Shri G. S. Institute of Technology and Science, Indore

Department of Electronics and Instrumentation Engineering

SYLLABUS

B. Tech. (Electronics and Instrumentation Engineering)

Academic Year 2024-25

Institute - Vision and Mission

Vision

A front-line institute in science and technology making significant contribution to human resource development envisaging dynamic needs of the society.

Mission

To generate experts in science and technology akin to society for its accelerated socio-economic growth in professional and challenging environment imparting human values.

Department - Vision and Mission

Vision

The department is committed to provide a holistic education that transforms the students into responsible engineers and facilitates them to build successful careers and excel in the field of Electronics and Instrumentation with social ethical standards.

Mission

To prepare emerging Electronics and Instrumentation engineers to possess good communication skills with the ability to work in multi-disciplinary groups, lead teams and understand their professional and ethical responsibilities for serving the needs of the society.

Shri G. S. Institute of Technology and Science

Department of Electronics and Instrumentation Engineering

Program Outcomes (PO)

B. Tech. (Electronics and Instrumentation Engineering)

PO1:	**Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2 :	**Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3 :	**Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4 :	**Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5 :	**Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6 :	**The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues 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 the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11 :	**Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12 :	**Life-long learning:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
MA-27xxx: MATHEMATICS-III

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	-	1	4	-	-	30	70	-	-	100

PRE-REQUISITE: Mathematics-I and Mathematics-II

COURSE OBJECTIVES: To enable the students to apply knowledge of Mathematics in various engineering fields by making them:

1. To develop concept of partial differential equations with its applications.
2. To introduce the concept of Fourier series and Fourier transform with their applications.
3. To acquire the knowledge of Laplace transform and its applications in solving ordinary differential equations.
4. To solve the problem related to differential calculus and integral calculus using numerical methods.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** Solve linear homogeneous partial differential equation of n^{th} order & their applications.
2. **CO2:** Obtain Fourier series expansion of function satisfying Dirichlet condition & Fourier transform of elementary function. Also apply concept of Fourier transform in solving linear partial differential equations.
3. **CO3:** Apply concept of Laplace Transform and its techniques to solve second order differential equation involving Dirac delta (Unit impulse).
4. CO4: Demonstrate the problems based on interpolation, numerical differentiation & integration.
5. CO5: Find the roots of the algebraic, transcendental equations and solve simultaneous equations using various numerical methods.

COURSE CONTENTS:
THEORY:

UNIT-I Advance Calculus: Jacobian's Taylor's and Maclaurin's series of two variable, Maxima and Minima of functions of two variables. Lagranges Method of undetermined multipliers and their applications. Elementary ideas of multiple integrals, change of order of Integration, change of variables in double integration using jacobian, Beta and Gamma functions.

UNIT-II: Fourier Series partial Differential Equations (PDE): Definition and Derivations, Odd and even functions, Half –Range Series, Change of Scale, Fourier Integral, Numerical Harmonic Analysis. Formation of PDE of first order and first **degree i.e.,** Pp+Qq=R, Linear Homogeneous Partial Differential Equations of nth order with constant coefficient. Separation of Variables. Application to Vibration of String and Transmission Line Equation. Applications of FT to solution of PDE.

UNIT-III Laplace and Fourier Transforms: Definition, LT of elementary and periodic functions, properties of LT and transforms of derivatives, Inverse Laplace Transform and its properties.

Convolution Theorem. Fourier Transforms, Sine and Cosine Transform, Application of LT to solution for linear differential equations with constant and variable coefficients, Simultaneous differential equations.

UNIT-IV Calculus of Finite Differences: Difference table, Operators E andΔ, Newton's forward and backward interpolation formula, Lagrange's interpolation formula, differentiation and integration, difference equations with constant coefficients.

UNIT-V Numerical Method: Solution of algebraic & transcendental equation: Newton Raphson method. Solution of simultaneous algebraic equation: Gauss elimination method, and Gauss Seidel method. Numerical solution of partial differential equations: Taylor's Picard's & Runge-Kutta Method.

ASSESMENT: Evaluation of students done through - Assignments, Seminars, Quiz, Mid sem Test exam, class performance & End exam of Session

TEXT BOOKS:

1. Paria G, "Ordinary Differential Equations with Laplace Transforms, Scholar's", Publications Indore.
2. Paria G, "A Textbook of vectors", Scholar's Publications, Indore.
3. Erwin. Kreyszig, "Advanced Engineering Mathematics", 8th edition, John Willy and Sons Publications, 1999.

REFERENCE BOOKS:

1. Ashok Ganguly et al., "Engineering Mathematics- Vol. II", Ramprasad and Sons, Bhopal.
2. Paria G, "Partial Differential Equations and Complex Variables", Scholar's Publications, Indore
3. Gyan A. K. and G. Paria, "A Textbook of Advance Calculus", Mudranika press Calcutta.
4. Ramana B V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Ltd., New-Delhi, 2006.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO2	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO3	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO4	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
CO5	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**
Avg.	**3**	**3**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**3**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx: CIRCUIT ANALYSIS AND SYNTHESIS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	2	-	3	1	-	30	70	40	60	200

PRE-REQUISITE: Fundamentals of basic Electrical engineering and Mathematics.

COURSE OBJECTIVES:

1. To familiarize the students with analysis and Synthesis of Networks and circuits.
2. To develop the basic understanding of various theorems used for analysis of electrical circuits.
3. To equip the students with the concept of time and frequency domain analysis.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. CO1: Apply KVL and KCL in Electrical Circuits.
2. CO2: Identify circuit Topology to reduce complexity.
3. CO3: Apply Fourier series and Laplace transform for circuit analysis and synthesis.
4. CO4: Apply various network topologies to analyzes and synthesis of various electrical parameters (2-port/Hybrid/T/ π)
5. CO5: To perform time domain analysis of electrical networks.

COURSE CONTENTS:
Theory:

UNIT-I: Basics of electrical Networks
Network elements: E.M.F., Current and Current density, Ideal and practical Voltage and Current Source and their characteristics, source transformations, Power and energy relations, Kirchhoff's lows, Current and voltage division, super node and mesh analysis . Fundamental of Ac circuits.

UNIT-II: Network Theorems & poly-phase circuit
Superposition, Reciprocity, Thevenin's, Norton's and Maximum power transfer theorem, Compensation, Tellenge's Millers theorem Δ-Y transformation, Poly-phase analysis, Power relation in AC Circuits, Power factor, Apparent and reactive power, Power triangle, Sinusoidal steady state analysis of RLC circuits,

UNIT-III Analysis of Coupled circuits & Resonance
Magnetic coupling, Study of ideal transformer, Dot convention and electrical equivalent of magnetically coupled circuits, Resonance: Series and parallel resonance, bandwidth & electivity, Q-factor, Effect of resistance of frequency response curve, Parallel resonance of RLC circuit.

UNIT-IV Two port network analysis & Network synthesis
Various network parameters: Z, Y, Hybrid, ABCD & there relationships condition of reciprocity and symmetry, Input and output impedances, Equivalent T and Π sections representation in parameter form, Ladder Network Function, Driving point and transfer impedances, Interpretation of poles and zeros, effect of their location in complex plane. Routh-Hurwitz Criterion of stability. Network

Synthesis: Hurwitz polynomial, Positive Real (PR) function, Properties of LC, RC, RL admittances, Foster realization of LC circuits, Ladder development and Cauer forms, Significance of elements in Foster & Cauer forms, Determination of end elements, Applicability of Foster and Cauer forms.

UNIT-V: Time Domain Analysis and Frequency domain analysis
Transient and steady state response of electrical circuits, Initial conditions & final condition in circuit elements, step and impulse response, solution to differential equation using Laplace transforms, Transform of various singularity functions, Convolutions, initial and final value theorem. Application of Laplace transformation to solve electrical circuits, Integrator and Differentiator circuits. Fundaments of active filters, Integrator and differentiator circuit, knowledge of state-space equations.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminar/ Quiz and two mid Semester Tests exam with weightage of 30% of total marks, End semester theory exam. Weightage in 70% of total marks.

TEXT BOOKS:

1. John D. Ryder & Charles M. Thomson, "Electronic Circuits & System Prentice ", Hall Inc", 1976
2. Van Valken burg M. E., "Network Analysis", Third Edition, Person Education.
3. D. Roy Choudhury, "Networks and Systems, New Age International, 1988.

REFERENCE BOOKS:

1. Charls A. Desoer and Ernest S. Kuh, "Basic Circuit Theory", McGraw Hill, 1969.
2. Franklin F. Kuo, "Network Analysis & Synthesis", Wiley Toppan, 2nd edition 1966.
3. Van Valkenburg M. E., "Introduction to Modern Network Synthesis", PHI.

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CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	-	-	-	-	-	-	-	-	-
CO2	3	2	2	-	-	-	-	-	-	-	-	-
CO3	3	2	3	1	-	-	-	-	-	-	-	-
CO4	3	2	3	1	-	-	-	-	-	-	-	-
CO5	3	2	3	1	-	-	-	-	-	-	-	-
Avg.	3	2	2.3	1	-	-	-	-	-	-	-	-

LABORATORIES OBJECTIVES:

1. To familiarize the students with basic electrical components and equipment's like CRO, multimeter, power supplies and their use for practical's.
2. To provide an environment to work in groups to perform practical and take readings.
3. To enable the students to record finding and obtain results practically and compare with theoretical results.

LABORATORY OUTCOMES: After completion of lab, the student will be able to:

1. CO1: Apply KVL and KCL in electrical circuit (EXP-1).
2. CO2: Apply Thevenin's/Norton's Theorem to analyze electrical circuits (EXP 2&3).
3. CO3: Apply Superposition Theorem, Reciprocity Theorem and maximum power transfer Theorem (Exp 4, 5 & 6).
4. CO4: Design and implement integrator/ differentiator and verify the functionality of circuits (Exp 7).

5. CO5: Obtain frequency response of series and parallel RLC circuit (with step input and sinusoidal input) & calculate its resonant frequency (EXP 4, 5, 8, 9, & 10).

