	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 isolated Switched Mode Power Supply
- To analyze the control aspects of converters
- To design various components of SMPS for computer systems

UNIT I POWER SEMICONDUCTOR 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 BASIC CONVERTER CIRCUITS 9

Principle, modes of operation, performance parameters and characteristics of Buck Regulator, Boost Regulator, Buck- Boost Regulator and Resonant Converters.

UNIT III ISOLATED SMPS 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 CONTROL ASPECTS 9

Voltage Mode Control of SMPS- Current Mode Control of SMPS - PWM Controllers, Isolation in feedback loop - Power Supplies with multiple output.

UNIT V DESIGN CONSIDERATIONS AND APPLICATIONS 9

Selection of output filter capacitor, energy storage inductor, Switches- Design of Snubber circuits, High Frequency Inductor and high frequency Transformer - power supplies for portable electronic gadgets.

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 semiconductor devices.

CO2: To understand various modes of operation of DC-DC converters.

CO3: To gain knowledge about isolated SMPS system.

CO4: To know the different control aspects of converters.

CO5: To design various components of DC - DC converters.

1.

TEXT BOOKS:

1. "Switched Mode Power Supplies, Design and Construction", H. W. Whittington, B. W. Flynn and D. E. MacPherson, Universities Press, 2009 Edition.
2. Mohan N. Undeland . T & Robbins W., "Power Electronics Converters, Application and Design", John Wiley, 3rd edition, 2002.
3. Umanand L., Bhat S.R., "Design of magnetic components for switched Mode Power Converters", Wiley Eastern Ltd., 1992.

REFERENCE BOOKS:

1. Robert. W. Erickson, D. Maksimovic, "Fundamentals of Power Electronics", Springer International Edition, 2005.
2. "Course Material on Switched Mode Power Conversion", V. Ramanarayanan.
3. Sanjaya Maniktala – "Switching power supplies A to Z" – 1st edition 2006, Elsevier Inc.
4. Daniel M Mitchell : "DC-DC Switching Regulator Analysis", McGraw Hill Publishing Company.
5. Ned Mohan et.al : "Power Electronics", John Wiley and Sons.
6. OtmarKilgenstein : "Switched Mode Power Supplies in Practice", John Wiley and Sons. N.P.Padhy, " Artificial Intelligence and Intelligent Systems", Oxford, 2013.
7. William S.Levine, "Control System Advanced Methods," The Control Handbook. CRC Press 2011.

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3. www.vidhyarthiplus.com
4. https://www.darshan.ac.in/diet/EE/SubjectDetail/2150903
5. https://www.tutorialspoint.com
6. https://www.electronics-tutorial.net

JEI9009	INTRODUCTION TO ANALYTICAL INSTRUMENTS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To familiarize with the basics of spectrometry.
- To impart knowledge about molecular spectroscopy.
- To get exposed to NMR and mass spectrometry.
- To introduce the concepts of chromatography.
- To know the principle of electro analysis and pH Meters.

UNIT I SPECTROMETRY 9

Introduction - Properties of electromagnetic radiation - wave properties – components of optical instruments - UV Spectrometry: Instrumentation and applications.

UNIT II MOLECULAR SPECTROSCOPY 9

Introduction – Beer's Law - Instrumentation and Applications of Molecular absorption spectrometry, Infrared absorption spectrometry, Raman spectroscopy.

UNIT III NMR AND MASS SPECTROMETRY 9

NMR: Basic principles, NMR spectrometer - Electron spin Resonance spectroscopy: Principles, Instrumentation - Mass spectrometers: Types and Applications.

UNIT IV CHROMATOGRAPHY 9

Basics of chromatography –Types: Liquid chromatography, Partition chromatography, Adsorption chromatography, Ion exchange chromatography– High Pressure Liquid Chromatography.

UNIT V ELECTRO ANALYSIS AND pH METERS 9

Electrochemical cells – Electrodes: Glass electrodes, hydrogen electrodes, reference electrodes, ion selective electrodes – pH Meters: Principle, Measurement of pH.

TOTAL: 45 PERIODS

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

CO1: To understand about the basics of spectrometry.
CO2: To gain knowledge about molecular spectroscopy.
CO3: To acquire the concepts of NMR and Mass spectrometry.
CO4: To pertain knowledge about the separation methods and chromatography.
CO5: To understand about electro analysis and pH meters.

TEXT BOOKS:

1. Skoog, D.A. F. James Holler, and Stanky, R.Crouch "Instrumental Methods of Analysis",Cengage Learning, 2007.
2. Willard, Hobart, et al., "Instrumental Methods of Analysis". 7th Edition, CBS, 1986.

