MALNAD COLLEGE OF ENGINEERING, HASSAN
(An Autonomous Institution Under VTU, Belagavi)

SYLLABUS FOR
III& IV SEMESTERS

2017 - 2018

DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING

MALNAD COLLEGE OF ENGINEERING, HASSAN

(An Autonomous Institution Under VTU, Belagavi)

DEPARTMENT OF ELECTRONICS & INSTRUMENTATION ENGINEERING

VISION of the Department

The Department will be a center of excellence for Electronics and Instrumentation studies driven by research in association with industry and society

MISSION of the Department

1. To augment infrastructure in emerging technologies .
2. To provide student centered environment for effective learning by giving hands-on experience.
3. To develop research culture and create facilities for transforming idea into products to cater to society and industrial needs.
4. To collaborate with industry, academia and research organizations for contribution to the higher order learning and research.
5. To prepare students to meet the challenges of dynamic industrial requirements and higher education.

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

The Students are Expected to Possess:

1. Capacity to undertake automation jobs having competency in design of controllers, installation and commissioning of process plants in coordination with interrelated domain team.
2. Required skills to Operate and maintain industrial instrumentation systems.
3. Acumen to pursue higher education in interrelated domains of instrumentation.
4. Ability to Design and Implement projects relevant to industry and community taking into account social, ethical and environmental considerations.
5. Knowledge of computational platforms and software applications related to domain needs.

PROGRAMME SPECIFIC OUTCOMES (PSOS)

PSO1: Adopt concepts of measurement and transduction for instrumentation.
PSO2: Employ knowledge of instrumentation for process automation.

PROGRAM OUTCOMES (POs)

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
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.
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.
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.
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.
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.
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.
8. **Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **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.
12. **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.

Scheme & Syllabus for III and IV semesters
B.E. – Electronics &Instrumentation Engineering
2017-18

Course Code	Course Title	L	T	P	C
III Semester					
MA301	Engineering Mathematics – III	4	0	0	4
EI302	Electronic Devices and Circuits	3	1	0	4
EI303	Network Analysis	3	1	0	4
EI304	Logic Design	3	1	0	4
EI305	Transducers and Instrumentation	4	0	0	4
EI306	Electronic Instrumentation and Measurement Techniques	3	0	0	3
EI307	Analog Electronics Lab	0	0	3	1.5
EI308	Instrumentation Lab	0	0	3	1.5
HS003	Communication Skills-1	0	0	2	1
		Total Credits			**27**
IV Semester					
MA401	Engineering Mathematics-IV	4	0	0	4
EI402	Linear ICs and Signal Conditioning Circuits	3	1	0	4
EI403	Process Instrumentation-I	3	1	0	4
EI404	Signals and Systems	3	1	0	4
EI405	Microprocessor	4	0	0	4
EI406	Introduction to VHDL Programming	4	0	0	4
EI407	Digital circuits and VHDL lab	0	0	3	1.5
EI408	Linear Integrated circuits lab	0	0	3	1.5
		Total Credits			**27**

ENGINEERING MATHEMATICS – III MA301
(Common to all branches)

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Course Objective:
The student will learn different numerical methods, transform techniques (Fourier transform and Z - transform) and application related problems.

Course Outcomes: Upon the completion of this course student will be able to:

CO1. Compute Fourier series and Fourier transform of a function
CO2. Compute Z - transforms of the given function and solutions of difference equations.
CO3. Determine solutions of algebraic and transcendental equations and analyze the given experimental data through interpolation.
CO4. Calculate length, area, volume of geometrical figures through numerical integration.
CO5. Compute the solution of system of equations, Eigen values, Eigen Vectors.
CO6. Solve problems on the numerical solution to ordinary differential equations and partial differential equations.

Part A

1. **Numerical Analysis - I**: Solution of algebraic & transcendental equations by Bisection method, Newton Raphson method. Solution of non - linear system of equations with initial conditions by Newton Raphson method.

6 hours

2. **Numerical Analysis - II**: Numerical Interpolation - Definition of forward, backward differences, Newton's forward and backward interpolation formulae, Lagrange's interpolation formula. Some application oriented engineering problems – To find the relation between the input and output of an experimental data. Choice of an interpolation formula, Spline interpolation - cubic spline method.

7 hours

Part B

3. **Numerical Analysis – III:** Numerical Integration: Computation of line integral by Simpsons 1/3rd rule, Illustrative examples from engineering field. Computation of double integral by Simpsons 1/3rd rule and applications with illustrative examples. Numerical solution of ordinary differential equations: Taylor series method, Runge-Kutta method of fourth order.

6 hours

4. **Numerical Analysis – IV:** Application of partial differential equations: Finite difference approximation to derivatives, Numerical solution of second order partial differential equations – Solution of Laplace equation by Gauss Seidel iteration method (initial approximation to be assumed using standard five point formula and diagonal five point formula), Solution of one – dimensional heat equation by Schmidt method, Gauss Seidel iterative formula. Numerical solution of wave equation.

7 hours

Part C

5. **Z-Transforms**: Definition, Standard forms, properties – Problems. Inverse Z transforms. Solution of Difference equations using Z Transforms, Application to deflection of a loaded string.

6 hours

6. **Linear algebra**: **Importance of Matrices in engineering**. Consistency and inconsistency of non homogeneous and homogeneous system of equations using the rank concept, Solution of the system of linear equations by Gauss elimination method and Gauss – Seidel iterative method. Eigen values and Eigen vectors of matrices. Application of Eigen values and Eigen vectors - mass on a spring, Electrical net work.

6 hours

Part D

7. **Fourier series:** Periodic functions and their graphical representation, representation of periodic functions as a Fourier series using Euler's method & change of interval method, half range series method, illustrative examples from engineering field. To represent the experimental data as a Fourier series using the method - Practical harmonic analysis.

7 hours

8. **Fourier Transforms and Inverse Fourier transforms**: Properties of Fourier transform, Evaluation of Complex Fourier, Fourier sine & Fourier cosine transforms. Inverse complex Fourier transform, Inverse sine & Cosine transforms.

7 hours

Note: Theorems and properties are without proof. Applicable to all the units.

Text books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th edition, 2016.
2. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd. 8th Edition (Wiley student edition) 2004.

Reference Books:

1. R. K. Jain and S. R. K. Jain & S. R. K. Iyengar, Numerical methods, New age International pvt. Publishers, 6th edition, 2014.
2. S.C. Chapra and R. Canale, Numerical analysis for engineers, Tata McGraw Hill Publications, 5th edition, 2005.

CO-PO, PSO Mapping

MA 301	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3	2	1											
CO2.	3	1												
CO3.	2	1	1											
CO4.	3	2	1											
CO5.	3	2	1											
CO6.	3	1	1											

ELECTRONIC DEVICES AND CIRCUITS EI302

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE:50**

Prerequisites: Basic Electronics

Course Outcomes: Upon the completion of this course student will be able to:

CO1: Characterize DC biasing of BJT
CO2: Formulate stabilization issue and performance aspect in AC domain
CO3: Illustrate frequency response of BJT and JFET amplifiers and determine operating points using h parameters
CO4: Design and calculate the efficiency of various configurations of power amplifiers
CO5: Design and analyze the feedback concepts in amplifier and oscillator
CO6: Design different types of power supplies

PART-A

1. **DC Biasing-BJTs:** Operating point, Fixed-Bias Configuration, Emitter-Bias Configuration, Voltage-Divider Bias Configuration, Collector Feedback Configuration, Emitter-Follower Configuration, Common-Base Configuration, and Miscellaneous Bias Configuration.