LIST OF EXPRIMENTS:

1. To study and verify Kirchhoff's Current Law and Kirchhoff's Voltage Law.
2. To Implement and verify Thevenin's theorem.
3. To Implement and verify Norton's theorem.
4. To Study and verify Superposition theorem.
5. To Study and verify Reciprocity theorem.
6. To verify Maximum Power Transfer theorem.
7. To study Integrator and Differentiator circuits and observe the input/output waveforms.
8. To verify frequency response of series R-L-C circuit and determine resonance frequency.
9. To Study frequency response of parallel R-L-C circuit and determine resonance frequency.
10. To Study series R-L-C circuit with step input for under damped, over damped and critical damped case.

ASSESMENT: Evaluation of students through- Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	3	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	-	3	2	-	3	-	-	-	-	-	-	-
CO4	--	3	2	3	3	-	-	-	-	-	-	-
CO5	-	3	3	3	-	-	-	-	-	-	-	-
Avg.	3	3	2.6	2.4	2.6	-	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx/EI27xxx: DIGITAL ELECTRONICS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Fundamentals of Basic Electronics and basic Algebra.

COURSE OBJECTIVES:

1. To introduce basic concepts and laws involved in Boolean algebra.
2. To familiarize the students with number system and logic gates.
3. To provide the students with the basic knowledge for designing combinational and sequential circuits.

COURSE OUTCOMES: At end of course, the students should be able to:

1. **CO1:** To perform reduction of logical expressions and implement it using logic gate.
2. **CO2:** To develop combinational circuits for given application and verify its operation.
3. **CO3:** To implement the sequential circuits & differentiate with combinational circuits.
4. **CO4:** To analyse memory classification and structure.
5. **CO5:** To implement asynchronous and synchronous circuits fall under digital electronics.

COURSE CONTENTS:
THEORY:

UNIT-I: Minimization Techniques and Logic Gates
Review of 3 variable Karnaugh map Minimization, Minterm – Maxterm - Sum of Products (SOP) – Product of Sums (POS), 4, 5 variable k map, Don't care conditions, NOR Implementations of Logic Functions using gates, NAND–NOR implementations - Quine-McCluskey method of minimization.

UNIT-II: Combinational Circuits
Design procedure – Half adder – Full Adder – Half subtractor – Full subtractor – Serial binary adder Parallel binary adder, Fast Adder - Carry Look Ahead adder – Serial Adder/Subtractor - BCD adder – Binary Multiplier – Binary Divider - Multiplexer/Demultiplexer – decoder - encoder – parity checker– code converters - Magnitude Comparator.

UNIT-III: Sequential Circuits
Latches, Flip-flops - SR, JK, D, T, and Master-Slave – Characteristic table and equation–Application table – Edge triggering – Level Triggering – Realization of one flip flop using other flip flops, Asynchronous counter –Asynchronous Up/Down counter - Synchronous counters – Synchronous Up/Down counters – Design of Synchronous counters: state diagram-State table –State minimization – State assignment - Excitation table and maps-Circuit implementation - Modulo–n counter, Registers – shift registers - Universal shift registers– Shift register counters – Ring counter – Johnson Counter-Shift counters - Sequence generators.

UNIT-IV: Memory Devices
Introduction of memory, Memory architecture, Classification of memories – ROM - ROM organization - PROM – EPROM – EEPROM –EAPROM, RAM – RAM organization – Write

operation – Read operation. Static RAM Cell-Bipolar RAM cell – MOSFET RAM cell – Dynamic RAM cell. Implementation of combinational logic circuits using ROM, PLA, PAL.

UNIT-V: Synchronous and Asynchronous Sequential Circuits

Synchronous Sequential Circuits: General Model – Classification – Design – Use of Algorithmic State Machine. State reduction methods, Asynchronous Sequential Circuits: Design of fundamental mode and pulse mode circuits. **Introduction to Computer Architecture Organization, Von Neumon & Harvard Architecture, RISC v/s CISC, Concept of Instruction Execution.**

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. M. Morris Mano, "Digital Design,", Third Edition, Prentice Hall of India Pvt. Ltd, 2003
2. R. P. Jain, "Modern Digital Electronics", Fourth Edition, Mc-Graw Hill, 1987.
3. William H. Gothmann, "Digital Electronics: An Introduction to Theory and Practice", Second Edition, Phi, 1982

REFERENCE BOOKS:

1. M. Morris Mano and Micheal D. Ciletti, "Digital Design", Sixth Edition, Pearson Education, 2018.
2. Thomas L. Floyd, "Digital Fundamentals", Eleventh Edition, Pearson, 2017.
3. Helbert Taub and Donald Schilling, "Digital Integrated Electronics", Mc-Graw Hill, 2017.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	1								1
CO2	3	3	2	1								1
CO3	3	3	2	1								1
CO4	3	2	1	1	2							2
CO5	3	2	1	3	3							2
Avg.	3	2.6	1.6	1.4	2.5							1.4

LABORATORIES OBJECTIVES:

1. To educate the students on the practical concepts of Digital Electronics and Boolean algebra.
2. To perform rigorous experiments with different types of designs as combinational and sequential logic circuits.
3. To enable the students to implement logic circuits and verify their truth table.

LABORATORY OUTCOMES: At end of lab session, the students should be able to:

1. CO1: Verify truth tables of logic gates & implementation of Boolean logic equations.
2. CO2: Design combinational circuits for given application and verify its operation.
3. CO3: Design, implement and verify the code conversion circuits using logic gates.
4. CO4: Design, implement and verify the sequential logic circuits.
5. CO5: Implement the decoder, multiplexer and counter using TTL ICs and verify their operation.

LIST OF EXPRIMENTS:

1. To verify the truth tables of various Logic gates (AND, OR, NOT, NAND, NOR, XOR & XNOR)
2. To implement AND, OR & NOT logic gates using NAND and NOR gate.
3. To verify Demorgan's Theorem with Boolean logic equations.
4. To implement and verify even & odd parity generator & checker.
5. To implement half adder, full adder, parallel adder, half subtractor and verify their truth tables.
6. To design, implement and verify the code conversion circuits: Binary to Gray Code and Gray to Binary Code.
7. To design, implement and verify BCD to Excess-3 code conversion circuit.
8. To design, implement and verify 4 to 1 line multiplexer and 1-to-4-line demultiplexer.
9. To design, implement and verify 8 to 3 Line Encoder and 3 to 8 Line Decoder circuit.
10. To verify the truth tables of various flip-flops.
11. To implement mod-N counter using TTL IC 74LS190.
12. To implement 1-of-8 decoder using TTL IC 74138.
13. To implement a 8-of-1 multiplexer using TTL IC 74139.

ASSESMENT: Evaluation of students through- Continuous performance analysis of students based on experiment performance, File preparation, and internal viva and file submission with weightage of 40% of total marks and End semester practical examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**2**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.6**	**2.4**	**1.6**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx: ELECTONIC DEVICES AND CIRCUITS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Fundamentals of Basic Physics and Mathematics.

COURSE OBJECTIVES:

1. To expose the students to operating principle of semiconductor devices and circuits.
2. To enable students to build rectifiers, clippers, and amplifier circuits with electronic components.
3. To enable the students to build models of various electronic components.

COURSE OUTCOMES: At end of course, the students should be:

1. CO1: Able to identify the semiconductor type and explain its working principle.
2. CO2: Able to discuss the working principle of diodes/BJT and their applications.
3. CO3: Able to develop the models of diodes & BJT/FET/MOSFET.
4. CO4: Able to explain the principle of operation of MOSFET & its circuit design.
5. CO5: To discuss fabrication techniques for integrated circuits.

COURSE CONTENTS:
THEORY:

UNIT-I: Basics of semiconductor devices
Intrinsic & Extrinsic semiconductors, Mobility and Conductivity, Hall effect, E-K diagram, Current Densities, Diffusion, Generation & Recombination of electron-hole pair, Continuity equation, Conductivity Modulation, Mass-action Law, Injected Minority Carrier Charge, p-n junction diode, V-I characteristics & their temperature dependence, Diode resistances, and capacitance, Breakdown diodes, Photodiodes, LEDs, Varactor Diode, Schottky Diode, Tunnel Diode.

UNIT-II: Diode and Transistor circuits
Clippers, Clampers, Clamping theorem, Rectifiers & Model of diode, bipolar junction transistor (BJT), Potential profile in PNP & NPN structures, Current components, Configurations, Early Effect, Eber's Moll Model. Transistor as an amplifier, Biasing & Thermal Stabilization, The Q – point stability, Stabilization against variation of ICO, VBE& β, Bias compensation, Millers theorem and its dual, Thermal run – way, Schottky and Photo – transistors.

UNIT-III: BJT Modelling and Introduction to FET
Hybrid model, Simplified model, Common emitter with emitter resistor, high i/p impedance circuits, Emitter follower, comparison of CB, CE, CC configuration, Darlington pair, Bootstrapping, Cascode Amplifier, Field effect transistors(FET), JFET, pinch off, V-I Characteristics, Small signal model, MOSFET, Derivation for drain current ID for E-MOSFET, Threshold voltage and body effect, CS &CD amplifiers, Biasing techniques, FET as VDR,

UNIT-IV: MOS Structure and Short channel effect theory

Band diagram for a MOS junction under accumulation, Depletion & inversion, MOS capacitor, C-V of an ideal & non- ideal capacitors, Characterization of MOS capacitors, MOS field effect transistor (MOSFET) V-I characteristics in three regions of operation & equivalent circuit. Short channel MOSFET: Effect of scaling of MOSFET, Short & narrow channel effects on V-I characteristics, Hot electron effect in MOSFET. Modelling of MOS transistor level-I, BISIM3

UNIT-V Silicon Processing and Introduction to Power electronic devices

Silicon Planar technology, Oxidation, Diffusion, Metallization, Ion-Implantation & chemical vapour deposition, Lithographic process, Typical Bipolar & MOS IC process sequence, Silicon controlled Rectifier, Holding and Latching current, di/dt triggering and other triggering methods & Uni junction Transistor (UJT) and UJT relaxation oscillator.

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weight age of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

TEXT BOOKS:

1. Jacob Millman & Christos C. Halkias, "Electronic Devices &Circuits", McGraw-Hill,1967.
2. Robert L. Boylestad, "Electronic devices and Circuits", PHI.
3. Ben G. Streetman, "Solid State Electronics Devices", Prentice Hall of India, 5th edition.

