Rashtreeya Sikshana Samithi Trust

R. V. COLLEGE OF ENGINEERING

(Autonomous Institution Affiliated to VTU, Belagavi)

R.V Vidyaniketan Post, Mysore Road

Bengaluru-560 059

Scheme & Syllabus

III & IV Semester B.E

Instrumentation Technology

(2012 Scheme)

VISION

Achieving academic excellence in Instrumentation Technology by adopting interdisciplinary research with a focus on sustainable and inclusive technologies.

MISSION

M1: To create an environment for students to excel in domain areas and get motivated to involve in interdisciplinary research by utilizing state of the art infrastructure.

M2: To impart technical knowledge, encourage experiential learning and develop future professional leaders.

M3: To establish industry-academia networking and develop industry-ready students and future entrepreneurs, to meet societal & industrial challenges.

M4: To motivate lifelong learning and research in sustainable technologies to find improved solutions for the betterment of society.

Program Educational Objectives (PEOs)

PEO1: Apply Instrumentation, Electronics, Controls and Automation concepts to develop technical solutions for industrial problems.

PEO2: Exhibit competency in adapting to various industrial challenges and work in inter-disciplinary projects with team spirit and professional ethics for achieving organizational goals.

PEO3: Pursue higher education in technology or management and achieve professional excellence by imbibing leadership qualities and communication skills.

PEO4: Become entrepreneurs with a focus on sustainable technologies and develop innovative solutions to meet industrial and societal needs.

Program Specific Outcomes (PSO)

PSO1: Design, analyze and practice the instrumentation, controls and automation concepts and techniques required for industrial and/or research pursuits resulting in product development, publications or patents.

PSO2: Demonstrate the knowledge of basic science, mathematics, electronic system design and programming for real-time applications, towards developing industrial solutions and become technology leaders of future.

Program Outcomes

PO1:	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and engineering specialization for the solution of complex engineering problem.
PO2:	**Problem analysis**: Identify, formulate, research, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
PO3:	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
PO4:	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5:	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools, including prediction and modeling to complex engineering activities, with an understanding of the limitations.
PO6:	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess Societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7:	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8:	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9:	**Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10:	**Communication**: Communicate effectively on complex engineering activities with engineering community and with the 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.

R.V. College of Engineering, Bangalore – 560059.

(Autonomous Institution, Affiliated to VTU, Belgaum)

DEPARTMENT OF INSTRUMENTATION TECHNOLOGY

SCHEME OF TEACHING & EXAMINATION

THIRD SEMESTER								
Sl. No.	**Course Code**	**Course**	**BoS**	**Credit Allocation**				**Total Credits**
				Lecture	**Practical**	**Tutorial**	**Self Study**	
1	12MA31	Applied Mathematics-III	Sc*	3	0	1	0	4
2	12EB32	Environmental Science and Biology for Engineers	Sc*	3	0	0	1	4
3	12IT/TE/EE33	Analog Electronic Systems (Theory and Practice)	TE	3	1	0	1	5
4	12IT/CSE/ISE/EE /TE34	Digital Logic Design (Theory and Practice)	EEE	3	1	0	1	5
5	12IT35	Electrical Circuit Analysis	IT	3	0	1	0	4
6	12IT36	Electrical and Electronic Instrumentation	IT	3	0	1	1	5
7	12DMA37	Bridge Course Mathematics – I						
		Total No. of Credits		**18**	**2**	**3**	**4**	**27**
		No. Of Hrs.		**18**	**04**	**06**	**16**	**44**

*** Sc-Science**

R.V. College of Engineering, Bangalore – 560059.

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Department of Instrumentation Technology

SCHEME OF TEACHING & EXAMINATION

FOURTH SEMESTER								
Sl. No.	**Course Code**	**Course**	**BoS**	**Credit Allocation**				**Total Credits**
				Lecture	**Practical**	**Tutorial**	**Self Study**	
1	12MA41	Applied Mathematics IV	Sc*	3	0	1	0	4
2	12EM42	Engineering Materials	ME	3	0	0	0	3
3	12IT43	Fluid Mechanics and Measurements	IT	3	0	0	1	4
4	12IT44	Microprocessor and Microcontroller (Theory and Practice)	IT	3	1	0	1	5
5	12IT45	Transducer and Smart Sensor (Theory and Practice)	IT	3	1	0	1	5
6	12IT/EE 46	Control Systems	IT	3	0	1	1	5
7	12HSS47	Innovation and Social skills		0	1	0	0	1
8	12DMA48	Bridge Course Mathematics - II						
		Total No. of credits		**18**	**03**	**02**	**04**	**27**
		No. Of Hrs.		**18**	**06**	**06**	**16**	**46**

*** Sc-Science**

APPLIED MATHEMATICS III		
Course Code: 12MA31		**CIE Marks: 100**
Hrs/Week: L:P:T:S:3:0:2:0		**SEE Marks: 100**
Credits: 04		**SEE : 3 Hrs**

Course Learning Objectives:

- The student should be able to analyze periodic phenomena using concept of Fourier series.
- Understand the basics of matrix theory and its applications for finding solution of system of linear equations.
- Finding the approximate solutions using numerical methods, for problems which do not have analytical solutions.
- Approximating functional values with different curves.
- Optimizing real functional with various applications.

Unit – I	**08 Hrs**
Fourier series and Fourier Transforms: Introduction, periodic functions, Even and odd functions, properties. Special waveforms - Square wave, half wave rectifier, saw-tooth wave and triangular wave. Euler's formula for Fourier series, Fourier series for functions of period 2L (particular cases), Dirichlet's conditions - problems. Half Range Fourier series- Construction of Half range cosine and sine series, Complex form of Fourier series. Complex Fourier Transforms –Properties & simple problems	
Unit – II	**07 Hrs**
Matrices and Linear Equations: Elementary transformation, rank of matrix by using Echelon form, consistency of system of linear equations and solutions, solution of system of linear equations using Gauss elimination method, Gauss Jordan method, Gauss Seidel method, Eigen values and Eigenvectors, finding largest eigen value by using Power method.	
Unit – III	**07 Hrs**
Curve Fitting and Interpolation: Method of Least squares - fitting of the curves of the form $y = ax + b$, $y = ae^{bx}$, $y = ax^b$ and $y = ax^2 + bx + c$, Correlation and Regression analysis. Finite differences-forward and backward differences, Interpolation-Newton's forward and backward interpolation formulae, Lagrange's interpolation formula.	
Unit – IV	**07 Hrs**
Numerical methods: Numerical integration – Simpson's rules, Weddle's rule and Gaussian quadrature (two point & three point formula). Numerical methods for first order ODE – Single step & Multistep methods-Taylor's series method, Runge-Kutta fourth order method, Adam-Bash forth's method, BVP for ODE – Shooting methods for second order ODE (All methods without proof).	
Unit – V	**07 Hrs**
Calculus of Variation: Introduction, Variation of functions and functional, extremal of a functional, variational problem, Euler's equation and special cases. Examples - Geodesics, Hanging cable, and Brachistochrome problem.	

Course outcomes:

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

- Apply knowledge of linear algebra for finding the solution of system of linear equations.
- Analyze and interpret physical phenomena which are periodic in nature by applying Fourier series.
- Solve Algebraic and transcendental equations using effective numerical methods.