7Hours

2. **Bias Stabilization and BJT AC Analysis:** Bias Stabilization, Practical Applications**,** Introduction to BJT AC Analysis, Application in the AC Domain, BJT Transistor Modeling.

6Hours

PART-B

3. **BJT and JFET Frequency Response:** Introduction, Logarithms, Decibels, Frequency Considerations, Normalization Process.

7Hours

4. **BJT and JFET Frequency Response*(Continued):***Miller Effect Capacitance, High frequency Response-BJT Amplifier, Multistage Frequency Effects, graphical determination of h-parameters.

6Hours

PART-C

5. **Power Amplifiers**: Introduction, Series-Fed Class A Amplifier, Transformer-Coupled Class A Amplifier, Class B amplifier Operation, Class B amplifier Circuits, Amplifier Distortion, Power Transistor heat Sinking, Class C and Class D Amplifiers.

7Hours

6. **Feedback and Oscillator Circuits:** Feedback concepts, Feedback connection Types. Practical feedback circuits, Feedback amplifier-phase and frequency considerations.

6Hours

PART-D

7. **Feedback and Oscillator Circuits (*Continued*):** Oscillator Operation, Phase shift oscillator, Wein bridge Oscillator, Tuned Oscillator circuit and Crystal Oscillator.

6Hours

8. **Power Supplies:** Introduction, General filter Considerations, Capacitor filter, RC filter, Discrete Transistor Voltage Regulation, IC voltage regulators and practical applications.

7Hours

Text Book:

1. Electronics Devices and Circuit Theory, Robert L.Boylestad and Louis Nashelsky, ,PHI, 9th Edition.

Reference Book:

2. Integrated Electronics: Analog and Digital Circuits, Jacob Millman and Christos C Halkias, , TMH, 2001.

E-Books:

1. www.pyroelectro.com/edu/analog
2. http://freevideolectures.com/Course/3020/Circuits-for-Analog-System-Design

MOOCs:

1. https://www.mooc-list.com/course/electronic-systems-and-digital-electronicsuninettuno?static=true
2. http://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-012-microelectronic-devices-and-circuits-spring-2009/
3. Introductory Analog Electronics Laboratory (Spring 2007) by MIT Open Courseware |Reviews and Ratings

CO-PO, PSO Mapping

EI 302	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO7.		3											2	3
CO8.		3												
CO9.		2												
CO10.			3											
CO11.		2												
CO12.			2									1		

NETWORK ANALYSIS EI303

Hours / week: 4 **Total hours: 52**

Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Basic Electrical Engineering

Course Outcomes: Upon the completion of this course student will be able to:

CO1: Characterize the different types of electrical energy sources.
CO2: Determine time response of linear electrical circuits using basic principles and theorems
CO3: Describe resonance phenomenon and design series and parallel resonance circuits.
CO4: Evaluate initial conditions to find out the complete response
CO5: Determine Laplace transform for various signals and circuits
CO6: Model and evaluate two port network parameters

PART-A

1: Basic Concepts: Practical sources, Source transformations, Loop and node analysis with linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh

07 Hours

2: Network Topology: Graph of a network, Concept of tree and co-tree, incidence matrix, tie -set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form, Solution of resistive networks, Principle of duality.

07 Hours

PART-B

3: Network Theorems – 1: Superposition, Reciprocity and Millman's theorems (Numerical only on independent sources)

06 Hours

4: Network Theorems – II: Thevinin's and Norton's theorems; Maximum Power transfer theorem (Numerical only on independent sources)

06 Hours

PART-C

5: Resonant Circuits: Series and parallel resonance, frequency response of series and Parallel circuits, Q –factor, Bandwidth. Relevant derivations and numerical.

06Hours

6: Transient behavior and initial 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. Relevant derivations and numerical.

07 Hours

PART-D

7: Applications of Laplace Transformation: Step, Ramp and Impulse responses, waveform Synthesis, Solution of networks using Laplace transforms, Initial and final value theorem and numerical

07 Hours

8: Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters and relationship between parameters sets. Relevant derivations and numericals.

06 Hours

Text Book:

1. Network Analysis, M. E. Van Valkenburg, PHI / Pearson Education, 3rd Edition.

Reference Book:

1. Networks and systems Roy Choudhury, 2nd edition, 2006 Re-print, New Age International Publications

E-Books:

1. nptel.ac.in/courses/108105065- Networks signals and systems by Prof T.K. Basu, IIT Kharagpur
2. nptel.ac.in/courses/108102042- Circuit Theory by Prof Dutta Roy S.C, IIT Delhi
3. www.electrodiction.com/circuit-theory

MOOCs:

1. http://elearning.vtu.ac.in/06ES34.html
2. https://www.coursera.org/course/circuits

CO-PO, PSO Mapping

EI 303	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	2	2											3	3
CO2.			3											
CO3.			3											
CO4.		2	1											
CO5.	3	1										1		
CO6.			3									1		

LOGIC DESIGN EI304

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE:50**

Prerequisites: Basic Electronics
Course Outcomes: Upon the completion of this course student will be able to:
CO1: Design optimal logic circuit based on digital fundamentals
CO2: Synthesize combinational logic circuits using various code conversion techniques
CO3: Design various combinational logic circuit using MSI components
CO4: Characterize the basic memory components for sequential circuits
CO5: Design of registers and counters
CO6: Evaluate synchronous counters using Mealy and Moore models

PART-A

1: Principles of combinational logic – I: Review of Boolean algebra, Normal and Canonical forms (Minterm and maxterm equations), Definition of combinational logic, Generation of switching equations from truth tables, Karnaugh maps-2, 3 and 4 variables; Completely and Incompletely specified functions (Don't Care terms), Simplifying Min term and Max term equations using K-map, Determination of minimal sum and minimal product expressions using essential prime implicants and essential prime implicates.

07 Hours

2: Principles of combinational Logic – II: Synthesis and Analysis of combinational logic circuits, code conversion: Binary to gray, Gray to Binary, Binary to BCD, BCD to Binary, BCD to excess-3 code, etc., Realization of logic circuits using Universal gates (NAND & NOR gates), VEM for completely specified functions

07 Hours

PART-B

3: Analysis and design of combinational logic: General approach, Adders and subtractors –Binary parallel adder &subtractors, Look ahead carry full adder, BCD adder and Magnitude comparators. Design BCD to Excess-3 code converter, Excess – 3 code to Binary converter (using Binary parallel Adder).

06 Hours

4: Analysis and design of combinational logic with MSI Components: Decoders-realization of Canonical expressions, Realization of BCD to Excess-3 code converter and Excess – 3 code to Binary converter, Encoders, Digital multiplexers – Realization of Boolean canonical expressions using multiplexers.