REFERENCE BOOKS:

1. S. M. Sze, "Physics of Semiconductor Devices", Wiley-Interscience, 1969.
2. Adel S. Sedra & Kenneth C. Smith, "Microelectronic circuits', Fifth Edition, Oxford University Press.
3. Donald A. Neamen, "Electronic Circuits: Analysis and Design", Third Edition, Mc-Graw Hill, 2006.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	-	-	-	-	-	-	-	-
CO2	3	2	3	2	-	-	-	-	-	-	-	-
CO3	3	3	2	3	-	-	-	-	-	-	-	-
CO4	3	2	2	2	-	-	-	-	-	-	-	-
CO5	3	2	2	3	-	--	-	--	-	--	-	--
Avg.	3	2.2	2.4	2.4	-	-	-	-	-	-	-	-

LABORATORIES OBJECTIVES:

1. The aim of this laboratory is to give practical exposure to the students on various electronic components, semiconductor devices and electronic instruments which facilitates designing basic electronic circuits and analyze their characteristics.
2. To enable the students to verify characteristics of various electronic components.

LABORATORY OUTCOMES: At end of lab session, the students should be able to:

1. **CO1:** To generate different waveforms using CRO & function generator and to measure parameters like amplitude and frequency.
2. **CO2:** To determine VI characteristics for diodes (PN Junction, LED & Zener)
3. **CO3:** To apply and perform the Hall Effect on semiconductors to identify their types and concentrations.

4. **CO4:** To build, test & obtain the characteristics & parameters of BJT from its input /output variations.
5. **CO5:** To build the circuit and obtain characteristics of N Channel MOSFET

LIST OF EXPRIMENTS:

1. (a)To study the cathode Ray Oscilloscope and Function Generator and obtain the sinusoidal waveform of some amplitude and frequency. (b) Measure the Peak and RMS value of sine wave obtained in part (a) and obtain their relationship.
2. To plot the V-I characteristic of LED and Zener Diode. To find out the cut-in voltage of LED and breakdown voltage of zener diode from V-I characteristic
3. Determine the semiconductor type from the polarity of Hall voltage, knowing the orientation of all field and current in the experimental arrangement. Calculate the carrier concentration and mobility from the magnitude of the hall voltage and known experimental variable.
4. Plot the input characteristic of BJT in common emitter configuration. To find input impedance alpha and beta of transistor.
5. Plot the output characteristic of BJT in common emitter configuration. To find output impedance alpha and beta of transistor
6. Study of hybrid (H) parameter of transistor. To find the hybrid parameter from input output characteristic of transistor in CE configuration as done in experiment 4 and 5.
7. Plot the static drain characterization of N channel MOSFET. To calculate its various performance parameters.
8. To write Spice codes for various electronics circuits and perform their simulation.

ASSESMENT: Evaluation of students through –Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weight age of 40% of total marks and End Semester practical Examination (external viva) with weight age of 60%oftotalmarks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-
CO3	3	2	3	2	2	-	-	-	-	-	-	-
CO4	3	2	3	3	2	-	-	-	-	-	-	-
CO5	3	3	2	3	1	-	-	-	-	-	-	-
Avg.	3	2.6	2.6	2.4	1.4	-	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx: FUNDAMENTALS OF MEASUREMENT

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of basic electronics engineering

COURSE OBJECTIVES:

1. To familiarize the students with measuring instruments and their applications.
2. To provide the students with basic knowledge of Analog instruments and their operation.
3. To impart the knowledge of AC and DC bridges for measurement of electrical parameters.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. CO1: To classify measuring instruments and their errors.
2. CO2: Illustrate construction and operations of CRO with its measuring application.
3. CO3: Identify Analog instruments for measuring purposes.
4. CO4: List & explain measurement techniques for resistance, voltage, current/voltage, phase, frequency, energy & power.
5. CO5: Classify A. C. bridges for measurement of electrical parameters like inductance, capacitance.

COURSE CONTENTS:
THEORY:

UNIT-I: Fundamentals of measuring instruments:
Fundamental methods of measurement, Classification of measuring instruments, Static and Dynamic characteristics, Error Classification and analysis, Standards of displacement, force, time, frequency, temperature and electrical standards. IEEE standards.

UNIT-II: Cathode ray Oscilloscope:
Construction and operation, measurement of amplitude, phase and frequency with CRO, Lissajous patterns, Fundamentals of EMI, RF measurements techniques, Network analyzers, Noise reduction techniques.

UNIT-III: Analog Instruments:
Electromechanical Analog indicating type instruments, operating principle, operating force (deflecting, controlling & damping), types of support (suspension, taut suspension, pivot & jewel bearing) control system (gravity control & spring control) Damping system. PMMC, moving iron & Electrodynamometer: Ammeters and voltmeters, Extension of instrument range, instrument transformers.

UNIT-IV Measurement of Low resistance (voltmeter-ammeter, Potentiometer, Kelvins double bridge), Voltage, current, phase (single phase electrodynamometer power factor meter), frequency (mechanical and electrical), Power (electrodynamometer watt meter), and energy (single phase induction type watt-hour meter), compensation, calibration and testing of measuring instruments.

UNIT-V A.C. Bridges:
A.C bridges for measurement of inductance, capacitance, Q factor and loss angle, universal impedance bridge. Design aspects of digital Multimeter and panel meters, Distortion and spectrum analysis.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminar/ Quiz and two mid Semester Tests exam with weightage of 30% of total marks, End semester theory exam. Weightage in 70% of total marks.

TEXT BOOKS:
1. A. K. Sawhney, "Electrical & Electronic Measurement & Instrumentation", Dhanpat Rai and Co., 2015.
2. D. S. Kumar, "Measurement System: Applications & design", Sixth Edition, Metropolitan, 2002.
3. B. C. Nakra & K. K. Choudhary, "Instrumentation measurement & analysis", Fourth Edition, Tata-McGraw Hill, 1999.

REFERENCE BOOKS:
1. W. D. Cooper, "Electronic Measurement, Fourth Edition, Pearson Education.
2. F. E. Terman & J. M. Petit, "Electronic Measurement", Second Edition, Mc-Graw Hill, 1952.
3. Joshep J. Carr, "Elements of Electronic Instrumentation and Measurement", Third Edition, Pearson Education, 2003.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	-	2	-	-	-	-	-	-	-	-
CO2	3	2	-	2	1	-	-	-	-	-	-	-
CO3	3	1	-	-	-	-	-	-	-	-	-	-
CO4	3	1	-	1	-	-	-	-	-	-	-	-
CO5	3	1	2	1	-	-	-	-	-	-	-	-
Avg.	3	1.2	2	1.5	1	-	-	-	-	-	-	-

LABORATORIES OBJECTIVES:
1. To provide the students with hands-on experience in using measuring instruments.
2. To familiarize students with Analog instruments.
3. To encourage students to perform measurement of electrical quantities such as phase, frequency, capacitance, inductance, and resistance.

LABORATORY OUTCOMES: After completion of lab, the student will be able to:
1. CO1: To measure amplitude, phase (Lissajous pattern) & frequency of unknow signal with CRO.
2. CO2: Construct & operationalize Analog instruments based on PMMC principle.
3. CO3: Measure unknown resistance using different methodologies.
4. CO4: Measure unknown Inductance using Maxwell's, Inductance Bridge, Hay's Bridge, Anderson's Bridge, Owen's Bridge.
5. CO5: Measure unknown capacitance using De – Sauty's Bridge, and Schering Bridge

LIST OF EXPRIMENTS:
1. Study of Cathode Ray Oscilloscope (CRO).
2. To measure Amplitude and Frequency of unknown signal using CRO.
3. To measure Phase and Frequency of unknown signal using Lissajous pattern.
4. Study of PMMC Instrument (Analog Ammeter and Voltmeter).

5. To Measure current and voltage in a circuit using Analog Ammeter and Voltmeter respectively
6. To measure medium rang resistance using Wheatstone bridge.
7. To find percentage limiting error in the measurement of valve of a given resistor and study of color coding system of resistor for 4 bands and 6 bands.
8. Study of A.C Bridges (Maxwell's, Inductance Bridge, Hay's Bridge, Anderson's Bridge, Owen's Bridge, De-Sauty's Bridge, and Schering's Bridge).
9. To measure unknown inductance of coil using Maxwell's Inductance Capacitance Bridge.
10. Study of Digital Storage oscilloscope.

ASSESMENT: Evaluation of students through- Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	-	3	3	2	3	-	-	-	-	-	-	-
CO2	3	3	3	3	3	-	-	-	-	-	-	-
CO3	3	-	3	2	-	3	-	-	-	-	-	-
CO4	-	3	-	3	3	3	-	-	-	-	-	-
CO5	-	3	3	-	3	-	-	-	--	-	-	--
Avg.	3	3	3	2.5	3	3	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx: ELECTRONIC WORKSHOP LAB

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	2	-	-	1	-	-	-	40	60	100

PRE-REQUISITE: Knowledge of Basic Electronics and Physics

LABORATORY OBJECTIVES:

1. Familiarize the students with various Electronics Devices and their specifications.
2. Develop the skills to design and test electronic circuits for various applications.
3. Develop the skills to diagnose faults and their rectification.

LABORATORY OUTCOMES: After completing the lab course, students will be able:

1. CO1: To identify the electronic component and their specifications.
2. CO2: To use electronic instruments for testing electronic components.
3. CO3: To use data sheet to find specifications of electronic components to be used and interpret the data sheet. Specifications.
4. CO4: To draw PCB layout of electronic circuit manually and to perform drilling and etching.
5. CO5: To identify the faults and rectify them to make electronic circuit operational.

LIST OF EXPRIMENTS:

1. Identification of electronic components with specification and functionality, type, size, color coding, package, symbol. Identification of active, passive components, wires, cables, connectors, switches, Fuse, Relays, Displays etc.
2. To use instruments like Multimeter, Function Generator, Power Supply, CRO, Soldering iron, desoldering pump.
3. Design electronic circuits, identify components and their ratings, interpret data sheet and their cost estimation.
4. Design and fabrication of single sided PCB for designed circuit with manual etching and drilling.
5. Assembling the electronic components on PCB by soldering manually and testing the circuit.
6. Identification of fault like open, short, damaged component, dry soldering and their proper rectification to make circuits operational.
7. Use the EDA tools for simulation of complicated circuits and PCB layout drawing tools to make PCB.
8. Mini project in group utilizing the knowledge of above practical.