3. R.S. Khandpur, Handbook of Analytical Instruments, Tata McGraw Hill publishing Co. Ltd., 2nd edition, 2006.

REFERENCE BOOKS:

1. Sharma, B.K, "Instrumental Methods of Chemical Analysis: Analytical Chemistry", Goel Publishing House, 1972.
2. Braun, Robert D, "Introduction to Instrumental Analysis". Pharma Book Syndicate, 1987.
3. Ewing,G.W, "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw-Hill, 1985.
4. Liptak, B.G., "Process Measurement and Analysis", CRC Press, 2005.
5. Haven, Mary C., et al., "Laboratory Instrumentation", 4th Edition, John Wiley, 1995.

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5. www.slideshare.net

OPEN ELECTIVE-IV

JEI 1910 INTRODUCTION TO ROBOTICS AND AUTOMATION L T P C
3 0 0 3

COURSE OBJECTIVES:

- To study the basic functional elements of robotics and automation
- To gain knowledge on various power sources and sensors used in robots.
- To impart knowledge on the manipulators and grippers.
- To educate on various path planning techniques.
- To familiarize with the programming languages and various applications.

UNIT I EVOLUTION OF ROBOTS AND AUTOMATION 9 Hours

Origin & various generations of Robots - Robotics system components - Asimov's laws of robotics - degree of freedom - work cell- Need for Automation - types - fixed, programmable and flexible automation systems.

UNIT II POWER SOURCES, SENSORS, AND ACTUATORS 9 Hours

Introduction to Hydraulic, pneumatic, and electric drives: Design– determination of HP of motor and gearing ratio – variable speed arrangements – path determination – micro machines in robotics – machine vision – ranging - laser, acoustic, magnetic, fiber optic and tactile sensors.

UNIT III MANIPULATORS AND GRIPPERS DIFFERENTIAL MOTION 9 Hours

Construction of manipulators - manipulator dynamics and force control - electronic and pneumatic manipulator control circuits - end effectors - various types of grippers - design considerations.

UNIT IV DYNAMICS AND CONTROL AND APPLICATIONS 9 Hours

Forward Kinematics - DenavitHartenberg Representation. Multiple solution Jacobian work envelop, Inverse Kinematics - Geometric approach - Hill climbing techniques.

UNIT V ROBOT PROGRAMMING AND APPLICATIONS 9 Hours

Robot programming - Fixed instruction, sequence control, General programming language, Specific programming languages. Robots for welding, painting, and assembly - Remote Controlled robots - Robots in manufacturing and non- manufacturing applications.

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

- To acquire the concepts in evolution of robot technology and automation.
- To select the usage of power sources and sensors used in robots.
- To perform the activities on manipulators, grippers, and robot dynamics.
- To pertain knowledge about the kinematics and path planning of the robots.
- To apply the knowledge on programming languages and applications of Robotics in automation.

TEXT BOOKS:

1. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore, Kindle edition 2019.
2. Saeed B Niku, Introduction to Robotics, Analysis, Systems, Applications, Prentice Hall, edition 2014.
3. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint, 2013.

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1. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
2. Asfahl C.R., Robots and manufacturing Automation, John Wiley, USA 1992.
3. Klafter R.D., Chimielewski T.A., Negin M., Robotic Engineering – An integrated approach, Prentice Hall of India, New Delhi, 1994.
4. JohnJ.Craig, Introduction to Robotics Mechanics and Control, Fifth edition, Pearson Education,2019.
5. John Craig ", Introduction to Robotics", Mechanics and Control,4Th Edition, Pearson Publications, 2018.
6. P.Jaganathan, " Robotics",4th Edition , Lakshmi Publications, 2018.

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www.magicmarks.in
https://robots.ieee.org
https://www.automate.org
www.hansonrobotics.com

		L	T	P	C
JEI1911	**SMART BUILDING AUTOMATION**	**3**	**0**	**0**	**3**

COURSE OBJECTIVES:

- To introduce the basic blocks of Building Management System.
- To impart knowledge in the design of various sub systems of building automation
- To familiarize with the emerging techniques of automation in Security Systems.
- To impart knowledge about the Fire Safety Management techniques.
- To teach the surveillance purposes of CCTV and Energy Management System.

UNIT I INTRODUCTION TO BUILDING AUTOMATION 9 Hours

Concept and application of Building Management System (BMS) and Automation- requirements and design considerations and its effect on functional efficiency of building automation system- architecture and components of BMS.

UNIT II HVAC SYSTEM 9 Hours

Different components of HVAC system like heating- cooling system- chillers- AHUs- compressors and filter units and their types. Design issues in consideration with respect to

efficiency and economics- concept of district cooling and heating.

