HINDUSTHAN COLLEGE OF ENGINEERING AND TECHNOLOGY

(An Autonomous Institution, Affiliated to Anna University, Chennai
Approved by AICTE, New Delhi & Accredited by NAAC with 'A' Grade)
Coimbatore – 641 032

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST

HICET

Curriculum & Syllabus

2018-2019

CHOICE BASED CREDIT SYSTEM

VISION AND MISSION OF THE INSTITUTION

VISION

To become a premier institution by producing professionals with strong technical knowledge, innovative research skills and high ethical values.

MISSION

IM1: To provide academic excellence in technical education through novel teaching methods.

IM2: To empower students with creative skills and leadership qualities.

IM3: To produce dedicated professionals with social responsibility.

Chairman - BoS
EIE - HiCET

Dean (Academics)
HiCET

ACADEMIC COUNCIL
Chairman
HINDUSTHAN COLLEGE OF ENGG & TECH

VISION AND MISSION OF THE DEPARTMENT

VISION

To impart quality technical education in the field of electronics and instrumentation engineering and strive to serve the society.

MISSION

M1. To enrich technical knowledge through effective teaching-learning process.

M2. To inculcate leadership and managerial skills.

M3. To create passion for serving the society with innovation and ethical responsible.

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PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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 engineering activities with an understanding of the limitations.

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

PO 7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

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

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

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

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PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1. Ability to apply concepts of measurement and sensor to design, calibrate and control various process instruments using industrial automation.

PSO 2. Ability to analyze advanced electronics and instrumentation concepts required for industrial and research pursuits.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

PEO 1. Graduates would have strong foundation in basic science and mathematics to formulate, analyze and solve electronics and instrumentation problems.

PEO 2. Graduates shall have good knowledge of instrumentation systems and their applications to design control and safety systems for industrial process.

PEO 3. Graduates exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

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CURRICULUM

HINDUSTHAN EDUCATIONAL AND CHARITABLE TRUST
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Hindusthan College of Engineering and Technology

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Approved by AICTE, New Delhi& Accredited by NAAC with 'A' Grade)
Coimbatore, Tamil Nadu.

TÜVRheinland CERTIFIED

DETAILS OF CHANGES CARRIED OUT IN CURRICULUM & SYLLABUS

CBCS PATTERN

UNDERGRADUATE PROGRAMMES

B.E. ELECTRONICS AND INSTRUMENTATION ENGINEERING (UG)

REGULATION-2016

For the students admitted during the academic year 2018-2019 and onwards

SEMESTER – I

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
		THEORY							
1	16MA1101	Engineering Mathematics-I (Matrices and Calculus)	3	1	0	4	25	75	100
2	16PH1101	Engineering Physics	3	0	0	3	25	75	100
3	16CY1101	Engineering Chemistry	3	0	0	3	25	75	100
4	16HE1101R	Essential English for Engineers -I	3	1	0	4	25	75	100
5	16GE1103	Problem Solving and Python Programming	3	0	0	3	25	75	100
6	16ME1201	Basics of Civil and Mechanical Engineering	3	1	0	4	25	75	100
		PRACTICAL							
7	16PS1001	Physical Sciences Lab – I	0	0	2	1	50	50	100
8	16GE1002	Engineering Practices Laboratory	0	0	4	2	50	50	100
9	16GE1003	Value Added Course I: Language Competency Enhancement Course-I	0	0	2	1	0	100	100
10	16GE1004	Problem Solving and Python Programming Lab	0	0	4	2	50	50	100
		Total Credits:	**18**	**3**	**12**	**27**	**300**	**700**	**1000**

SEMESTER – II

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
		THEORY							
1	16MA2102	Engineering Mathematics-II (Vector Calculus, Complex variables and Laplace transforms)	3	1	0	4	25	75	100
2	16PH2102	Physics of Materials	3	0	0	3	25	75	100
3	16CY2102	Environmental Sciences	3	0	0	3	25	75	100
4	16HE2102R	Essential English for Engineers - II	3	1	0	4	25	75	100

5	16GE2102	Engineering Graphics	2	0	4	4	25	75	100
6	16EI2201	Electrical Circuit Theory	3	0	0	3	25	75	100
PRACTICAL									
7	16PS2001	Physical Sciences Lab - II	0	0	2	1	50	50	100
8	16EI2001	Electrical Circuit Laboratory	0	0	4	2	50	50	100
9	16GE2001	Value Added Course II: Language Competency Enhancement Course-II	0	0	2	1	0	100	100
		Total Credits:	**17**	**2**	**12**	**25**	**250**	**650**	**900**

For the students admitted during the academic year 2017-2018 and onwards

SEMESTER - III

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA3103	Fourier Analysis and Statistics	3	1	0	4	25	75	100
2	16EI3201	Electronic Instrumentation	3	0	0	3	25	75	100
3	16EI3202	Electronic Devices and Circuits	3	0	0	3	25	75	100
4	16EI3203	Measurements and Instrumentation	3	0	0	3	25	75	100
5	16EI3204	Transducer Engineering	3	0	0	3	25	75	100
6	16ME3231	Fundamentals of Thermodynamics and Fluid Dynamics	3	0	0	3	25	75	100
PRACTICAL									
7	16EI3001	Transducer and Measurements Laboratory	0	0	4	2	50	50	100
8	16EI3002	Electronic Devices and Circuits Laboratory	0	0	4	2	50	50	100
		Total Credits:	**18**	**1**	**8**	**23**	**250**	**550**	**800**

SEMESTER – IV

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16MA4107	Numerical Methods	3	1	0	4	25	75	100
2	16EI4201	Electrical Machines	3	0	0	3	25	75	100
3	16EI4202	Linear Integrated Circuits and Applications	3	0	0	3	25	75	100
4	16EI4203	Digital Logic Circuits	3	0	0	3	25	75	100
5	16EI4204	Power Plant Instrumentation	3	0	0	3	25	75	100
6	16EI4205	Industrial Instrumentation - I	3	0	0	3	25	75	100
PRACTICAL									
7	16EI4001	Electrical Machines Laboratory	0	0	4	2	50	50	100
8	16EI4002	Linear and Digital Integrated Circuits Laboratory	0	0	4	2	50	50	100
		Total Credits:	**18**	**1**	**8**	**23**	**250**	**550**	**800**

For the students admitted during the academic year 2016-2017 and onwards

SEMESTER – V

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16EI5201	Industrial Instrumentation – II	3	0	0	3	25	75	100
2	16EI5202	Analytical Instrumentation	3	0	0	3	25	75	100
3	16EI5203	Microprocessors and Microcontrollers	3	0	0	3	25	75	100
4	16EI5204	Control Systems	3	1	0	4	25	75	100
5	16IT5231	Object Oriented Programming Using Java	3	0	0	3	25	75	100
6	16EI53XX	**Professional Elective – I**	3	0	0	3	25	75	100
PRACTICAL									
7	16EI5001	Microprocessors and Microcontrollers Laboratory	0	0	4	2	50	50	100
8	16EI5002	Industrial Instrumentation Laboratory	0	0	4	2	50	50	100
9	16IT5031	Object Oriented Programming Laboratory	0	0	4	2	50	50	100
		Total Credits:	**18**	**1**	**12**	**25**	**300**	**600**	**900**

SEMESTER – VI

S.No.	Course Code	Course Title	L	T	P	C	CIA	ESE	TOTAL
THEORY									
1	16EI6201	Process Control	3	1	0	4	25	75	100
2	16EI6202	Applied VLSI Design	3	0	0	3	25	75	100
3	16EI6203	Discrete Time and Signal Processing	3	0	0	3	25	75	100
4	16EI6204	Embedded Systems	3	0	0	3	25	75	100
5	16EI63XX	**Professional Elective – II**	3	0	0	3	25	75	100
6	16XX64XX	**Open Elective – I**	3	0	0	3	25	75	100
PRACTICAL									
7	16EI6001	Process Control Laboratory	0	0	4	2	50	50	100
8	16EI6002	Virtual Instrumentation Laboratory	0	0	4	2	50	50	100
9	16EI6701	**Technical Seminar**	0	0	2	1	0	100	100
		Total Credits:	**18**	**1**	**10**	**24**	**250**	**650**	**900**

LIST OF ELECTIVES

PROFESSIONAL ELECTIVE - 1

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C	CIA	ESE	TOTAL
1.	16EI5301	Thermal Power Plant Instrumentation	3	0	0	3	25	75	100
2.	16EI5302	Digital System Design	3	0	0	3	25	75	100
3.	16EI5303	Digital Image Processing	3	0	0	3	25	75	100
4.	16EI5304	Communication Engineering	3	0	0	3	25	75	100

PROFESSIONAL ELECTIVE - II

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C	CIA	ESE	TOTAL
1.	16EI6301	Industrial Electronics	3	0	0	3	25	75	100
2.	16EI6302	Biomedical Instrumentation	3	0	0	3	25	75	100
3.	16EI6303	Advanced Control Theory	3	0	0	3	25	75	100
4.	16EI6304	Instrumentation in Petrochemical Industries	3	0	0	3	25	75	100

OPEN ELECTIVES

S.NO.	COURSE CODE	COURSE TITLE	L	T	P	C	CIA	ESE	TOTAL
1.	**16EI6401**	Neural Networks and Fuzzy Systems	3	0	0	3	25	75	100

CREDIT DISTRIBUTION

Semester	I	II	III	IV	V	VI	VII	VIII	Total
Credits	27	25	23	23	25	24	24	16	**187**

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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA1101	ENGINEERING MATHEMATICS - I (MATRICES AND CALCULUS) (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Develop the skill to use matrix algebra techniques that is needed by engineers for practical applications.
2. Find curvature, evolutes and envelopes using the concept of differentiation.
3. Solve ordinary differential equations of certain types using Wronskian technique.
4. Familiarize the functions of several variables which are needed in many branches of engineering.
5. Understand the concept of double and triple integrals.

Unit	Description	Instructional Hours
I	**MATRICES** Eigen values and Eigen vectors of a real matrix – Properties of Eigen values and Eigen vectors (without proof) – Cayley - Hamilton Theorem (excluding proof) – Orthogonal matrices – Diagonalization of matrices by orthogonal transformation–Reduction of a quadratic form to canonical form by orthogonal transformation.	12
II	**DIFFERENTIAL CALCULUS** Curvature in cartesian co-ordinates – Radius and Centre of curvature - Circle of curvature – Involutes and Evolutes(parabola, ellipse, cycloid, asteroid) – Envelopes - single parameter and two parameter family of curves.	12
III	**ORDINARY DIFFERENTIAL EQUATIONS** Second and higher order linear differential equations with constant coefficients and with RHS of the form e^{ax} , x^n, sinax or cosax , $e^{ax}f(x)$ and $xf(x)$ where $f(x)$ is sinbx or cosbx – Method of variation of parameters – Linear differential equations with variable coefficients (Euler's equation)	12
IV	**FUNCTIONS OF SEVERAL VARIABLES** Total differentiation (excluding implicit functions) - Partial derivatives of composite functions - Taylor's series for functions of two variables-Maxima and minima of functions of two variables - Lagrange's method of undetermined multipliers – Jacobians.	12
V	**MULTIPLE INTEGRALS** Double integrals in Cartesian coordinates – Change of order of integration – Area enclosed by the plane curves (excluding surface area) – Triple integrals in Cartesian co-ordinates – Volume of solids using Cartesian co-ordinates.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Calculate Eigen values and Eigen vectors for a matrix which are used to determine the natural frequencies (or Eigen frequencies) of vibration and the shapes of these vibrational modes.
CO2: Apply the concept of differentiation to find the radius, centre and circle of curvature of any curve.
CO3: Develop sound knowledge of techniques in solving ordinary differential equations that model engineering problems.
CO4: Identify the maximum and minimum values of surfaces.
CO5: Computation of area of a region in simpler way by changing the order of integration and evaluation of triple integrals to compute volume of three dimensional solid structures.

TEXT BOOKS:

T1- Ravish R Singh, Mukul Bhatt, "Engineering Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2- Veerarajan T, "Engineering Mathematics–I", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS :

R1-Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. Pvt. Ltd. 2011.
R2- Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3- Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4-Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" Vol I, Second Edition, Pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PH1101	ENGINEERING PHYSICS (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Illustrate the fundamental knowledge in mechanical properties of matter and thermal physics.
2. Gain knowledge about laser and their applications.
3. Conversant with principles of optical fiber, types and applications of optical fiber.
4. Discuss the architectural acoustics and applications of Ultrasonics.
5. Extend dual nature of matter and the Necessity of quantum mechanics to explore the behavior of sub atomic particles.

Unit	Description	Instructional Hours
I	**PROPERTIES OF MATTER AND THERMAL PHYSICS** Elasticity – Hooke's law – Stress-strain diagram - Relation between three modulii of elasticity (qualitative) — Poisson's ratio – Bending moment – Depression of a cantilever – Derivation of Young's modulus of the material of the beam by Uniform bending – I-shaped girder. Modes of heat transfer – Thermal conductivity – Newton's law of cooling - Lee's disc method - Conduction through compound media (series and parallel).	9
II	**LASER AND APPLICATIONS** Spontaneous emission and stimulated emission – Population inversion – Pumping methods – Derivation of Einstein's coefficients (A&B) – Types of lasers – Nd:YAG laser, CO2 laser, Semiconductor lasers:(homojunction and heterojunction) – Laser Applications – Industrial applications: laser welding, laser cutting, laser drilling – Holography – Construction and reconstruction of images.	9
III	**FIBER OPTICS AND APPLICATIONS** Principle and propagation of light through optical fibers – Derivation of numerical aperture and acceptance angle – Classification of optical fibers (based on refractive index, modes and materials) – Crucible-crucible technique for fiber fabrication – Sources (LED and LASER) and detectors (p-i-n photodiode and avalanche photodiode) for fiber optics - Fiber optical communication link –Fiber optic sensors – Temperature and displacement sensors.	9
IV	**ACOUSTICS AND ULTRASONICS** Classification of sound – Weber–Fechner law – Sabine's formula (no derivation) - Absorption coefficient and its determination –Factors affecting acoustics of buildings and their remedies. Ultrasonic Production – Magnetostrictive generator – Piezoelectric generator – Determination of velocity using acoustic grating – Non destructive testing – Ultrasonic pulse echo system.	9
V	**QUANTUM PHYSICS AND APPLICATIONS** Black body radiation – Planck's theory (derivation) –Compton effect experimental verification only - Matter waves – Physical significance of wave function – Schroedinger's wave equations – Time independent and time dependent wave equations –Particle in a box (One dimensional) – Scanning electron microscope – Transmission electron microscope.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Enhance the fundamental knowledge in Properties of Matter and Thermal Physics.
CO2: Uunderstand the advanced technology of LASER in the field of Engineering and medicine.
CO3: Exposed the fundamental knowledge of Optical fiber in the field of communication Engineering.
CO4: Understand the production of ultrasonics and its applications in NDT.
CO5: Impart the fundamental knowledge on Quantum Physics.

TEXT BOOKS:

T1 - Rajendran V, Applied Physics, Tata McGraw Hill Publishing Company Limited, New Delhi, 2011.
T2- Gaur R.K. and Gupta S.L., Engineering Physics, 8th edition, Dhanpat Rai Publications (P) Ltd., New Delhi, 2013.

REFERENCE BOOKS:

R1 - Arthur Beiser "Concepts of Modern Physics" Tata McGraw Hill, New Delhi – 2010
R2 - M.N Avadhanulu and PG Kshirsagar "A Text Book of Engineering physics" S. Chand and Company ltd., New Delhi 2014
R3 - Dr. G. Senthilkumar "Engineering Physics – I" VRB publishers Pvt Ltd., 2013

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CY1101	ENGINEERING CHEMISTRY (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. The student should be conversant with boiler feed water requirements, related problems and water treatment techniques.
2. The student should be conversant with the principles of polymer chemistry and engineering applications of polymers and composites
3. The student should be conversant with the principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.
4. To acquaint the student with important concepts of spectroscopy and its applications.
5. To acquaint the students with the basics of nano materials, their properties and applications

Unit	Description	Instructional Hours
I	**WATER TECHNOLOGY** Hard water and soft water- Disadvantages of hard water- Hardness: types of hardness, calculations, estimation of hardness of water – EDTA method - scales and sludges – boiler corrosion – priming and foaming – caustic embrittlement; Conditioning methods of hard water – External conditioning - demineralization process- Internal conditioning - domestic water treatment: screening, sedimentation, coagulation, filtration, disinfection – chlorine – UV method; desalination: definition, reverse osmosis.	9
II	**POLYMER & COMPOSITES** Polymerization – types of polymerization – addition and condensation polymerization – mechanism of free radical addition polymerization – copolymers – plastics: classification – thermoplastics and thermosetting plastics, preparation, properties and uses of commercial plastics – PVC, Teflon – moulding of plastics (extrusion and compression); rubber: vulcanization of rubber, synthetic rubber – butyl rubber, SBR; composites: definition, types of composites – polymer matrix composites – FRP.	9
III	**ENERGY SOURCES AND STORAGE DEVICES** Introduction- nuclear energy- nuclear fission- controlled nuclear fission- nuclear fusion differences between nuclear fission and fusion- nuclear chain reactions- nuclear reactor power generator- classification of nuclear reactor- light water reactor- breeder reactor- solar energy conversion- solar cells- wind energy. Batteries and fuel cells: Types of batteries- alkaline battery lead storage battery- nickel-cadmium battery- lithium battery- fuel cell H_2 -O_2 fuel cell applications.	9
IV	**ANALYTICAL TECHNIQUES** Beer-Lambert's law – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – interferences - estimation of nickel by atomic absorption spectroscopy.	9
V	**NANOMATERIALS** Basics - distinction between molecules, nanoparticles and bulk materials; size-dependent properties. Nanoparticles: definition, carbon nanotubes (CNT), types of carbon nano tubes – single walled and multi walled carbon nanotubes – synthesis of carbon nanotubes: chemical vapour deposition – laser ablation – arc-discharge method; properties of CNT: mechanical, electrical, thermal and optical properties; applications of carbon nanotubes in chemical field, medicinal field, mechanical field and current applications.	9
	Total Instructional Hours	45

Course Outcome

1. Illustration of the basic parameters of water, different water softening processes and effect of hard water in industries.
2. Knowledge on basic properties and application of various polymers and composites as an engineering material.
3. Summarize the various energy sources and energy storage devices
4. Analyze various analytical skills in handling various machines, instruments, apart from understanding the mechanism involved.
5. Describe the basic properties and application of nano materials.

TEXT BOOKS

T1 - P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2015).
T2 - O.G.Palanna, "Engineering chemistry" McGraw Hill Education India (2017).

REFERENCES

R1 - B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
R2 - B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2005).
R3 - S.S.Dara "A Text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2010).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16HE1101R	ESSENTIAL ENGLISH FOR ENGINEERS – I (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. It fulfills the necessary skills needed in today's global workplaces.
2. Student will be able to interpret and illustrate formal communication.
3. It empowers students in choosing right lexical techniques for effective presentation
4. It equips the learner to analyze and list out things in logical order
5. The learner develops the ability to create and integrate ideas in a professional way.

Unit	Description	Instructional Hours
I	Getting to know people – Introduction – Talking about jobs (Present Simple) – Talking about working conditions(Adverb of Frequency) - Talking about company history and structure (Past simple, Prepositions of Time) – Talking about company activities (Connectors of addition and contrast, Present Continuous) – Focus on language – Parts of Speech – Gerund and Infinitives – Instruction-**General Vocabulary**.	12
II	Vocabulary practice – (Telephoning Leaving and taking messages) – requests and obligation – Describing trends (Adjectives and Adverbs) – Talking about company performance (present perfect and past simple, Reasons and consequences) – Reading Test Practice Describing products Dimensions, (Comparatives and Superlatives, Question formation) – Talking about product development (Sequencing words, Present continuous and going to) – Articles – Prepositions-Synonyms – Antonyms- Recommendations-**Interpretation of a chart**.	12
III	Talking about business equipment (Giving Instruction) – Letter Phrases- Writing Test Practice-Talking about facilities(Asking for and giving direction)- Presentation on a general topic -Talking about traffic and transport(making predictions)-**Discussion on current affairs**– Tenses- Present – Past-Future-Forms of verbs- Word techniques- Formation-Prefixes-Suffixes.	12
IV	Talking about conference arrangement(checking and confirming) – Talking about a conference before, after, when, until etc. – Listening Test Practice- talking about production process – passive-Talking about quality control Conditional 1 (real) (Making suggestions) – Itinery- Jumbled sentences- Paragraph writing- Essay writing – Checklist- Letter to Inviting Dignitaries – Accepting invitation- Declining Invitation.	12
V	Talking about call centers, insurance and changes in working practices (future possibility/probability)- Talking about banking- Speaking Test practice – Talking about delivery services (preposition of Time)- Talking about trading (Tense review)- Talking about recruitment conditional 2 (hypothetical) – talking about job applications (indirect questions) – Reading, Writing and Listening Test – Job application Letter and Resume Writing- Permission letters.	12
	Total Instructional Hours	**60**

Course Outcome

CO1 - Recognize different parts of speech for better usage.
CO2 - Interpret and illustrate formal communication
CO3 - Choosing right lexical techniques for effective presentation.
CO4 - Analyze and list out things in logical order.
CO5 - Create and integrate ideas in a professional way.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Meenakshi Raman and Sangeetha Sharma. "Technical Communication-Principles and Practice", Oxford University Press, 2009.
R2 - Rizvi, Ashraf. M. Effective Technical Communication. Tata McGraw-Hill, New Delhi.2005
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1101	COMPUTER PROGRAMMING (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Learn the fundamentals of computers.
2. Learn the basics of C programming
3. Learn the basics of Arrays and String
4. Learn the uses of functions and pointers.
5. Learn the basics of structures and unions.

UNIT	DESCRIPTION	TOTAL INSTRUCTIONAL HOURS
I	**BASICS OF COMPUTER** Generation and Classification of Computers- Basic Organization of a Computer –Input and Output Devices–Hardware and Software definitions- Categories of Software- Number System Conversion and problems. Need for logical analysis and thinking – Algorithm - Pseudo code – Flow Chart.	9
II	**BASICS OF 'C' PROGRAMMING** Fundamentals of ' C' programming – Structure of a 'C' program – compilation and linking processes – Constants, Variables – Data Types –Expressions using operators in 'C' – Managing Input and Output operations-Decision making-Branching and Looping-Case study	9
III	**ARRAYS AND STRINGS** Arrays – Initialization – Declaration – One dimensional and Two dimensional arrays. String- String Library functions – String Arrays. Matrix operations-Addition-Subtraction-Multiplication-Transpose-Case study.	9
IV	**FUNCTIONS AND POINTERS** Function – definition – Declaration – Types of Function definition – call by value-call by reference- Recursion – Pointers - Definition – Initialization – Pointers arithmetic – Pointers and arrays-Case study.	9
V	**STRUCTURES AND UNIONS** Structure- data type – definition – declaration –Nesting of structure - Union – Storage classes, Pre-processor directives-Case study.	9
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1: Use computers at user level, including operating systems, programming environments and differentiate between basic concepts of computer hardware and software.
CO2: Analyze problems, design and implementing algorithmic solutions.
CO3:Use data representation for the fundamental data types, read, understand and trace the execution of programs written in C language.
CO4: Write the C code using a modular approach and recursive concepts.
CO5: Explain the use of pointers, Structures and union.

TEXT BOOKS:

T1 – Balagurusamy "Programming in ANSI C", Seventh Edition, McGraw-Hill, 2016.
T2 - Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2011.