06 Hours

PART-C

5: Basic Sequential Circuits and their Applications: Review of basic latches and their applications: Basic Bi-stable Elements and Latches, SR Latch and $\overline{SR}$ latch, Applications of SR and SR Latch, A Switch Debouncer: The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip- Flop, T – FF, Edge Triggered Flip-Flop: The Positive Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. Characteristic Equations of all basic sequential circuits.

07 Hours

6: Sequential Circuits – 2: Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops, Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops

07 Hours

PART-D

7: Sequential Design – I: Introduction, Mealy and Moore Models, State Machine Notation for basic latches, Analysis of Synchronous Sequential Circuit.

06 Hours

8: Sequential Design – II: Construction of state Diagrams: Sequence detectors, Design of a Synchronous Counter using clocked D, T, SR and JK Flip-Flops based on Mealy and Moore models.

06 Hours

Text Books:

1. **Digital Principles and Design**, Donald D Givone, Tata McGraw Hill Edition, 2002.
2. Digital Logic Applications and Design, John M Yarbrough, , Thomson Learning, 2001.

Reference Book:

1. **Digital System Design**, Ronald J Tocci, PHI, 2nd edition

E Books:

1. http://www.free-engineering-books.com/2014/11/digital-fundamentals-by-thomasl-floyd.html
2. https://books.google.co.in/books/about/Fundamentals_of_Digital_Circuits.html?id=BOVkrtiLUcEC

MOOCs:

1. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
2. http://freevideolectures.com/blog/2010/11/130-nptel-iit-online-courses/
3. www. pyroelectrom.com/edu
4. http://nptel.ac.in/courses/117106086
5. http://nptel.ac.in/courses/117105080
6. Digital Circuits and Systems, Youtube - S. Srinivasan, IIT Madras
7. Digital Integrated Circuits, Youtube – Amitava Dasgupta, IIT Madras

CO-PO, PSO Mapping

EI 304	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3												2	
CO2.		3												
CO3.		3										1		
CO4.		2												
CO5.			3											
CO6.			2									1		

TRANSDUCERS AND INSTRUMENTATION EI305

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Basic Electronics, Mathematics

Course Outcomes: Upon the completion of this course student will be able to:

CO1: Distinguish functional elements of a system and classify the transducer.
CO2: Define the static characteristics and dynamic characteristics of instruments.
CO3: Characterize the instrument response in time and frequency domain.
CO4: Develop a mathematical model for a given physical system.
CO5: Describe resistive, capacitive and inductive transducer based on their working principle.
CO6: Employ piezo electric principle for transduction application.

PART-A

1: Introduction: Functional elements of an instrument: analog & digital modes of operation, I/O configuration of measuring instruments & instrument system- methods of correction for interfering & modifying inputs Definition of a transducer, Active and Passive Transducers, Primary and Secondary Transducers, Advantages of Electrical Transducers and Selection of Transducers. 07 Hours

2: Static Characteristics of Instruments: Definition, Static Calibration, Static Error & correction, accuracy & Precision, linearity, Resolution & Threshold, Sensitivity, Reproducibility, Repeatability, Range, Span and Bias, Drift, Dead time & Dead zone, Hysteresis, Stability and numericals.

07 Hours

PART-B

3: Time Domain Analysis: Zero Order Instruments, 1st & 2nd Order Instruments – Step, ramp, & Impulse Responses,(Derivations excluding second order system), Time Domain Specifications: Rise time, Delay time, Peak Overshoot & Settling time and numericals.

06 Hours

4: Dynamic Characteristics of Instruments: Definition, Speed of Response, measuring lag, Fidelity, Dynamic Error, dead time, Frequency response of 1st & 2nd order Systems, Correlation between time and Frequency response of 2nd Order Instruments and numericals.

06 Hours

PART-C

5: Resistive Transducers: Potentiometers: Characteristics, loading effect, Linearity & sensitivity, advantages & disadvantages of Resistive potentiometers. strain gauge: theory, Types, Applications, Thermistors, RTD and numericals.

07 Hours

6: Capacitive Transducers

Capacitive Transducers using change in area of plates, distance between plates, & change of dielectric constants, derivation for sensitivity Linearity by differential arrangement, frequency response, advantages, disadvantages & applications of Capacitive Transducers and numericals.

06 Hours

PART-D

7: Variable Inductance Transducer

Linear variable differential Transformer (LVDT): Principles, characteristics, advantages, disadvantages, applications, RVDT and numericals.

06 Hours

8: Special Transducers

Piezo-electric Transducers: Principles of operation, expression for output voltage, piezo-electric materials, equivalent circuit, Loading effect, charge Amplifier, frequency response, Applications and numericals.

07Hours

Text Book:

1. **Electrical & Electronic Measurements &Instrumentation** ,A.K. Sawhney, 17th edition

Reference Books:

1. **Measurement Techniques**, E.O.Doeblin, McGraw Hill publications. 6th edition
2. **Transducers and Instrumentation**, D.V.S Murthy PHI

E Books:

1. http://nptel.ac.in/courses/112103174/pdf/mod2.pdf
2. https://www.youtube.com/watch?v=1uPTyjxZzyo
3.http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic%20Measurements.htm
4. http://www.nptelvideos.in/2012/11/industrial-instrumentation.html
5. http://onlinevideolecture.com/?course_id=385&lecture_no=32

MOOCs:

1. http://nptel.ac.in/courses/112103174/3

CO-PO, PSO Mapping

EI 305	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3												3	1
CO2.		3												
CO3.		3	2											
CO4.		1												
CO5.		3				2						1		
CO6.		1												

ELECTRONIC INSTRUMENTATION AND MEASUREMENT TECHNIQUES EI306

Hours / week: 3 **Total hours: 40**
Exam hours: 3 **CIE: 50** **SEE:50**

Prerequisites: Basic Electronics, Basic Electrical Engineering
Course Outcomes: Upon the completion of this course student will be able to:
CO1: Differentiate the various types of measurement errors in electronic system.
CO2: Describe the working of voltmeter, frequency meter and potentiometer
CO3:.describe working of oscilloscope.
CO4: Illustrate the working of signal generators.
CO5: Measure RLC parameters using bridges.
CO6: Describe the functioning of optical display and transduction devices.

PART-A

1: Introduction: Measurement Errors: Gross errors and systematic errors, Absolute and Relative errors. Voltmeters: Multi-range voltmeter, Loading, AC voltmeter using Rectifiers – Half Wave and full wave.

05Hours

2: Digital Instruments: Digital Voltmeters – Introduction, DVM's based on V – T, V – F and Successive approximation principles, Resolution and sensitivity, General Specifications, Digital Multi-meters, Digital frequency meters and Digital Measurement of time.

05 Hours

PART-B

3: Oscilloscopes: Introduction, Basic principles, CRT features, Block diagram, applications, Dual beam and dual trace CRO concepts and Digital storage oscilloscopes-block diagram.

05 Hours

4: Signal Generators: Introduction, Fixed and variable AF oscillator, Signal generator, AF sine and Square wave generator, Function generator, Square and Pulse generator.