Reference Books

1.	B.S. Grewal - Higher Engineering Mathematics, Khanna publishers, 40th Edition, 2007, ISBN: 81-7409-195-5, Chapters 2, 10, 24, 28, 29, 31, 34.
2.	N.P Bali & Manish Goyal - A Text Book of Engineering Mathematics, Lakshmi publications, 7th edition, 2010, ISBN: 978-81-7008-992-6, Chapters: 3(3.34-3.40,3.46, 3.47), 10 (10.1-10.7-10.10), 2 (2.24 -2.26).
3.	Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition, 2007, ISBN: 978-81-265-3135-6, Chapters: 6, 7.1, 7.2,10(10.1-10.5,10.9-10.11),17, 18,19.
4.	Murray R Spiegel - Theory & problems of Fourier Analysis with applications to Boundary Value problems, Schaum's Outline Series.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

ENVIRONMENTAL SCIENCE AND BIOLOGY FOR ENGINEERS		
Sub Code: 12EB32		**CIE Marks: 100**
Hrs/week: L:P:T:S 3:0:0:4		**SEE Marks: 100**
Credits: 04		**SEE : 03 Hrs**

Course Learning Objectives:

Objectives for Environmental Technology

1. To make engineering graduates understand the changes happening in the environment over decades (to give statistics with causes)
2. Role of human beings in the changes in environment and ways and means of controlling the changes through technology
3. Sustainability issues in new technologies and its adaptation
4. Innovation (case studies) to arrest degradation of environment

Objectives for Applied Biology

1. To create awareness among all engineering graduates the need of biological study in engineering (biology related issues in each engineering profession with case studies and also application of biology in each program of engineering
2. Various branches of biological sciences (this might contain discussion of basic human physiology, sensors and systems)
3. Effect of environment on biological issues and think of solutions (case studies in industrial environment to be studied)

Unit – I	**06 Hrs**
Ecosystems and Environment : Principles of ecosystem, impact of human being on environment: pollution, resource depletion and global environmental issues, ecosystem health and environmental changes and human health. Procedure to assess ecosystem's health. Standards- ISO14000 and Environmental Impact Assessment – definition, objectives, and types. Rapid and Comprehensive Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS) and Finding Of No Significant Impact (FONSI). Some EIA examples –Thermal Power Plant, Mining, Fertilizer, Construction Projects, Airport, Water and Wastewater Treatment Plants.	
Unit – II	**10Hrs**
Strategies and Technology-Based Solutions for Improvement of Environment Quality: Environment quality objectives and 'Waste challenge' in modern society - types of waste: municipal, agricultural, medicinal, E-waste, industrial. Engineering ethics, 3 R's – Reduce, Reuse & Recycle, and Sustainable waste management: Compacting, drying, dewatering, bio-drying, composting, bioremediation, biodegradation (chemicals and oil spillage). Waste to energy – energy recovery by incineration, bio-gasification, gasification and pyrolysis, bioconversion to clean energy (biofuels). Some examples: Upflow anaerobic sludge blanket (UASB) digestion for waste water treatment and biogas production. **Technology To Reduce Pollution**:	

SO_2/CO_2 reduction by smoke-scrubber in coal thermal plants, chlorofluorocarbon (CFC) and incandescent bulb replacement, Renewable energy sources – wind, solar, tidal waves and biomass. Emerging technologies: Geo-engineering - ocean iron fertilization, green cement, bioremediation by terminator insects and synthetic biology.	
Unit – III	**06 Hrs**
Design and Modeling for Development of Environment : **Environmental Design**: principles, benefits and motivation. Environmental design for manufactured products, building and for developmental planning. Systems Engineering – Analysis - Design – synthesis - applications to environmental Engineering Systems. **Environmental Modeling**: introduction, forecast modeling and growth modeling, sensitivity analysis. Application of remote-sensing and geographic information systems (GIS) in environmental modeling.	
Unit – IV	**06 Hrs**
Introduction To Cell and Organ Systems : Cell Types: Structure of plant, animal and microbial cell and Specialized cells like stem cells and nerve cells. Biological macromolecules: Carbohydrates, proteins and nucleic acids and Special biomolecules – hormones, enzymes, vitamins and antibiotics. Introduction to organ systems for example digestive, respiratory, excretory nervous and circulatory. Nervous Control and coordination, sensory organs: Auditory, vision, olfactory, touch and taste.	
Unit – V	**08 Hrs**
Bio-Inspired Engineering (BIE) or Bionics : Biological phenomena and innovative engineering. Introduction to Bioelectronics, Bio-computing, bio-photonics and bio-mechatronics. Locomotion and Bio-inspired Robotics, Prosthesis and biomedical implants, Aerodynamics and flight muscle functioning (birds & Drosophila). **Signaling**: Enzymes and recognition receptors in biosensors; Neurotransmission and neural networks (artificial intelligence, signal processing and imaging); Bioelectric signals and cardiac generator. **Sound**: Ultrasonics in biology (echolocation in bats, sonar in whales & dolphins) and instrumentation (medical ultrasonography - ultrasound imaging). **Light**: Photosynthesis and photovoltaic cells.	
Self study: Case study, design and emerging technologies to be discussed pertaining to the course and beyond syllabus (1 credit) (4hrs\week) **Course outcomes :** **After going through the course students will be able to** a. The adverse changes in the environment due to human activities b. The need of innovative technology to arrest or reverse these changes. c. Ethical considerations important for systems engineering.	

d. Basics of biological phenomena. **e.** Their application in innovative engineering and development of technology.	

Reference Books

1.	Vijay Kulkarni and T. V. Ramachandra 2009. Environment Management. TERI Press; ISBN: 8179931846, 9788179931844
2.	Gerald Kiely 1997. Environmental Engineering. McGraw-Hill; ISBN: 9780077091279
3.	Sven Erik Jørgensen 2002. Integration of Ecosystem Theories: A Pattern Ecology & Environment; Edition 3, Springer; ISBN: 1402007558, 9781402007552.
4.	Linvil Gene Rich 2003. *Environmental Systems Engineering*, McGraw-Hill; ISBN: 9780070522503.
5.	Ni-Bin Chang: Systems Analysis for Sustainable Engineering: Theory and Applications (Green Manufacturing & Systems Engineering). McGraw-Hill Professional, 2011, ISBN: 0071630058, 9780071630054.
6.	Larry Canter 1995. "Environmental Impact Assessment", McGraw-Hill. ISBN: 0070097674.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Internal tests, each for 40 marks (15Marks for Quiz+ 25 Marks for descriptive), out of which best of two will be considered. In addition 20 marks to be earned through self learning component on emerging topics.

Scheme of Semester End Examination:

The question paper consists of Part-A and Part-B. Part-A is for 20 marks, containing objective type of questions covering the complete syllabus and is compulsory. Part B is for 80 marks, with 5 questions carrying 16 marks each.
In Part B, the examiner has to set TWO questions from each unit, out of which student has to answer ONE question from each unit.

ANALOG ELECTRONICS CIRCUITS (Theory and Practice)			
Course Code:12IT/EE/TE33		**CIE Marks**	**: 150**
Hrs/Week: L: P: T: S: 3: 2: 0: 4		**SEE Marks**	**: 150**
Credits : 05		**SEE Hrs**	**: 3+3**

Course Learning Objectives (CLO):

1. To design and characterize differential amplifiers using BJT and MOSFET
2. To study different parameters and basic circuits of op-amps
3. To design signal generation and wave shaping circuits using op- Amp
4. To design active filters and voltage regulators using Op-amp.
5. To design analog circuits using IC 555 and IC565
6. To realize basic ADC and DAC circuits.