REFERENCE BOOKS:

R1 - Yashavant P. Kanetkar. " Let Us C", BPB Publications, 2011.
R2- M.Rajaram and P.Uma maheswari, "Computer Programming with C" Dorling Kindersley (India) Pvt. Ltd., Pearson Education in South Asia, 2014.
R3 - Dr.N.Sengottaiyan and K.Ramya, "Fundamentals of Computer Programming",Cengage Learning (India) Pvt. Ltd.,2016.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME1201	BASICS OF CIVIL AND MECHANICAL ENGINEERING (COMMON TO EIE AND EEE)	3	1	0	4

Course Objective

1. To impart basic knowledge on Civil and Mechanical Engineering.
2. To explain the materials used for the construction of civilized structures.
3. To make the understand the fundamentals of construction of structure.
4. To explain the component of power plant units and detailed explanation to IC engines their working principles.
5. To explain the R & AC system.

Unit	Description	Instructional Hours
I	**SURVEYING AND CIVIL ENGINEERING MATERIALS** **Surveying**: Objects – types – classification – principles – measurements of distances **Civil Engineering Materials:** Bricks – stones – sand – cement – concrete – steel sections-Woods-Plastics.	12
II	**BUILDING COMPONENTS AND STRUCTURES** **Foundations:** Types, Bearing capacity – Requirement of good foundations. **Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Types of Bridges and Dams.	12
III	**POWER PLANT ENGINEERING** Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps– working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.	12
IV	**IC ENGINES** Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines.	12
V	**REFRIGERATION AND AIR CONDITIONING SYSTEM** Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.	12
		60
	Total Instructional Hours	

Course Outcome

CO1-Ability to explain the usage of construction material and proper selection of construction materials.
CO2-Ability to design building structures.
CO3-Ability to identify the components use in power plant cycle.
CO4-Ability to demonstrate working principles of petrol and diesel engine.
CO5-Ability to explain the components of refrigeration and Air conditioning cycle.

TEXT BOOKS:

T1 - Venugopal K. and Prahu Raja V., Basic Mechanical Engineeringl, Anuradha Publishers, Kumbakonam, 2000.
T2-Shanmugam G and Palanichamy M S, Basic Civil and Mechanical Engineeringl, Tata McGraw Hill Publishing Co., New Delhi, 1996.

REFERENCE BOOKS :

R1 - Ramamrutham S., Basic Civil Engineering, Dhanpat Rai Publishing Co. (P) Ltd. 1999.
R2-Seetharaman S., Basic Civil Engineering, Anuradha Agencies, 2005.
R3-Shantha Kumar S R J., Basic Mechanical Engineering, Hi-tech Publications, Mayiladuthurai.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PS1001	PHYSICAL SCIENCES LAB - I (PHYSICS LABORATORY – I) (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Evaluate the particle size of micro particles and acceptance angle of fibres.
2. Employ instrumental method to determine Young's modulus of a beam of metals.
3. Apply the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum

Expt. No.	Description of the Experiments
1.	Determination of Wavelength, and particle size using Laser
2.	Determination of acceptance angle and numerical aperature in an optical fiber.
3.	Determination of velocity of sound and compressibility of liquid – Ultrasonic Interferometer.
4.	Determination of wavelength of mercury spectrum – spectrometer grating
5.	Determination of thermal conductivity of a bad conductor – Lee's Disc method
6.	Determination of Young's modulus by Non uniform bending method
7.	Determination of specific resistance of a given coil of wire – Carey Foster's Bridge.
8.	Post office box Measurement of an unknown resistance

Total Practical Hours 30

Course Outcome

CO:1 Point out the particle size of micro particles and acceptance angle of fibres using diode laser.
CO:2 Assess the Young's modulus of a beam using non uniform bending methods.
CO:3 Illustrate the concept of diffraction and getting ability to calculate the wavelength of the mercury spectrum Using spectrometer.
CO:4 Identify the velocity of ultrasonic's in the given liquid.
CO:5 Illustrate phenomena of thermal conductivity of a bad conductor.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PS1001	PHYSICAL SCIENCES LAB – I CHEMISTRY LAB – I (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Acquire practical skills in the determination of water quality parameters.
2. Acquaint the students with the determination of molecular weight of a polymer by viscometry.
3. Acquaint the students with the estimation of chemical substances using instrumental analysis techniques

Expt. No.	Description of the Experiments
1.	Preparation of molar and normal solutions and their standardization.
2.	Estimation of total, permanent and temporary hardness of Water by EDTA
3.	Determination of chloride content of water sample by argentometric method.
4.	Determination of available chlorine in bleaching powder.
5.	Conductometric titration of strong acid vs strong base (HCl vs NaOH).
6.	Conductometric titration (Mixture of weak and strong acids)
7.	Conductometric precipitation titration using $BaCl_2$ and Na_2SO_4
8.	Determination of molecular weight and degree of polymerization using viscometry.
9.	Estimation of iron content of the water sample using spectrophotometer.(1,10 phenanthroline / thiocyanate method).
	Total Practical Hours 30

Course Outcome

CO1: Estimate the different types of hardness in a water sample.
CO2: Determine the chloride content of water sample.
CO3: Calculate the strength of acid using conductometric titrations.
CO4: Calculate the strength of strong and weak acid using conductometric titrations.
CO5: estimate the amount of salt using conductometric precipitation titrations.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE1002	ENGINEERING PRACTICES LABORATORY (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective: To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

Expt. No. — **Description of the Experiments**

I CIVIL ENGINEERING PRACTICE

Study of plumbing and carpentry components of Residential and Industrial buildings.

(A) PLUMBING WORKS:

1. Study on pipe joints, its location and functions: Valves, taps, couplings, unions, reducers, elbows in household fittings.
2. Study of pipe connection requirements for pumps.
3. Preparation of plumbing line sketches for water supply and sewage works.
4. Hands-on-exercise:
   - Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining components.
5. Demonstration of plumbing requirements of high-rise buildings.

(B) CARPENTRY USING POWER TOOLS ONLY:

1. Study of the joints in roofs, doors, windows and furniture.
2. Hands-on-exercise in wood works by sawing, planning and cutting.

II MECHANICAL ENGINEERING

(A) Welding:

1. Preparation of arc welding of Butt joints, Lap joints and Tee joints

(B) Machining:

1. Practice on Simple step turning and taper turning
2. Practice on Drilling Practice

(C) Sheet Metal Work:

1. Practice on Models– Trays, cone and cylinder.

DEMONSTRATION

(D) Smithy

- Smithy operations: Upsetting, swaging, setting down and bending.
- Demonstration of – Production of hexagonal headed bolt.

(E) Gas welding

(F) Foundry Tools and operations.

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GROUP B (ELECTRICAL & ELECTRONICS)

S.No	Description of the Experiments
	ELECTRICAL ENGINEERING PRACTICES
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.
	ELECTRONICS ENGINEERING PRACTICES
1	Study of Electronic components and equipments – Resistors - colour coding
2	Measurement of DC signal - AC signal parameters (peak-peak, RMS period, frequency) using CRO.
3	Study of logic gates AND, OR, NOT and NAND .
4	Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5	Measurement of average and RMS value of Half wave and Full Wave rectifiers.
	Total Practical Hours **45**

Course Outcome

CO1: Fabricate wooden components and pipe connections including plumbing works.
CO2: Fabricate simple weld joints.
CO3: Fabricate electrical and electronics circuits.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE1003	VALUE ADDED COURSE I: LANGUAGE COMPETENCY ENHANCEMENT COURSE-I (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments
1.	INTRODUCTION TO AERONAUTICAL ENGINEERING
2.	LEADERSHIP FOR ENGINEERS
3.	4G – NETWORK ESSENTIALS
4.	COMP. SCIENCE ESSENTIALS FOR SOFTWARE DEVELOPMENT
5.	INTRODUCTION ANALYTICS MODELLING
6.	MATERIAL SCIENCE AND ENGINEERING

Total Marks **100**

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PROGRAMME	COURSE CODE	NAME OF THE COURSE	L	T	P	C
B.E.	16GE1001	COMPUTER PROGRAMMING LAB (COMMON TO ALL BRANCHES)	0	0	4	2

Course Objective

1. Be familiar with Microsoft office software.
2. Be exposed to role of constants, variables, identifiers, operators and other building blocks of C Language.
3. Be familiar with the use of conditional expressions and looping statements to solve problems associated with conditions and repetitions.
4. Be familiar with the concept of Array and pointers dealing with memory management.
5. Be exposed to Structures and unions.

S.NO	DESCRIPTION PF THE EXPERIMENTS	TOTAL PRACTICAL HOURS
1.	**a. Word Processing:** 1. Document creation, Text manipulation with Scientific notations 2. Table creation, Table formatting and conversion 3. Mail merge and Letter preparation 4. Flow Chart	3
2.	**b. Spread Sheet:** 1. Chart - Line, XY, Bar and Pie. 2. Formula - formula editor. 3. Spread sheet - inclusion of object, picture and graphics, protecting the document and sheet. 4. Sorting and Import / Export features.	6
3.	**c. Basic C programming:** C program using I/O Statements	3
4.	C program using arithmetic operations	3
5.	Decision making statement & Looping Concepts • Designing a simple arithmetic calculator. (Use switch statement) • Performing the following operations: (Use loop statement) • Generate Pascal's triangle. • Construct a Pyramid of numbers.	6
6.	**d. Arrays and Strings** C program using one dimensional arrays	3
7.	C program using two dimensional arrays	3
8.	C program using string functions	3
9.	**e. Functions and pointers** Perform the following operations: (Use recursive functions) i. Find the factorial of a given integer. ii. Find the GCD (Greatest Common Divisor) of two given integers. iii. Solve Towers of Hanoi problem.	6
10.	Program to swap two numbers using pointers - call by reference.	3
11.	**f. Structures and Unions** C Program using Structures	3
12.	C Program using Unions	3
	TOTAL INSTRCTIONAL HOURS	**45**

Course Outcome

CO1: Use office packages for documentation and presentation.
CO2: Implement program using control structures.
CO3: Handle arrays and strings.
CO4: Handle functions and pointers.
CO5: Form heterogeneous data using structure and union.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA2102	ENGINEERING MATHEMATICS – II (VECTOR CALCULUS, COMPLEX VARIABLES AND LAPLACE TRANSFORMS) (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. Learn the basics of vector calculus comprising gradient, divergence, Curl and line, surface, volume integrals.
2. Understand analytic functions of complex variables and conformal mappings.
3. Know the basics of residues, complex integration and contour integration.
4. Apply Laplace transform techniques to solve linear differential equations.
5. Know the effective mathematical tools for the solutions of partial differential equations that model several physical problems in mathematical physics.

Unit	Description	Instructional Hours
I	**VECTOR CALCULUS** Gradient, divergence and curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green's theorem in a plane, Gauss divergence theorem and Stokes' theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelopipeds.	12
II	**ANALYTIC FUNCTIONS** Analytic function - Cauchy-Riemann equations - sufficient conditions (excluding proof) – Harmonic - conjugate harmonic functions– Construction of analytic functions (Milne-Thompson method) – Conformal mapping: $w = z+c$, cz, $1/z$ and bilinear transformation without problems related to the concept of conformal mapping.	12
III	**COMPLEX INTEGRATION** Complex integration – Statements of Cauchy's integral theorem – Taylor's and Laurent's series expansions - Singular points – Residues – Cauchy's residue theorem – Evaluation of real definite integrals as contour integrals around unit circle.	12
IV	**LAPLACE TRANSFORM** Laplace transform –Basic properties – Transforms of derivatives and integrals of functions - Transforms of unit step function and impulse function – Transform of periodic functions. Inverse Laplace transform - Convolution theorem (with out proof) – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.	12
V	**PARTIAL DIFFERENTIAL EQUATIONS** Formation of partial differential equations by elimination of arbitrary constants and arbitrary functions-Solution of standard types of first order partial differential equations of the form $f(p,q) = 0$, Clairaut's type: $z = px + qy + f(p, q)$ – Lagrange's linear equation- Linear homogeneous partial differential equations of second and higher order with constant coefficient.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Know the gradient, divergence and curl of vectors useful for engineering application like fluid flow, electricity and magnetism.
CO2: Test the analyticity to construct the analytic function and transform complex functions from one plane to another plane graphically.
CO3: Evaluate real and complex integrals over suitable closed paths or contours.
CO4: Know the applications of Laplace transform and its properties and to solve certain linear differential equations using Laplace transform technique.
CO5: Solve the engineering problems using Partial Differential Equations.

TEXT BOOKS:

T1 - Ravish R Singh, Mukul Bhatt, "Engineeing Mathematics", McGraw Hill education (India) Private Ltd.,Chennai,2017.
T2 - Veerarajan T, "Engineering Mathematics–II", McGraw Hill Education(India) Pvt Ltd, New Delhi, 2016.

REFERENCE BOOKS :

R1 - Bali N.P & Manish Goyal, "A Text book of Engineering Mathematics", 8th Edition, Laxmi Pub. 2011
R2 - Grewal B.S, "Higher Engineering Mathematics", 42nd Edition, Khanna Publications, Delhi, 2012.
R3 - Peter V. O'Neil, "Advanced Engineering Mathematics", 7th Edition, Cengage learning,2012.
R4 - Sivarama Krishna Das P and Rukmangadachari E., "Engineering Mathematics" pearson publishing, 2011.
R5- Wylie & Barett, "Advanced Engineering Mathematics", McGraw Hill Education, 6th edition, 2003

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PH2102	PHYSICS OF MATERIALS (COMMON TO ALL BRANCHES)	3	0	0	3

Course Objective

1. Gain knowledge about conducting materials.
2. Provide fundamental knowledge of semiconducting materials which is related to the engineering program.
3. Extend the properties of magnetic materials, applications and super conducting materials.
4. Defend the various types of dielectric materials and their uses.
5. Expose the students to smart materials and the basis of nano technology.

Unit	Description	Instructional Hours
I	**CONDUCTING MATERIALS** Introduction – Conductors – Classical free electron theory of metals – Electrical and thermal conductivities – Wiedemann–Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi function – Density of energy states – Carrier concentration in metals.	9
II	**SEMICONDUCTING MATERIALS** Introduction – Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – compound semiconductors –direct and indirect band gap of semiconductors- derivation of carrier concentration in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration — Hall effect –Determination of Hall coefficient – Applications	9
III	**MAGNETIC & SUPERCONDUCTING MATERIALS** **Magnetic Materials**: 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. **Superconducting Materials :** Superconductivity : properties(Messiner effect, effect of magnetic field, effect of current and isotope effects) – Type I and Type II superconductors – BCS theory of superconductivity(Qualitative) - High Tc superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.	9
IV	**DIELECTRIC & COMPOSITES MATERIALS** Introduction – Electrical susceptibility – dielectric constant – polarization - electronic, ionic, orientation and space charge polarization –internal field – Claussius – Mosotti relation (derivation) – dielectric loss and dielectric breakdown (qualitative) Introduction to composites materials – types of composites materials – polymer, metallic and ceramic matrix composites (qualitative). Application in surgery, sports equipment.	9
V	**SMART MATERIALS AND NANOTECHNOLOGY** **New Engineering Materials:** Metallic glasses – preparation, properties and applications – shape memory alloys (SMA) – characteristics, properties of NiTi alloy applications. **Nano Materials**: Synthesis - plasma arcing – Chemical vapour deposition – properties of nanoparicles and applications. – Carbon nano tubes – fabrication – pulsed laser deposition - Chemical vapour deposition - properties & applications.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Illustrate the electrical / thermal conductivity of conducting materials.
CO2: Understand the purpose of the acceptor or donor levels and the band gap of a semiconductor.
CO3: Interpret the basic idea behind the process of magnetism and applications of magnetic materials in every day life
CO4: Identify and compare the various types of dielectric polarization and dielectric breakdown.
CO5: Evaluate the properties and applications of various advanced engineering materials and develop the new ideas to synthesis Nanomaterials

TEXT BOOKS:

T1 - S.O.Pillai "Solid State Physics" New Age International Publishers, New Delhi – 2011.
T2- Rajendran V "Materials Science" McGraw-Hill Education" New Delhi -2016,

REFERENCE BOOKS:

R1 - William D Callister, Jr "Material Science and Engineering" John wiley and Sons, New York, 2014.
R2 - Raghavan, V. "Materials Science and Engineering – A First Course" Prentice Hall of India, New Delhi 2016.
R3 -Dr. G. Senthilkumar "Engineering Physics – II" VRB publishers Pvt Ltd., 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16CY2102	ENVIRONMENTAL SCIENCES	3	0	0	3

Course Objective

1. To gain knowledge on the importance of environmental education, ecosystem and biodiversity.
2. To acquire knowledge about environmental pollution – sources, effects and control measures of environmental pollution.
3. To find and implement scientific, technological, economic and political solutions to environmental problems.
4. To study about the natural resources, exploitation and its conservation
5. To be aware of the national and international concern for environment and its protection.

Unit	Description	Instructional Hours
I	**ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY** Importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers- energy flow in the ecosystem – ecological succession processes – Introduction, types, characteristic features, structure and function of the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.	9
II	**ENVIRONMENTAL POLLUTION** Definition – causes, effects and control measures of: Air pollution – Air pollution standards – control methods- Water pollution – Water quality parameters- Soil pollution - Marine pollution - Noise pollution- Thermal pollution - Nuclear hazards–role of an individual in prevention of pollution – pollution case studies.	9
III	**NATURAL RESOURCES** 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 overutilization of surface and ground water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and Desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.	9
IV	**SOCIAL ISSUES AND THE ENVIRONMENT** From unsustainable to sustainable development – urban problems related to energy- energy conversion – electrical energy calculations- environmental ethics: Issues and possible solutions – 12 Principles of green chemistry- Current Environmental issues at Country level – management of municipal sewage, municipal solid waste, Hazardous waste and Bio-medical waste – Global issues –Climatic change, Acid rain, greenhouse effect and Ozone layer depletion. Disaster management: floods, earthquake, cyclone and landslides.	9

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V	**HUMAN POPULATION AND THE ENVIRONMENT** Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare –Environmental impact analysis (EIA)- GIS-remote sensing-role of information technology in environment and human health – Case studies.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the natural environment and its relationships with human activities.
CO2: Characterize and analyze human impacts on the environment
CO3: Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes
CO4: Reflect critically about their roles and identities as citizens, consumers and environmental actors

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in a complex, interconnected world.

CO5: Understand and implement scientific research strategies, including collection, management, evaluation, and interpretation of environmental data.

TEXT BOOKS:

T1 - Anubha Kaushik and C. P. Kaushik, "Environmental Science and Engineering", Fourth edition, New Age International Publishers, New Delhi, 2014.

T2 – Deeksha Dave and S.S.Katewa, "Textbook of Environmental Studies", Second Edition, Cengage Learning, 2012.

REFERENCES:

R1 - Trivedi R.K. "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.

R2 - G.Tyler Miller, Jr and Scott E. Spoolman"Environmental Science" Thirteenth Edition, Cengage Learning, 2010.

R3 - Gilbert M. Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education, 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16HE2102R	ESSENTIAL ENGLISH FOR ENGINEERS – II (COMMON TO ALL BRANCHES)	3	1	0	4

Course Objective

1. The learner will be introduced to global corporate culture and professional communication.
2. It helps the students to focus on organizing professional event and documentation.
3. The student will be able to describe the events and process in an effective way.
4. It trains the student to analyze the problems and to find solution to it.
5. The learner will be familiar with business communication.

Unit	Description	Instructional Hours
I	Introduction- talking about teamwork- Making arrangements- Improving Communication in spoken language – Taking and leaving Voice mail messages (present Tense, Past Tense and Present Perfect) Talking about Business Hotel- (Speaking Activity) Talking about Corporate Hospitality- Formal and Informal Language – Making accepting and declining invitations (Auxiliary Verb, Countable or Uncountable Nouns) – Focus on Language – Definitions and Extended Definitions-**Reading comprehension.**	12
II	Talking about orders – Clarity Written Language – Phone and Letter Phrases – Talking about Company Finances – Conditional 1 and 2 – Managing Cash Flow (Intention and Arrangements Conditional 1 and 2) – Talking about Brands and Marketing – Ethical Banking- Talking about Public Relations – Organizing a PR Event – Describing Duties and Responsibilities – (Future Tense and Articles) – Reported Speech – Modal Verbs and Passive, Impersonal Passive Voice-**interpretation of posters or advertisements.**	12
III	Talking about relocation – Report Phrases – Talking about Similarity and difference- Giving Directions- Asking for Information and Making Suggestions – Talking about Location (Comparatives and Superlatives, Participles) – Talking about Company Performances- Describing Trends – Describing Cause and Effect – Talking about Environmental Impact – Discussing Green Issues – Language of Presentations (Adjectives and Adverbs, Determiners)- Homophones – Homonyms- Acronyms-Abbreviations- British and American words.	12
IV	Talking about Health and Safety – Expressing Obligation- Discussing Regulations- Talking about personnel Problems – Passives – Talking about Problem at Work (modal Verbs, Passives)- Talking about Expenses Claims- Talking about Air Travel (Relative Pronoun, Indirect Questions) – **E-mail Writing - Note completion-** Transcoding.	12
V	Talking about staff Benefits- Talking about Appraisal Systems (gerunds and Infinitives, Reported Speech) – Talking about Marketing Disasters – Expressing hypothetical Situations- Talking about entering Foreign Market (Conditional 3, Grammar review) – Letter for calling quotations, Replying for quotations – Placing an order and Complaint and **reply to a complaint**.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Introduced corporate culture and professional communication.
CO2: It focused on organizing a professional event and its documentation.
CO3: Improved the ability to describe the events and process in an effective way
CO4: Trained to analyze the problems and to find solution to it.
CO5: Practiced to make business communication.

TEXT BOOKS:

T1 - Norman Whitby, Cambridge English: Business BENCHMARK Pre-intermediate to Intermediate – 2nd Edition. 2014.
T2 - Ian Wood and Anne Willams. "Pass Cambridge BEC Preliminary", Cengage Learning press 2013.

REFERENCE BOOKS :

R1 - Communication Skills for Engineers, Sunitha Misra & C.Murali Krishna, Pearson Publishers
R2 - Technical Communication, Daniel G. Riordan, Cengage learning publishers.
R3 - Kamalesh Sadanan "A Foundation Course for the Speakers of Tamil-Part-I &II", Orient Blackswan, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE2102	ENGINEERING GRAPHICS (COMMON TO ALL BRANCHES)	2	0	4	4

Course Objective
1. To provide drafting skills for communicating the Engineering concepts and ideas.
2. To expose to BIS and International standards related to engineering drawings.

Unit	Description	Total Hours
I	**PLANE CURVES** Importance of engineering drawing, drafting instruments, drawing sheets – layout and folding, Lettering and dimensioning, BIS standards and scales. Geometrical constructions, Construction of ellipse, parabola and Hyperbola by eccentricity method, construction of cycloids and involutes of square and circle – Drawing of tangents and normal to the above curves.	15
II	**PROJECTIONS OF POINTS, LINES AND PLANE SURFACES** Introduction to Orthographic projections- Projection of points. Projection of straight lines inclined to both the planes, Determination of true lengths and true inclinations by rotating line method. Projection of planes (polygonal and circular surfaces) inclined to both the planes by rotating object method (First angle projections only).	15
III	**PROJECTIONS OF SOLIDS** Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is perpendicular and inclined to one plane and objects inclined to both the planes by rotating object method.	15
IV	**SECTION OF SOLIDS AND DEVELOPMENT OF SURFACES** Sectioning of simple solids with their axis in vertical position when the cutting plane is inclined to one of the principal planes and perpendicular to the other – Obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids, cylinder and cone. Development of lateral surfaces of truncated solids. Intersection of solids-cylinder vs cylinder.	15
V	**ISOMETRIC AND ORTHOGRAPHIC PROJECTIONS** Isometric views and projections of simple and truncated solids such as - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions. Free hand sketching of multiple views from a pictorial drawing. Perspective projection of solids in simple position using visual ray method.	15
	Total Instructional Hours	**75**

Course Outcome
CO1: Draw the orthographic and isometric views of regular solid objects including sectional views.
CO2: Recognize the International Standards in Engineering Drawing practices.