05 Hours

PART-C

5: DC Potentiometers: Principle of operation, standardization of DC Potentiometer, calibration of Ammeter, Voltmeter and Wattmeter. 05 Hours

6: DC bridges: Whetstone's bridge, derivation for sensitivity of quarter, half and full bridges, Kelvin's Bridge, Kelvin's double bridge, applications and numericals.

05 Hours

PART-D

7: AC bridges: Maxwell's bridge, Maxwell's inductance-capacitance bridge, Andersons Bridge, Desauty's bridge, Wien's bridge (including the analysis of phasor diagram for all), limitations and applications.

05 Hours

8: Photo Transducers and Photo Devices: Transducers-definition, photoelectric transducer, photovoltaic transducer, semiconductor photo devices, display devices: classification of display, LED and LCD.

05 Hours

Text Book:

1. Electronics & electrical measurements, A K Sawhney ,DhanpatRai& sons, 17th edition.

Reference Book:

1. Modern electronic instrumentation and measuring techniques, Cooper D & A D Helfrick, , PHI, 1998.

EBooks:

1. http://www.nptel.ac.in/courses/Webcoursecontents/IIT%20Kharagpur/Basic%20Electrical%20Technology/pdf/L-42(GDR)(ET)%20((EE)NPTEL).pdf
2. http://www.freeengineeringbooks.com/Instrumentation/Instrumentation- Engineering-Ebooks.php
3. http://www.vitorrent.me/search/ak+sawhney+instrumentation+and+measurement+pdf

MOOC:

1. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Madras/Electrical%20and%20Electronic%20Measurements%20(Video).htm

CO-PO, PSO Mapping

EI 306	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	2												2	1
CO2.	1													
CO3.			3											
CO4.			3											
CO5.		3												
CO6.					2							1		

ANALOG ELECTRONICS LAB EI307

Hours / week: 3 **Total Slots: 14**
Exam hours: 3 **CIE: 50** **SEE:50**

Prerequisites: Basic Electronics, Electronic devices & Circuits.
Course Outcomes: Upon the completion of this course student will be able to:
CO1: Illustrate the characteristics of basic electronic devices
CO2: Design various electronic circuit using basic components and device
CO3: Simulate basic electronic circuit using P-spice tool
CO4: Work as individual and group
CO5: Adopt professional ethics and responsibilities
CO6: Communicate instruction delivery for working and writing reports

Circuit Connection and Verification

1. Determination of operating point for CE configuration.
2. Design of single stage R–C coupled BJT amplifier and determination of the gain-frequency response, input and output impedances.
3. Design of BJT voltage series feedback amplifier and determine the gain, frequency response,
4. Testing of full wave and half wave rectifiers using diode(with/without RC filter)
5. Determination of static characteristics of SCR and Diac.
6. Design and testing of the performance of BJT Hartley oscillator.
7. Design and testing of single ended diode clipping circuits.
8. Design and testing of double ended diode clipping circuits.
9. Design and testing of diode clamping circuits (positive clamping and negative clamping).
10. Determination of line and load regulation for voltage regulator using IC.

Following experiments are to be simulated using P-Spice.

1. Familiarization of PSpice software.
2. Characteristics of BJT transistor in CB and CE configuration.

CO-PO, PSO Mapping

EI 307	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	2												2	1
CO2.		2	2											
CO3.					3									
CO4.									3					
CO5.								3						
CO6.										3				

INSTRUMENTATION LAB EI308

Hours / week: 3 **Total slots: 14**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Transducers & Measurements
Course Outcomes: Upon the completion of this course student will be able to:
CO1: Characterize first order system and transducers
CO2: Measure electrical parameters using DC/AC bridges
CO3: Work as individual and in group
CO4: Adopt professional ethics and responsibilities
CO5: Communicate instruction delivery for working and writing reports

List of Experiments

1. Characteristics of first order system (RC Network only).
2. Measurement of resistance by Wheatstone bridge and Determination of its sensitivity using quarter, half and full bridge configurations.
3. Measurement of Low resistance by Kelvin's Double Bridge.
4. Characteristics of RTD.
5. Characteristics of Thermocouple.
6. Characteristics of Thermistors.
7. Characteristics of L.V.D.T.
8. Characteristics of LDR.
9. Measurement of self inductance by Maxwell's bridge.
10. Measurement of self inductance by Anderson's Bridge.
11. Measurement of load by using strain gages mounted on cantilever beam (quarter, half and full bridge).
12. Calibration of Ammeter and Voltmeter using DC potentiometer.

CO-PO, PSO Mapping

EI 308	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3												3	
CO2.			2											
CO3.									3					
CO4.								3						
CO5.										3				
CO6.														

COMMUNICATION SKILLS – I HS003

Hours / week: 2 **Total Hours: 39**
Exam hours: 3 **CIE: 50** **SEE: 50**

Course Outcomes: Upon the completion of this course student will be able to:
CO1. Explain the rules of spelling, pronunciation and accent and demonstrate the speaking skills.
CO2. Draw conclusions, relate contents and make presentations using multimedia.
CO3. Express ideas in essay structure that are clearly linked through cohesive paragraphs and appropriate transitions.
CO4. Apply writing and presentation skills to assignments of other courses.

PART – A

Units 1 and 2: Me - My Dreams – SMART Goals, Explanation of Goals, Action Planning, Talking about self, Writing about self in 500 words, SWOT Analysis - SWOT through situations, Time management strategies and application in a given situation, Essay Writing, Spotting difference in formal and informal writing & Rewriting informal in formal form, Grammar - error corrections and Grammar exercises (application and analysis).

12 hours

PART – B

Units 3 and 4: Rules of spelling/ pronunciation & Accent, Homophones, Homonyms - Academic Vocabulary/ Speaking Skills, Time Management - Time management strategies and application in a given situation. Comprehensions - Reading comprehension for drawing inferences, skimming and scanning techniques.

9 hours

PART – C

Units 5 and 6: Understanding academic essay structure - Formal & Informal writing - Interpretation of graphs and Report writing, Negotiations/ Conflict Management - Application of negotiation and conflict management skills in a given situation, Power of Body Language - understanding body language, Interpreting body language, Individual activities through solving problems given in worksheets.

9 hours

PART – D

Units7 and 8: Taking and Giving directions – General & Academics, Giving and taking information - Writing process of model making (any) writing directions to reach a destination by looking at picture, Presentation Skills – Making academic presentations - Making power point presentations/ using multi-media. These sessions will be student centered practical sessions imparted through language games, group activities, group discussions based on video clippings.

9 hours

III Semester Bridge Course for Diploma Students
(Common to all Branches)
(Audit Course)

Course: Basic Mathematics - I — Code: MATDIP301
Hours / week: 3 — Total hours: 40

PART – A

1: Basic formulas: Partial fractions. Matrices and determinants: matrix transformation, matrix multiplication, evaluation of determinants.

5 hours

2: Differentiation-I: Review of limit and Continuity, differentiation- Basic formulas, Sum rule, product rule, quotient rule, chain rule and problems.