UNIT-I	
Active sources and Differential amplifiers: Review of devices -BJT, JFET and MOSFET and their characteristics. Introduction to active sources and differential amplifiers, internal structure of differential amplifiers, BJT current sources, MOSFET current sources, design of active current sources, characteristics of differential amplifiers, BJT differential amplifiers, BJT differential amplifiers With active loads, MOS differential amplifiers and design of differential amplifiers.	**07Hrs**
UNIT II	
Characteristics of practical Op-Amps: Introduction, Internal Structures of Op-Amps, Parameters of Practical Op-Amps, Input resistance, output resistance, input capacitance, Common mode rejection ratio, Large signal voltage gain, rise time, open loop voltage gain and bandwidth, slew rate, input voltage limits, output voltage limits, input offset voltage, input biasing current, input offset current, power supply rejection ratio, Thermal drift and offset voltage adjustment. Characteristics of ideal Op-Amps, op-amp SPICE models, Analysis of ideal Op-Amp circuits, non inverting amplifier, inverting amplifier, and Differential amplifiers using op-amp, op-amp SPICE models	**07Hrs**
UNIT III	
Circuits with Op-Amps and Diodes: Positive signal detectors, precision peak voltage detectors, precision Half-wave rectifiers, Precision Full-wave rectifiers, Precision clamping circuits, fixed voltage limiters, Adjustable voltage limiters, comparators, Threshold comparators, Zero-crossing detectors, Schmitt Triggers- inverting and non inverting Schmitt trigger, Schmitt trigger with reference voltage, effects on hysteresis on the output voltage, Square wave generators, Triangular wave generators, saw tooth-wave generators.	**07Hrs**

UNIT IV	
Active Filters: Introduction, Active versus passive filters, Types of Active filters, the Biquadratic function, Butterworth filters (Butterworth function for n=2 and n=3), Low -pass filters,(first order low pass filter, second order low pass filter, Butterworth low pass filters),Band-pass filters (wide band pass filters, narrow band pass filters) Band reject filters(wide band reject filters, narrow band reject filters)All pass filters. **Regulators:** Introduction, classification, linear regulators using op-amp and IC723.	**07Hrs**

UNIT-V	
Other Analog IC's and Applications: Voltage controlled oscillators-NE/SE-566, 555 Timer-functional block diagram, monostable and astable multivibrators and its applications, Phase lock loops-phase detectors, integrated circuit PLL and applications of 565 PLL, Sample and Hold circuits, Digital to analog converters-R-2R ladder, weighted resistor D/A converters, IC D/A converters, Analog to digital converters-successive approximation A/D converter and IC A/D converter.	**07Hrs**

UNIT VI
PRACTICALS

The students are expected to simulate the following circuits using Orcad PSPICE tool.

1. Modeling of current controlled voltage source, voltage controlled current source, current controlled current source using Orcad PSpice, Schematic entry of current sources & simulation of BJT, FET and MOSFET as Non linear devices.
2. Schematic entry of designed amplifier circuit and simulation of - Direct coupled and cascaded amplifiers, with Analysis of Bandwidth, Gain and Gain Bandwidth product.
3. Schematic entry of designed amplifier circuit and simulation of - Resistance capacitance coupling with Analysis of Bandwidth, Gain and Gain Bandwidth product
4. Schematic entry of designed amplifier circuit and simulation of - Feedback Amplifiers - Design and testing of voltage series feedback amplifier.
5. Designing and simulation of active filters (LPF, HPF).

The students are expected to implement the following circuits on hardware.

6. Wave shaping - Precision rectifiers (Half Wave & Full Wave), peak detector using IC 741.
7. Astable and Monostable multivibrators using IC555 timer
8. Waveform generation- Wein-bridge and phase shift oscillators, Schmitt trigger using IC741
9. Design and testing of a DAC using Ladder type using IC741.
10. Design and testing of ADC (Flash type).
11. Design and realization of second order LPF and HPF.

Self study: **12 Hrs**

Case study, design and emerging technologies to be discussed pertaining to the course and beyond syllabus (1 credit) (4hrs\week)

Course Outcome :

After going through the course student will be able to:

1. Design biasing circuits for obtaining the desired operating point and analyze simple amplifier circuits using BJTs and MOSFETs
2. Analyze the performance of Op-amp and build simple circuits using op-amps
3. Design and implement different types of oscillator circuits, waveforms generators, DAC and ADC using Op-amps.
4. Build analog circuits using Timer and PLL IC's.

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Reference Books:

1	M.H Rashid "Microelectronics circuits Analysis and Design", Thomson, ISBN:0-534-95174-0
2	Sedra & Smith "Microelectronics circuits", Oxford 5th edition, *ISBN*-13: 978-0195338836.
3	Millman & Grabel: "Microelectronics", TMH 2nd Edition, *ISBN* 13: 9780074637364.

Scheme of Continuous Internal Examination:

CIE consists of Three Internal tests, each for 40 marks (15Marks for Quiz+ 25 Marks for descriptive), out of which best of two will be considered. In addition 20 marks to be earned through self learning component on emerging topics.

Scheme of Continuous Internal Evaluation for Practicals:

In the laboratory students must perform at least 12 of the above experiments, out of which one major experiment and one minor experiment will be questioned during lab exam.

Scheme of Semester End Examination:

The question paper consists of Part-A and Part-B. Part-A is for 20 marks, containing objective type of questions covering the complete syllabus and is compulsory. Part B is for 80 marks, with 5 questions carrying 16 marks each.

In Part B, the examiner has to set TWO questions from each unit, out of which student has to answer ONE question from each unit.

Scheme of Semester End Examination for Practicals:

In the lab exam the student is required to answer and perform two questions

DIGITAL LOGIC DESIGN (Theory and Practice)		
Sub Code: 12 IT /EE/CSE/ISE/ TE 34		**CIE Marks: 150**
Hrs / Week: L:P:T:S:3:2:0: 4		**SEE Marks: 150**
Total credits: 5		**SEE hours: 3+3**

Course Learning Objectives (CLO):

1. To optimize logic expressions using Karnaugh map and Tabular method
2. To simplify Boolean equation and design combinational circuits with optimal gates.
3. To Analyze the working principles of Flip-Flops and design asynchronous sequential circuits
4. To design simple synchronous digital circuits based on finite state machine algorithm
5. To design, simulate and implement digital systems using HDL

UNIT I	
Simplification of Boolean Expressions: Formulation of the Simplification Problem, Prime Implicants and Irredundant Disjunctive Expressions, Prime Implicates and Irredundant Conjunctive Expressions, Karnaughs Map- Using Karnaugh Maps to obtain minimal Expressions for Complete Boolean functions, Minimal Expressions of Incomplete Boolean Expressions, The Quine MC-Cluskey Method of Generating Prime implicants and Prime implicates, Prime-Implicant / Prime-Implicate Tables and Irredundant expressions, Prime-Implicant / Prime-Implicate Table Reductions, VEM Technique (up to 4 variables), Binary Adders and Subtractors, Decimal Adders.	**07 Hrs**
UNIT II	
Logic Design with MSI Components and Programmable Logic Devices (PLD's): Comparators, Decoders, Encoders, Parity Generators and Parity Checking Circuits, Multiplexers, Programmable Logic Devices, Programmable Read-only memories, Programmable Logic Arrays, Programmable Array Logic and design of combinational circuits using PLD's.	**07 Hrs**
UNIT III	
Flip-Flops and Applications: The Basic Bistable Elements, Latches, Timing Considerations, Master-Slave Flip-Flops (Pulse-triggerred Flip-Flops), Edge – Triggerred Flip-Flops, Characteristics Equations, Registers, Counters, Design of Synchronous and asynchronous Counters.	**08 Hrs**
UNIT IV	
Synchronous Sequential Networks: Structure and operation of Clocked synchronous Sequential Networks, Analysis of Clocked Synchronous Sequential Networks, Modeling clocked synchronous sequential network behavior, State Table Deduction, The State Assignment, Completing the design of clocked synchronous sequential networks	**08 Hrs**
UNIT V	
Logic Families: Transistor – Transistor Logic (TTL), Emitter – Coupled Logic (ECL), The MOS Field	**06 Hrs**