TEXT BOOKS:

T1 - K.Venugopal, V.Prabu Raja, "Engineering Drawing, AutoCAD, Building Drawings", 5th Edition New Age International Publishers, New delhi 2016.
T2 - K.V.Natarajan, "A textbook of Engineering Graphics", Dhanalaksmi Publishers, Chennai.

REFERENCE BOOKS:

R1 - Basant Agrawal and C.M.Agrawal, "Engineering Drawing", Tata McGraw Hill Publishing Company Limited,New Delhi 2008.
R2 - K. R. Gopalakrishnan, "Engineering Drawing" (Vol. I & II), Subhas Publications, Bangalore, 1998.
R3 - M.B.Shah and B.C.Rana, "Engineering Drawing", Pearson Education, India, 2005.
R4 - N.S. Parthasarathy, Vela Murali, "Engineering Drawing", Oxford University press, India 2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI2201	ELECTRICAL CIRCUIT THEORY (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. To analyze electric circuits and solve complex circuits
2. To impart knowledge on various network theorems in AC and DC circuits
3. To provide knowledge on resonance phenomenon and analyze coupled circuits
4. To analyze transient response of AC and DC inputs to RL.RC and RLC circuits
5. To draw phasor diagrams of voltage and current for three phase circuits and measure power and power factor.

Unit	Description	Instructional Hours
I	**BASIC CIRCUITS ANALYSIS** Ohm's Law – Kirchoff's laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and Node voltage method –Super Mesh-Super Node – Phasor Diagram – Power, Power Factor and Energy.	9
II	**NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS** Network reduction: voltage and current division, source transformation – Dependent sources and Independent sources - star delta conversion. Thevenin's and Norton & Theorem – Superposition Theorem – Maximum power transfer theorem –Reciprocity Theorem-Millman's Theorem.	9
III	**RESONANCE AND COUPLED CIRCUITS** Series and Parallel resonance – frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Dot rule for coupled circuits - Tuned circuits – Single tuned circuits.	9
IV	**TRANSIENT RESPONSE** Transient response of RL, RC and RLC Circuits using Laplace transform for DC input - Time constants - Transient response of A.C. circuits for single loop circuit.	9
V	**THREE PHASE CIRCUITS** Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected, balanced & unbalanced loads – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits using two wattmeter method.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply basic laws to electrical circuits.
CO2: Solve electrical circuits using network theorems
CO3: Explain the concept of resonance and solve coupled circuit problems
CO4: Carryout problems in DC and AC transients
CO5: Analyse and calculate three phase AC circuit parameters

TEXT BOOKS:

T1 - William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", Tata McGraw Hill publishers, 6th edition, New Delhi, 2003.
T2 - Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis",Tata McGraw Hill, 2007

REFERENCE BOOKS :

R1 - Paranjothi SR, "Electric Circuits Analysis," New Age International Ltd., New Delhi,(1996).
R2 - Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series,Tata McGraw-Hill, NewDelhi, 2001.
R3 - Chakrabati A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
R4 - Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition,McGraw Hill, (2003).

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PS2001	PHYSICAL SCIENCES LAB – II PHYSICS LAB – II (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Evaluate the band gap of a semiconductor.
2. Apply the concept of interference and calculate the thickness of thin wire.
3. Acquire the practical skills in Young's modulus by uniform bending method.

Expt. No.	Description of the Experiments
1.	Determination of Young's modulus by uniform bending method
2.	Determination of band gap of a semiconductor
3.	Determination of Coefficient of viscosity of a liquid –Poiseuille's method
4.	Determination of Dispersive power of a prism - Spectrometer
5.	Determination of thickness of a thin wire – Air wedge method
6.	Determination of Rigidity modulus – Torsion pendulum
7.	Magnetic hysteresis experiment.
8.	Calibration of ammeter using potentiometer

Total Practical Hours **30**

Course Outcome

CO: 1. Experiment involving the physical phenomena of the Rigidity modulus of wire.
CO: 2. Determine the band gap of a semiconductor and variation of Energy Gap (E_g)with temperature.
CO: 3 Assess the Young's modulus of a beam using non uniform bending method.
CO: 4. Explain the concept of interference and calculate the thickness of thin wire and other fine objects.
CO: 5. Experiment provides a unique opportunity to validate Dispersive power of a prism using Spectrometer.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16PS2001	PHYSICAL SCIENCES LAB II CHEMISTRY LAB – II (COMMON TO ALL BRANCHES)	0	0	2	1

Course Objective

1. Acquire practical skills in the quantitative analysis of water quality parameters.
2. Acquire practical skills in the instrumental methods for quantitative Estimation of metal ion content.
3. Gain knowledge in determination of rate of corrosion.

Expt. No.	Description of the Experiments
1.	Determination of Dissolved Oxygen in water by Winkler's method.
2.	Estimation of alkalinity of water sample by indicator method.
3.	Estimation of hydrochloric acid by pH metry.
4.	Estimation of ferrous iron by Potentiometry.
5.	Estimation of Copper by EDTA
6.	Determination of sodium by flame photometry
7.	Determination of corrosion rate of mild steel by weight loss method.
	Total Practical Hours **30**

Course Outcome

CO1: Determine the level of DO in a water sample.
CO2: Identify and estimate the different types of alkalinity in water sample.
CO3: Estimate the acidity of water sample using pH metry.
CO4: Estimate the amount of copper in a brass sample.
CO5: Determine the metal ion content using instrumental methods.

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Programme	Course Code	Name of the Course	L	P	T	C
B.E.	16EI2001	ELECTRICAL CIRCUIT LABORATORY (COMMON TO EIE AND EEE)	0	0	4	2

Course Objective

1. To provide practical experience on verification of kirchoff's voltage law, kirchoff's current law and network theorems.
2. To design series and parallel resonant circuit and to analyse the simulation results.
3. To compare the time constant values of RL,RC circuits by conducting suitable experiments
4. To measure three phase power using two wattmeter method
5. To provide knowledge on signal measurements using CRO and DSO

S.No	Description of the experiments	Total Practical Hours
1.	Experimental verification of Kirchhoff's voltage and current laws	
2.	Experimental verification of network theorems (Thevenin's and Superposition).	
3.	Experimental verification of network theorems (Reciprocity Theorem and Maximum power transfer Theorem).	
4.	Experimental determination of time constant of RL & RC electric circuits.	
5.	Experimental determination of frequency response of RLC circuits.	
6.	Design and Simulation of series resonance circuit.	
7.	Design and Simulation of parallel resonant circuits.	
8.	Simulation of three phases balanced and unbalanced star, delta networks circuits.	
9.	Experimental determination of power in three phase circuits by two-watt meter method.	
10.	Study of CRO, DSO and measurement of sinusoidal voltage, frequency and power factor	
	Total Instructional Hours	**45**

Course Outcome

CO1: Verify ohm's law and Kirchoff's law
CO2: Understand and verify theorems
CO3: Perform mesh and nodal analysis
CO4:Understand transient response of RL,RC circuits for DC input
CO5: Evaluate frequency response of series, parallel resonant circuits and tuned circuits

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16GE2001	VALUE ADDED COURSE II: LANGUAGE COMPETENCY ENHANCEMENT COURSE-II (COMMON TO ALL BRANCHES)	0	0	2	1

Topic No.	Description of the Experiments
1.	A HANDS ON INTRODUCTION TO ENG. SIMULATIONS
2.	INTRODUCTION STEEL
3.	ENTREPRENEUR DEVELOPMENT
4.	DRINKING WATER TREATMENT
5.	MECHANICAL BEHAVIOR OF MATERIALS (LINEAR ELASTIC) (BEHAVIOR)
6.	FASCINATING WORLD OF ROBOTS AND ROBOTICS

Total Marks **100**

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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA3103	FOURIER ANALYSIS AND STATISTICS (COMMON TO AERO, AUTO, MECH, EEE AND EIE)	3	1	0	4

Course Objectives

1. Introduce Fourier series analysis which is central to many applications in engineering.
2. Solve boundary value problems by applying Fourier series.
3. Acquaint with Fourier transform techniques used in wide variety of situations.
4. Provide the necessary basic concepts of some statistical methods.
5. Manipulate different kinds of problems occurring in engineering and technology by applying the design of experiments.

Unit	Description	Instructional Hours
I	**FOURIER SERIES** Dirichlet's conditions- General Fourier Series – Odd and Even Functions – Half range sine and cosine series – Change of Interval - Parseval's Identity - Harmonic analysis. A spring -mass system deriven by an alterating square force, A series circuit with a sqaure –wave voltage, power delievered by a periodic current and modelling radiation intensity.	12
II	**BOUNDARY VALUE PROBLEMS** Classification - solution of one dimensional wave equation — one dimensional heat equation — steady state solutions of two dimensional heat equations (excluding insulated edges) – Fourier series solution in cartesian coordinates.	12
III	**FOURIER TRANSFORMS** Fourier Transform Pairs - Fourier sine and cosine transforms – Properties - Transforms of Simple functions – Convolution Theorem – Parseval's identity.	12
IV	**TESTING OF HYPOTHESIS** Large sample test based on Normal distribution for single mean and difference of means – Tests based on t (for single mean and difference of means) - F distribution – for testing difference of variance, Chi – Square test for Contingency table (Test for Independency) – Goodness of fit.	12
V	**DESIGN OF EXPERIMENTS** One way and two way classifications - Completely randomized design – Randomized block design –Latin square design.	12
	Total Instructional Hours	60 Hrs

Course Outcomes

CO1: Understand the mathematical principles of Fourier series which would provide them the ability to formulate and solve some of the physical problems of engineering.
CO2: Acquire the knowledge of application of Fourier series in solving the heat and wave equations.
CO3: Obtain the knowledge of Fourier transform techniques which extend its applications in Electrical circuit analysis, control system design and signal processing.
CO4: Acquire skills in analyzing statistical methods.
CO5: Have a clear perception of the statistical ideas and demonstrate the applications of these techniques to problems drawn from industry, management and other engineering fields.

TEXT BOOKS:

T1 - Veerarajan. T.,"Transforms and Partial Differential Equations", Tata McGraw Hill Education Pvt. Ltd., Secondreprint, New Delhi, 2012.

T2 - Gupta, S.C., & Kapoor, V.K., Fundamentals of Mathematical Statistics, Sultan Chand & Sons, Reprint 2011.

REFERENCE BOOKS :

R1 - C.Roy Wylie " Advance Engineering Mathematics" Louis C. Barret, 6th Edition, Mc Graw Hill Education India Private Limited, New Delhi 2003.

R2 - Kandasamy P., Thilagavathy K. and Gunavathy K.,"Engineering Mathematics Volume III", S.Chand& Company Ltd., New Delhi, 1996.

R3 - Walpole. R.E., Myers. R.H., Myers. S.L., and Ye. K., "Probability and Statistics for Engineersand Scientists", 8th Edition, Pearson Education, Asia, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3201	ELECTRONIC INSTRUMENTATION	3	0	0	3

Course Objective

1. Describe the various analog electronic instruments and it's working
2. Classify signal generators and different types of wave analyzers
3. Illustrate cathode ray oscilloscope and display devices.
4. Explain about digital electronic instruments and its conversion techniques.
5. Outline smart instrumentation and measurements.

Unit	Description	Instructional Hours
I	**ELECTRONIC ANALOG METERS** A.C and D.C voltmeters - ammeter, multimeter - power meter - Q meter - true RMS meter - vector impedance meter - vector voltmeter - component measuring instruments - RF voltage and power measurements. AF oscillators - Instrument Transformers - Instrumentation amplifier.	9
II	**SIGNAL GENERATORS AND WAVE ANALYZERS** Sine wave generator - Frequency synthesized sine wave generator - Sweep frequency generator, pulse and square wave generator - Function generator - Noise generator - Applications. Wave analyzer: Types - Harmonic distortion analyzer - Spectrum analyzer.	9
III	**CATHODE RAY OSCILLOSCOPE, RECORDERS AND DISPLAYS** General purpose oscilloscope - Screens for CRT graticules - Vertical & horizontal deflection systems - Delay line - Multiple trace - Dual beam & dual trace - Probes - Storage oscilloscopes - Applications. X-Y Plotters, magnetic tape recording - Data loggers. Display devices: LED, LCD - Bar graph display - seven segments and dot matrix displays.	9
IV	**DIGITAL INSTRUMENTS** Digital Ammeter and Voltmeter - auto ranging, auto zeroing - Measurements of Frequency and Time Interval - DMM, DPM, Comparison between analog and digital techniques of measurement. Successive approximation and dual slope types of ADC - digital frequency counters - digital storage oscilloscopes - LCR meter.	9
V	**SMART INSTRUMENTS AND APPLICATIONS** Serial, parallel ports, USB–IEEE 802.15.4/ZigBee - Instruments used in computer controlled system - Digital Transducers - Smart/intelligent instruments, comparison with conventional type instruments - Role of measuring instruments and recorders in Industries - Applications of digital instruments.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Define the construction and working nature of A.C and D.C analog instruments.
CO2: Summarize the signal generators and analyzers for various parameter measurements.
CO3: Demonstrate the working of oscilloscope, recorders and display devices.
CO4: Implement digital measuring instruments for applications.
CO5: Build a computer controlled digital instruments and transducers for suitable industrial applications.

TEXT BOOKS:

T1 - Albert D. Helfrick and William D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", Prentice Hall of India, 2008.
T2 - Kalsi.H.S, "Electronic Instrumentation", Tata McGraw Hill, 2010.

REFERENCE BOOKS:

R1 - Patranabis.D "Principles of Electronic Instrumentation", Prentice Hall of India Learning Pvt Ltd, 2009.
R2 - Rangan, C.S., Sarma G.R. and Mani V.S.V., "Instrumentation devices and systems", Tata McGraw Hill, New Delhi, 2008.
R3 - Kazem Sohraby, Daniel Minoli and Taieb Znati, "Wireless Sensor Networks - Technology, Protocols, and Applications" A John Wiley & Sons, Inc. Publications, 2007.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3202	ELECTRONIC DEVICES AND CIRCUITS (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Recall the basics of electronic devices.
2. Interpret the structure, operation and characteristics of transistors.
3. Analyze various configurations of BJT amplifiers.
4. Infer the basic concepts of large signal amplifiers.
5. Interpret the operations of feedback amplifiers and oscillators.

Unit	Description	Instructional Hours
I	**SEMICONDUCTOR DIODE** PN Junction Diode - Structure, Operation and V-I Characteristics, Diode Current Equation, Application of Diode - Rectifiers: Half Wave and Full Wave Rectifier - Zener Diode: Characteristics, Application of Zener Diode	9
II	**TRANSISTORS** Junction transistor - BJT: CE, CB and CC configurations, Transistor Biasing Circuits - JFET: Output and Transfer Characteristics, Structure, Operation and Characteristics of MOSFET and UJT.	9
III	**DESIGN AND ANALYSIS OF SMALL SIGNAL AMPLIFIER** BJT - Transistor Modeling, Hybrid Equivalent Circuit, Small Signal Analysis - Low Frequency Model : CE,CB,CC amplifiers, Differential Amplifier - A.C and D.C Analysis, Single Tuned Amplifiers.	9
IV	**LARGE SIGNAL AMPLIFIERS** Classification of Power Amplifiers, Efficiency of Class A and Class B Amplifier Complementary - Symmetry, Push - Pull Power Amplifiers- Calculation of Power Output, Efficiency and Power Dissipation - Crossover Distortion.	9
V	**FEEDBACK AMPLIFIERS AND OSCILLATORS** Advantages of Negative Feedback - Voltage / Current, Series, Shunt Feedback - Positive Feedback - Condition for Oscillations, RC Phase Shift - Wien bridge, Hartley, Colpitts and Crystal Oscillators.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the knowledge acquired about electronic devices.
CO2: Summarize the concepts of transistors.
CO3: Transform the acquired skill in designing an amplifier circuit.
CO4: Illustrate the working of large signal amplifiers.
CO5: Outline the concepts of feedback amplifiers, conditions for oscillation and types of oscillators.

TEXT BOOKS:

T1 - R.S.Sedha, "Applied Electronics" S.Chand Publications, 2008.
T2 - David A. Bell, "Electronic Devices and Circuits", 5th Edition, Prentice Hall of India, 2008.

REFERENCE BOOKS:

R1 - Rashid, "Micro Electronic Circuits" Thomson Publications, 1999.
R2 - Donald A Neamen, "Electronic Circuit Analysis and Design" Tata McGraw Hill, 3rd Edition, 2003.
R3 - Robert L. Boylestad, "Electronic Devices and Circuit Theory", Prentice Hall of India, 2002.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3203	MEASUREMENTS AND INSTRUMENTATION (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Recognize the fundamentals of measurement system.
2. Understand the instruments used for measuring electrical parameters.
3. Examine the D.C. and A.C. bridges.
4. Enumerate the data storage and display devices.
5. Describe the various transducers and data acquisition system.

Unit	Description	Instructional Hours
I	**CHARACTERISTICS, ERRORS AND STANDARDS OF INSTRUMENTS** Functional elements of an instrument - Static and dynamic characteristics - Errors in measurement - Statistical evaluation of measurement data - Standards and Calibration.	9
II	**MEASURING INSTRUMENTS** Principle – Construction - operation of Moving Coil and Moving Iron Instruments - Ammeters and Voltmeters - Single phase, three phase wattmeters and energy meters - Instrument transformers- Instruments for measurement of frequency and phase.	9
III	**COMPARISON METHODS OF MEASUREMENTS** D.C Bridges: Wheatstone - Kelvin double bride - AC bridges: Anderson bridge –Maxwell bridge and Schering bridge - D.C & A.C Potentiometers- Transformer ratio bridge - Self-balancing bridge.	9
IV	**STORAGE AND DISPLAY DEVICES** Introduction - Magnetic disk and tape recorders - XY Recorders- CRT display- Display storage oscilloscope - LED & LCD display - Inkjet and Dot matrix printer.	9
V	**TRANSDUCERS AND DATA ACQUISITION SYSTEMS** Classification of transducers- Resistive transducer - RTD and Strain gauge transducer, Capacitive transducers - Inductive transducers - LVDT- Piezoelectric transducer- Hall effect transducers - Elements of data acquisition - Smart sensor.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Illustrate the fundamentals of measurement system.
CO2: Analyze the instruments used for measuring electrical parameters.
CO3: Determine the circuit parameters (R, L, C and frequency) using bridges.
CO4: Describe the data storage and display devices.
CO5: Select and use various transducers and data acquisition system.

TEXT BOOKS:

T1 - Doebelin. E, "Measurement Systems: Application and Design", 6th Edition, Tata McGraw Hill Private Limited, 2012.
T2 - Sawhney. A.K, "A Course in Electrical and Electronics – Measurement and Instrumentation", 19th Edition, Dhanpat Rai & Sons, 2014.

REFERENCE BOOKS:

R1- D.V.S. Moorthy, "Transducers and Instrumentation", Prentice Hall of India Pvt Ltd, 2007.
R2 - H.S. Kalsi, "Electronic Instrumentation", Tata McGraw Hill, 2nd Edition 2004.
R3 - J. B. Gupta, "A Course in Electronic and Electrical Measurements", S. K. Kataria & Sons, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3204	TRANSDUCER ENGINEERING	3	0	0	3

Course Objective

1. Recall the fundamentals of measurement system.
2. Infer various resistive transducers operation with industrial parameters measurement.
3. Discuss the principle of working of various inductive transducers.
4. Apply the capacitive transducer working principle on industrial parameters measurement.
5. Illustrate the function of various miscellaneous transducers and sensors.

Unit	Description	Instructional Hours
I	**SIGNIFICANCE OF MEASUREMENT AND CHARACTERISTICS OF TRANSDUCER** Measurement system - Methods of measurements - Units and standards of measurement - Errors in measurement - Calibration methods - Statistical error analysis. Classification transducers - Characteristics of transducer - Mathematical model of transducer - Zero, First and Second order transducer - Response to impulse, step, ramp and sinusoidal inputs.	9
II	**RESISTIVE TRANSDUCERS** Resistance transducer - Principle of operation, construction, characteristics and application of potentiometer, strain gauge, thermocouple, Resistance Temperature Detector, thermostat, hot wire anemometer, moisture and humidity resistive transducer.	9
III	**INDUCTIVE TRANSDUCERS** Inductance transducer - Self and mutual inductive transducer- Principle of operation, construction, characteristics and application of LVDT, RVDT, synchro, variable reluctance transducer, eddy current transducer.	9
IV	**CAPACITIVE TRANSDUCERS** Capacitance transducer - Variable area type, variable air gap type - variable permittivity type; capacitive microphone - Frequency response - Applications (measurement of pressure, level, thickness, moisture and density).	9
V	**MISCELLANEOUS TRANSDUCERS AND SENSORS** Hall effect transducer-piezoelectric transducer - Magnetostrictive transducer - Digital transducer - Electrochemical transducer. Smart sensors - Proximity sensor - SQUID sensor - Biosensors - IC sensors - Safety sensor (Fire, smoke and gas leakage detection).	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Definition of errors, error analysis and characteristics response of different order transducers.
CO2: In-depth knowledge about resistive transducers.
CO3: Outline an adequate knowledge about various inductive transducers.
CO4: Make use of capacitive transducers on industrial parameters measurement.
CO5: Summarize the role of different industrial transducers and sensors.

TEXT BOOKS:

T1 - Sawhney. A.K, "A Course in Electrical and Electronics Measurements and Instrumentation", 19th Edition, Dhanpat Rai & Company Private Limited, 2004.
T2 - Renganathan. S, "Transducer Engineering", Allied Publishers, Chennai, 2003.

REFERENCE BOOKS:

R1 - Ernest O.Doebelin, "Measurement systems", 6th Edition, Tata McGraw Hill, New Delhi, 2011.
R2 - Patranabis. D, "Sensors and Transducers", Prentice Hall of India, 2003.
R3 - Patranabis. D, "Principles of Industrial Instrumentation", Tata McGraw Hill, New Delhi, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16ME3231	FUNDAMENTALS OF THERMODYNAMICS AND FLUID DYNAMICS	3	0	0	3

Course Objectives

1. To familiarize the students to understand the fundamentals of thermodynamics.
2. To acquire the knowledge and quantify the energy conversion.
3. To understand the energy degradation in thermodynamic systems.
4. To impart knowledge on the properties of fluids and its dimensions.
5. To learn about the performance of fluid machineries.

Unit	Description	Instructional Hours
I	**FUNDAMENTAL CONCEPTS & DEFINITIONS** Basic concepts - concept of continuum, comparison of microscopic and macroscopic approach. Path and point functions, state and processes. Intensive and extensive property, System and their types. Thermodynamic Equilibrium and Zeroth law of thermodynamics. Quasi-static, reversible and irreversible processes. Heat and work transfer, definition and comparison, sign convention. Displacement and other modes of work. Relationship between temperature scales, Modes of heat transfer.	9
II	**FIRST LAW OF THERMODYNAMICS** Closed system: Constant pressure, constant volume, constant temperature, adiabatic and polytropic process, P-V diagram. Steady flow energy equation - Open systems: Turbines, pumps, nozzles, boiler and heat exchanger.	9
III	**SECOND LAW OF THERMODYNAMICS AND BOILERS** Statements of second law and its corollaries - Heat Reservoir, source and sink- Heat Engine, Refrigerator and Heat pump. Steam Boilers and its types, Mountings and accessories of boilers.	9
IV	**FLUID PROPERTIES AND DIMENSIONAL ANALYSIS** Properties of fluids- mass density, specific weight, specific volume, specific gravity, viscosity, compressibility, surface tension, capillarity, vapour pressure and cavitation - Pressure and flow measuring instruments. Dimensions, Dimensional homogeneity, methods of dimensional analysis- Rayleigh and Buckingham's-π theorem.	9
V	**FLUID MACHINES** Classification of fluid machines- Fans, blowers, pumps, Turbines and compressors - working principle.	9
	Total Instructional Hours	**45**

Course Outcome

Upon completion of this course, the students will be able to:
CO1: Apply the thermodynamic Principles on its applications.
CO2: Solve the processes in Closed and open systems.
CO3: Calculate the performance of engine, refrigerator, and heat pump.
CO4: Develop skills in the properties of fluids and its dimensions.
CO5: Analyze the working and performance of various hydraulic machineries.