5 hours

PART – B

3: Differentiation-II: Taylor's series and Macluaurin's series of simple functions for single variable, simple Problems.

5 hours

4: Differentiation-III: Polar curves- angle of intersection between the curves, Pedal form.

5 hours

PART - C

5: Partial differentiation -I: Definition, Illustrative examples on Partial differentiation, Total differentiation, chain rule.

5 hours

6: Partial differentiation –II: Differentiation of composite and implicit functions, Jacobians illustrative examples and problems, simple problems.

5 hours

PART - D

7: Integration: Basic formulas, Illustrative examples, evaluation of definite integrals, Integration by parts, Bernoulli's rule of Integration.

5 hours

8: Integral calculus: Reduction formula for functions $sin^n x, \quad cos^n x, \; sin^n x cos^m x$ (without proof), Simple problems, Double & triple integration, simple problems with standard limits.

5 hours

Note: Theorems and properties are without proof. Applicable to all the units.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40 th edition (2007).
2. Erwin Kreyezig, Advanced Engineering Mathematics, Tata McGraw Hill Publications, 8th edition (2007).

ENGINEERING MATHEMATICS – IV MA 401
(Common to all Branches)

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Course Objective: The student will study the calculus of a complex valued function, correlation, curve fitting of data and different probability distribution functions.

Course Outcomes: Upon the completion of this course student will be able to:

CO1. Apply the concepts of analytic functions, conformal mapping to engineering oriented problems.
CO2. Adopt residue concept for complex integration.
CO3. Adopt statistical skills to analyze the data and study the engineering problems
CO4. Apply the probability theory and applications of discrete random variables and continuous random variables.
CO5. Apply the sampling theory for a given problem.
CO6. Adopt the joint probability concepts for Markov chain based engineering problems.

PART A

1. Functions of a complex variable: Analytic functions. Statement of Cauchy-Riemann equations in Cartesian and polar forms. Harmonic functions. Construction of an analytic function using Milne-Thomson method (Cartesian & Polar forms). Illustrative examples from Engineering Field.

6 hours

2. Conformal Mapping: Definition of Conformal transformation and discussion of standard transformations - $w = z^2, w = e^z, w = z + \frac{k^2}{z}$. Bilinear transformation, Cross ratio property, Illustrative examples**.** Applications of conformal mapping**.**

6 hours

PART B

3. Complex Integration: Cauchy's theorem, Cauchy's Integral formula, Evaluation of integrals using Cauchy's integral formula, Zeros of an analytic function, Singularities and Residues, Calculation of residues, Evaluation of real definite integrals.

7 hours

4. Statistics: Curve fitting by least square method – Straight lines, parabola, and exponential curves. Correlation – Karl Pearson coefficient of correlation and Spearman's rank correlation coefficient. Regression analysis, Illustrative examples from engineering field, Physical interpretation of numerical value of the rank correlation coefficient.

6 hours

PART C

5. Probability: Discrete Random Variables: Definitions and properties, PDF & CDF, Expectation and Variance. Theoretical distributions – Binominal and Poisson distribution. Illustrative examples.

6 hours

6. **Continuous Random Variables:** Definition and properties, PDF and CDF, Expectation and Variance. Theoretical distribution of a Continuous random variable – Exponential and Normal/Gaussian distribution. Discussion on the choice of PDF. Illustrative examples from engineering field.

7 hours

PART D

7. Sampling Distribution: Testing a hypothesis, Level of significance, Confidence limits, Simple sampling of attributes, Test of significance for large samples, Comparison of large samples, Student's t-distribution, Chi-square distribution and F- distribution.

8 hours

8. Joint Probability Distribution & Stochastic Processes: Concept of joint probability, Joint distributions of discrete random variables, Independent random variables – problems. Joint expectation, co-variance and correlation. Markov Chains: Introduction, stochastic matrices, fixed probability vectors and regular stochastic matrices.

6 hours

Note: Theorems and properties are without proof. Applicable to all the units.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 44th Edition, 2016.
2. Erwin Kreyezig, Advanced Engineering Mathematics, Wiley India Pvt. Ltd 9th edition, 2014.
3. B V Ramana Higher Engineering Mathematics, Tata McGraw Hill Publications, 2nd edition, 2007.

Reference Books:

1. Murray R Spiegel, John Schiller R Alur Srinivasan, Probability and Stastics,Tata McFrown 5th reprint 2004ed.
2. Statistics for engineers and Scientists, William Navide, Migrahill education, India pvt. Ltd., 3rd edition 2014.

CO-PO, PSO Mapping

MA 401	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3	2	1											
CO2.	3	2												
CO3.	3	1	1											
CO4.	3	2	1											
CO5.	3	2	1											
CO6.	3	2	1											

LINEAR INTEGRATED CIRCUITS AND SIGNAL CONDITIONING CIRCUITS EI402

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Basic Electronics

Course outcomes: Upon the completion of this course student will be able to**:**

CO1: Describe fundamentals of Opamp and its behavior in open loop configuration
CO2: Design of Opamp circuits with positive and negative feedback and their applications.
CO3: Measure basic performance parameters of Opamp.
CO4: Use of Opamp with diodes and capacitors for special applications.
CO5: Design circuits to generate basic signals using Opamp and timer.
CO6: Design SCC for specified instrumentation applications.

PART-A

1. **Introduction to OPAMPs:** Basic internal circuit of OPAMP (Differential Amplifier), Block diagram representation of a typical OPAMP, OPAMP terminals and its ideal characteristics /Specifications; OPAMP in Open loop configuration: Open loop voltage gain, Zero Crossing detector: Inverting & Non Inverting ZCDs; Positive and Negative voltage level detectors, LM 339-Quad Comparator, Generation of PWM using LM339.

7Hours

2. **OPAMPs with negative feedback and its applications:** Inverting and Non Inverting amplifier: Closed loop voltage gain, Input impedance, Output impedance, Bandwidth with feedback, Applications: Adder (Multichannel amplifier), Inverting averaging amplifier, Non Inverting Adder, Voltage follower: Ideal voltage source, Difference amplifier: Subtractor and design problems.

7 Hours

PART-B

3. **OPAMPs with positive feedback and its applications:** Effect of noise on comparator circuits, Design aspects of ZCD with Hysteresis (Schmitt trigger),(Design aspects of Voltage level detectors with Hysteresis (both Inverting and Non Inverting), Applications: ON – OFF control principles(Design problems) and independently adjustable set point controller.

6 Hours

4. **DC performance and AC performance of OPAMPs:** Measurement and effect of OPAMP Parameters: Input bias current, Input offset current, Input offset voltage, Frequency response of OPAMP: Open loop and Closed loop configurations. Slew rate and output voltage, Problems.

6 Hours

PART-C

5. **Special Applications of OPAMPs:** V-I (both floating load and grounded load) converter and their Applications: Diode match finder, Zener diode tester, design of high input impedance DC/AC voltmeter using ammeter, I-V converter and its applications; design of I-V circuit for Photo based sensor, Precision rectifiers: Half wave and Full wave;, Frequency response of Integrator, Differentiator and their Design.