CO-PO Articulation Matrix - LAB:

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1				1					1
CO2	3											
CO3	3	2	2	1			3					2
CO4	3	2	2	1								2
CO5									3	3	3	
Avg.	3	2	1.67	1			2		3	3	3	1.67

ASSESMENT: Evaluation of students through- Continuous performance analysis of students based on experiment performance, File preparation, and internal viva and file submission with weightage of 40% of total marks and End semester practical examination (external viva) with weightage of 60% of total marks.

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
EI27xxx: ANALOG ELECTORINICS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
3	2	-	3	1	-	30	70	40	60	200

PRE-REQUISITE: Network Theory, Basic Electronics and Engineering mathematics

COURSE OBJECTIVES:

1. To develop the understanding of amplifiers, coupled amplifiers and their frequency analysis.
2. To introduce the students to the concept of feedback in amplifiers and oscillators.
3. To familiarize the students with Operational amplifiers, Tuned RF amplifiers and multivibrators.

COURSE OUTCOMES: After completion of course, the students will be able to:

1. CO1: To perform the frequency response and gain calculations of single/double stage amplifiers.
2. CO2: To explain principle of feedback amplifier & oscillators.
3. CO3: To analyse and apply OP-Amp fundamentals and Op-amp applications.
4. CO4: To classify & plot frequency response of tuned RF voltage amplifiers.
5. CO5: To describe the operating principle of Multi vibrators & linear wave shaping circuits.

COURSE CONTENTS:
THEORY:

UNIT-I: Low frequency analysis of RC coupled amplifiers, effect of coupling and bypass Amplifier at high frequencies, Hybrid-π model equivalent circuit in CE configuration, f_α, f_β and f_γ parameter, High frequency response of single/two stage amplifiers using BJT & FET. Gain-band width product. Effect of cascading on gain & bandwidth, Transformer coupled and Direct coupled amplifier.

UNIT-II: Feedback Amplifier: General feedback theory, characteristics of negative feedback amplifiers, Effect of negative feedback on input and output resistance of amplifiers. Oscillators: Principle of oscillation, Barkhausen stability criterion, Audio frequency oscillator: Phase shift & Wien bridge oscillators, RF Oscillator: Colpitts & Hartley, Crystal Oscillator.

UNIT-III Operational amplifiers: Differential Amplifiers, swamping resistor, Constant current source and current mirror circuit, Equivalent circuit of Op-amp, Virtual ground, Offset error in voltages & currents & their temperature drift, Op-amp parameters such as CMRR, PSRR, Slew rate, frequency response of Op-Amp, Study of Op-amp ICs like 741,324,308 etc., Linear and non-linear application of Op-amp, Integrator, Differentiator, Log& antilog amplifiers, Precision rectifier, comparators, Schmitt trigger , Sample & hold circuit, Instrumentation amplifiers.

UNIT-IV: Tuned RF voltage amplifiers: Single and double tuned amplifiers, Gain and bandwidth calculations, frequency response of under coupled, critically and over coupled circuits, Introduction to RFICs, Power supplies: Review of regulators using Zener diodes, series and shunt regulators,

Over current protection using current limiting fold back and crowbar protection, Regulators using ICs,

UNIT-V: Multi vibrators circuit using BJT and Op-amp, Emitter coupled binary circuit, 555 – Timer IC, application, square wave and Triangular wave and Saw tooth wave generators, Linear Wave shaping circuits, RC high pass & low pass circuit, Effect of Tilt or sage.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Robert L. Boylsted, "Electronics Devices and Circuit Theory", Pearson, 2021.
2. Adel S. Sedra and Kenneth C. Smith, "Microelectronics Circuits: Theory and Applications", Seventh Edition, Oxford University Press, 2017.
3. D. Roy Choudhary and Shail Bala Jain, "Linear Integrated Circuits", Sixth Edition, New age International Publisher, 2021.

REFERENCE BOOKS:

1. Ramakant A. Gayakwad, "Op-Amps and Linear Integrated Circuits", Fourth Edition, Pearson Education.
2. Jacob Millman, Christos Halkias and Chetan D. Parikh, "Integrated Electronics: Analog and Digital Circuits and Systems, Second Edition, Mc-Graw Hill, 2017.
3. John D. Ryder, "Electronic Fundamental and Applications: Integrated and Discrete Systems", Fifth Edition, PHI, 1975.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**1**									
CO2	**3**	**2**	**1**	**1**								
CO3	**3**	**2**	**2**	**2**								**1**
CO4	**3**	**1**	**1**									
CO5	**3**	**2**	**2**	**1**								**1**
Avg.	**3**	**1.6**	**1.4**	**1.33**								**1**

LABORATORIES OBJECTIVES:

1. To make students skilled in implementing analog circuits in lab and testing circuits using electronic equipment's like CRO, function generator, multimeter etc.
2. To encourage the students to learn Spice simulator to simulate analog circuits.

LABORATORY OUTCOMES: After completing the lab session, students will be able to:

1. CO1: Plot frequency responses of different RC coupled amplifiers & calculate their parameters.
2. CO2: Plot frequency response of feedback amplifiers & oscillators.
3. CO3: Build the various multi- vibrators & observe their output waveform.
4. CO4: Implement and verify the different applications using Op-Amp.
5. CO5: Plot the frequency response of Tuned amplifiers.

LIST OF EXPRIMENTS:

1. To implement RC Coupled Amplifiers and plot its frequency response.
2. To calculate the voltage gain, bandwidth & Band-gain-width product of two stage RC coupled amplifier and also observe frequency response of RC coupled amplifier using LT Spice Simulator.
3. a) To calculate the voltage gain, bandwidth & Band-gain-width product of single stage Emitter follower and also observe frequency response of RC coupled amplifier using LT Spice Simulator. (b) To calculate the voltage gain, bandwidth & Band-gain-width product of single stage Common base amplifier and also observe frequency response of RC coupled amplifier using LT Spice Simulator.
4. To obtain the frequency response characteristics of a voltage shunt amplifier, with and without feedback & determine upper and lower cut-off frequencies.
5. To determine the frequency of oscillation of the RC phase shift oscillator and to find the phase shift of each section of RC network.
6. To design A-stable, Mono-stable & Bi-stable multi-vibrator and observe their output waveform.
7. A. To design and construct Differential amplifier using BJT (BC107). B. To calculate common mode gain & Differential mode gain. C. To calculate common mode rejection ratio (CMRR).
8. To design the following using Operational amplifier (IC741) & verify the output response ● summing amplifier ● unity follower ● integrator ● differentiator.
9. To design Emitter coupled binary circuit using OP-AMP & BJT, also observe its output waveform.
10. To design Single & double Tuned voltage amplifier and study the frequency response.

ASSESMENT: Evaluation of students through- Continuous performance analysis of students based on experiment performance, File preparation, and internal viva and file submission with weightage of 40% of total marks and End semester practical examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	3	-	-	-	-	-	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	3	1	1	1	-	-	-	-	-	-	-
Avg.	3	2.6	2	1.6	1.6	-	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
EI27xxx: SENSORS & TRANSDUCERS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of fundamentals of measurements.

COURSE OBJECTIVES:

1. To make the students familiar with construction and working principle of different types of sensors and transducers.
2. To make the students aware of measuring instruments and the methods of measurement.
3. To introduce the students to the concept of selecting the sensors for particular applications.

COURSE COUCOMES: After completing the course, the students will be able to:

1. Identify role of Sensor and transducers in instrumentation.
2. Explain the transducer construction, classification, principle of operation & characteristics.
3. Classify the transducers for measurement of force, pressure, vacuum measurement.
4. Analyze transducers for measurement of temperature.
5. List the transducers for flow and level measurement.

COURSE CONTENTS:
THEORY:

UNIT-I: Role of transducers in instrumentation- Transducers construction, classification and characteristics. Principles of operation and characteristics, interfacing of transducers and signal conditioning

UNIT-II: Transducers for measurement of displacement, strain, velocity, acceleration etc. Potentiometer, LVDT, Strain gauge, capacitance gauge, piezoelectric transducers and accelerometers.

UNIT-III: Force and pressure measurement: Force: Standards and Calibration, Basic methods of force measurement (Spring, beam, diaphragm) Strain gauge: basic principle, gauge factor, types of strain gauge, materials and their properties, bonding material compensation techniques, bridge configuration, Rosettes, Tactile sensors, Piezoelectric sensors, LVDT as secondary sensor. Pressure: Standards and calibration Units and relations. Positive Pressure Sensors: Manometers – U tube, Well type, inclined tube, Ring balance, Micro manometer, use of seal pots, range of measurement Elastic – Bourdon, Diaphragm, Bellows and their types, materials and their properties, range of measurement Electronic – LVDT, Strain gauge, Capacitive, Piezoelectric, Thin film, Variable reluctance, Vibrating element (Diaphragm and Wire), High Pressure Measurement – Bulk modulus

cell, Bridgeman type Differential Pressure Measurement: Force balance, Motion balance, Capacitance delta cell, Ring balance DP cell. Vacuum measurement: McLeod gauge, Thermal Conductivity (Pirani, Thermocouple), hot cathode ionization gauge, Molecular momentum (Knudsen) gauge, Cold Cathode ionization (Penning) gauge. Calibrating Instruments – Dead Weight Tester (Pressure, Vacuum).

UNIT-IV: Temperature measurement: Temperature Scales, Standards and Units and relations, Classification of temperature sensors. Mechanical: Bimetallic Thermometer – Working Principle, Various types, Filled system thermometers – SAMA classifications, Sources of errors and their remedies, Dip effect. Electrical: Resistance Temperature Detectors – Principle, materials and their properties, Types and ranges, different sources of errors and compensations. Thermistor: Types (NTC, PTC), Measuring Circuits Thermocouple: Terminology, Types (B, E, J, K, R, S,T), determination of polarity, Characteristics, Laws of thermoelectricity, Study of thermocouple tables (calculation of intermediate temperature and voltage), Lead wire compensation, Cold junction compensation techniques, Protection (Thermo well), EMF Measurement methods, Thermopiles Noncontact Types: Pyrometers: Total Optical, Infrared.