TEXT BOOK:

T1 – Nag P.K., "Basic and Applied Thermodynamics", 2nd Edition, Tata McGraw Hill Publication, 2002.
T2 - Claus Borgnakke and Richard E.Sonntag, "Fundamentals of thermodynamics", 7th Edition, John Wiley & sons, 2009.

REFERENCES:

R1 - Rajput R.K, "Thermal Engineering", 3rd Edition, Laxmi Publication, Delhi, 2012.
R2 - Yahya S.M., "Turbines, Compressors and Fans", 4th Edition, McGraw-Hill Education 2011.
R3 - Bansal R.K., —Fluid Mechanics and Hydraulic Machines, 9th Ed, Laxmi Publications, Delhi, 2015.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3001	TRANSDUCER AND MEASUREMENTS LABORATORY	0	0	4	2

Course Objective

1. Analyze the suitable instruments to meet the requirements of industrial applications.
2. Infer the various techniques of resistance, capacitance and inductance measurements.
3. Assess the concept of calibration technique in various measuring instruments.

Expt. No.	Description of the Experiments
1.	Characteristics of a Potentiometric transducer.
2.	Characteristics of Strain gauge and Load cell.
3.	Temperature Characteristics of a. Thermocouple. b. Thermistor. c. RTD.
4.	Characteristics of LVDT.
5.	Characteristics of Photoelectric tachometer.
6.	Characteristics of Hall effect transducer.
7.	Measurement of resistance using a. Wheatstone bridge. b. Kelvin's bridge.
8.	Measurement of Capacitance using Schering Bridge.
9.	Measurement of Inductance using Anderson Bridge.
10.	Calibration of Ammeter and Voltmeter using Student type Potentiometer.
11.	Calibration of Single-phase Energy meter and Wattmeter.
12.	Study of Smart Transducers.

Total Practical Hours 45

Course Outcome

CO1: Make use of sensors and transducers to measure the industrial parameters.
CO2: Represent the designing knowledge in signal conditioning circuits.
CO3: Analyze the characteristics of different transducers.
CO4: Discuss the various techniques of passive element measurements.
CO5: Impart knowledge to the students in handling the different kinds of transducers which they often meet in different aspects of transducers.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI3002	ELECTRONIC DEVICES AND CIRCUITS LABORATORY (COMMON TO EIE AND EEE)	0	0	4	2

Course Objective	1.Apply the knowledge gained in designing basic electronic circuits 2.Design feedback amplifiers and oscillators 3.Infer the working of cathode ray oscilloscope

Expt. No.	Description of the Experiments
1.	Characteristics of a. Semi conductor diode b. Zener diode
2.	Single Phase half-wave rectifiers with filters
3.	Single Phase full wave rectifiers with filters
4.	Characteristics of Transistor under a. Common Emitter Configuration b. Common Collector Configuration c. Common Base Configurations
5.	Characteristics of JFET and UJT
6.	Design of Relaxation Oscillator
7.	Design and Frequency response characteristics of a Common Emitter amplifier
8.	Design of Feedback Amplifier-Current series
9.	Design of transistor RC phase shift oscillator
10.	Characteristics of photo diode and photo transistor, study of light activated relay circuit
11.	Realization of first order passive filters
12.	Study of CRO and DSO for phase and frequency measurements
	Total Practical Hours 45

Course Outcome	CO1: Analyze about the characteristics of semiconductor devices CO2: Experiment the working of rectifier CO3: Design various electronic circuit configurations CO4: Demonstrate the frequency response of amplifiers CO5: Examine the design of current series feedback amplifier and RC phase shift oscillator

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16MA4107	NUMERICAL METHODS (COMMON TO AERO, AUTO, MECH, EEE &EIE)	3	1	0	4

Course Objective

1. Solve algebraic, transcendental and system of linear equations by using various techniques.
2. Apply various methods to find the intermediate values for the given data.
3. Be Familiar with the concepts of numerical differentiation and numerical integration of the unknown functions.
4. Understand the concept of solving ordinary differential equations by applying single and multi-step methods.
5. Appraise the methods introduced in the solution of ordinary differential equations and partial differential equations.

Unit	Description	Instructional Hours
I	**SOLUTION OF ALGEBRAIC AND TRANSCENDENTAL EQUATIONS** Solution of equation – Fixed point iteration : x = g(x) method – Newton-Raphson method – Solution of linear system by Gauss Elimination and Gauss Jordan method – Iterative method : Gauss seidel method.	12
II	**INTERPOLATION** Interpolation: Newton's forward and backward difference formulae – Lagrangian interpolation for unequal intervals – Divided difference for unequal intervals : Newton's divided difference formula.	12
III	**NUMERICAL DIFFERENTIATION AND INTEGRATION** Differentiation using interpolation formula – Newton's forward and backward interpolation formulae for equal intervals – Newton's divided difference formula for unequal intervals - Numerical integration by Trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Double integration using Trapezoidal and Simpson's rules	12
IV	**INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS** Single step methods: Taylor's series method – Euler and Modified Euler methods for first order equation – Fourth order Runge- kutta method for solving first order equations – Multi step method: Milne's predictor and corrector method and Adam – Bash forth predictor corrector method.	12
V	**BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS** Finite difference solution of second order ordinary differential equation – Finite difference solution of one dimensional heat equation by explicit and implicit methods – One dimensional Wave equation – Two dimensional Heat equations – Laplace and Poisson Equations.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Solve the system of linear algebraic equations representing steady state models and non linear equations arising in the field of engineering.
CO2: Understand the concept of interpolation in both cases of equal and unequal intervals.
CO3: Express the information from discrete data set through numerical differentiation and summary information through numerical integration.
CO4: Classify and solve ordinary differential equations by using single and multi step methods.
CO5: Acquire knowledge of finding the solution of ordinary and partial differential equations which are useful in attempting any engineering problems.

TEXT BOOKS:

T1 Sankara Rao K, "Numerical Methods for Scientists and Engineers", 3rd edition, Prentice Hall of India Private limited, New Delhi,2007.

T2 M.K.Jain,S.R.K.Iyengar, R.K.Jain "Numerical methods for Scientific and Computation", Fifth Edition, New Age International publishers 2010.

REFERENCE BOOKS:

R1 Kreyszig.E. "Advanced Engineering Mathematics", Eight Edition, John Wiley and sons (Asia) limited.

R2 Grewal B.S. and Grewal J.S. " Numerical Methods in Engineering and Science ", 6th Edition , Khanna publishers, New Delhi 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4201	ELECTRICAL MACHINES	3	0	0	3

Course Objective

1. Understand the principles of operations of electrical machines
2. Define the construction details of transformers
3. Understand the construction of AC electrical machines
4. Draw the phasor diagram of various machines
5. Introduce special electrical machines

Unit	Description	Instructional Hours
I	**D.C. MACHINES** D.C. Generator - Principle of operation and construction of DC generator - EMF equation - Characteristics - Armature reaction - Commutation. D.C. Motor - Types - Torque equation - Characteristics - Starting and speed control D.C. Motor	9
II	**TRANSFORMERS** Principle - Theory of ideal transformer - EMF equation - Construction details of shell and core type transformers - Tests on transformers - Equivalent circuit - Phasor diagram - Introduction to three-phase transformer connections.	9
III	**SYNCHRONOUS MACHINES** Synchronous Generator - Principle of operation and construction - types - EMF Equation - Vector diagram. Synchronous motor- Starting Methods - Torque equation - V curves - Speed control - Hunting	9
IV	**INDUCTION MACHINES** Three-phase Induction motor - principle of operation - Types - Torque-slip and Torque-speed characteristics - Starting methods and Speed control of induction motors. Introduction to induction generators.	9
V	**SINGLE PHASE INDUCTION MOTOR AND SPECIAL ELECTRICAL MACHINES (QUANTITATIVE TREATMENT ONLY)** Single phase induction motors - Double field revolving theory - Capacitor start capacitor run motors - Shaded pole motor - Repulsion type motor - Universal motor - Hysteresis motor - Permanent magnet synchronous motor - Switched reluctance motor - Brushless D.C motor - Stepper motor.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: State the principle of operation and construction of D.C. machines
CO2: Ability to write the transformers operation and construction
CO3: List the operation of synchronous machines
CO4: Explain the operation and control of induction machines
CO5: Illustrate the operation of special electrical machines

TEXT BOOKS:

T1 - Kothari D. P. and Nagrath I. J, "Electric Machines", Fourth Edition, McGraw Hill Education (India) Private Limited, 2015.
T2 - Deshpande M. V., "Electrical Machines", Prentice Hall of India Learning Pvt. Ltd., New Delhi, 2011.

REFERENCE BOOKS :

R1 - M.N.Bandyopadhyay, "Electrical Machines Theory and Practice", Prentice Hall of India Learning Pvt. Ltd., New Delhi, 2009.
R2 - B.L.Theraja and A.K.Theraja, "A Text Book of Electrical Technology" Volume II, S.Chand and Company, 2013.
R3 - C.A.Gross, "Electric Machines", CRC Press 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4202	LINEAR INTEGRATED CIRCUITS AND APPLICATIONS (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Infer adequate knowledge on IC fabrication procedure.
2. Relate the characteristics of linear integrated circuits and their applications.
3. Apply OP-AMP on various applications like Timers, PLL circuits, ADC and DAC.
4. Impart the basic knowledge of regulator circuits and special function ICs.
5. Summarize internal functional blocks of special function ICs.

Unit	Description	Instructional Hours
I	**IC FABRICATION** IC classification - chip size and circuit complexity - fundamental of monolithic IC technology - Silicon wafer preparation - Epitaxial growth - Oxidation - Masking and Etching - diffusion of impurities - Assembly Processing and packaging - Fabrication of Diode and FET.	9
II	**CHARACTERISTICS OF OP-AMP** Basic information of OP-AMP - Ideal OP-AMP characteristics - DC characteristics - AC characteristics - frequency response of OP-AMP - Slew Rate - differential amplifier - Basic applications of OP-AMP - Inverting and Non-inverting Amplifiers- summer - differentiator and integrator - V/I and I/V converters.	9
III	**APPLICATIONS OF OP-AMP** Instrumentation amplifier - First order LPF - First order HPF - First order Band pass and Band reject filters - Comparators - multivibrators - waveform generators - clippers - clampers - peak detector- S/H circuit - D/A converter : R- 2R ladder and weighted resistor types - A/D converters : Duel Slope, Successive Approximations.	9
IV	**SPECIAL IC's** Functional block- characteristics and application circuits with IC 555 Timer - Application: Missing pulse detector, PWM, FSK Generator, PPM,SCHMITT Trigger - IC566 voltage controlled oscillator - IC565 - Phase Lock Loop IC - PLL application: frequency multiplication/division, AM Detection.	9
V	**APPLICATION IC's** IC voltage regulators - LM78XX - 79XX Fixed voltage regulators - LM317 - 723 Variable voltage regulators - switching regulator - LM 380 power amplifier - IC8038 function generator - Opto Coupler IC's.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the IC fabrication procedure.
CO2: Analyze the characteristics of operational amplifiers.
CO3: Outline the applications of OP-AMP.
CO4: Understand the working principle of special IC's.
CO5: Outline the function of voltage regulator as special IC's.

TEXT BOOKS:

T1 - D.Roy Choudhary, Sheil B.Jani, "Linear Integrated Circuits", Second Edition, New Age International Pvt. Ltd, 2003.
T2 - S.Salivahanan & V.S. Kanchana Bhaskaran, "Linear Integrated Circuits", Tata McGraw Hill, 2008.

REFERENCE BOOKS:

R1 - Ramakant A.Gayakward, "Op-amps and Linear Integrated Circuits", Fourth Edition, Prentice Hall of India Learning Pvt. Ltd 2000.
R2 - Robert F.Coughlin, Fredrick F. Driscoll, "Op-amp and Linear ICs", Prentice Hall of India Learning Pvt. Ltd, 6th Edition, 2012.
R3 - Floyd, Buchla, "Fundamentals of Analog Circuits", Pearson Education, 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4203	DIGITAL LOGIC CIRCUITS (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Recall the basic number systems, codes and logical gates.
2. Infer the Boolean algebra and minimization logic.
3. Design combinational circuits.
4. Outline the design of synchronous and asynchronous sequential circuits.
5. Write a VHDL Coding for digital circuits

Unit	Description	Instructional Hours
I	**DIGITAL SYSTEM** Binary Numbers - Octal - Hexa Decimal and other base numbers - Number base conversions - complements - signed binary numbers - Floating point number representation - binary codes - error detecting and correcting codes - digital logic gates - Boolean algebra - basic theorems - Boolean functions - canonical and standard forms	9
II	**MINIMIZATION OF LOGIC CIRCUITS** Gate - Level Minimization and combination circuits - K-Map Methods - Three Variable - Four Variable - Five Variable - sum of products - product of sums Simplification - Don't care conditions - NAND and NOR implementation and other two level implementation.	9
III	**COMBINATIONAL LOGIC CIRCUITS** Design Procedure - Combinational circuit for different code converters and other problems - Binary Adder - subtractor - Multiplier - Magnitude Comparator - Decoders - Encoders - Multiplexers - Demultiplexers	9
IV	**SYNCHRONOUS AND ASYNCHRONOUS SEQUENTIAL CIRCUITS** Latches - Flip-flops - analysis of clocked sequential circuits - design of counters – Up counters -Down counters - Ripple counters - Registers - Shift registers - Synchronous Counters - Asynchronous Sequential Circuits: Reduction of state and flow tables - Race free state assignment	9
V	**VHDL AND PROGRAMMABLE LOGIC DEVICES** RTL Design - combinational logic - Sequential circuit - Operators - Introduction to Packages - Subprograms - Test bench. (Simulation / Tutorial Examples: adders, counters, flip-flops, FSM, Multiplexers / Demultiplexers) - Introduction to Programmable Logic Devices: PROM - PLA - PALS	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply knowledge of various number systems and simplify the logical expressions using Boolean functions.
CO2: Evaluate the concepts and minimization of logic circuits.
CO3: Develop combinational circuits.
CO4: Design and analysis of synchronous and asynchronous sequential circuits.
CO5: Build VHDL program for adders, counters, flip-flops, FSM, Multiplexers / De-multiplexers.

TEXT BOOKS:

T1 - Raj Kamal, ' Digital systems-Principles and Design', Pearson Education 2nd edition, 2007.
T2 - M. Morris Mano, 'Digital Design with an introduction to the VHDL', Pearson Education 2013.

REFERENCE BOOKS:

R1 - Anand Kumar, "Fundamentals of Digital Circuits, Prentice Hall of India, 2013.
R2 - John F.Wakerly, 'Digital Design Principles and Practices", 4th edition , Prentice Hall of India Learning Private Ltd 2006.
R3 - Albert Paul Malvino Donald P.Leach,"Digital Principles and Applications, 4th edition, Tata Mc Graw-Hill 1994.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4204	POWER PLANT INSTRUMENTATION	3	0	0	3

Course Objective

1. Discuss the types of various methods of power generation.
2. Analyse the parameter for monitoring and controlling power plant.
3. Distinguish the various control loops available in boiler.
4. Discuss the operation of turbines and various control methods.
5. Interpret the operation of nuclear power plants.

Unit	Description	Instructional Hours
I	**METHODS OF POWER GENERATION** Power generation - types - importance of instrumentation in power generation - basic building block for all types of power generation plants – Piping and Instrumentation diagram (P&I)- cogeneration.	9
II	**PARAMETERS OF POWER PLANT AND ITS MEASUREMENT** Electrical and non electrical parameter measurement - correction factor for steam temp and steam pressure - drum level measurement - radiations detector - smoke density measurement - dust monitor - speed vibration, shell temperature monitoring and control.	9
III	**CONTROL LOOPS IN BOILER** Combustion Control-air/fuel ratio control - furnace draft control - main steam and reheat steam temperature control - super heater control - attemperator - deaerator control - distributed control system in power plants - Furnace safety interlocks and interlocks in boiler operation. Trimming of combustion air - Soot blowing. Burner management - Coal pulverizer control - Boiler types	9
IV	**TURBINE MONITORING AND MEASUREMENT** Types of steam turbines - Turbine protection measurement - Speed measurement - Free governor mode operation - Automatic Load-Frequency Control - Turbine oil system - Oil pressure drop relay - Oil cooling system - Turbine run up system.	9
V	**RENEWABLE POWER GENERATION** Solar energy resource - Solar sites and land resources - Solar power generation technologies - Solar thermal power generation - Photovoltaic devices - Cost of solar power - Wind resources - Wind turbine technology - Wind turbine anatomy - Offshore wind turbine technology - Wind farms - Environmental effects of wind power - Wind intermittency and grid issues - Wind capacity limits – Repowering - Cost of wind power	9
	Total Instructional Hours	**45**

Course Outcome

CO1 : Outline the various methods of power generation.
CO2 : Correlate the important measurement of various parameters instruments associated with power plants.
CO3 : Identify the appropriate control loop in boilers.
CO4 : Appraise the process involved in the operation of turbines.
CO5 : Outline the operation of nuclear power plants.

TEXT BOOKS:

T1 - Jain. R.K, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 1995.
T2 - Sam Dukelow. G "The control of Boilers", Instrument Society of America, 1991.

REFERENCE BOOKS :

R1 - Elonka. S.M and Kohan. A.L, "Standard Boilers Operations", McGraw Hill, New Delhi, 1994.
R2 - S.N. Singh, "Electrical Power Generation, Transmission and Distribution", Prentice Hall of India, 2011.
R3 - Chattopadhyay. P , " Boiler Operation Engineering", Tata McGraw Hill Education, 2000.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4205	INDUSTRIAL INSTRUMENTATION-I	3	0	0	3

Course Objective

1. Infer the concepts of Speed, Force and Torque measurements in instrumentation.
2. Discuss the methods of Acceleration, Vibration, Density and Viscosity measurements.
3. Illustrate various pressure measurement instruments.
4. Demonstrate various temperature measuring instruments.
5. Outline the methods used for the measurement of temperature.

Unit	Description	Instructional Hours
I	**MEASUREMENT OF SPEED, FORCE AND TORQUE** Speed - Measurement of speed - moving iron and moving coil type - AC and DC tacho generators, photo electric pickup - stroboscope - Force - Measurement of force - Load cell, pneumatic and hydraulic load cell - Torque - Measurement of torque - Strain gauge, relative regular twist.	9
II	**MEASUREMENT OF ACCELERATION, VIBRATION, DENSITY AND VISCOSITY** Accelerometers - LVDT, piezoelectric, and variable reluctance type accelerometers Mechanical type vibration instruments - Seismic instrument as an accelerometer and vibrometer - Calibration of vibration pick-ups Units of density, specific gravity and viscosity used in industries - Baume scale, API scale - Pressure head type densitometer - Float type densitometer - Ultrasonic densitometer - Bridge type gas densitometer - Viscosity terms - Saybolt viscometer Rotameter type.	9
III	**MEASUREMENT OF PRESSURE** Units of pressure - Manometers - different types - Elastic type pressure gauges - Bourdon tube, bellows, diaphragms - Electrical methods - Measurement of vacuum-McLeod gauge, thermal conductivity gauges, Ionization gauge - flapper-nozzle assembly, Dead weight tester - Calibration and selection of pressure gauges.	9
IV	**MEASUREMENT OF TEMPERATURE** Temperature scales - bimetallic thermometer - filled-in thermometer - Electrical method of measurement - RTD - 3wire and 4 wire RTD, Thermistor, Thermocouples, laws of thermocouple, cold junction compensation, special techniques for measuring high temperature using thermocouples - thermal well - Radiation methods of temperature measurement - Pyrometers - radiation pyrometer and optical pyrometers - Calibration and selection of thermal sensing meters.	9
V	**THERMOCOUPLE AND RADIATION PYROMETER** Thermocouples - Laws of thermocouple, Fabrication of industrial thermocouples, Signal conditioning for thermocouple, isothermal block reference junctions, Commercial circuits for cold junction compensation, Response of thermocouple, Special techniques for measuring high temperature using thermocouple, Radiation fundamentals, Radiation methods of temperature measurement, Total radiation pyrometers, Optical pyrometers, Two colour radiation pyrometers - Fiber optic sensor for temperature measurement.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret the measurement of Speed, Force and Torque in instrumentation
CO2: Classify the Instruments used for measurement of Acceleration, Vibration, Density and Viscosity
CO3: Choose the instruments used for the measurement of pressure
CO4: Design temperature measuring instruments
CO5: Identify the methods used for the measurement of temperature

TEXT BOOKS:

T1 - E.O. Doebelin, "Measurement Systems – Application and Design", Tata McGraw Hill Ltd., 2003.
T2 - R.K. Jain, "Mechanical and Industrial Measurements", Khanna Publishers, New Delhi, 1999.

REFERENCE BOOKS :

R1 - D. Patranabis, "Principles of Industrial Instrumentation", Tata McGraw Hill Ltd.,1996.
R2 - A.K. Sawhney and P. Sawhney, "A Course on Mechanical Measurements, Instrumentation and Control", Dhanpat Rai and Co, 2004.
R3 - S.K. Singh, "Industrial Instrumentation and Control", Tata McGraw Hill, 2003.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4001	ELECTRICAL MACHINES LABORATORY	0	0	4	2

Course Objective

1. Apply the knowledge gained to conduct load test on D.C machines.
2. Exposed to the load test on single and three phase induction motor.
3. Familiar with the operation of starters.

Expt. No.	Description of the Experiments
1.	a. Open circuit characteristics of D.C. shunt generator. b. Load characteristics of D.C. shunt generator
2.	Load test on D.C. shunt motor.
3.	Load test on D.C. series motor.
4.	Load test on D.C. Compound motor.
5.	Swinburne's test
6.	Speed control of D.C. shunt motor.
7.	Load test on single phase transformer
8.	a. Open circuit test on single phase transformer b. Short circuit test on single phase transformer
9.	Load test on single phase induction motor.
10.	Load test on three phase induction motor.
11.	a. No load test on three phase induction motor b. Blocked rotor test on three phase induction motor
12.	Study of starters

Total Practical Hours **45**

Course Outcome

CO1: Demonstrate the principle of DC generators, DC motors.
CO2: Explain the principle and to conduct test on transformers.
CO3: Validate suitable test to compute the characteristics of motors.
CO4: Establish suitable experiments on generators.
CO5: Demonstrate about starting methods of motors.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI4002	LINEAR AND DIGITAL INTEGRATED CIRCUIT LABORATORY (COMMON TO EIE AND EEE)	0	0	4	2

Course Objective

1. Impart the knowledge on Boolean function, code converter and D to A.
2. Analyze the functions of encoder and decoder, multiplexer and shift register.
3. Design the functions and characteristics of Op- amp.

S.No	Description of the Experiments
	DIGITAL LOGIC CIRCUITS
1.	Implementation of Boolean Functions, Adder/ Subtractor circuits.
2.	Code converters: Excess-3 to BCD and Binary to Gray code converter and vice-versa.
3.	Encoders and Decoders.
4.	Multiplexer and De-multiplexer.
5.	Shift Register and Ring Counter.
	ANALOG CIRCUITS
6.	Astable and Monostable multivibrator and using IC 555 timer
7.	Performance characteristics of Op-amp IC.
8.	D/A and A/D Converter.
9.	Application of Op-Amp: Inverting and Non-Inverting amplifier.
10	Application of Op-Amp: Adder and Subtractor.
11.	Application of Op-Amp: Differential amplifier, Integrator and Differentiator
12.	Study of VCO and PLL ICs.
	Total Practical Hours 45

Course Outcome

CO1: Implement the Boolean function and analyze the performance of code conversion.
CO2: Evaluate the functions of D to A converter, encoder and decoder.
CO3: Understand the performance of multiplexer, shift register and ring counters.
CO4: Analyze the performance of Op-amp IC.
CO4: Assimilate the knowledge on VCO and PLL ICS.