Effect Transistor, NMOS and PMOS Logic, CMOS Logic, Interface between logic families, Tri-state buffer, RAM and ROM memory, Static and dynamic hazards in logic circuits.	
UNIT VI	
PRACTICALS	
PART A 1. Realization of Parallel adder / subtractor using IC 7483 2. Design and Realization of adder, subtractor using IC 74153 and binary to gray code conversion using IC 74139 3. Design and realization of One/Two bit comparators using basic gates. Realization of 4 bit comparators using IC 7485. 4. Realization of decoder, encoders and priority encoders 5. Realization and verification of SR and JK flip-flops using universal gate. Realization of Master-Slave flip-flop using IC7476. 6. Design of programmable counters using IC74192 & IC74193 7. Realization of ring counter and Johnson counter. 8. Design and verification of Parity generators and parity checkers. **PART B** The students are required to design any one digital system using the concepts learnt in PART A. The designed circuit has to be realized using discrete hardware components and implement on FPGA using HDL 1. Addition of two numbers whose sum is less than 9 2. Design a Stop Clock to display from 0 to 9 Sec. 3. Design a Stop Clock to display from 1 to 9 min. 4. Design a Circuit that will display random numbers from 0 to 9. 5. Design a circuit that will transmit 4 bit of information serially / over a single channel. 6. Sequence Generator 7. Switch debouncer 8. Programmable Signal Generator 9. 4 bit by 3 bit binary multiplier 10. Data serializer 11. Design of parity generator and checker using multiplexer 12. Design a digital system to control a dc motor using decoder 13. Design a digital system to generate carry, overflow and auxiliary carry for an 8 bit addition and subtraction using suitable IC`s 14. Design a 2 bit comparator using PAL 15. Design a driver circuits with current rating	
Self Study: Case study, design and emerging technologies to be discussed pertaining to the course and beyond syllabus (1 credit) (4hrs\week)	**12 Hrs**
Course Outcome : After going through the course student will be able to: 1. Understand and Remember the basic fundamentals of combinational and sequential circuits 2. Apply the concepts to design combinational and sequential circuits. 3. Analysis and Evaluate different state machine technique to design a circuit. **4.** Design a complete system using combinational and sequential circuits.	
Scheme of Continuous Internal Evaluation: CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one	

seminar on new topics / model presentation etc. for 10 marks.	
Scheme of Continuous Internal Evaluation for Practicals: In the laboratory students must perform at least 12 of the above experiments, out of which one major experiment and one minor experiment will be questioned during lab exam.	
Scheme of Semester End Examination: The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily	

ELECTRICAL CIRCUIT ANALYSIS		
Course code: 12IT34		**CIE Marks: 100**
Hrs/Week: L:P:T:S :3:0:2:0		**SEE Marks: 100**
Credits: 4		**SEE: 03 Hrs**

Course Learning Objectives:

1. To impart the basic electrical circuit analysis using Mesh & Nodal concepts including the effects of practical & ideal power sources.
2. To learn solving complex circuit problems by means of network theorems.
3. To study the effects of circuit parameters on resonance and learn 2-port model analysis of networks.
4. To predict the initial & final behaviour of RLC circuits during switching.
5. To study the theorems & applications of Laplace Transform analysis for RLC Circuits and to learn by self-study simulation exercises using PSpice / Multisim softwares.

Unit – I	**7 Hrs**
Basic Concepts: Practical sources, source transformations, Loop and Nodal analysis with linearly dependent and independent sources for DC and AC networks, Principle of Duality.	
Unit – II	**7 Hrs**
Network Theorems: Superposition Theorem, Reciprocity, Thevenin's, Norton's, Maximum Power Transfer, and Millman's theorems.	
Unit – III	**7 Hrs**
Resonance in Circuits: Series and Parallel resonance, Q-factor and Bandwidth, Response by varying f, L, & C parameters in the circuits. **Two-Port Network parameters:** Definition of z, y, h and transmission parameters, modeling with these parameters, and relationship between parameter sets.	
Unit – IV	**7 Hrs**
Transient behavior and initial/final conditions: Behavior of circuit elements under switching condition and their representation. Evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations**.**	
Unit – V	**7 Hrs**
Laplace Transformation and its Applications: Laplace Transforms of some important functions, step, ramp, impulse and sinusoidal waveform synthesis, Initial and final value theorems, Solving RLC networks with initial conditions using Laplace Transform analysis. Exercise problems on Network Analysis methods, given in Reference books, and Solving problems using PSpice Software.	

Course outcomes:

The students will be able to:

1. Understand and Remember the basic fundamentals of electrical circuits.
2. Apply the techniques to design electrical networks.
3. Analyze complex circuits using different techniques.
4. Evaluate the design solutions and suggest electrical requirements for complex circuits.

Reference Books:

1. M.E Van Valkenburg ." Network analysis" . PHI, 3rd edition, reprint 2011, ISBN: 978-81-203-0156
2. Ravish R Singh "Electrical networks", Tata Mcgraw Hill, Reprint 2012. ISBN 9780070260962
3. Mahmood Nahvi & Joseph A Edminister, Electric Circuits, Schaum series, Mcgraw hill, 5th edition, 2010, ISBN 978-0-07-060173

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15marks for Quiz + 30marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part-A and Part-B. Part A is for 20 marks covering the complete syllabus and is compulsory. Part B is for 80 marks, with 5 questions carrying 16 marks each.

In Part B, the examiner has to set TWO questions from each unit, out of which student has to answer ONE question.

ELECTRICAL AND ELECTRONIC INSTRUMENTATION		
Course code: 12IT36		**CIE Marks: 100**
Hrs/Week: L:P:T:S : 3:0:2:4		**SEE Marks: 100**
Credits: 5		**SEE: 03 Hrs**

Course Learning Objectives:

1. To get a thorough knowledge of the electronic measurement concepts.
2. To provide the knowledge in checking the quality of measurements.
3. Select appropriate measuring instruments and measurement method which minimizes error.
4. Develop an interest to design the DC, AC bridges as per the requirements.
5. Learn the relevance of digital instruments in measurements.
6. Discuss the importance of signal generators and signal analyzers in measurements.
7. Explain the need for data acquisition systems.