6 Hours

6. **Waveform Generators:** Multivibrators using OPAMPs: Free running (square wave generator) and one shot multivibrators, Triangular wave generator; Phase shift oscillator, Design problems, 555 Timer: Introduction, Astable multivibrators and Mon stable multivibrators: applications and their applications.

7 Hours

PART-D

7. **Active Filters:** Introduction to Filters: Design aspects of Low pass Butterworth filter; first order and Second order filters, Design aspects of High pass Butterworth filter; first order and Second order filters, Higher order filters, Design aspects of Band pass filter and Band rejection filter. Design Problems.

7 Hours

8. **Signal conditioning circuits:** Basic differential Amplifiers, differential versus single input amplifiers, Instrumentation amplifier, Basic Bridge Amplifiers, Balancing and linearization techniques for the bridges, Design of Signal conditioning circuits for Strain gauge, Thermistor, RTD, Thermocouple and AD590.

6 Hours

Text Books:

1. **Operational Amplifiers and Linear Integrated Circuits**, Robert. F. Coughlin & Fred.F. Driscoll, , PHI/Pearson, 2006
2. **Operational Amplifiers and Linear Integrated Circuits**, Ramakant A. Gayakwad, , 4th edition, PHI

Reference Book:

1. Linear Integrated Circuits, D. Roy Choudhury and Shail B. Jain, , 2nd edition, Reprint 2006, New Age International

E Books:

1. http://freevideolectures.com/Course/2321/Electronics-for-Analog-Signal-Processing-I
2. http://freevideolectures.com/Course/2322/Electronics-for-Analog-Signal-Processing-I

MOOCs:

1. http://ocw.tudelft.nl/courses/microelectronics/analog-integrated-circuitdesign/course-home/
2. Introductory Analog Electronics Laboratory (Spring 2007) by MIT Open Courseware |Reviews and Ratings
3. http://www.pannam.com/blog/free-resources-to-learn-electrical-engineering/

CO-PO, PSO Mapping

EI 402	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3		2											
CO2.		3												
CO3.		3												
CO4.			3										2	1
CO5.		3	2											
CO6.			3											

PROCESS INSTRUMENTATION-I EI403

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Transducers and Instrumentation

Course outcomes: Upon the completion of this course student will be able to:

CO1: Describe measurement techniques for displacement and force
CO2: Describe measurement techniques for computation of torque and shaft power for rotating members
CO3: Illustrate working of contact and non contact temperature determination
CO4: Illustrate various techniques for low and medium pressure measurement

CO5: Employ specified flow meters for industrial applications based on their classification
CO6: Choose suitable sensor and switch for level measurement

PART-A

1: Measurement of Displacement: Principles of measurement of displacement, resistive potentiometer, capacitance pickup, Variable Inductance and Reluctance Pickup, LVDT and ultrasonic transducer.

06 Hours

2: Measurement of Force, Torque & Shaft Power: Introduction to force, Hydraulic Load cell, Pneumatic Load cell, Elastic force Devices, Transmission Dynamometers, Driving type Dynamometers, Absorption Dynamometers.

07 Hours

PART-B

3: Temperature Measurement: Thermal expansion methods-bimetallic thermometers, liquid-in-glass thermometers, pressure thermometers; thermoelectric sensor - common thermocouples, reference junction consideration, electrical resistance sensors- conductive sensor (resistance thermometers), bulk semiconductor sensors (thermistors) and junction semiconductor sensors.

07 Hours

4: Radiation Temperature Sensors: Chopped radiation type optical pyrometer, Automatic null balance radiation thermometers (optical pyrometers). Two color radiation thermometers, Black body-tipped fiber optic radiation thermometer. Fluro-optic temperature measurement.

06 Hours

PART-C

5: Pressure Measurement: Basic methods of pressure measurement; manometers, elastic transducers (Types of Measuring Devices Only). Low pressure measurement- McLeod gage, Knudsen gage, momentum-transfer (viscosity) gages, thermal conductivity gages, ionization gages.

07 Hours

6: Flow Measurement-1: Classification of flow meter, Head type flow meters. Constant-area, variable-pressure-drop meters (obstruction meters). Pitot tubes. Constant pressure-drop, variable area meters (rotameters). Hot wire and hot film anemometer.

07 Hours

PART-D

7: Flow Measurement-2: Electromagnetic flow meters, Ultrasonic flow meters, Laser Doppler velocimeter; turbine meters, positive displacement meters (Nutating disc meter, sliding vane type meter). Metering pumps. Drag force flow meters.

06 Hours

8: Level Measurement: Capacitance level sensor: bare and coated, single point conductivity level sensor, Force balance differential pressure sensors, displacement level switch, float level switches.

06 Hours

Text Books:

1. **Measurement systems application and design**, ERNEST O DOEBELIN, 6th Edition, McGraw-Hill.
2. **Instrumentation Measurement and analysis**, B.C.Nakra and K.K.Chaudhry, TMH,2002(Units 2 & 5)

Reference Books:

1. **Instrumentation Devices & Systems**, Rangan, Mani, Sharma, , 2nd Edition TMH.
2. **Instrument Engineers Hand book (process measurement)** B G LIPTAK, Chilton book Company

E Books:

1. http://nptel.ac.in/courses/112103174/pdf/mod2.pdf
2. https://www.youtube.com/watch?v=1uPTyjxZzyo
3. http://nptel.iitg.ernet.in/courses/Elec_Engg/IIT%20Bombay/Electrical%20and%20Electronic%20Measurements.htm
4. http://www.nptelvideos.in/2012/11/industrial-instrumentation.html
5. http://onlinevideolecture.com/?course_id=385&lecture_no=32

MOOC:

1. http://nptel.ac.in/courses/112103174/3

CO-PO, PSO Mapping

EI 403	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3	2												
CO2.	3	2												
CO3.	3					1								
CO4.	3					1							3	2
CO5.	3					1								
CO6.		3				1								

SIGNALS & SYSTEMS EI404

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Engineering Mathematics

Course outcomes: Upon the completion of this course student will be able to**:**

CO1: Describe fundamentals of signals and systems
CO2: Establish time domain representation for LTI systems
CO3: Use Fourier transforms for continuous time signals
CO4: Use Fourier transforms for discrete time signals
CO5: Employ Z transforms to analyze discrete time signals and systems

PART-A

1. **Introduction**: Definitions of a signal and a system, classification of signals, basic Operations on signals, elementary signals, Systems viewed as Interconnections of operations, properties of systems.

07 Hours

2. **Time-domain representations for LTI systems-1:** Impulse response representation, Concepts of Convolution, Computation of Convolution Sum and its properties.

07 Hours

PART-B

3. **Time-domain representations for LTI systems – 2:** System representation: Differential and difference equation Representations, System response by solving differential and difference equation.

07 Hours

4. **Fourier representation for signals and Analysis:** Introduction, the Fourier series for continuous time periodic signals and their properties. Numericals on properties.

06 Hours

PART-C

5. **Continuous Time Fourier Transforms and applications:** Introduction, the Fourier transform representation for continuous time non- periodic signals and their properties. Numericals on properties.