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SYLLABUS

Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5201	INDUSTRIAL INSTRUMENTATION - II	3	0	0	3

Course Objective

1. Outline the types of variable head type flow meters.
2. Discuss the different types of flow meters.
3. Illustrate the working of electrical type flow meters.
4. Classify the different level measurement techniques.
5. Observe the measurement techniques of viscosity, humidity and moisture content.

Unit	Description	Instructional Hours
I	**VARIABLE HEAD TYPE FLOW METERS** Measurement of Flow - Variable Head Type Flow meters - Orifice plate - venture tube - Flow Nozzle - Dall Tube - Installation of Head flow meters - Pitot tube.	9
II	**QUANTITY METERS, AREA FLOW METERS AND MASS FLOW METERS** Differential pressure transmitters - Quantity meters - Inferential flow meters - variable area flow meters - Mass flow meters - Open Channel flow measurement - Calibration of Flow meters - selection of flow meters.	9
III	**ELECTRICAL TYPE FLOW METERS** Electromagnetic flow meter - Ultrasonic flow meters - Solid flow measurement - vortex shedding flow meter - Flow switches - Anemometer.	9
IV	**LEVEL MEASUREMENT** Float-Type level Indicators - Level measurement using displacer and torque tube - Air purge system - boiler drum level measurement - Electrical methods - Radiometric method - Ultrasonic sensors - Solid level measurement.	9
V	**MEASUREMENT OF VISCOSITY, HUMIDITY AND MOISTURE** Basics of Viscosity measurement - Saybolt viscometer - Rotameter viscometer- Consistency meters - measurement of Humidity - Dry and Wet Bulb Psychrometers - Dew-point Hygrometers - moisture measurement in solids.	9
	Total Instructional Hours	45

Course Outcome

CO1: Categorise variable head type flow meters.
CO2: Summarise the different types of flow meters.
CO3: Demonstrate the electrical characteristics used in flow meters.
CO4: Analyse the level measurement techniques for different applications.
CO5: Prioritize the different measuring meters for viscosity, humidity and moisture.

TEXT BOOKS:

T1 - D.Patranabis, "Principles of Industrial Instrumentation", 3rd Edition, Tata McGraw Hill, New Delhi, 2010.
T2 - K.Krishnaswamy, S.Vijayachitra, "Industrial Instrumentation", Second Edition, New Age International Publishers, 2010.

REFERENCE BOOKS:

R1 - B.G.Liptak, "Instrumentation Engineers Handbook (Measurement)", CRC Press, 2005.
R2 - S.K.Singh., "Industrial Instrumentation and Control", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2009.
R3 - Eckman, D.P., "Industrial Instrumentation", CBS Publishers and Distributer Pvt Limited, 2004.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5202	ANALYTICAL INSTRUMENTATION	3	0	0	3

Course Objective

1. Understand various methods of analysis in electromagnetic spectrum.
2. Study important methods of analysis of in chromatography.
3. Introduce pollution monitoring instruments.
4. Infer the knowledge about pH meters.
5. Gain knowledge about Microscopic techniques.

Unit	Description	Instructional Hours
I	**COLORIMETRY AND SPECTROPHOTOMETRY** Elements of Analytical Instruments - Beer-Lambert law - Colorimeters - Single and double beam filter photometer - Multi-channel photometer - IR Spectrophotometers - Basic components - Types - FTIR spectrophotometers - Flame photometers - Atomic absorption and emission spectrophotometers.	9
II	**CHROMATOGRAPHY** Liquid Chromatography - Types - Column chromatography - Thin layer Chromatography - Paper partition Chromatography-Applications - High pressure liquid chromatography. Gas chromatography - Basic parts - Chromatographic column - Sources - Detectors - Thermal conductivity detector, Flame-ionization detector - Flame photometric detector-Atomic emission detector.	9
III	**INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS** Types of gas analyzers - Paramagnetic oxygen analyzer, IR gas analyzer, Thermal conductivity analyzer - Gas density analyzer - Ionization of gases. Air pollution due to Co, So_2, No_2 analyzers, Dust and smoke measurements.	9
IV	**pH METERS AND DISSOLVED COMPONENT ANALYZERS** Principle of pH measurement - Hydrogen electrode, Glass electrode, Reference electrode - Selective Ion electrode, ammonia electrodes - Biosensors - Dissolved oxygen analyzer - Sodium analyzer - Silicon analyzer.	9
V	**NUCLEAR MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES** Principle of NMR - types - Construction and applications - Electron spin resonance spectroscopy - components. Scanning Electron Microscope (SEM) - Basic principles, Instrumentation and applications. Transmission Electron Microscope (TEM) - Basic principles, Instrumentation and applications. Mass spectrometers - Types and applications.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the principle of Spectrophotometers
CO2: Identify liquid and gas chromatographic techniques
CO3: Gain knowledge about gas analyzers and pollution monitoring system
CO4: Analyze pH measurements and dissolved gas components
CO5: Explain the principle of nuclear magnetic resonance and microscopic techniques

TEXT BOOKS:

T1 - R.S. Khandpur, "Handbook of Analytical Instruments", McGraw Hill Education (India) Private Limited, Third edition, 2015.
T2 - Robert D.Braun, "Introduction to Instrumental Analysis", PharmaMed Press/BSP books, Second edition, 2012.

REFERENCE BOOKS:

R1 - Bela G. Liptak, "Process Measurement and Analysis", Volume I, CRC Press, Forth edition, 2003.
R2 - G.W. Ewing, "Instrumental Methods of Analysis", Mc Graw Hill, 2004
R3 - James Keeler, "Understanding NMR Spectroscopy", Second Edition John Wiley & Sons, 2010.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5203	MICROPROCESSORS AND MICROCONTROLLERS (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Infer the fundamental components of 8085 architecture.
2. Discuss the assembly language programming with simple examples.
3. Integrate the concept of peripheral's interfacing with assembly language programming.
4. Explain the fundamental architecture of 8051 microcontroller and its programming concepts.
5. Propose the architecture study of advance microprocessors and microcontrollers.

Unit	Description	Instructional Hours
I	**ARCHITECTURE AND MEMORY INTERFACING OF 8085 PROCESSOR** Functional Block Diagram - Pinouts and signals - Memory Interfacing - I/O ports and Interfacing Concepts - Timing Diagram - Interrupts.	9
II	**PROGRAMMING OF 8085 PROCESSOR** Instruction format, Data Transfer, Arithmetic & Logic, Branch, Machine Control Instructions- Addressing Modes - Writing Assembly Language Programming: Loop Structure with Counting & Indexing - Look up table - Stack and Subroutine Instructions Stack-Sample Programs.	9
III	**PERIPHERAL INTERFACING** Study of Architecture and Programming of Peripheral IC's:8255 PPI, 8259 PIC, 8251 USART,8279 Keyboard Display Controller and 8253 Timer/ Counter - 8237 DMA - Interfacing with 8085:A/D & D/A converter.	9
IV	**MICROCONTROLLER 8051** Difference between Microprocessor and Microcontroller - Functional Block Diagram - Pinouts and Signals - Memory Organization - Interrupt Structure - Timer - I/O Ports and Data Transfer concepts - Serial Communication.	9
V	**MICROCONTROLLER PROGRAMMING & APPLICATIONS** Instruction Format - Addressing modes - Simple Programming Exercises - Interfacing: Keyboard and Display, Closed Loop Control of Servo Motor, Stepper Motor, Washing Machine Control. Study of Architecture of PIC Microcontroller, Arduino, Beagle bone, Raspberry pi modules.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Interpret architecture of 8085 microprocessor and 8051 microcontroller
CO2: Observe the programming concept involved in 8085 & 8051.
CO3: Discuss the commonly used peripheral/ interfacing IC's with its programming.
CO4: Outline on simple programming skill for 8051 and its applications.
CO5: Employ the role of advanced microcontrollers & it's module in an embedded industries.

TEXT BOOKS:

T1 - Krishna Kant, "Microprocessors and Microcontrollers", Prentice Hall of India, New Delhi, 2007.
T2 - Muhammad Ali Mazidi, Janice G. Mazidi "The 8051 Microcontroller and Embedded System", Pearson Education, 2003.

REFERENCE BOOKS:

R1 - R.S. Gaonkar, "Microprocessor Architecture Programming and Application", Penram International Publishing Private limited, 5th edition 2010.
R2 - N.K.Srinath, "8085 Microprocessor Programming and Interfacing", Prentice Hall of India, Pvt Ltd, 2010.
R3 - N.Senthil Kumar, M.Saravanan, S.Jeevananthan, "Microprocessors and Microcontrollers" Oxford press, 2013.
R4 - William Kleitz, "Microprocessor and Microcontroller: Fundamental of 8085 and 8051 Hardware and Software" Pearson Education, 1998.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5204	CONTROL SYSTEMS (COMMON TO EIE AND EEE)	3	1	0	4

Course Objective

1. State the different methods of system representations and transfer function models for various systems.
2. Discuss time response system analysis.
3. Explain about frequency response system analysis.
4. Establish methods of stability analysis and controller compensators.
5. Outline advanced and sampled data control systems.

Unit	Description	Instructional Hours
I	**CONTROL SYSTEMS AND THEIR REPRESENTATIONS** Basic elements in control system; Systems and their representation – Open and closed loop systems – Transfer Function models – Mechanical Translational, Rotational systems – Electrical systems – Analogies – mechanical and Electrical analogous systems – Synchros – AC and DC servomotors.	12
II	**TIME RESPONSE ANALYSIS** Block diagram representation, Construction, Block diagram reduction techniques – Signal flow graphs – Standard test signals – Order of a system – impulse, step response of first order systems – second order system(under damped and critically damped) – Time domain specifications – Type Number of control system –Static Error constants – Steady state error.	12
III	**FREQUENCY RESPONSE ANALYSIS** Frequency response –Advantages – Frequency domain specifications, Types – Bode plot – Polar plot – M and N circles – Correlation between frequency and time domain specifications.	12
IV	**STABILITY AND COMPENSATOR DESIGN** Characteristics equation – Routh Hurwitz criterion – Relative and conditional stability, Root locus concept, construction, stability criterion. Effects of P,PI,PID controller modes of feedback control – Compensator – Types – Lag, lead and lag-lead networks – Lag-Lead compensator design using Bode plot.	12
V	**STATE MODELS AND SAMPLED DATA SYSTEMS** Concept of state and state models – State models for linear and time invariant Systems – State model of Armature and Field control system – Concept of Controllability and Observability. Introduction to digital control system, Introduction of Digital Controllers (Qualitative Treatment only).	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Apply basic knowledge for modeling of mechanical, electrical control systems
CO2: Deduct the different order systems with various inputs and their response
CO3: Estimate the various frequency domain specifications by phase analysis
CO4: Investigate the open and closed loop control systems stability and stability corrections
CO5: Develop a state models and discrete control systems for any application

TEXT BOOKS:

T1 - Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Learning Private Ltd, 5th Edition, 2010.
T2 - I.J.Nagrath and M.Gopal, "Control System Engineering," New Age international (P) Ltd, New Delhi, 2006.

REFERENCE BOOKS :

R1 - Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Prentice Hall of India, 2012.
R2 - M.Gopal, "Digital Control and State Variable Methods", Tata McGraw-Hill, New Delhi, 2003.
R3 - Nagoor Kani A " Control Systems Engineering," RBA publications, Chennai, 2006

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16IT5231	OBJECT ORIENTED PROGRAMMING USING JAVA (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Describe the concepts of Object Oriented Programming
2. Impart the fundamental concepts of core JAVA.
3. Enable the students to gain programming skills in JAVA.
4. Know how to handle exceptions.
5. Understand multithread programming logic

Unit	Description	Instructional Hours
I	**INTRODUCTION** Object oriented programming concepts – objects-classes- methods and messages-abstraction and encapsulation-inheritance- abstract classes- polymorphism-Overview of Object Oriented System Development –Object basics-Class hierarchy-UML	9
II	**OVERVIEW OF JAVA LANGUAGES** Basics of Java programming, Data types, Variables and Arrays, Operators, Control structures – Classes, Objects and Methods- access specifiers – static members –Constructors-this keyword-finalize method	9
III	**PACKAGES AND INTERFACES** Inheritance– Method Overriding- Abstract class-final keyword- Java API Packages –Naming conventions-creating, accessing, using Packages-Hiding classes- Interfaces: Multiple inheritance-defining, extending, implementing interfaces	9
IV	**EXCEPTION HANDLING** Fundamentals-Exception types –Uncaught exceptions-Using try and catch-Multiple Catch-Nested try-Throws-Finally-Built in Exceptions-Throwing own exceptions	9
V	**MULTITHREAD PROGRAMMING** Creating Threads- Extending thread class-Stopping and Blocking Thread-Life cycle –Using Thread-Thread Exceptions-Thread priority-Synchronization-Runnable Interface-Inter thread communications	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Understand the concepts of OOPs
CO2: Design the syntax, semantics and classes in Java language
CO3: Analyze object inheritance and its use.
CO4: Apply various types of Exception handling
CO5: Implement the use of multithread programming.

TEXT BOOKS:

T1 - Herbert Schild, "Java The Complete Reference", Eighth Edition, McGraw Hill, 2011.
T2 - Ali Bahrami, "Object Oriented Systems Development", Pearson Education, 2008.

REFERENCE BOOKS :

R1 - E Balagurusamy, "Programming with JAVA", Fifth Edition, McGraw Hill, 2015.
R2 - Michael Blaha, JamesRumbaugh, "Object-Oriented Modeling and Design With UML", Second Edition, Pearson Education, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5001	MICROPROCESSORS AND MICROCONTROLLERS LABORATORY (COMMON TO EIE AND EEE)	0	0	4	2

Course Objective

1. Discuss the assembly language programming with simple examples.
2. Integrate the concept of peripheral's interfacing with assembly language programming.
3. Propose the concepts of industrial drive interfacing concepts with programming.

Expt. No.	Description of the Experiments
1.	Simple arithmetic operations: d. 8-bit addition/subtraction/multiplication/division. e. 16 bit addition/subtraction.
2.	Programming with control instructions: a. Sorting Operations. b. Largest/ Smallest of given numbers. c. Code conversions.
3.	Programming using Rotate and Complement instructions.
4.	Generation of waveforms by interfacing D/A.
5.	Conversion of Analog signal to digital code with A/D interfacing.
6.	Traffic light controller.
7.	Keyboard and 7-segment display interface with 8279.
8.	Interface the stepper motor to perform clockwise and anti-clock wise rotation.
9.	Demonstration of basic function with 8051 microcontroller execution, including a. Conditional jumps b. Calling subroutines.
10.	Programming Practices with 8085 Simulators.
11.	Generation of PWM signal using timer and counter with 8051.
12.	Study on a. Raspberry pi/ Arduino based interfacing b. Stepper motor interfacing

Total Practical Hours 45

Course Outcome

CO1: Outline the 8085 architecture and its programming execution.
CO2: Implement interfacing knowledge with different applications.
CO3: Discriminate the programming concepts of 8051 with 8085.
CO4: Simplify the assembly language programming to text based programming with open source compiler.
CO5: Interpret the programming relevant to industrial applications.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5002	INDUSTRIAL INSTRUMENTATION LABORATORY	0	0	4	2

Course Objective

1. Analyze various measurement schemes that meet the desired specifications and requirements.
2. Interpret the principles of level and flow measurements.
3. Demonstrate various bio medical equipments.

Expt. No.	Description of the Experiments
1.	Discharge coefficient of a. Orifice plate. b. Venturi Tube. c. Pitot Tube.
2.	Testing of pressure gauge using dead weight tester.
3.	Measurement of viscosity of test solutions.
4.	Characteristics of vacuum pressure measurement.
5.	Level measurement using d/p transmitter and capacitance based level measurement.
6.	Measurement of absorbance and transmittance of test solutions using UV – Visible spectrophotometer.
7.	pH meter standardization and measurement of pH values of solutions.
8.	Measurements of conductivity of test solutions.
9.	Study of Control valve characteristics.
10.	ECG and pulse rate measurement.
11.	Respiration rate and blood pressure measurement using oscillometric method
12.	Study of EEG measurement.

Total Practical Hours 45

Course Outcome

CO1: Illustrate the characteristics of Pressure, Temperature, flow, level, density and viscosity measurements.
CO2: Analyze the measured value for displaying or controlling the physical variables
CO3: Categorise different field instruments for different applications.
CO4: Demonstrate the principles involved in different measuring techniques.
CO5: Examine the bio medical related measuring devices.

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Programme	Course Code	Name of the course	L	T	P	C
B.E.	16IT5031	OBJECT ORIENTED PROGRAMMING LABORATORY (COMMON TO EIE AND EEE)	0	0	4	2

Course Objective

1. Get a clear understanding of object-oriented concepts.
2. Write java programs to solve mathematics, science and engineering problems.
3. Identify compile time and runtime errors, syntax and logical errors
4. Import the essentials of java class library and user defined packages.
5. Make the students to write programs using multithreading concepts and handle exceptions

Expt. No.	Description of the Experiments
	Simple Java Applications
1.	Understanding References to an Instant of a Class
2.	Handling Strings
3.	Concept of class and arrays
4.	Constructor
5.	Overloading and overriding
6.	Inheritance
7.	Developing interfaces- multiple inheritance, extending interfaces
8.	Creating and accessing packages
	Threading
9.	Creation of Threading
10.	Multi-Threading
	Exception Handling Mechanism in Java
11.	Implementing Predefined Exceptions
12.	Implementing User Defined Exceptions
	Total Practical Hours **45**

Course Outcome

CO1: Gain the basic knowledge on Object Oriented concepts.
CO2: Ability to develop applications using Object Oriented Programming Concepts.
CO3: Ability to implement features of object oriented programming to solve real world problems.
CO4:Demonstrate simple applications using java
CO5:Implementing various java applications using multithread programming

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6201	PROCESS CONTROL	3	1	0	4

Course Objective

1. Define the basic concept of mathematical modeling of any physical process.
2. Observe the characteristics of various controller actions and its form.
3. Illustrate the various types of final control elements in process control.
4. Establish an evaluation criterion and different controller tuning methods.
5. Build a multi loop control schemes for suitable applications.

Unit	Description	Instructional Hours
I	**PROCESS MODELING AND DYNAMICS** Introduction to Process control - Need for process control - Degrees of freedom - Mathematical model of Flow, Level, Pressure and Thermal processes - Interacting and non-interacting systems - Continuous and batch processes - Self regulation - Servo and regulatory operations - Heat exchanger - CSTR - Linearization of nonlinear systems.	12
II	**CONTROL ACTIONS AND CONTROLLERS** Characteristic of on-off, proportional, single speed floating, integral and derivative controllers - P+I,P+D and P+I+D control modes - Electronic PID controller, controller design problems - Auto/manual transfer–Reset Wind-up and prevention - Derivative and Proportional kick - Bumpless transfer, Practical forms of PID Controller.	12
III	**FINAL CONTROL ELEMENTS** I/P converter - Pneumatic and electric actuators - Valve Positioner - Control Valves - Characteristic of Control Valves:- Inherent and Installed characteristics - Valve body:- Commercial valve bodies - Types - Control valve sizing - Cavitation and flashing - Selection of control valves.	12
IV	**CONTROLLER TUNING** Evaluation Criteria - IAE, ISE, ITAE and ¼ decay ratio - Tuning: - Process reaction curve method, Ziegler-Nichols method, Tyreus-Luyben method and Damped oscillation method - Determination of optimum settings for mathematically described processes using frequency response approach – Autotuning- Design of Hybrid-PID:Motor Control.	12
V	**MULTILOOP PROCESS CONTROL** Feed-forward control - Ratio control - Cascade control - Inferential control - Split-range and introduction to multivariable control - MIMO systems, Examples - IMC - Model Predictive Control - Adaptive control. Case Studies: Distillation column - Boiler drum level control - P&ID diagram.	12
	Total Instructional Hours	**60**

Course Outcome

CO1: Develop a mathematical model for any process control systems.
CO2: Classify the different controller modes and its design methodologies.
CO3: Distinguish the valves, positioner and their operation on environment.
CO4: Choose a proper tuning method for P, I, D controllers and capable to simulate them.
CO5: Implementing conventional control architectures with advanced multi-loop technique with piping and instrumentation diagrams.

TEXT BOOKS:

T1 - Stephanopoulos. G, "Chemical Process Control - An Introduction to Theory and Practice", Prentice Hall of India, 2008.

T2 - D. P. Eckman, "Automatic Process Control", 7th Edition, John Wiley, New York, 1958.

REFERENCE BOOKS:

R1 - Johnson .C.D, "Process Control Instrument Technology", 8th Edition, Pearson Education, 2006.

R2 - Bequette. B.W,"Process Control Modeling, Design and Simulation", Prentice Hall of India, 2004.

R3 - Krishnaswamy.K, "Process Control", New Age International Publishers, 2015.

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Programme	Course code	Name of the Course	L	T	P	C
B.E.	16EI6202	APPLIED VLSI DESIGN	3	0	0	3

Course Objective

1. Infer the basic concepts of CMOS technology.
2. Recall the concepts of combinational logic circuits.
3. Relate the fundamentals of sequential logic circuits.
4. Implement the chip design using programming devices.
5. Write VHDL program for digital circuits.

Unit	Description	Instructional Hours
I	**CMOS TECHNOLOGY** Fabrication Technology - Electrical Properties of CMOS Circuits - Scaling Principles and Fundamental Limits - Layout Design Rules - Stick Diagram	9
II	**COMBINATIONAL LOGIC CIRCUITS** Examples of Combinational Logic Design - Elmore's Constant, Pass Transistor Logic - Transmission Gates - Static and Dynamic CMOS Design - Power Dissipation - Low Power Design Principles	9
III	**SEQUENTIAL LOGIC CIRCUITS** Static and Dynamic latches and registers - Timing Issues - Pipelines, Clock Strategies - Memory Architecture and Memory Control Circuits - Low Power Memory Circuits	9
IV	**IMPLEMENTATION STRATEGIES** Full custom and Semi Custom Design, Standard Cell Design and Cell Libraries - FPGA Building Block Architecture - FPGA Interconnect Routing Procedures	9
V	**VHDL PROGRAMMING** RTL Design - Combinational Logic Types - Operators - Packages - Sequential circuits - Subprograms - Test Benches (Adders, Flip flop, Counters, FSM, Multiplexer, Demultiplexer)	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Explain the fabrication of basic CMOS circuit.
CO2: Design combinational logic circuits.
CO3: Demonstrate sequential CMOS logic circuits.
CO4: Establish digital system using FPGA.
CO5: Build VHDL programming for digital circuits.

TEXT BOOKS:

T1 - Weste and Harris,"CMOS VLSI Design", Pearson Education,4th Edition,2005
T2 - Charles. H, Roth, "Digital System Design using VHDL", Thomson learning, 2004.

REFERENCE BOOKS :

R1 - N.Weste, K.Eshraghian, "Principles of CMOS VLSI Design", Second Edition, Addison Wesley 2000.
R2 - R.Jacob Baker, Harry W.LI., David E.Boyee, "CMOS Circuit Design, Layout and Simulation", Prentice Hall of India, 2005.
R3 - A.Pucknell, Kamran Eshraghian, "BASIC VLSI Design", Third Edition, Prentice Hall of India, 2007.

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Programme	Course code	Name of the Course	L	T	P	C
B.E.	16EI6203	DISCRETE TIME AND SIGNAL PROCESSING	3	0	0	3

Course Objectives

1. Enumerate signals, systems, time and frequency domain concepts.
2. Recall the concepts of z-transforms.
3. Interpret fundamental mathematical tools of DSP techniques.
4. Classify digital filters for processing of discrete time signals.
5. Categorize programmable digital signal processor and its applications.