Unit – I	**07 Hrs**
Measurements and Measurement Systems: Measurements, Significance and methods, Classification of instruments, Deflection and Null type instruments, Functions of Instruments and Measurement Systems, Applications of Measurement Systems, Elements of a Generalized Measurement System. **Qualities of measurements**: Introduction, Performance characteristics: static and dynamic characteristics, Errors in measurement, types of static errors, Sources of errors, Statistical analysis.	
Unit – II	**07 Hrs**
Voltmeters and Multimeters: Introduction, Basic meter as a DC Voltmeter, DC Voltmeter, Multi-range voltmeter, Extending voltmeter ranges, Loading, AC voltmeter using Rectifiers-Half wave and Full wave, Peak responding and True RMS voltmeters. **Digital Instruments:** Digital Voltmeters – Introduction, Dual Slope Integrating type DVM, Integrating type DVM, Successive Approximation DVM, Resolution and Sensitivity, General specifications, Microprocessor based Ramp type DVM, Digital Multimeters, Digital frequency meters, Digital measurement of time.	
Unit – III	**07 Hrs**
DC & AC Bridges: Introduction, Wheat stone's bridge, Problems**.** Maxwell's bridge, Schering's bridge, Wein's bridge, Problems, Digital RCL meter. **Cathode ray Oscilloscopes:** Introduction, Cathode ray tube, Deflection amplifiers, Waveform display, Measurement of voltage, frequency and phase, Storage Oscilloscopes, Sampling Oscilloscopes and Digital Storage Oscilloscopes.	
Unit – IV	**07 Hrs**
Signal Generators and Analyzers: Introduction, LF signal generators, RF signal generators, Function, Pulse, Sweep Frequency and Arbitrary Waveform generator. Harmonic Distortion, Distortion meter, Spectrum Analyzer, Digital Spectrum Analyzer, Additional waveform analyzing instruments, Network analyzer, Logic Analyzer.	
Unit – V	**07 Hrs**
Data acquisition systems: Introduction, Generalized data-acquisition system, Objectives, Signal conditioning of the inputs, Single channel data acquisition system, Multichannel DAS, Computer based DAS. **Computer-Controlled Test systems:** Introduction, Testing an audio amplifier, Testing a radio receiver, Schematic representation of the IEEE 488 instrumentation bus, Instruments used in Computer-Controlled Instrumentation, IEEE 488 Electrical Interface, RS 232 Interface.	

Course outcomes:	
1. Understand & remember the basics of Electrical & Electronic measuring instruments and their characteristics. 2. Apply measuring instruments and measurement methods for quantification, visualization, & error-free displays. 3. Analyze & Evaluate the instrument system performance. 4. Design various measuring instrumentation for specific application.	
Reference Books:	
1. David A Bell, "Electronic Instrumentation and Measurements", PHI / Pearson Education, 2nd edition, 2008, ISBN :978-81-203-2360. 2. H. S. Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2010, ISBN: 9780070702066. 3. Cooper D & A D Helfrick, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 2007, ISBN: 978-81-203-0752-0. 4. A.K. Sawhney "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, 18th Edition, 2010, ISBN: 81-7700-016-0.	
Scheme of Continuous Internal Evaluation:	
CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.	
Scheme of Semester End Examination:	
The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.	

BRIDGE COURSE MATHEMATICS- I		
Course code: 12DMA37		**CIE Marks: 100**
Periods / Week: 2		**SEE Marks: 100**
Audit course		**SEE: 03 Hrs**

Course Learning Objectives:

1. Apply the knowledge of ordinary and partial differentiation in engineering and real life problems;
2. Learn how to formulate and interpret a Taylor series approximation of a function.
3. Comprehend basic meaning of partial derivatives.
4. Make the student recognize and model differential equations and apply analytical techniques to compute solutions.
5. Recognize and model differential equations, apply analytic techniques to compute solution for engineering problems.

Unit – I	**06 Hrs**

Differential Calculus

Successive differentiation, n^{th} derivatives of standard functions, Leibnitz's theorem (without proof). Taylor's series and Maclaurin's series for function of single variable (without proof).

Unit – II	**06 Hrs**

Partial Differentiation

Introduction-partial derivatives, total derivative, differentiation of composite and implicit functions. Jacobians and problems.

Unit – III	**06 Hrs**

Ordinary differential equations

Solution of first order and first degree differential equations - variable separable methods homogeneous, linear, Bernoulli, exact equations (without integrating factor).

Unit – IV	**06 Hrs**

Linear ordinary differential equations of second and higher order

Linear differential equations of higher order with constant coefficients. Solution by inverse differential operator method. Solution by method of variation of parameters.

Unit – V	**06 Hrs**

Vector Analysis

Vector Algebra - Vector addition, Multiplication (dot, cross & triple products), Vector differentiation – velocity, acceleration of a vector point function.

Course outcomes:

Upon completing this course, the student will be able to:

1. Use the concept of functions of several variables and their partial derivatives for computing the areas, volumes using multiple integrals.
2. Ability to apply concept of differential equations to handle physical problems.

Reference Books:

1. B. S. GREWAL, "Higher Engineering Mathematics", Khanna Publications, 40^{th} edition, 2007.
2. N. P. BALI, MANISH GOYAL "A Text Book of Engineering Mathematics", Laxmi Publications, 7^{th} edition, 2007.
3. B. V. RAMANA "Higher Engineering Mathematics", Tata Mc Graw Hill Publications, 2007.
4. E- KREYSZIG "Advanced Engineering Mathematics", John Wiley & sons Publications, 8^{th} edition, 2007.

Scheme of Continuous Internal Evaluation:
CIE consists of Two Tests each for 50 marks (20 marks for Quiz + 30 marks for descriptive).
Scheme of Semester End Examination:
The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will consist of eight questions out of which five questions have to be answered.

APPLIED MATHEMATICS IV CIRCUIT BRANCHES (EC/TE/IT ENGINEERING)		
Course Code: 12MA41		**CIE Marks: 100**
Hrs/Week: L:P:T:S : 3:0:2:0		**SEE Marks: 100**
Credits: 04		**SEE : 3 Hrs**

Course Learning Objectives:

1. Provide basic definitions and theorems of the calculus of complex functions which are involved in any field problems of Engineering.
2. Use of Bessel functions and Legendre polynomials and their properties in Heat, wave and Laplace equations with cylindrical and spherical symmetry.
3. The theory of probability in study of random phenomena, analyzing and interpreting data that involves uncertainity.
4. Apply linear programming techniques for optimization problems subject to linear constraints in the various areas of Engineering & Science.
5. A student will be able to find the solution of partial differential equations which arise in physical situations.

Unit – I	**07 Hrs**
Complex Analysis Complex variables - Function of a complex variable, analytic functions-Cauchy-Riemann equations in cartesian and polar forms (without proof), properties of analytic functions, construction of analytic functions by Milne-Thomson method. Complex integration - Complex line integrals-Cauchy's theorem and corollaries (without proof), Taylor's and Laurent's series (statements only), singularities, poles, residues, residue theorem (without proof) - problems.	
Unit – II	**07 Hrs**
Special Functions Introduction of Bessel's and Legendre's differential equation using the solution of Laplace equation in cylindrical and spherical system. Series solution of Bessel's differential equation leading to Bessel function of first kind, recurrence relations, generating functions, Bessel's integral formula, orthogonality of Bessel function. Legendre's differential equation, Legendre polynomials, Rodrigue's formula.	
Unit – III	**07 Hrs**
Linear Programming Problem Mathematical formulation of Linear Programming Problem, Graphical method, Simplex method and Big M method.	
Unit – IV	**07Hrs**
Probability and Distributions Basics of Probability: Sample Space, events, probability of an event, addition theorem. Conditional probability, Multiplication theorem, Baye's rule. Random Variables: Discrete and continuous, Probability mass function, Probability density function, Cumulative density function, Mean, Variance, standard deviation Binomial, Poisson, Exponential and Normal Distributions.	
Unit – V	**07 Hrs**
Partial Differential Equations Classification of second order Partial differential equations - Elliptic, Parabolic and Hyperbolic. Solution of two dimensional Laplace equation in polar	

coordinates by the method of separation of variables. Solution of two dimensional heat flow in transient state and steady state. Solution of two dimensional wave equation by the method of separation of variables. Vibrating membrane, solution in the case of rectangular and circular membrane - Simple problems.	