UNIT-V: Transducers for measurement of flow and level. Turbo magnetic, Electromagnetic and other flow meters. Various methods of level measurements, Ultrasonic level gauge. Measurement of humidity and moisture. Various sensors employed in instrumentation, introduction to MEMS, wireless sensors, fingerprint sensors.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. B. C. Nakara and K. Chaudhary, “Instrumentation Measurement and Analysis”, Fourth Edition, Mc-Graw Hill, 2016.
2. Walter Lang, “Sensors and Measurement Systems”, Second Edition, River Publishers, 2021.
3. D. Patranabis, “Sensors and Transducers”, Second Edition, PHI, 2003.

REFERENCE BOOKS:

1. Jacob Fraden, “Handbook of Modern Sensors: Physics, Designs, and Applications”, Fourth Edition, Springer, 2014.
2. M. J. Usher and D. A. Keating, “Sensors and Transducers: Characteristics, Applications, Instrumentations, Interfacing”, Second Edition, Springer, 1996.
3. D. V. S. Murty, “Transducers and Instrumentations”, Second Edition, PHI, 2008.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	2	2	2	-	-	-	-	-	-	-
CO2	3	3	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-	-
CO4	3	2	3	3	1	-	-	-	-	-	-	-
CO5	3	2	3	3	1	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	2.6	1.2	-	-	-	-	-	-	-

LABORATORIES OBJECTIVES:

1. Help the students to perform the measurement of various electrical and electronic quantities.
2. To provide practical knowledge of sensor technology, features and characteristics of sensors and their real time applications.

3. Educate the students to select sensors for particular applications.

LABORATORY OUTCOMES: After completion of lab session, students will be able:

1. CO1: To measure the temperature using RTD and other types of transducers.
2. CO2: To calculate the linearity and sensitivity of Strain gauge.
3. CO3: To measure the displacement using LVDT and to investigate behavior of LVDT.
4. CO4: To measure displacement using capacitive type transducer and to find its sensitivity.
5. CO5: To use level sensor for measurement of level.

LIST OF EXPRIMENTS:

1. To plot the characteristics and behavior of a resistive type transducer
2. To study and use of RTD characteristics using temperature measuring instrument workbench
3. To measure the Strain using Strain Gauge and cantilever assembly.
4. To obtain the linear range of operation of strain gauges.
5. To determine the sensitivity of Strain gauge trainer.
6. To investigate the behaviour and the characteristics of LVDT.
7. To calculate the displacement using parallel plate capacitor.
8. To study and use of Thermocouple characteristics using temperature measuring instrument workbench.
9. To measure the sensitivity of Variable area capacitor.
10. To study and use of level sensor for level measurement using level measuring instrument workbench.

ASSESMENT: Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.6**	**2.4**	**2.2**	**1.6**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
EI27xxx: DIGITAL CIRCUIT DESIGN USING HDL

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of digital logic and design techniques.

COURSE OBJECTIVES:

1. To impart knowledge of coding the digital logic and circuits in VHDL and Verilog.
2. To familiarize the students with the full custom and semi-custom VLSI design flow.
3. To make aware with the architecture of CPLD, FPGA and other PLDs.

COURSE OUTCOMES: After completion of the course, the student will be able to:

1. **CO1:** Classify various design approaches and interpret Gajeski's chart.
2. **CO2:** Identify the different features & characteristics of VHDL.
3. **CO3:** Design and simulate various combinational & sequential logic circuits using different modelling techniques.
4. **CO4:** Differentiate the VHDL and Verilog for logic design.
5. **CO5:** Classify Programmable logic arrays & devices.

COURSE CONTENTS:
THEORY:

UNIT-I: Introduction to VLSI: Custom VLSI design flow, Gajeski's chart, Various design approaches: Top-down, Bottom-Up, Mixed, PLD based design flow, Synthesis, Simulation, Placement and routing, Floor Planning, Verification, Back-annotation.

UNIT-II: VHDL: History of VHDL, pros and Cons of VHDL, VDHL flow elements: Entity, Architecture, Configuration, Component instantiation, package, Library; Hierarchy, Concurrency, Logic and Delay modelling, Architecture of event driven simulators, Syntax and Semantics of VHDL, Variable and signal Types, arrays and attributes. Operators, expressions and signal assignments. Component instantiation.

UNIT-III: VHDL Modelling: Dataflow and Structural Modelling: Data flow Modelling, Concurrent Assignment statements, Block statements, Structural Modelling, Component declaration and Instantiation, Generate statements. Behavioural Modelling: Process statement, Loop control statements, multiple processes Signal Drivers, Examples of combinatorial and synchronous logic circuits include flip-flops, counters, registers, memories, tri-state buffers etc.

UNIT-IV: Introduction to Verilog and other HDLs: Syntax and Semantics of Verilog, variable types, arrays and tables, operator expressions and signal assignment. Modules, nets and register, few examples of combinational and sequential circuits, Introduction to System Verilog.

UNIT-V: Designing with programmable logic devices/CPLD/ FPGA: - Programmable logic arrays (PLAs), and other sequential programmable logic devices (PLDs), complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs. Xilinx 3000 series FPGAs, designing with FPGAs Xilinx 4000 series FPGAs.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. J. Bhaskar, "VHDL Primer", Third Edition, Pearson education Asia, 2001.
2. Zainalabedin Navabi, "VHDL: Analysis and Modelling of Digital Systems", Second Edition, McGraw hill international Ed. 1998.
3. Samir Palnitkar, "Verilog HDL: A Guide to Digital Design and Synthesis", Second Edition, Pearson India, 2003.

REFERENCE BOOKS:

1. Douglas Perry, "VHDL: Programming By Example", Fourth Edition, Mc-Graw Hill Publications, 2002.
2. Stephen Brown and Zvonko Vranesic, "Fundamentals of Digital Logic with With VHDL Design", Third Edition, Mc-Graw Hill, 2017.
3. Ricardo Jasinski, "Effective Coding with VHDL: Principles and Best Practices", The MIT Press, 2016.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1	2									
CO2	3	1	1									1
CO3	3	3	1									1
CO4	3	2	1									1
CO5	3	1	1									2
Avg.	3	1.6	1.2									1.25

LABORATORIES OBJECTIVES:

1. To familiarize the students with modern CAD tools like Xilinx, Vivado and Modelsim.
2. To provide hands-on practical knowledge of VHDL code writing, simulating and synthesis.
3. To provide hands-on practical knowledge of FPGA boards for downloading VHDL/Verilog code.

LABORATORY OUTCOMES: After completing the lab, the student will be able to:

1. **CO1:** Design and simulate the combinational circuit like adders and subtractors using VHDL in Vivado flow.
2. **CO2:** Design and simulate the sequential circuit like flip-flops and counters using VHDL in Vivado flow.
3. CO3: Synthesize the VHDL code in Xilinx tool to obtain the RTL view.
4. CO4: Design, Synthesize and download VHDL code in Artix-7 FPGA boards to verify functionality of logic.
5. CO5: Interface the seven-segment display and keyboard with Artix-7 FPGA boards.

LIST OF EXPRIMENTS:

1. Write and simulate the VHDL code for logic gates.
2. To implement half adder and Full adder using VHDL and to simulate.
3. To implement half subtractor and Full Subtractor using VHDL and to simulate.
4. Design Synthesize and Simulate ripple carry adder using full adder in VHDL.
5. Design and implement 2 x 4 and 3x8 decoders using VHDL structural, data flow and behavioural modelling and compare RTL synthesis.
6. Implement and Synthesize 4x1 multiplexer using concurrent and sequential statements in VHDL and verify its operation by downloading code using Artix-7 FPGA board.
7. Design 4-bit synchronous Up-counter having synchronous preset and clear in VHDL.
8. Implement D and T flip-flops using sequential statements and verify the operation by downloading code in Artix-7 FPGA boards.

ASSESMENT: Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	3	3	2	2	-	-	-	-	-	-	-
CO3	3	2	3	3	2	-	-	-	-	-	-	-
CO4	3	2	2	3	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	--	-	--	-	--	--
Avg.	3	2.4	26	2.2	1.4	-	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
HU-27xxx: ECONOMICS FOR ENGINEERS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: NIL

COURSE OBJECTIVES:

1. To develop the optimizing skills of technology-use in engineering problems.
2. To articulate economic analytical skills so as to contextualize the solutions of engineering problems.
3. To explore the potential of students in economic perspective of engineering professional goals.
4. To make sense of need of entrepreneurship and understand the financial reports of a business.

COURSE OUTCOMES: (Cognitive Level – Understand) – After completion of course, the students will be able to:

1. **CO1:** Explain behaviour of Consumer so as to estimate the demand pattern and demand elasticity for a product.
2. **CO2:** Plan the production; choose appropriate production technology (combination of production factors); and estimate feasible range of production.
3. **CO3:** Analyse the production-cost-profit relation and select the suitable project for investment.
4. **CO4:** Estimate price and the equilibrium for a firm/organization in different competitive market situations.
5. **CO5:** Review, summarize and compare the financial statements of an accounting entity and able to Apply financial ratio technique for financial analysis. Co-6: Explain and illustrate the entrepreneurship and phases of start-up.

COURSE CONTENTS:
THEORY:

UNIT-I: Nature and scope of economics, Economic cyclic flow, Central Economics problems, macro and macro and microeconomics, concept, determinates and law of demand and supply, Elasticity of Demand, Equilibrium price, consumer surplus and equilibrium.

UNIT-II: Production, cost and Revenue: Production function, laws of return to variable proportion, Laws of return to scale, cost concepts, cost functions and their inter relation,

Revenue Concepts and functions, break-even analysis, Time value of money and Investment analysis NPV, IRR, ARR and payback period method.

UNIT-III Pricing and Market: Price determination and firm's equilibrium under perfect competition and monopoly, price-output determination under monopolistic competition, kinked demand curve, collusive and non-collusive oligopoly, cournot's oligopoly model of price determination.

UNIT-IV: Entrepreneurship and entrepreneur, entrepreneurship and start-up, characteristics of an entrepreneur, forms of business organization, phases of startup, small cottage and large-scale enterprises, entrepreneurship opportunities in India. Factors of development of entrepreneurship, Entrepreneurial Motivation Concept, Major Entrepreneurial Competencies.

UNIT-V: Accountancy: Accountancy and bookkeeping, GAAP, Assets, Liabilities and Capital, types of accounts, Journal, Ledger, Trial Balance and Financial Statements, Financial Ratio Analysis.