Unit	Description	Instructional Hours
I	**SIGNALS AND SYSTEMS** Introduction - Classification of Discrete time signals and systems - analysis of discrete-time linear time - invariant systems - discrete time systems described by difference equations - implementation of discrete time systems- correlation - Sampling and quantization.	9
II	**DISCRETE TIME SYSTEM ANALYSIS** Definition - properties of z-transform - rational z transform - region of convergence - inverse z - transform - computation of the convolution sum of finite length sequences - analysis of linear time invariant systems in the z domain - one sided z transform - Frequency analysis of discrete time signals.	9
III	**DISCRETE FOURIER TRANSFORM AND COMPUTATION** DFT - properties - IDFT -convolution- overlap add and save method - Efficient computation of the DFT using Radix - 2 FFT algorithms - Decimation in time - Decimation in frequency.	9
IV	**DESIGN OF DIGITAL FILTERS** Design of IIR filters - characteristics of commonly used analog filters - Butterworth and Chebyshev filters - digital design using impulse invariant and bilinear transformation. Design of FIR filters - Symmetric and Antisymmetric FIR filters - Windowing techniques - Structures realization of digital filters.	9
V	**DIGITAL SIGNAL PROCESSORS** General and special purpose digital signal processors - Introduction to programmable DSPs - Architecture of TMS320C5X - assembly language instructions - instruction pipelining in C5x - application programs in C5x - DSP applications.	9
	Total Instructional Hours	45

Course Outcomes

CO1: Understand about discrete time signals and systems.
CO2: Demonstrate the use of z transforms for signal processing applications.
CO3: Apply mathematical tools for all DSP techniques.
CO4: Analyse linear digital filters both FIR and IIR using different techniques and their associated structures.
CO5: Illustrate the selection of DSP processors for different applications.

TEXT BOOKS:

T1 - J.G. Proakis and D.G. Manolakis, "Digital Signal Processing Principles, Algorithms and Applications", Fourth Edition, Prentice Hall of India Learning Private Limited, 2008.
T2 - B.Venkataramani, M.Bhaskar, "Digital Signal Processors – Architecture, Programming and Applications", Tata McGraw Hill,2003.

REFERENCE BOOKS:

R1 - Andreas Antonious, "Digital Signal Processing – Signals, Systems and Filter", Tata McGraw Hill , 2006.
R2 - Emmanuel C. Ifeachor, Barrie W.Jervis, "Digital Signal Processing, a practical approach", Pearson Education, 2004.
R3 - S.K. Mitra, "Digital Signal Processing", Third Edition, Tata McGraw Hill, 2006.
R4 - Alan V.Oppenheim,Ronald W.Schafer with John R.Buck, "Discrete Time Signal Processing", 2nd Edition, Pearson Education, 2009.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6204	EMBEDDED SYSTEMS (COMMON TO EIE AND EEE)	3	0	0	3

Course Objective

1. Illustrate the design procedure and standards of embedded system
2. Describe the interfacing network components of embedded system.
3. Discussion of embedded system design technology with various modeling.
4. Review of embedded system design policies via RTOS.
5. Make use of embedded system for developing a real time system application.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO EMBEDDED SYSTEMS** Introduction to Embedded Systems - Design process of embedded systems - Structural units in embedded processor, Selection of processor & memory devices - Direct Memory Access - Memory management methods - Timer and Counter, Watchdog Timer, Real Time Clock.	9
II	**EMBEDDED NETWORKING** Introduction, I/O Device Ports & Buses - Serial Bus communication Protocols - UART-RS232 standard - RS422/ RS485 - CAN Bus -Serial Peripheral Interface (SPI) - Inter Integrated Circuits (I^2C) - USB - Parallel Device Protocols - Need for device drivers.	9
III	**EMBEDDED PRODUCT DEVELOPMENT ENVIRONMENT** Embedded Product Development Life Cycle(EDLC) - Objectives, Different Phases of EDLC, Computational models of EDLC- Data Flow Graph, State Machine Model, Sequential Program Model, Concurrent Model, Object Oriented Model - Hardware - software Co-design - issues - Embedded system design technology.	9
IV	**REAL-TIME OPERATING SYSTEM** Introduction to basic concepts of RTOS - Task, process & threads - Interrupt Service Routines, Multiprocessing and Multitasking, Preemptive and Non - preemptive scheduling, Context switching, Task communication- shared memory, message queue - synchronization between processes-semaphores, Mailbox, pipes. Real Time Operating systems: Vx Works, MUCOS-II.	9
V	**EMBEDDED SYSTEM APPLICATION** Case Study: Automatic Chocolate Vending Machine (ACVM), Digital Camera, Mobile phone, Washing Machine, Smart card System Application.	9
	Total Instructional Hours	**45**

Course Outcome

CO1. Infer knowledge about various embedded development Strategies.
CO2. Illustrate the bus/ network communication among processor and I/O interfacing.
CO3. Abstract various multiprocessing scheduling algorithms.
CO4. Explanation of basic knowledge of various RTOS and their feature.
CO5. Employ the role of embedded system on various real-time application.

TEXT BOOKS:

T1 - Rajkamal, 'Embedded System-Architecture, Programming and Design', Tata McGraw Hill, 3rd Edition, 2015.
T2 - Peckol, "Embedded system Design", John Wiley & Sons, 2010.

REFERENCE BOOKS :

R1 - Shibu. K.V, "Introduction to Embedded Systems", Tata Mc Graw Hill, 2009.
R2 - Elicia White," Making Embedded Systems", O' Reilly Series, 2011.
R3 - Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6001	PROCESS CONTROL LABORATORY	0	0	4	2

Course Objective

1. Apply the knowledge gained in control of various physical systems.
2. To be exposed to the design of multi loop process control
3. To be familiar with the working of P, PI, PID Controllers and Tuning.
4. To experimentally verify the design and implementation of controllers for various physical processes

Expt. No.	Description of the Experiments

Simulation Based Experiments:

1. Response of First Order and Second order Systems with and without transportation lag.
2. Response of Second Order System with and without PID Controller.
3. Design and tuning of PID controller using Ziegler-Nichols and Cohen-Coon Method.
4. Modeling and control of Single/Two capacity level process .
5. Design and Implementation of Practical Forms of PID Controller on the simulated model of a Typical Industrial Process.
6. Auto-tuning of PID Controller of a typical Industrial Process.

Hardware Based Experiments (Experiments carried out on the skid mounted plants):

7. (i) Study of a Process Control Training plant.
   (ii) Study the characteristic of Step and Impulse response of Interacting and Non-interacting systems.
8. Characteristics of Pneumatically Actuated Control Valve (with and without Positioner).
9. (i)Closed loop control of Level process for Servo and Regulator Operation.
   (ii) Closed loop control of Flow process for Servo and Regulator Operation.
10. Closed loop control of Pressure process for Servo and Regulator Operation.
11. Closed loop control of ON/OFF controlled Thermal process.
12. (i)Design and implementation of Complex Control system (Ratio/Cascade/Feed forward).
    (ii) Study of AC and DC drives.

Total Practical Hours 45

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6002	VIRTUAL INSTRUMENTATION LABORATORY	0	0	4	2

Course Objective

1. Observe the basic graphical programming knowledge using Lab VIEW platform.
2. Make use of data acquisition concept to interface real time instruments.
3. Design the programming for process control and other applications.

Expt. No.	Description of the Experiments
1.	Verification of Arithmetic and Boolean operations.
2.	Program to find Addition of first "n" natural numbers using FOR and WHILE loop.
3.	Implementation of Array functions.
4.	Implementation of Cluster functions.
5.	Program for implementing Seven segment displays.
6.	Program to perform Traffic light control.
7.	Generation of Waveform and its measurements.
8.	Design of Low and High Pass Filter using MULTISIM.
9.	Using NI ELVISmx , Design and verify the characteristics of a. Rectifier. b. Differentiator. c. Integrator circuit.
10.	Signal Generation Using NI-DAQmx, Frequency analysis.
11.	Program to control Temperature by using Thermocouple and DAQ.
12.	Program for controlling the speed of a DC motor using PID tool box.

Total Practical Hours **45**

Course Outcome

CO1 : Discuss about basic concepts of virtual instrumentation and its programming.
CO2 : Generalize the graphical programming knowledge with data flow concept.
CO3 : Compose the data acquisition concepts for interfacing real-instrument.
CO4 : Transform the circuit simulation concept to the hardware implementation using NI MULTISIM and ELVISmx.
CO5 : Evaluate the process control applications with graphical programming environment.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6701	TECHNICAL SEMINAR	0	0	2	1

Course Objective

1. Develop self knowledge skills of utilizing various resources for a technical presentation.
2. Appraise technical presentation ability and communication skills.
3. Motivate the commitment approach to complete tasks.

During the seminar session each student is expected to prepare and present a topic on their respective area of interest on engineering/technology, for about 8 to 10 minutes. In a session of two periods per week, 15 students are expected to present the seminar. Each student is expected to present at least twice during the semester.

At the end of the semester, he/she shall submit a report on his/her topic of seminar and a three member Departmental Committee constituted by Head of the Department will evaluate the presentation, report and conduct viva voce examination to award marks appropriately.

Course Outcome

CO1: Highlight technical ideas, strategies and methodologies
CO2: Choose a real world problem, identify the requirement and extend the presentation
CO3: Manipulate the recent tools and teaching aids in their presentation topics.
CO4: Explain their ideas with confidence
CO5: Validate the acquired knowledge through oral presentations and report submission

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5301	THERMAL POWER PLANT INSTRUMENTATION	3	0	0	3

Course Objective

1. Identify the sources of thermal energy generation.
2. Understand the process involved in steam power generation and it's impact on environment.
3. Outline the operation of various equipments involved in the generation of steam.
4. Design various control loops in boiler.
5. Analyze the operation and plot the performance characteristics of turbines.

Unit	Description	Instructional Hours
I	**FUELS AND COMBUSTION** Sources of Chemical Energy - Availability of Fuels-Characteristics of Coal - Other Solid Fuels-Petroleum and Natural Gas - Principles of Combustion - Combustion Calculations - Design Aspect of Burner - Flame Stability - Design Aspects of Furnace.	9
II	**STEAM POWER PLANT CYCLES AND ITS IMPACT ON ENVIRONMENT** Laws of Thermodynamics-Carnot Cycle - Stirling Cycle-Ericsson Cycle - Rankine Cycle - Kalina Cycle-Binary Vapor Cycle - Impact of Performance Parameter on Economics of Generation-Impact of Performance Parameter on the Environment	9
III	**STEAM GENERATORS AND BOILERS** Boiling and Circulation- Design-Classification and Utilization- Boiler Mounting and Accessories - Superheaters and Reheaters - Economizers - Air Heaters - Insulation - Supercritical Boilers - Pulverized Coal-Fired Boilers - Fluidized - Bed Combustion Boilers	9
IV	**CONTROL LOOPS IN BOILER** Combustion Control-air/fuel ratio control - furnace draft control - main steam and reheat steam temperature control - super heater control - attemperator - deaerator control - distributed control system in power plants - interlocks in boiler operation - Trimming of combustion air - Soot blowing - Combustion control for liquid and solid fuel fired boiler.	9
V	**TURBINE MONITORING AND CONTROL** 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.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the knowledge acquired to design the equipments involved in thermal power generation.
CO2: Summarize the process involved in steam power generation and it's impact on environment.
CO3: Outline the operation of equipments involved in the generation of steam.
CO4: Assess the performance of various control loops in boiler.
CO5: Appraise the operation of turbines.

TEXT BOOKS:

T1 - Dipak Sarkar, "Thermal Power Plant", Elsevier, 2015
T2 - Sam Dukelow. G "The Control of Boilers", Instrument Society of America, Second Edition 1991.

REFERENCE BOOKS:

R1 - Mukopadhyaya, "Operation and Maintenance of Thermal Power Plants", Springer, 2016.
R2 - Elonka. S.M, and Kohan. A.L, "Standard Boilers Operations", McGraw Hill, New Delhi, 1994.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI5302	DIGITAL SYSTEM DESIGN	3	0	0	3

Course Objective

1. Recall the concepts of combinational circuit design
2. Relate the fundamentals of sequential circuit design
3. Interpret programmable logic devices and memory
4. Summarize the concepts of digital system design
5. Infer the fundamental concepts of verilog

Unit	Description	Instructional Hours
I	**COMBINATIONAL CIRCUIT DESIGN** Introduction - Analysis and design procedures for Multiplexers - Demultiplexers - Encoders - Decoders - Code converters - comparators	9
II	**SEQUENTIAL CIRCUIT DESIGN** Analysis of clocked synchronous sequential circuits and modeling - State diagram, state table, state table assignment and reduction - Design of synchronous sequential circuits - Design of Asynchronous sequential circuits	9
III	**DESIGNING WITH PROGRAMMABLE LOGIC DEVICES AND MEMORY** Read only memory - Principles and design considerations of specific PROMS,EPROMS, SRAMS, and SDRAMS, PLA's ,PAL's - Other sequential programmable logic devices	9
IV	**DIGITAL SYSTEM DESIGN CASE STUDIES** Multiphase clock generators - digital FIR design using TTL/CMOS IC's - PRBS generator, digital PLL's - DRAM controller design - LED/LCD display controller and other examples.	9
V	**INTRODUCTION TO VERILOG** Verilog as HDL - Levels of Design Description - Concurrency - Gate level modeling - Data flow Modeling - Behavioral Modeling - Test benches.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Apply the concepts of combinational circuit in a digital system
CO2: Demonstrate sequential circuit design
CO3: Design with programmable logic devices for applications
CO4: Apply the acquire knowledge in digital system design
CO5: Build VHDL/Verilog code for combinational and sequential circuits

TEXT BOOKS:

T1 - Charles. H, RothJr, "Digital System Design using VHDL", Thomson learning.2004.
T2 - Floyd,"Digital "Fundamentals with PLD Programming", Prentice Hall of India.,2006.

REFERENCE BOOKS :

R1 - Charles. H, RothJr, "Fundamentals of Logic Design", Cengage Learning.,2010.
R2 - Donald D.Givone, "Digital Principles and Design", Tata McGraw–Hill., 2007.
R3 - Morris Mano. M, "Digital Design", 3rd edition, Pearson Education, 3rd edition,2007.

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Programme	Course code	Name of the Course	L	T	P	C
B.E.	16EI5303	DIGITAL IMAGE PROCESSING	3	0	0	3

Course Objective

1. Interpret the fundamentals of digital image.
2. Infer the basics of image enhancement technique.
3. Apply the image filtering and restoration technique.
4. Perform the image reconstruction process.
5. Analyze the image compression standards.

Unit	Description	Instructional Hours
I	**DIGITAL IMAGE FUNDAMENTALS** Digital Image Representation - Elements of Digital Image Processing system - Elements of Visual Perception - Image Sampling and Quantization - Relationship between Pixels - Color Models.	9
II	**IMAGE ENHANCEMENT** Spatial Domain: Point Operation, Histogram Modelling, Basics of Spatial Filtering - Smoothing and Sharpening Spatial Filter - Multispectral Image Enhancement.	9
III	**IMAGE FILTERING AND RESTORATION** Image Observation Models - Mean Filters - Inverse and Wiener Filtering - Segmentation: Edge and Boundary Detection - Morphological Processing - Erosion and Dilation- Watershed Algorithm.	9
IV	**IMAGE RECONSTRUCTION** Random Transform - Reconstruction from Blurred Noisy Projection, Fourier Reconstruction - Fan Beam Reconstruction - Three Dimensional Tomography.	9
V	**IMAGE DATA COMPRESSION** Fundamentals of Coding - Pixel Coding ,Shannon's coding, Huffman Coding, Variable Length Coding - Image Compression Standards - JPEG, MPEG Standards.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Summarize the fundamentals of digital image processing.
CO2: Apply the spatial and multispectral enhancement techniques in a image.
CO3: Construct the segmentation algorithm for restoration of digital image.
CO4: Establish the image reconstruction techniques.
CO5: Assess the encoding process and image compression standards.

TEXT BOOKS:

T1 - Anil Jain.K "Fundamentals of Digital Image Processing", Prentice Hall of India Learning Pvt.Ltd,2011.
T2 - Rafeal C. Gonzalez, Richard E. Woods "Digital Image Processing" Third Edition, Pearson Education, 2010.

REFERENCE BOOKS :

R1 - S.Jayaraman, E.Esakkirajan and T.Veerkumar, "Digital Image Processing" Tata McGraw Hill Education Private Ltd, 2009.
R2 - Willliam K Pratt, "Digital Image Processing", John Willey, 2002.

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Programme	Course code	Name of the Course	L	T	P	C
B.E.	16EI5304	COMMUNICATION ENGINEERING	3	0	0	3

Course Objective

1. Interpret the basic concepts involved in amplitude modulation.
2. Discuss about the angle and discrete modulation systems.
3. Analyze the source code information theory and coding techniques.
4. Discuss the multiple access techniques involved in wire and wireless Communication.
5. Categorize the different modes of communication systems.

Unit	Description	Instructional Hours
I	**AMPLITUDE MODULATION** Introduction - Amplitude Modulation - Generation of AM waves - DSB- DSB/SC – SSB -VSB - AM Transmitter - AM Receiver - TRF, Super Heterodyne Receivers.	9
II	**ANGLE AND DISCRETE MODULATION SYSTEMS** Introduction to Phase Modulation - Frequency Modulation - Introduction - Frequency Spectrum of FM wave - Types of FM Generation of FM - Amstrong Method & Reactance Modulations, Introduction to Pulse Modulation – PAM,PWM,PPM - Sampling and Quantization - Comparisons of Pulse Modulation Technique.	9
III	**INFORMATION THEORY AND CODING** Primary Communication - Entropy - Shannon Fano Coding - Huffman Coding - Line Encoding - BW-SNR Trade Off Codes - Error Control Codes: Convolution Codes and Linear Block Codes.	9
IV	**MULTIPLE ACCESS TECHNIQUE** SS&MA techniques : FDMA - TDMA - CDMA - SDMA - Application in Wire and Wireless Communication - Advantages.	9
V	**SATELLITE AND OPTICAL FIBER COMMUNICATION** Introduction to Satellite Communication - Types of Satellite Orbits - Satellite Earth Station - Multiple Access in Satellite Communication - Introduction to Optical Communication - Optical fiber link - Optical Fiber Modes and Configuration - Light Sources and Detectors.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Describe the concept and generation methods involved in amplitude modulation system.
CO2: Compare the phase, frequency and pulse modulation techniques.
CO3: Determine the amount of information in a high bit rate transmission.
CO4: Elaborate the multiple access techniques involved in communication.
CO5: Innovate various medium for digital communication.

TEXT BOOKS:

T1 - Taub & Schilling," Principles of Communication Systems", Tata McGraw Hill 2007.
T2 - Theodore S Rappaport, "Wireless Communications", Second Edition, Pearson Education, 2011.

REFERENCE BOOKS :

R1 – Sklar,"Digital Communication Fundamentals and Applications", Pearson Education, 2001.
R2 - Wilbur L.Pritchard, Henri G.Suyderhoud, "Satellite Communication Systems Engineering" Pearson Education, Second Edition, 2011.
R3 - R.P.Khare, "Fiber Optics and Optoelectronics", Oxford University Press, 2008.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6301	INDUSTRIAL ELECTRONICS	3	0	0	3

Course Objective

1. Discuss the operation of power semiconductor devices and their switching characteristics
2. Design controlled converter circuits.
3. Differentiate the operation of various chopper circuits.
4. Analyse the operation of inverter circuits for 120° mode and180° mode operation.
5. Classify AC to AC converter circuits based on it's operation.

Unit	Description	Instructional Hours
I	**POWER SEMICONDUCTOR DEVICES** Power Diode, SCR, TRIAC, GTO, BJT, MOSFET, IGBT - Static and Dynamic characteristics - Triggering and commutation circuit for SCR - Design of Driver and snubber circuit.	9
II	**PHASE CONTROLLED CONVERTERS** 2 pulse, 3 pulse and 6 pulse converters - performance parameters - Effect of source inductance - Dual converters - steady state analysis	9
III	**DC TO DC CONVERTER** Step down and step up chopper - control strategy - Commutation in choppers - Switched mode regulators - Buck, Boost, Buck- Boost converter - Resonant Converters and its topologies	9
IV	**INVERTERS** Inverters Basics - PWM techniques - Single phase and Three Phase Voltage Source Inverters (120° mode and180° mode) - Current Source Inverter - Voltage and Harmonic Control - Space Vector Modulation techniques for inverters .	9
V	**AC TO AC CONVERTERS** Single phase and Three Phase AC voltage controllers - Control Strategy - Power Factor Control - Multistage Sequence Control - Single Phase and Three Phase Cyclo Converters - Matrix Converters.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Outline the operation of power semiconductor devices and their switching characteristics.
CO2: Illustrate the operation of power electronic rectifier circuits.
CO3: Identify the appropriate chopper circuit for various applications.
CO4: Choose the appropriate mode of operation of inverter.
CO5: Compile the operation of AC to AC converters.

TEXT BOOKS:

T1 - M. H .Rashid, "Power Electronics: Circuits, Devices and Applications", Pearson Education, Third Edition, New Delhi, 2004.
T2 - P. S. Bhimbra "Power Electronics", Khanna Publishers, Third edition, 2003.

REFERENCE BOOKS :

R1 – Joseph Vithayathil, "Power Electronics, Principles and Applications", McGraw Hill , 6th Reprint, 2013.
R2 - Ned Mohan, Tore. M. Undel and, William. P. Robbins, "Power Electronics: Converters, Applications and Design", John Wiley and sons, Third Edition, 2003.
R3 - M. D. Singh and K.B. Khanchandani, "Power Electronics," McGraw Hill India, 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6302	BIOMEDICAL INSTRUMENTATION	3	0	0	3

Course Objective

1. Recall fundamentals of biomedical systems.
2. Discuss about the communication mechanics involved in biomedical system with few examples.
3. Outline the measurement of certain important non-electrical parameters.
4. Infer the basic principles in medical imaging techniques.
5. Generalize about life assisting and therapeutic devices.

Unit	Description	Instructional Hours
I	**PHYSIOLOGY AND TRANSDUCERS** Cell and its structure - Resting and Action Potential - Nervous system - synapse - transmitters and neural communication - Basic components of a biomedical system - Transducers - selection criteria Tremor Measuring Instruments - Radiation Thermometry.	9
II	**ELECTRO – PHYSIOLOGICAL MEASUREMENTS** Electrodes - Limb electrode - pregelled disposable electrodes - Micro, needle and surface electrodes - Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers. ECG – EEG – EMG – ERG - Lead systems and recording methods - Typical waveforms.	9
III	**NON-ELECTRICAL PARAMETER MEASUREMENTS** Measurement of blood pressure - Cardiac output - Heart rate - Heart sound - spirometer - Body Plethysmography - Blood Gas analysers: pH of blood –measurement of blood pCO2, pO2, finger-tip oxymeter - ESR, GSR measurements.	9
IV	**MEDICAL IMAGING AND TELEMETRY** X-ray machine, echocardiography - CT - MRI - Ultrasonography Endoscopy - Gamma camera - Thermography - Different types of biotelemetry systems Retinal Imaging - Imaging application in Biometric systems - Analysis of digital images.	9
V	**ASSISTING AND THERAPEUTIC EQUIPMENTS** Pacemakers - Defibrillators - Ventilators - Nerve and muscle stimulators - Diathermy - Heart - Lung machine - Audio meters - Dialyzers - Lithotripsy - Robotic surgery - orthopedic prostheses fixation.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Summarize the concepts of physiology and transducers
CO2: Choose different electro-physiological measurements techniques
CO3: Apply the measurement techniques of non-electrical parameters
CO4: Elaborate the basic principles in imaging techniques
CO5: Experiment the basic knowledge in life assisting and therapeutic devices

TEXT BOOKS:

T1 - R.S.Khandpur, "Hand Book of Bio-Medical instrumentation", Tata McGraw Hill, 2003.
T2 - R.Ananda Natarajan, "Biomedical Instrumentation and Measurements", Second edition, Prentice Hall of India Learning Private Ltd., 2016.