06 Hours

6. **Discrete Time Fourier series and Discrete Time Fourier transform:** Fourier series representation of discrete time periodic signals and their properties, The Fourier transforms representation of discrete time non periodic signals and their properties.

07 Hours

PART-D

7. **Z-Transforms and applications:** Introduction, Z – transform, Region of convergence, properties of ROC, Properties of Z – transforms and numericals.

06 Hours

8. **Inverse Z-transforms and applications:** Inverse Z – transforms (PFE method). Transform analysis of LTI Systems, unilateral Z-Transform and its application to solve difference equations.

06 Hours

Text Books:

1. Signals and Systems, Simon Haykin and Barry Van Veen, John Wiley & Sons, 2001.Reprint 2002

2. Modern Digital Signal Processing, V. Udayashankara, Second Edition, PHI

Reference Book:
1. Signals and Systems, Roborts, TMH, 2004

E Books:
1. NPTEL lecture Video on Signals and Systems by Prof. S.C.Dutta Roy,
http://www.satishkashyap.com/2012/04/iit-video-lectures-on-signals-and.html
2. NPTEL lecture Video on Signals and Systems by Prof. T.K. Basu, IIT Kharagpur.
http://www.nptel.ac.in/courses/108105065/
3. http://cnx.org/contents/a80b2905-e6aa-4f4e-8460-f2e13980c389@1/Laboratorymeasurement-of-impu

MOOCs:
1. https://www.edx.org/course/signals-systems-part-1-iitbombayx-ee210-1x-0
2. https://www.edx.org/course/signals-systems-part-2-iitbombayx-ee210-2x-0

CO-PO, PSO Mapping

EI 404	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.		3												
CO2.			3	1										
CO3.	3	2										1	3	2
CO4.	3	2										1		
CO5.	3	2										1		

MICROPROCESSOR EI405

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**
Prerequisites: Logic Design
Course outcomes: Upon the completion of this course student will be able to**:**
CO1: Describe architecture, minimum mode and maximum mode operations of 8086
CO2: Illustrate functioning of 8086 instructions and assembler directives
CO3: Develop ALP for elementary applications
CO4: Describe various exceptions for 8086
CO5: Interface memory and I/O ports
CO6: Describe functioning of numeric data processor

PART-A

1. **The Processor-8086:** Register organization of 8086, Architecture of 8086, Signal Descriptions of 8086, Physical memory organization, Minimum mode 8086 systems and timings, Maximum mode 8086 systems and timings, mode of operation.

07Hours

2. **8086 Instruction Set:** Data transfer, Arithmetic, Bit manipulation, String, Processor control and Program execution transfer instructions of 8086.

07Hours

PART-B

3. **Assembler directives & Instruction Templates:** Addressing modes of 8086, Assembler directives, Machine language instruction format and templates (for only MOV instruction).

06Hours

4. **Assembly Language Programming with 8086**: A few machine level programs, Programming with an assembler, Assembly language example programs.

06Hours

PART-C

5. **Special Architectural Features and Related Programming:** Introduction to stack, Stack structure of 8086, Interrupts and Interrupt service routines, Interrupt cycle of 8086, Non-maskable & maskable interrupts, Interrupt Programming, Macros, Timings and delays.

06Hours

6. **Basic Peripherals and their Interfacing with 8086:** Semiconductor memory interfacing, Dynamic RAM interfacing, Interfacing I/O ports.

07Hours

PART-D

7. **Special Purpose Programmable Peripheral Devices and Their Interfacing**: Programmable communication Interface 8251- USART, Programmable Interrupt Controller 8259 -PIT.

06Hours

8. **Multi-microprocessor Systems:** Introduction, Interconnection Topologies, Software aspects of multi-microprocessor Systems, Numeric processor 8087- Architecture, Signal descriptions, Register set, Exception handling, Interconnections of 8087 with 8086.

07Hours

Text Book:

1. Advanced Microprocessors and Peripherals, A.K.Ray and K.M. Bhurchandi, Tata McGraw Hill, 1st Edition, 1996, (Chapters 1,2,3,4,5,6 and 8)

Reference Book:

1. Microcomputer systems the 8086/8088 family, Architecture, Programming and Design, Yu-Cheng Liu & Glenn A Gibson, PHI, 2nd Edition.

E Book:

1. http://freevideolectures.com/Course/3018/Microprocessors-and-Microcontrollers

MOOCs:

1. Embedded Systems - Shape The World
https://www.edx.org/course/embedded-systems-shape-world-utaustinx-ut-6-02x
2. Electronic Interfaces: Bridging the Physical and Digital Worlds
https://www.edx.org/course/electronic-interfaces-bridging-physical-uc-berkeleyxee40lx-0

CO-PO, PSO Mapping

EI 405	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.					2									
CO2.			2		1									
CO3.					3							1		3
CO4.		3												
CO5.					2							1		
CO6.		2	3											

INTRODUCTION TO VHDL PROGRAMMING EI406

Hours / week: 4 **Total hours: 52**
Exam hours: 3 **CIE: 50** **SEE: 50**
Prerequisites: Logic Design
Course outcomes: Upon the completion of this course student will be able to**:**
CO1: Distinguish various identifiers, data objects, operators and data types
CO2: Design data flow model for given digital circuit
CO3: Illustrate behavioral model for given applications
CO4: Develop structural model for given digital system
CO5: Identify suitable model for given application
CO6: Synthesize digital circuit using packages and library functions

PART-A

1. **Introduction:** Fundamentals of VHDL, A Brief History of VHDL, Capabilities, Basic Terminology, Entity Declaration, Architecture Body, Identifiers, Data objects, Operators and Data types.

06 Hours

2. **Data –Flow Modeling:** Concurrent Signal Assignment statement, Concurrent V/S Sequential Signal Assignment, Conditional signal Assignment Statement, Selected Signal Assignment Statement, The Unaffected Value and Block Statement.

07 Hours

PART-B

3. **Behavioral Modeling:** Entity Declaration, Architecture Body, Process Statement, Variable Assignment Statement, Signal assignment statement, Wait, If, Case, Null Statements, Loop Next, Exit, Assertion, Report Statements Inertial delay model and Transport delay model, Multiple Processes.

07 Hours

4. **Structural Modeling and state Machines:** Component declaration, Component Instantiation and State machines.

06 Hours

PART-C

5. **Generics and Configurations & Advance Features:** Generics, Why Configurations, Configuration Specification, configuration Declaration, Default Rules, Generate statements, Type Conversions, Attributes.

06 Hours

6. **Sub Programs &Advanced HDL Descriptions:** Functions, Procedures, Subprogram overloading, Operator Overloading, Functions File Processing, Examples of File Processing

07 Hours

PART-D

7. **Packages and Libraries:** Package Declaration, Package Body, design File, design Libraries, Implicit Visibility, and Explicit Visibility.

07 Hours

8. **Synthesis Basics:** Highlights of Synthesis, Synthesis information from Entity and Module, Mapping Process in the Hardware Domain.

06 Hours

Text Books:

1. **A VHDL Primer**- J.Bhaskar – PHI Publications
2. **Introduction to HDL Programming** - NazeihM.Botros- Dreamtech Press (Available through John Wiley – India and Thomson Learning).