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Jhingan M. I, "Economics of development and Planning", 40th Edition, Vrinda Publication.
2. Ahuja H. L. "Advance economic theory",21st Edition, S Chand Publication.
3. Riggs, Bedworth and Randhawa, "Engineering Economics", Fourth Edition, Tata Mc-Graw Hill.

REFERENCE BOOKS:

1. Nirmal Jain, "Principles of Accountancy",
2. Rajeev Roy, "Entrepreneurship", Second Edition.

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
MA-27xxx: MATHEMATICS-IV

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	1	4	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Mathematics-I and Mathematics-II

COURSE OBJECTIVES: Enable the students to apply knowledge of Mathematics in various Engineering fields by making them:

1. To introduce the basic theory of complex variables and its applications.
2. To incorporate the knowledge of random variables, its distribution and stochastic process with Markov chain.
3. To utilize the concept of reliability for improving quality of manufacturing components.
4. To present all usual basic concepts of graph theory, graph properties (with simplified proofs) and formulation of typical graph problems.

COURSE OUTCOMES: After completing this course, students will be able to:

1. **CO1:** Solve engineering problems using complex variable techniques such as contour integral & transformation.
2. **CO2:** Apply concept random variables in one and two dimensions and its distribution.
3. **CO3:** Apply concepts stochastic process, Markov chain and their applications.
4. **CO4:** Apply concept of reliability & maintainability for quality improvement in electronics system.
5. **CO5:** Apply concept of graph theory & solve minimal weight & shortest path problems using algorithms.

COURSE CONTENTS:
THEORY:

UNIT-I: Functions of Complex Variables: Analytic function, Cauchy-Riemann equations and Harmonic functions: Conjugate functions and their applications. Complex integrals. Cauchy's integral theorem and integral formula. Singularities, poles residues, residue theorem, Contour integration for simple cases, conformal mapping and its application to two-dimensional problems in electric field.

UNIT-II: Statistics: Modern view of Probability theory, Random Experiments, Sample space, Random Variables, Distribution Function and Density Function, Random Variables of Discrete and Continuous type, Functions of two random variables, bivariate probability with conditional and marginal probability distribution.

UNIT-III: Stochastic Process and Markov Chain: General concepts and definition of stochastic processes, Mean, Auto-correlation and auto-covariance, Classification of Stochastic Process and some problems. Probability vectors, Stochastic Matrix, Fixed Point of a Matrix, Definition of Markov Chain, Transition matrix and Graph, some theorems and applications, Queuing Theory, Birth and Death Process.

UNIT-IV: Reliability: Basic concepts, Failure law, Bath Tub Curve, Evaluation of Reliability of a component from test data, System Reliability, Components in series and parallel, Redundancy, Nunneries parallel system. A brief idea of software reliability.

UNIT-V: Graph Theory and Combinatorial Optimization: Graphs – Definitions and basic properties. Isomorphism, Euler Circuits and Hamiltonian cycle. Digraphs. Trees- properties, spanning trees, Planer graphs. Shortest path problem, Dijkstra algorithm, Shortest spanning tree-Kruskal and Prim algorithm, Flow augmented paths-Ford-Fulkerson algorithm, cut sets. Max. Flow min. cut Method theorem

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Ramana B V, "Higher Engineering Mathematics", Tata McGraw Hill Publishing Company Ltd., New Delhi, 2006
2. Das H. K, "Higher Engineering Mathematics", S. Chand New Delhi, 2011.
3. Baisnab A, and Jas M, "Elements of Probability and Statistics", Tata McGraw Hill Book Company, New Delhi, 1993.

REFERENCE BOOKS:

1. Jain, R.K. and Iyengar S.K, Advanced Engineering Mathematics, Narosa Publishing House, New-Delhi, 2006.
2. Veerarajan T, Statistics, "Probability and Random Process, 2nd Edition", Tata McGraw Hill Publishing Company Ltd., New Delhi 2003.
3. Balagurusamy E., "Reliability Engineering", Tata McGraw-Hill Education Pvt. Ltd., New Delhi, 2012.

CO-PO Articulation Matrix

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

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-B (4-YDC)
EI27xxx: SOFTWARE WARKSHOP LAB

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	4	-	-	2	-	CW	END SEM	SW	END SEM	100
						-	-	40	60	

PRE-REQUISITE: Basic analog and digital circuits, Polynomials, Matrix etc.

COURSE OBJECTIVES:

1. To provide a thorough understanding and analysis of signals and systems using MATLAB.
2. To provide the student the enough knowledge of creating and controlling simple plot and user interface graphics objects in MATLAB.

COURSE OUTCOMES: After completion of lab session, the student will be able to:

1. **CO1:** To implement the MATLAB Desktop, Command window and the Graph Window
2. **CO2:** Perform mathematical and logical calculations using MATLAB.
3. **CO3:** Apply and analyse numerical computations using MATLAB.
4. **CO4:** Write script programs using Python/ Perl for various applications.

COURSE CONTENTS: Practical's on:

UNIT-I Introduction to MATLAB: MATLAB Interactive Sessions

UNIT-II Functions & Files

UNIT-III Plotting: XY- plotting functions, Bar Graphs, Area Function, STEM Function, Special Plot types, Interactive plotting, Function Discovery, Regression, 3-D plots.

UNIT-IV Linear Algebraic Equations, Symbolic Processing With MATLAB

UNIT-V Introduction to scripting language- Python and Perl.

LIST OF EXPRIMENTS:

1. Introduction to MATLAB: To define & use variables, vectors, Matrices & its functions in MATLAB.
2. To study various arithmetic operators and mathematical functions in MATLAB.
3. Write a MATLAB program to plot 3-dimension and 2- dimension figure.
4. Write a MATLAB program to plot continuous time and discrete time Signals.
5. Write a MATLAB program to perform amplitude-scaling, time-scaling and time-shifting on a given signal.
6. Write a MATLAB program to plot magnitude and phase response of a given system.
7. To implement basic logical operations using MATLAB.
8. Write a MATLAB program to make functions for performing various task such as identifying number whether it's odd or even.
9. Checking linearity/non-linearity of a system using SIMULINK. Build a system that amplifies a sine wave by a factor of two.
10. Write a scripting program using Python/Perl for any particular application.

TEXT BOOKS:

1. William Palm III. "Introduction to MATLAB for Engineers" Third Edition, Mc-Graw Hill.
2. Brian R. Hunt (Editor), Ronald L. Lipsman, J. Rosenberg, "A Guide to MATLAB: For Beginners and Experienced Users", Cambridge University Press, 2001.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**1**	**3**							
CO2	**3**	**2**	**1**	**1**	**2**							
CO3	**3**	**2**	**1**	**1**	**2**							**1**
CO4	**3**	**2**			**3**							**1**
Avg.	**3**	**2.25**	**1.33**	**1**	**2.5**							**1.5**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. II Year SEM-A (4-YDC)
EI27xxx: VALUES HUMANITIES & PROFESSIONAL ETHICS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	2	-	-	2	-	CW	END SEM	SW	END SEM	100
						-	-	40	60	

PRE-REQUISITE: NIL

COURSE OBJECTIVES:

1. To make students understand of his/her social responsibility as an engineer.
2. To create an awareness on Engineering Ethics and Human Values.
3. To make students capable of doing self-exploration and recapitulation.
4. To make students aware of the global problems.

COURSE OUTCOMES: - After completion of course, the students will be able to:
CO1: Explain and elaborate the social institutions through which the society and nation is governed.
CO2: Describe the kinds of values and ethics and their importance
CO3: Contextualize the professional attitude and approaches as per needs of society and values.
CO4: Explain and illustrate the process of Social, Political and Technological changes in-context to global changes.

COURSE CONTENTS:
THEORY:

UNIT-I Role of Humanities in Engineering education, social institutions and association, social stratification in India, social change and its determinants.

UNIT-II Self-Exploration, recapitulation, coexistence of self and body and their needs and activities, Morals, Values and Ethics, Universal and Situational values, . Balance between - rights and duties,

UNIT-III. Concept of personal and group Ethics: Ethical and decision making capability and its development: Meaning of Ethical dilemma, steps to solve ethical dilemma

UNIT-IV Engineering Ethics: engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger variety of moral issued - types of inquiry - moral dilemmas – moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy Models of Professional Roles.

UNIT-V Global Issues: Multinational corporations - Environmental ethics - computer ethics - weapons development – engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership.

ASSESMENT: Only Sessional Work (100 marks) on the basis of internal viva (30) Attendance (20), Quizzes/Tests (30) and Presentations (20) will be awarded against the assessment done throughout the session.

TEXT BOOKS:

1. Little, William, "An Introduction of Ethics", Allied Publisher, Indian Reprint 1955.
2. William, K Frankena, "Ethics:", Prentice Hall of India,1988.
3. Gaur R. R., Sangal R. and Bagaria G. P., "Haman Values and Professional Ethics", Excel Books, New Delhi, 2010

REFERENCE BOOKS:

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York1996
2. Govindarajan M, Natarajan S, Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
IT37005: DATA STRUCTURES

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

PRE-REQUISITE: Fundamentals knowledge of programming and C language.

COURSE OBJECTIVES: This course intending to provide the knowledge of linear and non-linear data structures and develop skills to apply appropriate data structure in problem solving.

COURSE OUTCOMES: After the completion of course, student will able to:
CO1: Describe various linear and non-linear data structures &analyse algorithms efficiency.
CO2: Solve problems involving graph and tree.
CO3: Apply sorting and searching algorithms to the small and large data sets
CO4: Describe the hash function and concepts of collision and its resolution methods
CO5: Choose appropriate data structures to solve real world problems efficiently.

COURSE CONTENTS: THEORY:

UNIT 1: Introduction to Data Structures: Data types, abstract data types, Arrays: definition, single dimensional and multidimensional arrays, strings, Linked List: definition and application, singly linked lists, doubly linked lists, and circular list, sparse matrices, application of linked lists. Algorithms efficiency and big-O notation.

UNIT 2: Stacks: definition, stack implementation and operations, infix, postfix and prefix expressions, stack application, recursion, recursive definition and processes, recursive examples(Tower of Hanoi, Fibonacci Series etc),Recursion Types(Head Recursion ,Tail Recursion, Excessive Recursion, Direct Recursion, Indirect Recursion), Queues: definition, queues implementation, sequential representation, circular queue, de-queue, and queue application.