REFERENCE BOOKS:

R1 - M.Arumugam, "Bio-Medical Instrumentation", Anuradha Publications, 2003.
R2 - L.A. Geddes and L.E.Baker, "Principles of Applied Bio-Medical Instrumentation", John Wiley & Sons, 1975.
R3 - J.Webster, "Medical Instrumentation", John Wiley & Sons, 1995.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6303	ADVANCED CONTROL THEORY	3	0	0	3

Course Objective

1. Recall the basics of state and state models.
2. List the methods of sampling and its stability tests.
3. Illustrate about non-linear systems.
4. Establish phase plane analysis on control systems.
5. Interpret about stability analysis of linear and non-linear systems.

Unit	Description	Instructional Hours
I	**STATE VARIABLE REPRESENTATION** Introduction to state concept - state equation of linear continuous time systems, matrix representation of state equations. Phase variable and canonical forms of state representation - state transition matrix - Controllability - Observability, State feedback design via pole placement technique.	9
II	**SAMPLED DATA CONTROL SYSTEMS** Sampling process - Z transform method - pulse transfer function - analysis of the sampling process - data reconstruction and hold circuits - zero order hold circuit - Sampling theorem. Stability of sampled data system - Jury's test, Bilinear Transformation.	9
III	**NONLINEAR SYSTEMS** Introduction - characteristics of nonlinear systems. Types of non-linearity -Analysis through Linearization about an operating point - harmonic linearization - Stability analysis by describing Method - application of describing function for stability analysis of autonomous system with single nonlinearity.	9
IV	**PHASE PLANE ANALYSIS** Concept - Construction of phase trajectories for nonlinear systems and linear systems with static nonlinearities - Singular points - Classification of singular points - Limit cycle - simple variable structure system.	9
V	**STABILITY ANALYSIS** Definition of stability - asymptotic stability and instability, Equilibrium points - BIBO and relative stability - Lyapunov stability criteria – Lyapunov methods to stability of linear and nonlinear systems, continuous and discrete time systems.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Develop the state space model and state feedback design for advanced control systems.
CO2: Manipulate the sampled data control systems and discrete control systems.
CO3: Classify the linear/non-linear system theory and their representations.
CO4: Constructing the phase plane trajectories for various nonlinear systems.
CO5: Evaluate advanced control system problems using various stability criterion.

TEXT BOOKS:

T1 - Katsuhiko Ogata, "Modern Control Engineering", Prentice Hall of India Learning Pvt Ltd, 5th Edition,2010.
T2 - Hassan K. Kahalil, "Non-linear Systems", Pearson Education, 2002.

REFERENCE BOOKS :

R1 - B.C.Kuo, "Automatic Control Systems", Prentice Hall of India Pvt. Ltd., New Delhi,1998.
R2 - M.Gopal, "Digital Control and State Variable Methods", Tata McGrawHill, New Delhi,2003.
R3 - A.Nagoor Kani "Advanced Control System", 2nd Edition, RBA publications, 2014.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6304	INSTRUMENTATION IN PETROCHEMICAL INDUSTRIES	3	0	0	3

Course Objective

1. Interpret the process involved in oil extraction.
2. Categorize the petroleum refining process.
3. Discuss the various products available from petroleum
4. Classify the control loops available in petrochemical industry.
5. Observe various safety instrumentation systems available in petrochemical industry.

Unit	Description	Instructional Hours
I	**OIL EXTRACTION AND PROCESSING** Techniques used for oil discovery - seismic survey - methods of oil extraction - oil rig system – Primary and Secondary recovery - Enhanced oil recovery - separation of gas and water from oil – control loops in oil gas separator - scrubber - coalescer.	9
II	**PETROLEUM REFINING PROCESS** Petroleum refining process - unit operations in refinery - thermal cracking - catalytic cracking - catalytic hydrocracking - catalytic reforming - polymerization - isomerization - alkylation - Production of ethylene, acetylene and propylene from petroleum	9
III	**CHEMICALS PRODUCTS FROM PETROLEUM** Chemicals from methane, acetylene, ethylene and propylene - production process of polyethylene, polypropylene, ethylene dioxide, methanol, xylene, benzene, toluene, styrene, VCM and PVC	9
IV	**CONTROL LOOPS IN PETROCHEMICAL INDUSTRY** 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	9
V	**SAFETY IN INSTRUMENTATION SYSTEMS** Area and material classification as per National Electric Code (NEC) - Classification as per International Electro technical Commission (IEC) - Techniques used to reduce explosion hazards - Pressurization techniques - Intrinsic safety - Mechanical and Electrical isolation - Lower and Upper explosion limit	9
	Total Instructional Hours	**45**

Course Outcome

CO1. Outline the process involved in oil extraction.
CO2. Outline the methods of oil refining.
CO3. Discuss the various products available from petroleum industry.
CO4. Identify the appropriate control loop existing in the petrochemical industry.
CO5. Appraise various safety instrumentation systems existing in petrochemical industry.

TEXT BOOKS:

T1 - Ram Prasad, "Petroleum Refining Technology", Khanna Publishers, New Delhi, 2000.
T2 - J.H.Gary, J.E.Handwork, M.J.Kaiser, "Petroleum Refining (Technology and Economics)", CRC Press,
2007.

REFERENCE BOOKS:

R1 - B.G.Liptak, "Instrumentation in Process Industries", Chilton Book Company, 2005.
R2 - A.L.Waddams, "Chemicals from Petroleum", Butter and Janner Ltd., 2000.
R3 - Oil and Gas Production Handbook, ABB, 2013.

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Programme	Course Code	Name of the Course	L	T	P	C
B.E.	16EI6401	NEURAL NETWORKS AND FUZZY SYSTEMS	3	0	0	3

Course Objective

1. Introduce about artificial neural networks.
2. Classify on various neural network architectures and its training algorithms.
3. To learn about fuzzy systems.
4. Gain knowledge about fuzzy logic control design.
5. Build application based on neural network and fuzzy control systems.

Unit	Description	Instructional Hours
I	**INTRODUCTION TO NEURAL NETWORKS** Introduction to Artificial Neural Networks-Differences between biological and artificial neural networks - Typical architecture - Common activation functions - Learning Rules and Learning Methods of ANN - McCulloch-Pitts network - Perceptron - Single layer and Multi layer Feed forward network.	9
II	**NEURAL NETWORK ARCHITECTURES AND ALGORITHMS** Feedback networks - Back propagation neural net - Algorithm and Applications - Discrete time hop field networks - Self organising maps - Counter propagation - Architecture - Algorithm and applications - Adaptive Resonance Theory.	9
III	**INTRODUCTION TO FUZZY SYSTEMS** Introduction to Fuzzy logic - Properties and operations on classical sets and fuzzy sets - Crisp and fuzzy relations - Cardinality - Features of membership function - Standard forms and boundaries - Fuzzification - Membership value assignments - Lambda cuts for fuzzy sets and relations - De-fuzzification methods.	9
IV	**FUZZY LOGIC CONTROL** Membership function - Fuzzy Rules - Knowledge base - Rule base - Decision making logic - Fuzzy Inference system - Optimizations of membership function using neural networks - Adaptive fuzzy systems - ANFIS.	9
V	**APPLICATIONS OF NEURAL NETWORKS AND FUZZY LOGIC** Applications of neural networks: Pattern recognition - Image compression – Communication - Control systems - Applications of fuzzy logic: Fuzzy pattern recognition - Fuzzy image compression – Washing machine.	9
	Total Instructional Hours	**45**

Course Outcome

CO1: Infer the concepts of feed forward neural networks.
CO2: Summarize the various neural networks architectures and its training algorithms
CO3: Discover the concept of fuzziness involved in various systems and fuzzy set theory.
CO4: Implement the fuzzy logic control mechanism and adaptive fuzzy logic systems for suitable control problems.
CO5: Design the neural network/fuzzy logic control for real time applications.

TEXT BOOKS:

T1 – Laurene V. Fausett, "Fundamentals of Neural Networks", Pearson Education, New Delhi, 2004.
T2 - Timothy J Ross, "Fuzzy Logic with Engineering Applications", John Willey and Sons, 2005.

REFERENCE BOOKS:

R1 - Kosko, B, "Neural Networks and Fuzzy Systems: A Dynamical Approach to Machine Intelligence", Prentice Hall of India, 2004.
R2 - Zimmerman H.J., "Fuzzy set theory and its Applications", Allied Publishers, 2001.
R3 - Jack M. Zurada, "Introduction to Artificial Neural Systems", PWS Publishing Co, 2002.
R4 - Klir G J and Folger T "Fuzzy Sets, Uncertainty and Information", Prentice Hall of India, 2002.

Chairman - BoS
EIE - HiCET

Dean (Academics)
HiCET

Hindusthan College of Engineering And Technology
Approved by AICTE, New Delhi, Accredited with 'A' Grade by NAAC
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Coimbatore - 641032

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

ACDEMIC YEAR 2018-2019

REGULATIONS 2016

CO'S, PO'S & PSO'S MAPPING

SEMESTER I

16MA1101-Engineering Mathematics-I

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

16PH1101-Engineering Physics

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	3	2	3	3	-	-	-	-	-	-	1	1
CO2	3	2	3	3	3	-	-	-	-	-	-	-	1	1
CO3	3	2	3	3	3	3	-	-	-	-	-	-	1	2
CO4	3	2	3	1	2	-	2	-	-	-	-	-	1	1
CO5	3	2	-	1	2	-	-	-	-	-	-	-	2	1
Avg	3	2	3	2	2.6	-	2	-	-	-	-	-	1.2	1.2

16CY1101-Engineering Chemistry

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

16HE1101R -Essential English for Engineers –I

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	1	-	-	-	-	1	1	-	-	3	-	1	-	-
CO2	1	1	-	2	-	2	1	-	2	3	-	2	-	1
CO3	1	-	1	-	-	3	-	-	2	3	-	1	-	1
CO4	1	1	1	1	-	1	1	-	2	3	-	2	-	-
CO5	1	-	1	1	-	2	1	-	-	3	-	2	1	1
Avg	1	1	1	1.3	-	1.8	1	-	2	3	-	1.6	1	1

16GE1103-Problem Solving and Python Programming

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	2	1	1	-	-	-	-	2	2	3
CO2	3	2	2	-	2	1	-	-	-	-	-	2	2	3
CO3	3	2	2	-	2	1	1	-	-	-	-	2	3	3
CO4	3	2	2	2	2	1	-	-	-	-	-	2	3	3
CO5	3	2	2	-	2	1	-	-	-	-	-	2	3	3
Avg	3	2	2	0.4	2	1	0.2	-	-	-	-	2	3	3

16ME1201-Basics of Civil and Mechanical Engineering

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

16GE1002-Engineering Practices Laboratory

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

16GE1004 - Problem Solving and Python Programming Lab

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	2	1	2	-	-	-	-	2	2	3
CO2	3	2	2	-	2	1	2	-	-	-	-	2	2	3
CO3	3	2	2	1	2	1	2	-	-	-	-	2	2	3
CO4	3	2	2	2	2	1	2	-	-	1	-	2	2	3
CO5	3	2	2	-	2	1	1	-	-	-	-	2	2	3
Avg	3	2	2	0.6	2	1	2.4	-	-	0.2	-	2	2	3

SEMESTER II

16MA2102 -Engineering Mathematics-II

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

16PH2102-Physics of Materials

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	1	1	1	-	-	-	-	-	-	1	1
CO2	3	3	1	1	2	-	-	-	-	-	-	-	2	1
CO3	3	2	1	2	2	-	-	-	-	-	-	-	3	2
CO4	3	3	1	2	2	1	-	-	-	-	-	-	1	1
CO5	3	2	2	3	2	1	2	-	-	-	-	-	2	2
Avg	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	-	1.8	1.4

16CY2102-Environmental Science

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	-	_	_	2	3	3	2	_	2	2	2	1
CO2	2	1	1	_	_	2	3	3	2	_	2	2	2	1
CO3	2	-	-	_	_	2	3	3	2	_	2	2	2	1
CO4	2	1	2	_	_	2	3	3	2	_	2	2	2	2
CO5	2	1	2	_	_	2	3	3	2	_	2	2	2	2
Avg	2	0.6	0.8	_	_	2	3	3	2	_	2	2	2	1.2

16HE2102R -Essential English for Engineers – II

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	-	-	-	-	-	-	-	-	1	3	-	-	1	-
CO2	2	2	-	-	-	2	-	-	3	3	-	2	-	1
CO3	2	-	2	-	-	-	-	-	2	3	-	-	1	-
CO4	-	1	-	1	-	-	-	-	1	2	-	2	1	1
CO5	2	1	2	-	1	-	-	-	1	3	-	-	2	1
Avg	2	1.3	2	1	1	2	-	-	1.6	2.8	-	2	1.2	1

16GE2102-Engineering Graphics

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	-	1	-	1	-	-	1	1	1	1	2
CO2	3	3	2	1	1	-	1	-	-	1	1	1	1	2
CO3	3	3	3	-	1	1	1	-	-	1	1	-	1	1
CO4	3	3	3	1	1	2	1	-	-	1	1	1	1	1
CO5	3	3	3	1	1	3	1	-	-	1	1	1	1	1
Avg	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4

16EI2201 - Electrical Circuit Theory

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	2	-	-	-	1	-	-	-	3	3
CO2	3	3	-	-	2	-	-	-	-	-	2	-	3	3
CO3	3	2	-	2	1	-	-	-	-	-	2	-	3	3
CO4	3	2	1	2	-	-	1	2	-	-	2	-	2	2
CO5	2	2	1	-	-	-	1	-	-	-	-	-	3	3
Avg	3	2.8	0.6	0.8	1	-	0.4	0.4	0.2	-	1.2	-	2.8	3

16EI2001-Electrical Circuit Laboratory

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	2	-	-	-	1	-	-	-	3	3
CO2	3	3	-	-	2	-	-	-	-	-	2	-	3	3
CO3	3	2	-	2	1	-	-	-	-	-	2	-	3	3
CO4	3	2	1	2	-	-	1	2	-	-	2	-	2	2
CO5	2	2	1	-	-	-	1	-	-	-	-	-	3	3
Avg	3	2.8	0.6	0.8	1	-	0.4	0.4	0.2	-	1.2	-	2.8	3

SEMESTER III

16MA3103-Fourier Analysis and Statistics

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

16EI3201- Electronic Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	2	-	-	2	-	-	-	3	3
CO3	3	2	-	-	-	-	2	-	-	-	-	1	3	3
CO4	3	2	2	3	-	-	1	-	-	-	-	2	3	3
CO5	3	3	3	3	-	-	1	-	-	1	-	2	3	3
Avg	3	2.2	1.6	1.2	-	0.2	1.4	-	0.4	0.2	-	1.2	3	3

16EI3202 - Electronic Devices and Circuits

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	-	-	-	-	-	-	-	-	3	2
CO2	3	3	2	-	-	2	1	-	2	-	-	-	3	2
CO3	3	2	-	-	-	-	2	-	-	-	-	-	2	3
CO4	3	2	2	3	-	-	1	-	-	-	-	2	3	3
CO5	1	3	3	3	-	-	1	-	-	1	-	2	3	3
Avg	2.6	2.8	1.6	1.2	-	0.2	1.4	-	0.4	0.2	-	0.8	2.8	3

16EI3203 - Measurements and Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	-	1	-	1	-	-	-	-	1	3	3
CO2	3	3	2	-	-	2	1	-	-	-	-	1	3	3
CO3	3	3	2	2	-	-	1	-	-	-	-	1	3	3
CO4	3	3	2	-	-	-	1	-	-	1	1	2	3	3
CO5	3	3	3	3	1	-	1	1	-	1	-	2	3	3
Avg	3	3	2.2	1	0.4	0.4	1	0.2	-	0.4	0.2	1.4	3	3

16EI3204 - Transducer Engineering

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	1	-	1	-	-	-	-	1	3	3
CO2	3	2	2	-	-	2	1	-	-	-	-	1	3	3
CO3	3	3	2	2	-	-	1	-	-	-	-	1	2	3
CO4	3	3	2	-	-	-	1	-	-	1	-	2	3	3
CO5	3	3	3	3	1	-	1	-	-	1	-	2	3	3
Avg	3	2.8	2.2	1	0.4	0.4	1	-	-	0.4	-	1.4	2.8	3

16ME3231 - Fundamentals of Thermodynamics and Fluid Dynamics

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	1	1	1	-	-	-	-	-	1	2	3
CO2	2	3	3	1	1	-	-	-	-	-	-	1	2	3
CO3	3	3	2	2	1	1	-	-	-	-	-	1	2	3
CO4	2	3	1	1	2	2	1	-	1	-	2	1	3	2
CO5	3	3	1	1	1	3	-	-	1	-	-	1	3	3
Avg	2.6	3	1.8	1.2	1.2	1.4	0.2	-	0.4	-	0.4	1	2.2	2.8

16EI3001 - Transducer and Measurements Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	3	-	-	-	-	-	3	-	-	-	3	3
CO2	2	3	3	3	-	-	-	-	3	-	-	-	3	3
CO3	2	3	3	-	-	-	-	-	3	-	-	-	3	3
CO4	2	1	3	2	-	-	1	-	3	-	-	-	3	2
CO5	2	-	3	-	3	-	1	-	3	-	-	3	3	2
Avg	2	1.6	3	0.4	0.5	-	0.4	-	3	-	-	0.5	3	2.6

16EI3002 - Electronic Devices and Circuits Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	3	-	-	-	-	3
CO2	2	1	2	-	-	1	-	-	3	-	2	-	2	3
CO3	3	1	3	-	-	2	-	-	3	-	1	-	2	2
CO4	3	1	1	-	-	3	-	-	3	-	-	-	1	2
CO5	3	-	-	-	-	-	-	-	3	-	-	-	3	3
Avg	2.8	1.2	1	-	-	1	-	-	3	-	0.5	-	1.6	2.2

SEMESTER IV

16MA4107 – Numerical Methods

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	2	-	-	-	-	-	-	2	2	2
CO2	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO3	3	3	3	3	2	-	-	-	-	-	-	2	2	1
CO4	3	3	3	3	3	-	-	-	-	-	-	2	2	1
CO5	3	3	3	3	3	-	-	-	-	-	-	2	2	1
Avg	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2

16EI4201 - Electrical Machines

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	3	2	1	1	1	1					1	3	3
CO2	3	3	3	3	1							1	3	3
CO3	3	3	3	2	1		1		1			1	1	3
CO4	3	3	3	3	1	1	1		1			2	1	3
CO5	3	3	2	2	1						1	2	3	3
Avg	2.8	3	2.6	2.2	1	0.4	0.6		0.4		0.2	1.4	2.2	3

16EI4202 - Linear Integrated Circuits and Applications

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	1	2	-	-	2	-	-	-	-	-	-	3	3
CO3	3	1	2	2	-	-	-	-	-	-	-	-	1	3
CO4	3	1	2	-	-	-	2	-	-	-	-	2	1	3
CO5	3	3	3	3	-	-	-	-	-	-	-	2	-	3
Avg	3	2.2	2.2	2.5	-	2	0.4	-	-	-	-	2	2.2	3

16EI4203 - Digital Logic Circuits

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	1	-	1	-	-	-	-	1	3	2
CO2	3	-	2	-	-	2	1	-	-	-	-	-	3	2
CO3	-	1	2	2	-	-	1	-	-	-	-	-	1	3
CO4	3	-	2	-	-	-	1	-	-	1	-	2	1	3
CO5	1	3	3	3	1	-	1	-	-	-	-	2	1	3
Avg	2	1.2	2.2	0.5	0.4	0.4	1	-	-	0.2	-	0.5	1.8	2.6

16EI4204-Power Plant Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	-	1		1	-	1	1	1	1	-	-	2	2
CO2	-	2	2	2	1	2	1	-	-	-	-	-	2	2
CO3	2	2	2	-	1	1	1	-	1	-	-	-	2	2
CO4	2	2	2	-	1	1	1	-	-	-	1	1	2	2
CO5	-	1	2	1	1	1	1	-	-	-	1	-	2	2
Avg.	1.2	1.4	1.8	0.6	1	1	1	0.2	0.4	0.2	0.4	0.2	2	2

16EI4205- Industrial Instrumentation-I

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	-	-	-	-	-	-	-	-	-	-	3	2
CO3	-	-	-	-	-	-	-	-	-	-	-	-	-	3
CO4	3	-	-	-	-	-	-	1	2	-	-	2	-	3
CO5	1	3	3	3	-	-	-	-	-	-	-	2	-	3
Avg	2	1.2	2.2	1	-	0.4	-	0.2	0.4	-	-	0.8	1.2	2.6

16EI4001 - Electrical Machines Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	-	-	-	-	-	-	3	-	-	2	-	3
CO2	3	2	-	2	-	-	-	-	3	-	-	2	-	3
CO3	3	2	-	2	-	-	-	-	3	-	-	-	-	3
CO4	3	1	-	-	-	-	1	-	3	-	-	-	1	3
CO5	3	-	-	-	-	-	-	-	3	-	-	2	3	3
Avg	3	1.2	-	0.8	-	-	0.2	-	3	-	-	1.2	1.2	3

16EI4002 - Linear and Digital Integrated Circuits Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	-	-	3	-	-	2	-	3
CO2	2	-	2	-	-	-	-		3	-	-	2	-	3
CO3	3	-	3	2	-	-	-	-	3	-	-	-	-	3
CO4	3	-	-	-	2	-	-	-	3	-	-	-	-	2
CO5	3	-	-	2	-	-	-	-	3	-	-	2	3	3
Avg	2.8	0.4	2.5	0.8	0.4	-	-	-	3	-	-	1	0.6	2.8

SEMESTER V

16EI5201 -Industrial Instrumentation – II

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	3	3
CO2	3	2	2	2	1	-	-	-	-	-	-	1	3	3
CO3	3	2	2	2	1	-	1	-	-	-	-	1	3	3
CO4	3	2	1	2	1	-	1	-	-	1	-	1	2	3
CO5	3	3	3	2	1	-	-	-	-	1	-		2	3
Avg	3	2.2	2	2	1	-	0.4	-	-	0.4	-	0.6	2.6	3

16EI5202 - Analytical Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	-	2	-	-	2	2	-	-	-	-	-	3	3
CO3	-	1	2	2	-	-	-	-	-	-	-	-	2	3
CO4	3	-	2	-	-	-	1	-	-	1	-	2	2	3
CO5	1	3	3	3	-	-	1	-	-	-	-	2	3	3
Avg	2	1.2	2.2	1	-	0.4	1.2	-	-	0.2	-	0.8	2.6	3

16EI5203 - Microprocessors and Microcontrollers

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	1	-	1	-	-	-	-	1	2	2
CO2	3	-	2	-	-	2	1	-	-	-	-	1	2	2
CO3	2	1	2	2	-	-	1	-	-	-	-	1	2	3
CO4	3	-	2	-	-	-	1	-	-	-	-	2	2	3
CO5	2	3	3	3	1	-	1	-	1	-	-	2	2	3
Avg	2.6	1.2	2.2	1	0.4	0.4	1	-	0.2	-	-	1.4	2	2.6

16EI5204 – Control Systems

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	2	-	-	-	-	-	1	3	3
CO3	3	1	2	2	2	2	-	-	-	-	-	-	2	3
CO4	3	2	2	-	-	-	1	-	-	1	-	2	3	3
CO5	3	3	3	3	-	-	-	-	-	-	-	2	3	3
Avg	3	2.4	2.2	1	0.4	0.4	0.2	-	-	0.2	-	1.2	2.8	3

16IT5231 - Object Oriented Programming Using Java

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	2
CO2	3	-	2	-	-	2	-	-	-	-	-	-	3	2
CO3	1	1	2	2	-	-	-	-	-	-	-	-	2	3
CO4	3	-	2	-	-	-	-	-	1	-	-	2	1	3
CO5	1	3	3	3	-	-	-	-	1	-	-	2	1	3
Avg	2.2	1.2	2.2	1	-	0.4	-	-	0.4	-	-	0.6	2	2.6