Reference Books:

1. **Circuit design with VHDL**, VolneiA.Pedroni, PHI
2. **VHDL Programming by Examples** -Douglas perry-Tata McGraw-Hill.

EBooks:

1. http://access.ee.ntu.edu.tw/course/dsd_99second/2011_lecture/W2_HDL_ Fundamentals_2011-03-02.pdf
2. http://www.ics.uci.edu/~alexv/154/VHDL-Cookbook.pdf
3. http://ece.niu.edu.tw/~chu/download/fpga/verilog.pdf

MOOCs:

1. Electronic Design Automation http://nptel.ac.in/courses/106105083/
2. Digital system design with PLDs and FPGAs http://nptel.ac.in/courses/117108040/
3. Fundamentals of HDL (Lecture #008)
   https://www.youtube.com/watch?v=rdAPXzxeaxs&index=8&list=PLE3BC3EBC9CE15FB0

CO-PO, PSO Mapping

EI 406	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3	2												

CO2.		3			2									
CO3.		3	2		1									
CO4.			3		2								2	3
CO5.		3			2							1		
CO6.			3		2									

DIGITAL CIRCUITS AND VHDL LAB EI407

Hours / week: 3 **Total slots: 14**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Logic Design and Introduction To VHDL Programming

Course outcomes: Upon the completion of this course student will be able to**:**

CO1: Develop logic circuits using basic digital IC's

CO2: Develop and synthesize VHDL code for digital system

CO3: Work as an individual and in group

CO4: Adopt professional ethics and responsibilities

CO5**:** Communicate information delivery for working and writing reports

CIRCUIT CONNECTION AND VERIFICATION

1. Realization of half/full adder and half/full sub tractor using logic gates.
2. Realization of (a) parallel adder/subtractors using 7483 chip,(b) Binary to Gray code converter and vice versa.
3. MUX/DEMUX use of 74153, 74139 for arithmetic circuits and code converter.
4. Realization of two bit comparator using 7483.
5. Realization of 3-bit Synchronous and Asynchronous counters as a sequential circuit and mod-n counter design using Flip-flops.
6. SIPO, SISO, PISO, PIPO operations using 7495S.
7. Design and testing of ring counter and Johnson counter.

PROGRAMMING

1. Write VHDL code to realize all the logic gates
2. Write a VHDL program for the following combinational designs
   a. 2 to 4 decoder
   b. 8 to 3 (encoder without priority & with priority)
   c. 4 bit binary to gray converter
   d. Multiplexer, de-multiplexer, comparator.
3. Write a VHDL code to describe the functions of a Full Adder Using three modeling styles.
4. Develop the VHDL code for the following flip-flops, SR, D, JK, and T.
5. Design 4 bit binary, BCD counters (Synchronous reset and Asynchronous reset) and "any sequence" counters

CO-PO, PSO Mapping

EI 407	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
CO1.			3	2										
CO2.			3		2							1		
CO3.									3	2			2	3
CO4.								3						
CO5.										3				

LINEAR INTEGRATED CIRCUITS LAB EI408

Hours / week: 3 **Total slots: 14**
Exam hours: 3 **CIE: 50** **SEE: 50**

Prerequisites: Linear ICs and Signal Conditioning Circuits

Course outcomes: Upon the completion of this course student will be able to**:**

CO1: Measure various Opamp parameters

CO2: Design Opamp and timer circuits for various applications

CO3: Work as an individual and in group
CO4: Adopt professional ethics and responsibilities
CO5: Communicate information delivery for working and writing reports

List of Experiments

1. Measurement of op-amp parameters
2. Op-amp in open loop configuration:
    a. Zero Crossing Detector
    b. Inverting Positive and Negative voltage level detectors
    c. Non-inverting Positive and Negative voltage level detectors
3. Op-amp in closed Loop configuration(with negative feedback): Inverting amplifier, Multi channel amplifier as adder and averager
4. Op-amp in closed Loop configuration(with positive feedback): Schmitt trigger; ZCD with hysteresis,
5. Op-amp in closed Loop configuration (with positive feedback): Inverting VLD with Hysteresis and Non-inverting VLD with Hysteresis.
6. Selected applications of Op-amp: V-I and I-V converter
7. Op-amp with Diodes: Half wave and Full wave Precision Rectifier
8. Op-amp with capacitors: Integrator and Differentiator
9. Wave form generators using Op-amp:
    a. Astable Multivibrator using Op-amp
    b. Monostable Multivibrator using Op-amp
10. Wave form generators using timer IC555:
    a. Astable Multivibrator
    b. Monostable Multivibrator
11. Butterworth Low pass & High pass Filters
12. Basic signal conditioning Circuits:
    a. Basic Differential Circuit and Subtractors
    b. Instrumentation Amplifier

CO-PO, PSO Mapping

EI 408	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
CO1.	3													
CO2.			3											
CO3.									3	2			3	2
CO4.								3						
CO5.										3				

IV Semester Bridge Course for Diploma Students
(Common to all Branches)
(Audit Course)

Course: Basic Mathematics - II — Code: MATDIP401
Hours / week: 3 — Total hours: 40

PART – A

1: Differential Equations-I: Solution of first order first degree differential equations- Variable separable methods, Homogeneous Equations, Exact differential equations Illustrative examples from engineering field. (Without I.F direct problems).

5 hours

2: Differential Equations-II: Linear & Bernoulli's differential equations, Illustrative examples from engineering field.

5 hours

PART – B

3: Differential Equations-III: Solution of second and higher order equations with constant coefficient by inverse differential operator method: $f(D)_y = e^{ax}$,

$f(D)y = cos(ax+b)/\sin(ax+b), f(D)y = ax^2+bx+c$,
$f(D) = e^{ax}\cos(ax+b)/e^{ax}\sin(ax+b)$, $f(D)y = xcos(ax+b)/xsin(ax+b)$

(Simple problems). Illustrative examples from engineering field.

5 hours

4: Laplace Transforms-I: Definitions, Laplace transforms of elementary functions, Laplace transforms of derivatives and integrals (without proof) illustrative examples

5 hours

PART –C

5: Laplace Transforms-II: Periodic functions, Unit step function, Unit impulse function Illustrative examples from engineering field.

5 hours

6: Laplace Transforms-III: Inverse transforms simple problems, Applications of Laplace transforms to differential equations. Illustrative examples from engineering field.

5 hours

PART –D

7: Vector Algebra: Vector addition, Multiplication (Dot and Cross product), Triple products, vector differentiation, velocity, acceleration of a vector point function, Gradient, divergence and curl.

5 hours

8: Vector integration: Evaluation of Line integrals, surface integrals and volume integrals simple problems, Statement of Green's theorem, Stokes theorem and Gauss Divergence theorem, Illustrative examples from engineering field.

5 hours

Note: Theorems and properties are without proof. Applicable to all the units.

Text Books:

1. Dr. B. S. Grewal, Higher Engineering Mathematics, Khanna Publications, 40th edition (2007).
2. Erwin Kreyezig, Advanced Engineering Mathematics, Tata McGraw Hill Publications, 8th edition (2007).