Course outcomes:

1. Provide basic definitions and theorems of the calculus of complex functions which are involved in any field problems of Engineering.
2. Use Bessel functions, Legendre polynomials and their properties in heat, wave and Laplace equations with cylindrical and spherical symmetry.
3. Study of random phenomena, analyzing and interpreting data that involves uncertainty, using theory of probability.
4. Interpret the models of probability distributions for real life and engineering problems.

Reference Books:

1. S. Grewal - Higher Engineering Mathematics, Khanna Publishers, 40th Edition, 2007, ISBN: 81-7409-195-5, Chapters: 16, 17, 19, 20, 26, 33.
2. Bali & Manish Goyal - A Text Book of Engineering Mathematics, Lakshmi Publications, 7th edition, 2010, ISBN: 978-81-7008-992-6,Chapters: 15, 16, 21.
3. Erwin Kreyszig - Advanced Engineering Mathematics, John Wiley & Sons, 9th Edition, 2007, ISBN: 978-81-265-3135-6, Chapters: 4,11, 12, 20, 22.
4. Seymour Lipschutz & Marc Lars Lipson- Theory and Problems of Probability, Schaum's Outline Series, 2nd Edition, ISBN: 0-07—118356-6, Chapters: 1,2,3,4,5,6.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

ENGINEERING MATERIALS		
Course code: 12EM42		**CIE Marks: 100**
Hrs/Week: L:P:T:S : 3:0:0:0		**SEE Marks: 100**
Credits: 3		**SEE: 03 Hrs**

Course Learning Objectives(CLO):

Graduates shall be able to

1. The versatile use of materials from biomedical applications to aerospace industries
2. The different properties of materials.
3. Different types of ferrous alloy its properties and applications.
4. Concept of phase transformation due to temperature in alloys.
5. Various heat treatment methods employed in the industry and its affect on the mechanical properties.
6. Importance of ceramics, polymers and composites, its types, applications.
7. Nano Materials synthesis, advantages over conventional materials.

Unit – I	**6 Hrs**
INTRODUCTION **Classification of Materials -** Metals, Ceramics, Polymers, composites, Advanced Materials- semiconductors, biomaterials, smart materials, nanostructured materials and their applications. **Material properties –** Mechanical properties, thermal properties – Heat capacity, CTE, thermal conductivity, Electrical and Electronic conductivity, Magnetic properties – dia, para, ferro, ferri, antiferro, domains and hysteresis. Optical properties -Luminescence and photoconductivity.	
Unit – II	**10Hrs**
Ferrous materials and Alloys - Binary phase diagrams, Phase Rule, Lever Rule, Solidification, Nucleation and Grain Growth. Cast Iron, Chromium steels, Nickel steels, Silicon Steels, Tungsten and Molybdenum Steels & Stainless Steels; Tool Steels, structural steels, Corrosion and Heat Treatment. **Non-ferrous materials and alloys –** Aluminium, Copper and Titanium, their alloys, properties and applications.	
Unit – III	**8 Hrs**
Overview of Flexible Electronics Technology History of Flexible Electronics, Materials for Flexible Electronics , Fabrication Technology for Flexible Electronics Fabrication on Sheets by Batch Processing, Fabrication on Web by Roll-to-Roll Processing , Additive Printing, Low-temperature Amorphous and Nanocrystalline Silicon Materials, Low-temperature Dielectrics, Low-temperature Thin-film Transistor Devices**.** **Ceramic Materials -** Definition, Classification of Ceramic Materials, Processing Methods, Properties and Industrial, Medical and Commercial Applications.	
Unit – IV	**6 Hrs**
COMPOSITES - Types of Matrix Materials and Reinforcements, Selection of Composites, Properties, Applications, Rule of Mixture for density, elastic modulus and tensile strength. **Nanomaterials -** Definition, classification and synthesis – physical and chemical processes, Characterization of nanomaterials – Electron microscope, X-Ray Diffraction, particle size analyzer	

Unit – V	6 Hrs
Advanced materials for - Construction Applications, Biomedical applications, High temperature Applications, Sensors and Actuators - Shape Memory Alloys and Composites, Thin films and coatings. **Course Outcome:** After successful completion of the course the students will be able to: 1. Classify materials based on properties. 2. Compute the properties of composites based on the properties of the constituents. 3. Draw Binary phase diagrams and identify the phases. **4.** Identify characterization techniques for nanomaterials, thin films, flexible electronics, biomedical applications, high temperature applications, sensors and actuators.	

Reference Books

1.	William D. Callister, "Materials Science & Engineering- An Introduction"; Wiley India Pvt. Ltd.; 6th Edition; 2006; New Delhi; ISBN:9814-12-669-1:; 1,4,6,7,8,9
2.	Fred W. Billmeyer, "Text Book Of Polymer Science"; Wiley-Interscience Publication; 2nd Edition; 1984; ISBN:0-471-82834-3; 8
3.	Donald R. Askland, Pradeep P. Phule, "Essentials of Materials Science and Engineering", Thomas Canada Learning INDIA EDITION, ISBN:81-315-0233-3
4.	William Smith, "Foundation of Materials Science and Engineering", 3rd Edition, McGraw Hill, 1997. ISBN:9780073529240
5.	Flexible Electronics: Materials and Applications, William S. Wong and Alberto Salleo, eds. ISBN 978-0-387-74362-2, 2009

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Fluid Mechanics and Measurements		
Course code: 12IT43		**CIE Marks: 100**
Hrs/Week: L:P:T:S : 3:0:0:4		**SEE Marks: 100**
Credits: 4		**SEE: 03 Hrs**

Course Learning Objectives:

The course is designed to :

1. Introduce the properties of fluids and measure fluid pressure.
2. Analyze the fluid flow through venturimeter, orifice meter, pitot tube and simple pipes.
3. Find the efficiency of power transmission through nozzles and orifices.
4. Learn the classification of turbines.

Unit – I	**07 Hrs**
Introduction and properties of Fluids: Introduction, Liquids and their properties, Density, Specific weight, Specific gravity, compressibility, Surface tension of water, Capillarity, Viscosity, Numerical examples. **Fluid pressure and its measurements:** Pressure head, Atmospheric pressure, Gauge pressure, Measurement of fluid pressure, Tube gauges to measure fluid pressure, Mechanical gauges, Numerical examples	
Unit – II	**07 Hrs**
Fluid flow and its analysis: Energy of a liquid in motion, Total energy and total head of a liquid particle in motion, Bernoulli's equation and its limitations, Euler's equation for motion, Practical applications of Bernoulli's equation to venturimeter, Orifice meter & pitot tube. Numerical examples. **Flow through Simple Pipes**: Loss of Head in Pipes, Total energy line, Transmission of power through pipes, Time of emptying a tank through a long pipe, Time of flow One Tank into another through a long pipe, Numerical examples.	
Unit – III	**07 Hrs**
Flow through Nozzles: Velocity of water through a nozzle, Efficiency of power transmission through a nozzle, Uses of nozzles and their problems, Effect of pipe elasticity on Hammer Blow, Surge Tanks, Numerical examples. **Flow through Orifices:** Types of Orifices, Vena Contracta, Hydraulic coefficients, Discharge through a large rectangular Orifices, Numerical examples.	
Unit – IV	**07 Hrs**
Turbines: Classification of Turbines & applications impulse turbine Pelton wheel schematics construction, work done, power produced efficiency, hydraulic. Mechanical & overall efficiencies & numerical examples.	
Unit – V	**07 Hrs**
Reaction Turbines: Main component constructor classification , radial, mixed inward flow turbines, outward flow turbine, efficiency of Reaction turbine - Mechanical, hydraulic & overall efficiency & Numerical examples.	