UNIT 3: Tree: binary tree, Binary Tree representations: node and implicit array representation, internal and external nodes, binary tree traversals, threaded binary trees, Representing list as binary trees, Huffman algorithm, heterogeneous binary trees, Tree Searching: insertion into and deletion from binary search tree, efficiency of binary search tree operations, AVL tree, red-black tree and tree applications.

UNIT 4: Graph: Graphs, representation of graphs using adjacency matrix and adjacency linked lists, Spanning Trees, Graph Traversals: depth first search and breadth first search, Dikstra's shortest path algorithm. General SGSITS search trees: multiway search trees, searching, implementing and traversing a multiway search tree, B-tree, binominal heap, Fibonacci heap, B+ Tree, Digital search trees.

UNIT 5: Searching & Sorting: Dictionary as ADT, efficiency of sequential searching, searching an ordered table, indexed sequential search, Binary search: general background, efficiency consideration, Exchange

sorts: bubble sort, quick sort, selection and tree sorts, straight selection sort, binary tree sort, heap sort, insertion sorts: simple insertion, shell sort, merge and radix sorts. Hashing: open hashing; close hashing, rehashing, dynamic and extendible hashing.

ASSESMENT:
The assessment is continuous evaluation process, which includes two mid-semester test, assignment/Quiz & regularity with 30% weightage of total marks. The end-term theory examination weightage is 70%.

TEXT BOOKS:
1. Langsum, Augestein and Tenenbaum,"Data structures using C", 2nd Edition Pearson Education. 2. Thomas H. Cormen ,"Introduction to algorithm", 2nd Edition, Prentice Hall of India.
3. Mark Allen Weiss,"Data structures and algorithm analysis in C", 3rd Edition, Pearson Education.

REFERENCE BOOKS:
1. Yeshwant Kanetkar , "Data Structures through C", 1st Edition BPB.
2. Behroz A. Fourozan, "Data Structure: A Pseudocode approach", 2nd Edition, Cengage Learning India.

CO-PO Articulation Matrix (T)

IT37005 (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	1	2	2							1
CO2	3	3	2	2								1
CO3	3	2	2									1
CO4	3	2	2									1
CO5	3	3	3	3	2	1						1
Average	3	2.6	2	2.3	2							1

LABORATORIES OBJECTIVES: This laboratory focuses to develop programming skills using different data structures and know the strength and weakness of different data structures.

LABORATORY OUTCOMES: After the completion of laboratory sessions, student will able to,
CO1: Use the appropriate data structure in context of solution of given problem.
CO2: Develop programming skills which require in solving given problem
CO3: Implement and analyze operations on linked list.
CO4: Implement and analyze operations on array.
CO5: develop programming skills to implement different programs corresponding to various sort techniques.

LIST OF EXPRIMENTS:

1. Write a program to a) Create dynamic int array using malloc() and free() (b) Create dynamic char array using calloc() and free().
2. Write a program to implement 1) linear Search 2) Binary Search.
3. Write a program to implement 1) Bubble Sort 2) Insertion Sort 3) Selection Sort 4) merge sort and 5) Quick sort.
4. Write a menu driven program to implement following operations on the singly linked list. (a) Insert a node at the front of the linked list. (b) Insert a node at the end of the linked list. (c) Insert a node such that linked list is in ascending order.(according to info. Field) (d) Delete a first node of the linked list. (e) Delete a node before specified position. (f) Delete a node after specified position.

5. Write a program to implement following operations on the doubly linked list. (a) Insert a node at the front of the linked list. (b) Insert a node at the end of the linked list. (c) Delete a last node of the linked list. (d) Delete a node before specified position.
6. Write a program to implement following operations on the circular linked list. (a) Insert a node at the end of the linked list. (b) Insert a node before specified position. (c) Delete a first node of the linked list. (d) Delete a node after specified position.
7. Write a program for stack that performs following operations using array. (a) PUSH (b) POP (c) PEEP (d) CHANGE (e) DISPLAY.
8. Write a program to convert infix notation to postfix notation using stack.
9. Write a program to implement QUEUE using link list that performs following operations (a) INSERT (b) DELETE (c) DISPLAY.
10. Write a program to implement circular Queue using array that performs following operations (a) INSERT (b) DELETE (c) DISPLAY.
11. Write a program to implement stack using link list.
12. Write a program to implement Queue using link list.
13. Write program to create binary Tree and create binary Tree Traversal

ASSESMENT:
Evaluation of students done through-experiment performance, internal viva, external viva, File preparation and submission. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab. The end-term practical examination weightage is 60%.

CO-PO Articulation Matrix for LAB

IT37005 (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	2		3							
CO2		2	2		3							
CO3		3	3		2							2
CO4		3	3		2							2
CO5		3	3		3							2
Average		2.6	2.6		2.6							2

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EI37006: MICROPROCESSOR SYSTEMS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	-	3	1	-	30	70	40	60	200

PRE-REQUISITE:- Basic knowledge of digital electronics & introduction to microcomputers.

COURSE OBJECTIVES: The purpose of this course is to get acquainted with the fundamentals of microprocessor systems.This course focuses to introduce architecture of 16/32 bit microprocessors and design of electronic circuits using microprocessors. It also emphasizes to interface & program various peripherals in microprocessor based circuits.Students will be able to demonstrate programming proficiency using the various addressing modes and data transfer instructions of the target microprocessor.

Course Outcomes: After completion of course, the students will be able to:
CO1: Analyze organization of microprocessors and microcomputers with its architecture and register set.
CO2: Illustrate instruction set of 8085 processor for different applications.
CO3: Interface various I/O devises with 8085 microprocessor and program them.
CO4: Analyze 16 bit microprocessor (8086) and it's working modes
CO5: Analyze ARM processor and different instruction set architectures of microprocessor.

CO-PO Articulation Matrix for Theory

EI37006 Microprocessor systems (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											2
CO2	3				2							
CO3	3	2	2		2							3
CO4	3				1							2
CO5	3	1	1		1							2
Average	3	1.5	1.5		1.5							2.25

COURSE CONTENTS: THEORY:

UNIT-I – Introduction to Microprocessor & 8085 Microprocessor
Evolution of Microprocessors, organization of Microcomputers, Types of microprocessor, 8085 Microprocessor Architecture, arithmetic logic unit and control unit, Instruction cycle and timing diagram , instruction set of 8085, Addressing Modes.

UNIT-II- Programming with Microprocessor
Assembly Language Programming Basic, Instruction and data formats, Stack & Subroutines, Time Delay routines, Programming of microprocessor, Interfacing Memory and I/O devices: Memory mapped I/O and I/O, latches and tri-state buffers.

UNIT-III – Interfacing Device and peripheral subsystems
I/O INTERFACE: Programmable peripherals 8155 and 8255, their features, programming and applications, programmable interrupt controller 8259, Introduction of other supporting ICs: USART 8251, keyboard controller 8279, and direct memory access data transfer (DMA) controller 8237, ADC and DAC chips and their interfacing.

UNIT-IV Introduction to 16 bit Microprocessor
Architecture of 8086, Register Organization, pin description, Programming Model, Memory addresses, Addressing Modes, Memory Segmentation, Physical Memory Organization. Signal descriptions of 8086-Common Function Signals, Minimum& Maximum mode signals, Pipelining in 8086 microprocessor.

UNIT-V: Introduction to Advance Microprocessor
RISC and CISC Architecture, Evolution of ARM Processor, Fundamentals, ARMv7: Introduction, Registers, Current program status register, Interrupt and the vector table, Pipelining: 3 stage and 5 stage. Introduction to SUN-SPARC Microprocessor.

ASSESMENT:
The assessment is continuous evaluation process, which includes two mid-semester test, assignment/Quiz & regularity with 30% weightage of total marks. The end-term theory examination weightage is 70%.

TEXT BOOKS:
1. **R.S.** Gaonkar, "Microprocessor Architecture programming and application with 8085", 6th edition, Penram International publishing, October 2013.
2. Douglous Hall, "Microprocessor and interfacing", 2nd edition, Mcgraw Hills Higher Education, Jan 2005.
3. A.K. Ray & K.M. Bhurchandi, "Advanced Microprocessor and Peripherals", 2nd edition, Mcgraw Hill Education, Jan 2006.

REFERENCE BOOKS:
1. Mohamed Rafiquzzaman, "Microprocessor and Microcomputer Based System Design", second edition, CRC Press, 1995.
2. A. Nagoor Kani, "8085 Microprocessor and Its Application", third edition McGraw-Hill Education Pvt. Ltd 2012.
3. S. Mathur, "Microprocessor 8085 and Its Interfacing", Prentice-Hall of India learning Pvt. Ltd, 2013.

LABORATORIES OBJECTIVES: The Microprocessor and operating systems Laboratory is designed:
1. To develop programs to implement algorithms of engineering problems.

2. In this lab, students are expected to get hands-on experience in using hardware and software simulators for 8085.
3. To develop communication skill through laboratory note book with written descriptions of code, flowchart and results.
4. To get exposure for various interfacing techniques.

LABORATORY OUTCOMES: After the completion of laboratory schedule, student will able to:
CO1: Develop capability for designing and documenting simple programs to implement algorithms of engineering problems. (Trainer kit-M85-03)
CO2: Design &Analyze an interfacing of microprocessor with various peripherals devices.
CO3: Illustrate various industrial applications of microprocessor in the real world.
CO4: Develop professional journal writing & presentation to discuss the progress of the project.

LIST OF EXPRIMENTS:
1. Write an Assembly language program to copy 8 –bit data.
2. Write an Assembly language program for addition of two 8 -bit numbers.
3. Write an Assembly language program for addition of two 16-bit numbers with carry.
4. Write an Assembly language program for Substraction of two 8 -bit numbers.
5. Write an Assembly language program to copy a series of data.
6. Write an Assembly language program to find the largest number of given series.
7. Write an Assembly language program to find the smallest number of given series.
8. Write an Assembly language program to arrange a given series in ascending order.
9. Write an Assembly language program to arrange a given series in descending order.
10. Write an Assembly language program to multiply to 8 bit numbers.

ASSESMENT: Evaluation of students done through-experiment performance, internal viva, external viva, File preparation and submission. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab.The end-term practical examination weightage is 60%.