UNIT III ACCESS CONTROL & SECURITY SYSTEMS 9 Hours

Concept of automation in access control system for safety- Physical security system with components- Access control components- Computer system access control – DAC- MAC- and RBAC

UNIT IV FIRE & ALARM SYSTEM 9 Hours

Different fire sensors- smoke detectors and their types- CO and CO2 sensors- Fire control panels- design considerations for the FA system concept of IP enabled fire & alarm system- design aspects and components of PA system.

UNIT V CCTV SYSTEM & ENERGY MANAGEMENT SYSTEM 9 Hours

Components of CCTV system like cameras- types of lenses- typical types of cables- controlling system- concept of energy management system- occupancy sensors- fans & lighting controller. Introduction to structural health monitoring and methods employed.

TOTAL: 45 PERIODS

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

- To understand the concept behind building automation.
- To design sub systems for building automation and integrate those systems.
- To implement emerging techniques of automation in Security Systems.
- To figure out the fire & Alarm systems.
- To monitor for security purpose and reinforce Energy Management System.

TEXT BOOKS:

1. Jim Sinopoli, Smart Buildings, Butterworth, Heinemann imprint of Elsevier,2nd Edition., 2010.
2. Albert Ting Pat So, WaiLok Chan, Intelligent Building Systems, Kluwer Academic publisher, 4th Edition., 2019.
3. Reinhold A. Carlson, Robert A. Di Giandomenico, Understanding Building Automation Systems, Published by R.S. Means Company- 1991.

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1. 1.Morawski.E, Fire Alarm Guide for Property Managers, Publisher: Kessinger Publishing,2007.
2. 2.Albert Ting,PatSo,WaiLok Chan, Intelligent Building Systems Kluwer Academic publisher,3 rd Edition- 2012.
3. 3.Building Automation: Control Devices and Applications by In Partnership with

NJATC (2008).

4. 4.Building Control Systems,Applications Guide (CIBSE Guide) by The CIBSE (2000).
5. 5. David Fisher,"Building Automation Integration with Open Protocols",Amer Technical Publications,2009.

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http://www.nptelvideos.in/
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https://smarteh.com
https://behrtech.com

JEI1912	INTRODUCTION TO PLC AND DCS	L	T	P	C
		3	0	0	3

COURSE OBJECTIVES:

- To give an introductory knowledge of the Programmable Logic Controller.
- To impart the fundamental concepts of PLC Programming Instructions.
- To provide overview of the languages used for PLC Programming.
- To get an exposure about the basic concepts of distributed control system.
- To provide insight of the interfaces used in DCS.

UNIT I INTRODUCTION TO PLC 9 Hours

Introduction to Programmable Logic Controllers: Evolutions – Components – Architecture, Discrete and Analog I/O modules – Basics of PLC Programming- Ladder Logic.

UNIT II PLC PROGRAMMING INSTRUCTIONS 9 Hours

Timer and Counter Instructions – Program control instructions – Data manipulation and math instructions –Shift register instructions- programming examples.

UNIT III PLC PROGRAMMING (OTHER LANGUAGES) 9 Hours

Functional block programming - Sequential function chart – Instruction list – Structured text programming – PLC controlled sequential Process with examples - Case studies in PLC.

UNIT IV DISTRIBUTED CONTROL SYSTEM 9 Hours

Introduction to Distributed Control System: Evolution - Types – Architectures – Comparison - Local Control unit- Process interfacing issues- Communication Modules.

UNIT V INTERFACES IN DCS 9 Hours

Introduction to operator interfaces: Low level and high-level operator interfaces – Displays - Engineering interfaces: Low level and high-level engineering interfaces – Case studies in DCS.

TOTAL : 45 PERIODS

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

- To understand all the important concepts of PLC.
- To develop PLC programs using various instructions.
- To apply the various programming languages for industrial applications.
- To gain knowledge on the basic concepts of distributed control system.
- To acquire knowledge on the interfaces used in DCS and their real time examples.

TEXT BOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, kindle edition, 2019
2. Michael P. Lukas, Distributed Control Systems: Their Evaluation and Design, Van Nostrand Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation' Marcel Dekker, Inc., Newyork ,1990.

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1. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
2. Hughes, T.A., "Programmable Logic Controllers: Resources for Measurements and Control Series", 3rd Edition, ISA Press, 2004.
3. McMillan, G.K., "Process/Industrial Instrument and Controls Handbook", 5thEdition, McGraw- Hill handbook, New York, 1999.
4. NPTEL Notes on, "Programmable Logic Control System" by Department of Electrical Engg., IIT Kharagpur.
5. Shanthi Sasidharan, "Logic and Distributed Control System" CBA Publishers,2014.

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