Course outcomes:

Students should be able to

1. Appreciate difference between fluid mechanics terminology.
2. Apply various manometers for pressure measurements.
3. Analyze and predict fluid flow in pipeline and to calculate the efficiency and discharge through nozzle and orifices.
4. Recognize the components and evaluate the efficiency of impulse and reaction hydraulic and turbine.

Reference Books:

1. R.S. Khurmi, "A text book of Hydraulics, Fluid Mechanics and Hydraulic Machines", McGraw Hill,19th Edition, ISBN:81-219-1676-3.
2. P.N.Modi and S.M.Seth, "Hydraulics", Amit Publisher and Distributors, McGraw Hill, 17th Edition, 2011 ISBN: 9788189401269.
3. Lewitt E.H, "Hydraulics and the Mechanics of Fluids", 5th Edition, 2011, ISBN: 9781447438823.
4. Victor Lyle Streeter, E. Benjamin Wylie, Keith W. Bedford "Fluid Mechanics", 8th Edition., McGraw Hill,2007, ISBN: 97800706253721979.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Microprocessors and Microcontroller (Theory and Practice)		
Course code: 12IT44		**CIE Marks: 100**
Hrs/Week: L:P:T:S : 3:2:0:4		**SEE Marks: 100**
Credits: 5		**SEE: 03 Hrs**

Course Learning Objectives:

1. To introduce 8086 architecture, pin configuration and addressing modes.
2. To provide knowledge about Instruction set and assembler directives.
3. To give insight into architecture and instruction set and programming concepts of 8051.
4. To give an overview of subroutines.
5. To give the concepts of interfacing peripherals to both processors and microcontrollers.

Unit – I	**07 Hrs**
Introduction to 8086: Introduction, The 8086 Microprocessor, Pin Configuration of 8086, Memory organization of 8086, 8086 Minimum Mode Configuration, Maximum Mode Configuration of 8086,Bus Cycles of 8086,Addressing Modes of 8086.	
Unit – II	**07 Hrs**
Instructions Set of 8086: Instruction Format, Instruction Templates, Instruction Set of 8086.Assembler Directives, MASM Assembler, Programming of 8086, Flowchart, Programming steps.	
Unit – III	**07 Hrs**
The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts. **Addressing Modes:** Introduction, Addressing modes, External data moves, code memory read only data moves, push and pop codes, data exchanges.	
Unit – IV	**07 Hrs**
Instruction Set and Operations, Byte level logical operations, bit level logical operations, rotate and swap operations. Introduction, flags, incrementing, decrementing, addition, subtraction, multiplication and division. **Operations on Subroutines**: The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns, More Detail on Interrupts, Example Problems.	
Unit – V	**07 Hrs**
Peripherals and Interfacing with 8086: Memory interfacing, key board, display. **Interfacing with 8051:** Interfacing, ADC, DAC and Stepper Motor.	
Laboratory Experiments: 1. Data Transfer-Block move, Exchange, Sorting, Finding largest element in the string. 2. Arithmetic Instructions-Addition/subtraction, multiplication and division, square, Cube–(16 bits Arithmetic operations–bit addressable). 3. Code conversion: HEX –BCD, BCD-ASCII, BCD-Seven segment. 4. Interfacing 8255 in I/O and bsr mode. 5. Waveform generation using DAC (0800). 6. Interfacing 8- bit multichannel ADC (0808). 7. Interfacing and programming 8253 timer. 8. Arithmetic Instructions-Addition/subtraction, multiplication and division, square, Cube–(16 bits Arithmetic operations–bit addressable using 8051MC).	

Course outcomes:

1. Remember and understand the basic fundamentals of Microprocessor 8086 and Microcontroller 8051
2. Apply the Instruction and addressing mode knowledge of write the program.
3. Analysis and evaluate different instruction set and addressing modes to write a compact code
4. Create new application by interfacing μP and μC using C-Code.

Reference Books:

1. Sunil Mathur, "Microprocessor 8086 architecture, programming and interfacing", PHI Learning private limited, 1st edition, 2011, ISBN:-978-8120340879.
2. Yu-cheng Liu and Glenn Gibson" microcomputers systems the 8086/8088 family, architecture, programming & design", 4th edition (PHI) 2008, ISBN: 978-81-203-0409.
3. Kenneth J Ayala, "The 8051 microcontroller architecture, programming and applications", Thomson learning, 2nd edition, 2005, ISBN: 978-81-293-2954.
4. Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D Mckinlay, "The 8051 microcontroller and embedded systems using assembly and C", Pearson PHI, 8th edition, 2009, ISBN: 978-81-203-2954.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Continuous Internal Evaluation for Practical's:

In the laboratory students must perform at least 7 of the above experiments, out of which one major experiment and one minor experiment will be questioned during lab exam.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Examination for Practicals:

In the lab exam the student is required to answer and perform two questions

TRANSDUCER AND SMART SENSORS (Theory and Practice)		
Course code: 12IT45		**CIE Marks: 100 + 50**
Hrs/Week: L:P:T:S: 3:2:0:4		**SEE Marks: 100 + 50**
Credits: 5		**SEE: 03 + 03Hrs**

Course Learning Objectives:

1. To impart the principles and working modes of various types of Resistive, Inductive, Capacitive and special transducers.
2. To give an idea about the applications of various transducers and selection criteria of a transducer
3. To describe different data conversion techniques and their applications
4. To give an insight into the principles and applications of special transducers.

Unit – I	07 Hrs
Introduction: Transducers: Definition of a transducer, Block Diagram, Active and Passive Transducers, Advantages of Electrical transducers **Resistive Transducers: Potentiometers:** Characteristics, Loading effect, and problems **Strain gauge:** Theory, Types, applications and problems **Thermistor, RTD:** Theory, Applications and Problems **Thermocouple:** measurement of thermocouple output, compensating circuits, lead compensation, advantages and disadvantages of thermocouple.	
Unit – II	**07 Hrs**
LVDT: Characteristics, Practical applications and problems **Capacitive Transducers:** Capacitive transducers using change in area of plates, distance between plates and change of di-electric constants, Applications of Capacitive Transducers and problems **Piezo-electric Transducers:** Principles of operation, expression for output voltage, piezo-electric materials, equivalent circuit, loading effect, and Problems.	
Unit – III	**07 Hrs**
Special Transducers: Hall effect transducers, Thin film sensors, and smart transducers: Principles and applications. Introduction to MEMS Sensors and Nano Sensors, Schematic of the design of sensor, applications.	
Unit – IV	**07 Hrs**
Static and Dynamic characteristics of instruments- static characteristics, dynamic characteristics, Step response and impulse response of zero, 1^{st} and 2^{nd} order systems and Problems.	
Unit – V	**07 Hrs**
Data Converters: Introduction to Data Acquisition System, types of DAC, Binary Weighted DAC, R-2R ladder DAC, DAC-0800, Types of ADC, Single Slope ADC, Dual slope integrated type ADC, Flash ADC, 8-bit ADC-0808, Programmable Gain Amplifier.	
Laboratory Experiments: 1. Characteristics of potentiometer resistance transducer. Measurement of strain using half and full bridge. 2. Characteristics of capacitance transducer & LVDT. 3. Characteristics of thermistor & RTD. 4. Characteristics of thermocouple & AD590. 5. Characteristics of LDR, photo diode, and photo transistor. 6. Digital to analog converter (DAC-0800). 7. 8 bit ADC-0808 characteristics. 8. Programmable gain amplifier (PGA) using MUX.	