16EI5001-Microprocessors and Microcontrollers Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	1	3	-	-	-	3	-	3	-	-	-	3	3
CO2	2	3	3	3	-	-	3	-	3	-	-	-	3	3
CO3	2	3	3	-	-	-	3	-	2	-	-	1	1	3
CO4	2	1	3	2	-	-	3	-	2	-	-	1	3	2
CO5	2	-	3	-	3	-	3	-	3	-	-	3	3	3
Avg	2	1.6	3	1	0.6	-	3	-	2.3	-	--	1	2.6	2.8

16EI5002 - Industrial Instrumentation Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	3	-	3	-	-	2	-	3
CO2	2	3	-	1	-	-	3	-	3	-	-	2	-	3
CO3	3	2	3	2	-	-	3	-	3	-	-	3	1	2
CO4	3	-	-	1	2	-	3	-	3	-	1	-	2	2
CO5	3	-	-	-	-	-	3	-	3	-	-	2	3	3
Avg	2.8	1.2	0.6	0.8	0.4	-	3	-	3	-	0.2	1.8	1.2	2.8

16IT5031- Object Oriented Programming Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	3	-	-	-	3	-	3	-	-	-	3	3
CO2	2	2	3	3	-	-	3	-	3	-	-	-	3	3
CO3	2	2	3	-	2	-	3	-	2	-	-	1	1	3
CO4	3	2	3	2	1	-	3	-	2	-	-	1	3	3
CO5	2	2	3	-	3	-	3	-	3	-	-	3	3	3
Avg	2.2	2	3	1	1	-	3	-	2.3	-	-	1	2.6	3

16EI5301 -Thermal Power Plant Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	1	-	1	-	1	1	1	1	-	-	2	3
CO2	3	2	2	2	1	2	1	-	-	-	-	-	2	3
CO3	3	2	2	-	1	1	1	-	1	-	-	-	3	3
CO4	3	3	2	-	1	1	2	-	-	-	1	1	3	3
CO5	3	3	2	1	1	1	1	-	-	-	1	-	3	3
Avg	3	2.6	1.8	0.6	1	1	1.2	0.2	0.4	0.2	0.4	0.2	2.6	3

16EI5302-Digital System Design

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	3	1	-	-	-	2	3	3
CO2	3	2	2	-	-	-	3	1	-	-	-	2	3	3
CO3	3	3	2	-	-	1	2	1	-	1	-	2	3	3
CO4	3	3		-	-	1	-	1	-	-	1	2	3	3
CO5	3	3	1	3	3	-	-	1	-	-	1	2	3	3
Avg	3	2.6	1.2	0.6	0.6	0.4	1.2	1	-	0.2	0.4	2	3	3

16EI5303-Digital Image Processing

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	2	-	2	-	-	-	-	3	3	3
CO2	3	2	3	2	2	-	2	-	1	-	-	3	3	3
CO3	3	2	2	3	2	-	1	-	-	-	-	3	3	3
CO4	3	3	3	3	2	-	2	-	-	1	-	3	3	3
CO5	3	3	3	3	2	-	1	-	-	1	-	2	3	3
Avg	3	2.6	2.8	2.8	2	-	1.2	-	0.2	0.4	-	2.8	3	3

16EI5304-Communication Engineering

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	2	2	1	1	1	3	1	1	-	1	2	3
CO2	3	3	2	2	1	1	1	3	1	1	-		3	3
CO3	3	3	3	3	1	1	2	3	1	3	-	1	3	3
CO4	3	3	3	3	-	-	2	3	1	3	1	-	2	3
CO5	3	2	2	2	1	-	2	3	1	1	-	-	2	3
Avg	3	3	2.4	2.4	0.8	0.8	1.4	3	1	1.8	0.4	0.6	2.2	3

SEMESTER VI

16EI6201 – Process Control

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	2	-	-	2	-	-	-	1	-	-	3	3
CO3	3	1	2	2	2	2	-	-	-	-	-	-	2	3
CO4	3	1	2	-	-	-	1	-	1	2	-	2	2	3
CO5	3	3	3	3	-	-	1	-	-	-	-	2	2	3
Avg	3	2.2	2.2	1	0.4	0.8	0.4	-	0.2	0.6	-	0.8	2.2	3

16EI6202-Applied VLSI Design

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	-	3	2	-	-	-	1	-	-	1	-	3	3
CO2	3	2	3	3	-	-	-	-	-	-	-	-	3	3
CO3	3	2	3	3	2	-	-	-	-	1	-	-	3	3
CO4	3	2	3	3	-	-	-	1	-	-	-	-	3	3
CO5	3	2	3	3	2	-	-	1	-	-	2	-	3	3
Avg	3	2	3	2.8	2	-	-	0.6	-	0.2	0.6	-	3	3

16EI6203- Discrete Time and Signal Processing

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2	2	1	-	-	-	-	-	-	-	2	2
CO2	3	2	2	2	1	-	-	-	-	-	-	-	2	3
CO3	3	2	2	2	1	-	-	-	-	1	-	-	2	3
CO4	3	3	1	2	1	-	-	1	-	1	-	-	2	2
CO5	3	1	3	2	1	-	-	-	-	-	-	-	2	2
Avg	3	2	2	2	1	-	-	0.2	-	0.4	-	-	2	2.6

16EI6204 -Embedded System

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	2										3	3
CO2	3	2	2			2							3	3
CO3	2	1	2	2									2	3
CO4	3	2	2						1			2	2	3
CO5	3	3	3	3				1	1	1		2	2	3
Avg	2.8	2.2	2.2	1		0.4		0.2	0.4	0.2		0.8	2.2	3

19EI6001 – Process Control laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	1	3				3		3			2	3	3
CO2	3	3	3	3	2		3		3				2	3
CO3	3	3	3	1	2		3		3			2	3	3
CO4	3	2	3	2	3		3		3			3	3	3
CO5	3	2	3	1	2		3		3			3	3	3
Avg	3	2.2	3	1.4	1.8		3		3			2	2.8	3

16EI6002 - Virtual Instrumentation Laboratory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	2	-	3	-	-	2	-	3
CO2	2	1	-	-	-	-	2	-	3	-	-	2	1	3
CO3	3	-	3	-	-	-	2	-	3	-	-	-	1	3
CO4	3	-	-	-	2	-	2	-	3	-	-	-	-	2
CO5	3	-	-	-	-	-	2	-	3	-	1	2	3	3
Avg	2.8	0.6	1	0.8	0.4	-	2	-	3	-	0.2	1.2	1.2	2.8

16EI6701- Technical Seminar

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	-	-	-	-	2	-	3	-	-	2	2	3
CO2	2	1	-	-	-	-	2	-	3	-	-	2	2	3
CO3	3	1	3	-	-	-	2	-	3	-	-	-	2	3
CO4	3	2	-	-	2	-	2	-	3	-	1	-	2	2
CO5	3	-	-	-	1	-	2	-	3	-	1	2	2	2
Avg	2.8	1.2	1	0.8	0.6	-	2	-	3	-	0.4	1.2	2	2.6

16EI6301-Industrial Electronics

PO & PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	-	-	-	1	-	-	-	-	-	2	3
CO2	3	3	2	-	2	-	2	-	-	-	-	-	2	3
CO3	3	2	3	-	2	-	2	-	-	-	-	-	3	2
CO4	3	3	1	-	1	-	-	-	1	-	1	-	2	3
CO5	3	2	2	-	2	-	-	-	1	-	-	-	3	3
Avg	3	2.6	2.2		1.4		1.2		0.4		0.2		2.2	2.8

16EI6302-Biomedical Instrumentation

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	2	1	-	-	-	-	-	-	-	-	1	2	3
CO2	3	3	1	-	-	-	2	-	-	-	-	2	2	3
CO3	3	3	3	-	1	-	-	-	-	-	-	1	2	3
CO4	3	2	3	2	-	-	-	-	-	-	-	1	2	3
CO5	3	3	-	-	2	-	1	-	-	-	-	2	3	3
Avg	3	2.6	2	0.4	0.6	-	1.2	-	-	-	-	1.4	2.2	3

16EI6303-Advanced Control Theory

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	3	-	-	-	2	2	3	1	3	3
CO2	3	3	2	3	2	-	-	-	2	2	3	3	3	3
CO3	3	3	1	2	3	-	1	-	2	2	1	2	3	3
CO4	2	3	3	3	3	-	-	1	2	2	3	2	3	3
CO5	3	3	1	3	3	-	-	1	3	1	3	2	3	2
Avg	2.8	3	2.2	2.8	2.8	-	0.2	0.4	2.2	1.8	2.6	2	3	2.8

16EI6304-Instrumentation in Petrochemical Industries

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	2	2	-	-	-	-	-	-	-	-	-	-	3	3
CO2	3	2	-	1	-	-	-	-	-	-	-	-	3	3
CO3	2	2	3	1	-	-	-	-	1	-	2	3	3	3
CO4	3	2	3	1	-	1	-	1	1	-		3	3	3
CO5	3	2	1	-	-	2	-	-	-	-	2	-	3	3
Avg	2.8	2	1.8	1	-	0.6	-	0.2	0.4	-	0.8	2	3	3

OPEN ELECTIVE

16EI6401-Neural Networks and Fuzzy Systems

PO& PSO	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO1	3	3	3	3	-	-			-	-	2	3	3	3
CO2	3	2	2	3	-	-			-	-	2	2	3	3
CO3	3	2	1	3	-	-	1		1	-	2	2	3	3
CO4	3	3	1	3	-	-	2		1	-	3	2	3	3
CO5	3	3	2	3	-	-			-	-	3	2	3	3
Avg	3	3	2.2	3	-	-	0.6		0.4	-	2.2	2	3	3

Chairman Board of Studies

Dean - Academics

REGULATIONS 2016

B.E ELECTRONICS AND INSTRUMENTATION ENGINEERING

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

Graduates of the programme B E Electronics and Instrumentation Engineering will

PEO 1. Graduates would have strong foundation in basic science and mathematics to formulate, analyze and solve electronics and instrumentation problems.

PEO 2. Graduates shall have good knowledge of instrumentation systems and their applications to design control and safety systems for industrial process.

PEO 3. Graduates exhibit professionalism with ethics, communication and team work to satisfy the needs of the society.

PROGRAM OUTCOMES (POs)

Engineering Graduates will be able to:

PO 1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO 2. **Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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

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 engineering activities with an understanding of the limitations.

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

PO 7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

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

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

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

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

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

PROGRAM SPECIFIC OUTCOMES (PSOs)

PSO 1. Ability to apply concepts of measurement and sensor to design, calibrate and control various process instruments using industrial automation.

PSO 2. Ability to analyze advanced electronics and instrumentation concepts required for industrial and research pursuits.

MAPPING OF CO'S, PO'S & PSO'S

COs	POs												PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**1**	**2**
I	3	3	3	3	3	3	3	3	3	3	3	3	3	3
II	3	3	3	3	3	3	3	3	3	3	3	3	3	3
III	3	3	3	3	3	3	3	3	3	3	3	3	3	3
IV	3	3	3	3	3	3	3	3	3	3	3	3	3	3
V	3	3	3	3	3	3	3	3	3	3	3	3	3	3

Hindusthan College of Engineering And Technology
Approved by AICTE, New Delhi, Accredited with 'A' Grade by NAAC
(An Autonomous Institution, Affiliated to Anna University, Chennai)
Coimbatore - 641032

DEPARTMENT OF ELECTRONICS AND INSTRUMENTATION ENGINEERING

REGULATIONS 2016

Mapping of Course Outcome and Programme Outcome:

Year	Sem	Course code & Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
I	I	16MA1101-Engineering Mathematics-I	3	3	3	2	2	-	-	-	-	-	-	2	2	2
		16PH1101-Engineering Physics	3	2	3	2	2.6	-	2	-	-	-	-	-	1.2	1.2
		16CY1101-Engineering Chemistry	3	2	2	2	2	1	-	-	-	-	-	1	1	1
		16HE1101R -Essential English for Engineers – I	1	1	1	1.3	-	1.8	1	-	2	3	-	1.6	1	1
		16GE1101-Computer Programming	3	2	2	0.4	2	1	0.2	-	-	-	-	2	3	3
		16ME1201-Basics of Civil and Mechanical Engineering	3	1	1	-	-	1	-	-	-	-	-	1	3	2
		16GE1001 -Computer Programming Lab	3	2	2	0.6	2	1	2.4	-	-	0.2	-	2	2	3
		16GE1002-Engineering Practices Laboratory	3	-	3	-	3	-	-	-	1	-	-	-	1	2
		16GE1003 - Language														

		Competency Enhancement Course-I														
	II	16MA2102 - Engineering Mathematics-II	3	3	3	2	2	-	-	-	-	-	-	2	1	2
		16PH2102-Physics of Materials	3	2.4	1.2	1.8	1.8	0.6	0.4	-	-	-	-	-	1.8	1.4
		16CY2102-Environmental Science	2	0.6	0.8	-	-	2	3	3	2	-	2	2	2	1.2
		16HE2102R -Essential English for Engineers – II	2	1.3	2	1	1	2	-	-	1.6	2.8	-	2	1.2	1
		16GE2102-Engineering Graphics	2.8	3	2.6	1	1	2	1	-	-	1	1	1	1	1.4
		16EI2201 - Electrical Circuit Theory	3	2.8	0.6	0.8	1	-	0.4	0.4	0.2	-	1.2	-	2.8	3
		16EI2001-Electrical Circuit Laboratory	3	2.8	0.6	0.8	1	-	0.4	0.4	0.2	-	1.2	-	2.8	3
		19HE2071 - Language Competency Enhancement Course-II														
II	III	16MA3103-Fourier Analysis and Statistics	3	2	3	1	2	-	-	-	-	-	-	2	3	1
		16EI3201- Electronic Instrumentation	3	2.2	1.6	1.2	-	0.2	1.4	-	0.4	0.2	-	1.2	3	3
		16EI3202 - Electronic Devices and Circuits	2.6	2.8	1.6	1.2	-	0.2	1.4	-	0.4	0.2	-	0.8	2.8	3
		16EI3203 - Measurements and Instrumentation	3	3	2.2	1	0.4	0.4	1	0.2	-	0.4	0.2	1.4	3	3
		16EI3204 - Transducer Engineering	3	2.8	2.2	1	0.4	0.4	1	-	-	0.4	-	1.4	2.8	3
		16ME3231 - Fundamentals of Thermodynamics and	2.6	3	1.8	1.2	1.2	1.4	0.2	-	0.4	-	0.4	1	2.2	2.8

		Fluid Dynamics														
		16EI3001 - Transducer and Measurements Laboratory	2	1.6	3	0.4	0.5	-	0.4	-	3	-	-	0.5	3	2.6
		16EI3002 - Electronic Devices and Circuits Laboratory	2.8	1.2	1	-	-	1	-	-	3	-	0.5	-	1.6	2.2
	IV	16MA4107 – Numerical Methods	3	3	3	3	2.6	-	-	-	-	-	-	2	2	1.2
		16EI4201 - Electrical Machines	2.8	3	2.6	2.2	1	0.4	0.6		0.4		0.2	1.4	2.2	3
		16EI4202 - Linear Integrated Circuits and Applications	3	2.2	2.2	2.5	-	2	0.4	-	-	-	-	2	2.2	3
		16EI4203 - Digital Logic Circuits	2	1.2	2.2	0.5	0.4	0.4	1	-	-	0.2	-	0.5	1.8	2.6
		16EI4204-Power Plant Instrumentation	1.2	1.4	1.8	0.6	1	1	1	0.2	0.4	0.2	0.4	0.2	2	2
		16EI4205- Industrial Instrumentation-I	2	1.2	2.2	1	-	0.4	-	0.2	0.4	-	-	0.8	1.2	2.6
		16EI4001 - Electrical Machines Laboratory	3	1.2	-	0.8	-	-	0.2	-	3	-	-	1.2	1.2	3
		16EI4002 - Linear and Digital Integrated Circuits Laboratory	2.8	0.4	2.5	0.8	0.4	-	-	-	3	-	-	1	0.6	2.8
III	**V**	16EI5201 -Industrial Instrumentation – II	3	2.2	2	2	1	-	0.4	-	-	0.4	-	0.6	2.6	3
		16EI5202 - Analytical Instrumentation	2	1.2	2.2	1	-	0.4	1.2	-	-	0.2	-	0.8	2.6	3
		16EI5203 - Microprocessors and Microcontrollers	2.6	1.2	2.2	1	0.4	0.4	1	-	0.2	-	-	1.4	2	2.6
		16EI5204 – Control Systems	3	2.4	2.2	1	0.4	0.4	0.2	-	-	0.2	-	1.2	2.8	3
		16IT5231 - Object Oriented Programming	2.2	1.2	2.2	1	-	0.4	-	-	0.4	-	-	0.6	2	2.6

		Using Java														
		16EI53XX - Professional Elective – I														
		16EI5001- Microprocessors and Microcontrollers Laboratory	2	1.6	3	1	0.6	-	3	-	2.3	-	-	1	2.6	2.8
		16EI5002 - Industrial Instrumentation Laboratory	2.8	1.2	0.6	0.8	0.4	-	3	-	3	-	0.2	1.8	1.2	2.8
		16IT5031- Object Oriented Programming Laboratory	2.2	2	3	1	1	-	3	-	2.3	-	-	1	2.6	3
	VI	16EI6201 – Process Control	3	2.2	2.2	1	0.4	0.8	0.4	-	0.2	0.6	-	0.8	2.2	3
		16EI6202-Applied VLSI Design	3	2	3	2.8	2	-	-	0.6	-	0.2	0.6	-	3	3
		16EI6203- Discrete Time and Signal Processing	3	2	2	2	1	-	-	0.2	-	0.4	-	-	2	2.6
		16EI6204 -Embedded System	2.8	2.2	2.2	1	-	0.4	-	0.2	0.4	0.2	-	0.8	2.2	3
		16EI63XX - Professional Elective – II														
		16XX64XX -Open Elective - I														
		19EI6001 – Process Control laboratory	3	2.2	3	1.4	1.8	-	3	-	3	-	-	2	2.8	3
		16EI6002 - Virtual Instrumentation Laboratory	2.8	0.6	1	0.8	0.4	-	2	-	3	-	0.2	1.2	1.2	2.8
		16EI6701-Technical Seminar	2.8	1.2	1	0.8	0.6	-	2	-	3	-	0.4	1.2	2	2.6

IV	VII	16EI7201-Computer Control of Process	2.6	1.2	2.2	1	0.4	0.8	0.4	-	0.4	-	-	0.8	2.2	2.6
		16EI7202-Industrial Data Networks	2.2	1.8	2.2	-	1.4	-	0.8	-	0.4	-	0.2	-	2	2.4
		16EI7203-Programmable Logic and Distributed Control System	2.8	2.2	2	0.4	0.6	-	0.2	-	0.4	-	-	1.4	2	2.8
		16EI73XX - Professional Elective - III														
		16EI73XX - Professional Elective - IV														
		16XX74XX -Open Elective - II														
		16EI7001-Computer Control of Process and Simulation Laboratory	2.8	1.2	1	0.8	0.6	-	0.4	-	3	-	-	1.2	1.2	2.8
		16EI7002-Instrumentation System Design Laboratory	2.8	1.2	1	0.8	0.4	-	0.4	-	2.6	-	-	1.2	1	2.8
		16EI7701-Internship / Industrial Training	3	2.8	0.6	1	0.6	1	1	0.6	1.6	-	0.2	0.8	2.8	2.2
	VIII	16EI83XX - Professional Elective - V														
		16EI83XX - Professional Elective - VI														
		16EI8901-Project Work	2.6	2	1	1.2	-	1	-	0.6	1.4	0.6	0.8	1	2.6	2.8

PROFESSIONAL ELECTIVE COURSES

Elective	Sem	Course code & Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
I	V	16EI5301-Thermal Power Plant Instrumentation	3	2.6	1.8	0.6	1	1	1.2	0.2	0.4	0.2	0.4	0.2	2.6	3
		16EI5302-Digital System Design	3	2.6	1.2	0.6	0.6	0.4	1.2	1	-	0.2	0.4	2	3	3
		16EI5303-Digital Image Processing	3	2.6	2.8	2.8	2	-	1.2	-	0.2	0.4	-	2.8	3	3
		16EI5304-Communication Engineering	3	3	2.4	2.4	0.8	0.8	1.4	3	1	1.8	0.4	0.6	2.2	3
II	VI	16EI6301-Industrial Electronics	3	2.6	2.2	-	1.4	-	1.2	-	0.4	-	0.2	-	2.2	2.8
		16EI6302-Biomedical Instrumentation	3	2.6	2	0.4	0.6	-	1.2	-	-	-	-	1.4	2.2	3
		16EI6303-Advanced Control Theory	2.8	3	2.2	2.8	2.8	-	0.2	0.4	2.2	1.8	2.6	2	3	2.8
		16EI6304-Instrumentation in Petrochemical Industries	2.8	2	1.8	1	-	0.6	-	0.2	0.4	-	0.8	2	3	3
III	VII	16EI7301-Fiber Optics and Laser Instrumentation	3	2.4	2	1	-	-	0.2	0.4	-	0.4	-	0.6	2	3
		16EI7302-Adaptive Control and System Identification	3	2.1	2	1	-	-	0.4	0.4	-	0.6	-	0.6	3	3
		16EI7303-Instrumentation in Cement and Steel	2.8	2.2	1.8	1	-	0.6	0.2	0.8	0.4	-	1.2	2	2.6	3

		Industries														
		16EI7304-Telemetry and Telecontrol	3	3	2	1	-	-	0.4	0.6	-	0.4	-	0.6	2.6	3
IV		16EI7305-Instrumentation in Paper Industries	3	2.6	2.6	1.8	1	2.6	1.4	1.4	1.4	-	-	2.2	3	3
		16EI7306-Micro Electro Mechanical Systems	3	2.6	2	2	3	-	0.2	-	-	3	-	2.6	3	3
		16EI7307-Non-Linear Control System	3	3	2.2	2.8	2.8	-	0.2	0.4	2.2	1.8	2.6	2	3	3
		16EI7308-Sensor Technology	3	3	2	2	3	-	0.4	-	-	3	0.2	2.6	2.8	3
V	**VIII**	16EI8301-Instrumentation System Design	3	3	1.2	0.6	0.6	0.4	1.2	1	-	0.4	0.4	2	2.8	3
		16EI8302-Microcontroller Based System Design	3	3	1.4	0.6	0.6	0.4	1.2	0.4	-	0.4	0.4	2.2	2.8	3
		16EI8303-Robotics and Automation	3	3	0.8	3	-	-	1.2	1	0.2	-	1.8	2.6	2.6	3
		16EI8304-Nuclear Power Plant Instrumentation	3	1.4	2.6	1.8	1	2.6	1.4	1.4	1.4	-	-	1.2	3	3
VI		16EI8305-Environmental Instrumentation	2.8	3	0.8	3	-	-	1.2	1	0.2	-	1.8	2.2	2.6	3
		16EI8306-Safety Instrumentation System	3	3	0.8	3	-	-	0.4		0.2	-	2	2.6	3	3
		16EI8307-Instrumentation Systems for Disaster Management	3	2.6	0.4	1.2	0.6	-	0.4	1	1.2	-	0.6	2	3	2.6
		16EI8308-Professional Ethics in Engineering	3	2.6	0.6	-	-	2.4	2.2	3	1.8	2.4	-	2.2	3	3

OPEN ELECTIVE COURSES

Elective	Sem	Course code & Name	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
I	VI	16EI6401-Neural Networks and Fuzzy Systems	3	3	2.2	3	-	-	0.6		0.4	-	2.2	2	3	3
II	VII	16EI7402- Electrical Energy Management and Audit	3	2.6	1.4	1	-	0.4	0.4	0.6	0.4	-	2	1.2	3	3

1-Low, 2-Medium, 3-High, - No Correlation

Chairman Board of Studies

Dean - Academics