9. Sample and hold circuits. 10. Analog multiplexer 11. I to V converter & V to F converter	

Course outcomes:

1. Remember and understand the basic principles of transducers and smart sensors.
2. Apply the knowledge of transducers and sensors to comprehend digital instrumentation systems.
3. Analyze and evaluate the performance of different sensors, transducers and converters for various applications.
4. Design and create a system using appropriate sensors for a particular application.

Reference Books

1. A.K. Sawhney "Electrical and Electronic Measurements and Instrumentation", Dhanpat Rai and Sons, 18th Edition, 2008,ISBN 81-7700-016-0
2. Arun K. Ghosh, "Introduction to Measurement and Instrumentation", PHI 3rd Edition,2009, ISBN 978-81-203-3858-6
3. Stephen Beeby, "MEMS mechanical sensors", Artech House, 2004, ISBN 1-58053-536-4
4. D.V.S. Murthy "Transducers and Instrumentation", PHI Publication, 2nd Edition 2008, ISBN 978-81-203-3569-1

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Continuous Internal Evaluation for Practical's:

In the laboratory students must perform at least 10 of the above experiments, out of which one major experiment and one minor experiment will be questioned during lab exam.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

Scheme of Semester End Examination for Practical's:

In the lab exam the student is required to answer and perform two questions.

CONTROL SYSTEMS					
Course Code	**:**	**12 IT / EE46**		**CIE MARKS**	**: 100**
Hrs/Week	**:**	**L:P:T:S : 3:0:2:4**		**SEE MARKS**	**: 100**
Credits	**:**	**05**		**SEE HRS**	**: 03 Hrs**

Course Learning Objectives (CLO):

1. Develop model and simulate single-input single-output linear systems.
2. Acquire working knowledge of system science-related mathematics.
3. Design a system, component or process to meet desired needs.
4. Identify, formulate and solve control engineering problems.
5. Write equivalent differential equation and transfer function models for a give system.
6. Acquire the knowledge of classical control system analysis techniques, system response and performance characteristics.
7. Analyze and evaluate stability of feedback control systems using both time and frequency domain methods.
8. Express the effects of PID controllers and compensators on the system performance.
9. Design and evaluate controllers for linear systems.

UNIT I	
Introduction: Definitions, Classification of control systems open loop and closed loop, linear and non linear, time variant and time invariant, continuous and discrete time systems. Block diagram of a typical closed loop control system showing the basic structure and different terminologies.	**01 Hrs**
Modeling and representation of control system: The transfer function concept, transfer function of simple electrical networks, different forms of transfer functions, transfer function of a closed loop system, block diagrams and signal flow graphs.Masons gain formula.Modeling of mechanical translational and rotational systems and their electrical analog, gear trains, modeling of a.c & d.c servomotors.	**07 Hrs**
UNIT II	
Time response of feedback control systems: Standard test signals, step response of first and second order systems, time domain specifications. Type and order of the system, Steady state error and static error constants. Effect of feedback on sensitivity.	**08 Hrs**
UNIT III	
Stability analysis: Concept of stability, types of stability, Routh Hurwitz criterion, relative stability analysis.	**03 Hrs**
Root locus: Introduction, concept of magnitude and angle criterion, construction of root loci, root contours. Effect of adding a pole/zero to the system.	**05 Hrs**
UNIT IV	
Frequency domain analysis: Introduction to frequency domain plots. Polar plots, frequency domain specifications, concept of phase margin and gain margin, correlation between time and frequency response. Principle of argument, Nyquist plots and Nyquist stability criterion. Bode plots, stability analysis using Bode diagrams.	**08 Hrs**
UNIT V	
Controllers and compensators: Basic control actions P,PI,PD and PID controllers and their effects on the dynamic and static behaviour of the system. Lag, lead and lead-lag compensators, realization using RC networks. Design of controllers and compensators.	**08 Hrs**

Course outcomes:

1. Comprehend the basic concepts of Transfer function, modeling and stability of control systems.
2. Apply concepts and Evaluate Transfer functions and performance and stability of systems.
3. Apply different techniques and analyze stability of systems
4. Develop the models and Design systems to meet the desired parameters

References:

1. J. Nagrath and M Gopal, "Control system engineering" , New age international publishers, 5th edition,2007.
2. M.Gopal , "Control systems - Principles and design", TMH,2nd edition,2006
3. K.Ogata, "Modern control engineering", Pearson education, 2004 , 4th edition.
4. R.C.Dorf and R.H.Bishop, 'Modern Control Systems,' Addison Wesley, 1995.
5. Kuo B.C., Automatic Control Systems, Prentice Hall of India Ltd., New Delhi, 1995.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:

The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.

BRIDGE COURSE MATHEMATICS- II		
Course code: 12DMA48		**CIE Marks: 100**
Periods / Week: 2		**SEE Marks: 100**
Audit course		**SEE: 03 Hrs**

Course Learning Objectives:

1. Recognize partial differential equations and apply analytic techniques to compute solution for engineering problems.
2. Apply the significance of vector integration and their theoretical importance in engineering problems.
3. Identify and solve initial value problems, physically interpret the solutions using the Laplace transforms.

Unit – I	**06 Hrs**
Laplace Transforms Definition, transforms of elementary functions, properties, derivatives and integrals, unit step function.	
Unit – II	**06 Hrs**
Inverse Laplace Transforms Inverse Laplace transforms- properties, convolution theorem- statement only and problems, solution of linear differential equations.	
Unit – III	**06 Hrs**
Integral Calculus Multiple integrals: Double and triple integrals. Area enclosed by plane curves, Volume of solids. Definition of beta and gamma functions and problems.	
Unit – IV	**06 Hrs**
Partial Differential Equations (PDE) Formation of Partial differential equations by elimination of arbitrary constants/functions. Solution of Lagrange's linear PDE. Solution of PDE by the Method of separation of variables (first and second order equations).	
Unit – V	**06 Hrs**
Vector Integral Calculus Line integrals, Surface and Volume Integrals –problems. Green's theorem (with proof). Stokes Theorem, Gauss Divergence Theorem (without proof) –problems.	

Course outcomes:

Upon completing this course:

- The student will be able to solve problems arising in signal processing and various systems using Laplace transforms techniques for problems arising in signals and systems.
- The student will be able to apply vector integration to different Engineering applications.

Reference Books:

1. B. S. Grewal, "Higher Engineering Mathematics", Khanna Publications, 40th edition 2007.
2. N. P. Bali, Manish Goyal, "A Text Book of Engineering Mathematics", Laxmi Publications, 7th edition, 2007.
3. B. V. Ramana, "Higher Engineering Mathematics", Tata Mc Graw Hill Publications, 2007.
4. E- Kreyszig "Advanced Engineering Mathematics", John Wiley & sons Publications,8th edition, 2007.

Scheme of Continuous Internal Evaluation:

CIE consists of Three Tests each for 45 marks (15 marks for Quiz + 30 marks for descriptive) out of which best of two will be considered. In addition there will be one seminar on new topics / model presentation etc. for 10 marks.

Scheme of Semester End Examination:
The question paper consists of Part A and Part B. Part A will be for 20 marks covering the complete syllabus and is compulsory. Part B will be for 80 marks and shall consist of five questions (descriptive, analytical, problems or/and design) carrying 16 marks each. All five from Part B will have internal choice and one of the two have to be answered compulsorily.