CO-PO Articulation Matrix for Laboratory

EI37006 Microprocessor systems (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1		2	3		2							2
CO2		2	3		2							2
CO3												2
CO4									1	3		1
Average		2	3		2							1.75

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EI xxx: CMOS VLSI DESIGN

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of Digital Circuit and Basics of Semiconductors is required.

COURSE OBJECTIVES:

1. To nurture the students with CMOS digital logic design.
2. To provide the students with the knowledge of trade-off between speed, power and area in CMOS digital VLSI design.
3. To provide enough knowledge to students for digital logic design with FSM.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** Explain importance of MOS transistor in designing VLSI circuits.
2. **CO2:** Implement and analyse CMOS Inverter for static & dynamic characteristics.
3. **CO3:** Design and analyse Dynamic and Domino logic.
4. **CO4:** Design FSM using Mealy and Moore machines.
5. **CO5:** Classify memory systems and differentiate between custom and semi-custom design.

COURSE CONTENTS:
THEORY:

UNIT-I Review of MOS, PMOS, NMOS, MOS device design equations, Short Channel and Narrow Channel Width Effects. MOS small signal and large signal model, MOS capacitances, Technology Scaling.

UNIT-II Basics of CMOS: Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation.

UNIT-III CMOS logic structures: Domino logic, NP Zipper Logic, CVSL, DVSL. Basics of VLSI Design, implementation of Logic functions, rise time/ fall time/ delay time considerations. Fan-in, fan-out, standard cell design, cell libraries.

UNIT-IV FSM Design: State machines, Mealy & Moore machines, state diagrams, state table reduction techniques for state tables, transition tables, design of sequential circuits using FSMs, VHDL coding for FSMs.

UNIT-V Memory based subsystem design, Static RAM, Dynamic Ram, Full custom and Semi-custom design, Clocking strategies, Clocked system, Latch and Resistors, System timing, two phase clocking, four phase clocking.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

TEXT BOOKS:

1. Neil H. E. West and Kamran Eshraghain, "Principles of CMOS VLSI Design: A Systems Perspective", Second Edition, Pearson, 1993.
2. Wayne Wolf, "Modern VLSI Design: Systems on Silicon", Second Edition, Prentice Hall, 1998.
3. Jan M Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Pearson, 2016.

REFERENCE BOOKS:

1. Charles H. Roth and Larry L. Kinney, "Fundamentals of Logic Design", Seventh Edition, Cl Engineering Publishers, 2013.
2. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Seventh Edition, Oxford University Press, 2017.
3. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL", Third Edition, Mc-Graw Hill, 2017.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.2**	**2**	**2**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

LABORATORIES OBJECTIVES:

1. Demonstrate the ability to use Cadence EDA tool for CMOS circuit design.
2. Students will be given hands-on of Virtuoso schematic and layout of CMOS circuits.
3. Students will be provided with a hands-on Spectre simulator for simulation and Assura for physical verification (DRC, LVS, and RCX) of CMOS circuits.

LABORATORY OUTCOMES: On completion of lab course, the student will be able to:

CO1: Able to use the Cadence EDA tools for CMOS circuits design.
CO2: Design CMOS logic circuits using Virtuoso Schematic editor of Cadence.
CO3: Able to use Spectre simulator to analyze functional and timings of logic circuits.
CO4: Design the layout of CMOS circuits using Virtuoso layout editor tool.
CO5: Demonstrate the use of Assura tool for physical verification of layout.

LIST OF EXPRIMENTS:

1. Introduction to Cadence Virtuoso EDA tools design flow.
2. To simulate the VI characteristics of NMOS and PMOS to obtain various performance parameters.
3. To obtain voltage transfer characteristics of CMOS inverter and observe the effect to varying W/L ratio on VTC.
4. To obtain the dynamic characteristics of CMOS inverter.
5. To design and verify performance parameters of 2 input NAND & NOR gates based on inverter sizing.
6. To implement two input NAND & NOR gates using domino logic and compare its performance with CMOS logic.
7. To implement and simulate 4-bit full adder using CMOS transistors.
8. Study the various design rules for layout using 180 nm technology.
9. Design the layout of CMOS inverter using 180nm technology & observe the effect of parasitics on its performance.
10. Design the Layout of 4-bit Full adder using 180 nm technology.

ASSESMENT:

Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.4**	**2.4**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EI37481: TEST & CALIBRATION LAB

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	4	-	-	2	-	CW	END SEM	SW	END SEM	100
						-	-	40	60	

PRE-REQUISITE: Basic Measurement system and fundamentals of instrumentation.

LABORATORY OBJECTIVES: This laboratory session are aimed to give the wide description to analyze different methods of calibration in systems. It also focuses to classify and rectify the source of error in measurement systems.

LABORATORY OUTCOMES: After the completion of course, student should able to:
CO1: Measure static and dynamic characteristic in measurement system
CO2: Discuss concepts of testing of measuring Equipment.
CO3: Describe and analyze the errors in electronic equipment and systems.
CO4: Calibrate test equipment.
CO5: Implement linearization techniques to eliminate the errors in system

LABORATORY CONTENTS:

1. Testing & Calibration of Measurement setup: Dynamic Characteristics: Dynamic response; Transient response; speed of response, fidelity, measuring lag etc.
2. Linear approximation, compensation techniques. Significance of testing and calibration, Calibration curve, Standards for calibration, Different calibration procedures-primary, secondary, direct, indirect, routine calibration, Calibration setup: pressure gauge, level etc. Calibration of Ammeter, Voltmeter and Wattmeter, Energy meter.
3. Analysis of Errors: Definition; Types of errors; Calculation methods of different errors; Gaussian curve; precision Index; Variance; Standard deviation; Uncertainty in measurement, Chi-Square Test, Curve fitting methods. Galvanometers: D'Arsonaval Galvanometer- construction, Torque equation, Dynamic characteristic, Ballistic Galvanometer.

CO-PO Articulation Matrix

Test & Calibration EI37481												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2										1
CO2	3	2										2
CO3	3	2	2	3								2
CO4	3	2	2	3								2
CO5	3	2	2	3								2
Average	3	2										1.8

LIST OF EXPRIMENTS:

1. Measure of static and dynamic characteristic of measurement system
2. Testing of active and passive and active component with CRO and multimeter.
3. To derive and analyze mathematical modeling for measurement system.
4. Testing of voltmeter for calibration error.
5. Testing of ammeter for calibration error.
6. To analyze type of error curve.
7. Calibration of ammeter using DC potentiometer.
8. Calibration of voltmeter using DC potentiometer
9. Calibration of the scale of voltmeter.
10. To analyze type of Gaussian curve

ASSESMENT: Evaluation of students done through-experiment performance, internal viva, external viva, File preparation and submission. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab. The end-term practical examination weightage is 60%.

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EI37482: INTERNSHIP EVALUATION-I

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	4	-	-	2	-	-	-	50	-	50

PRE-REQUISITE: NIL

COURSE OBJECTIVES: This internship will acts as bridge between theoretical backgrounds to current scenario of industrial works. It emphasizes to develop following four major aspects in an intern:
1. Skill development
2. Understanding real world applications
3. Career awareness
4. Personal development

COURSE OUTCOMES: after the completion of internship, student will be able to:
CO1: Explore career alternatives prior to graduation.
CO2: Develop work habits and attitudes necessary for job success.
CO3: Identify, write down, and carry out performance objectives
CO4: Develop communication, interpersonal and other critical skills in the job interview process.
CO5: Asses their strength, weakness and opportunity in the selected industry

CO-PO Articulation Matrix

Internship Evaluation-I EI37482												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											3
CO2		3										3
CO3									2	3		3
CO4									1	3	2	3
CO5												3
Average	3	3							1.5	3	2	3

PROGRAM ELECTIVE I

1	ECXXX	Analog & Digital Communication
2	EIXXX	Smart Sensors
3	EIXXX	Peripherals & Interfacing

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EC 37XXX: ANALOG AND DIGITAL COMMUNICATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70	-	-	100

PRE-REQUISITE: Basic knowledge of signals & systems.

COURSE OBJECTIVES: The goal of this course is to introduce basic principles of Continuous wave (CW) Modulation, Pulse Modulation, as required for Electronics engineering students. The course aims to make the student familiar with Digital Communication, transmission & reception etc.

COURSE OUTCOMES: After the completion of this course, student will able to,
CO1: Compare & contrast different signals & variables used in communication
CO2: Apply & analyze amplitude modulation in communication system.
CO3: Compare & analyze different angle modulation schemes for their efficiency and bandwidth
CO4: Analyze the behavior of a communication transmitter/ receiver system module.
CO5: Analyze different digital modulation schemes, digital receiver system module.

COURSE CONTENTS:
THEORY:

UNIT-I – Signals and Random Variables:
Types of signals: deterministic & random, periodic & non- periodic, analog & discrete, energy & power signals. Fourier series, Fourier transform and its properties, Gaussian and Rayleigh probability density function, mean, variance and standard deviation, central limit theorem, Voltage & Power decibel Scales.

UNIT-II – Amplitude Modulation:
Need of modulation in a communication system, block schematic of a typical communication system.AM of modulation system, modulation index, generation & detection of AM wave, side transmitter block diagram.

UNIT-III – Frequency Modulation:
Relationships between phase & frequency modulation, FM wave & its spectrum, phasor diagram of narrowband FM signal, wideband FM, methods of generation & detection of FM , discriminators, pre-emphasis & de-emphasis.

UNIT-IV – Receivers and Noise:
TRF receiver & its limitations, necessity of heterodyning, Super heterodyne radio receivers, IF amplifiers & selection of intermediate frequency, RF amplifiers. Detectors. Sources of noise, noise figure, noise bandwidth, effective noise temperature.

UNIT-V – Introduction to Digital Communication:
Nyquist sampling theorem, time division multiplexing, pulse modulations and PCM, quantization error, introduction to BPSK & BFSK, Shannon's theorem for channel capacity.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End Semester theory exam. Weight age is 70 % of total marks.

TEXT BOOKS:
1. Lathi B.P. "Analog and Digital Communication Systems" 2nd edition, oxford publication, Jan 2011.
2. Singh R.P & Sapre, "Communication Systems Analog & Digital" 3rd edition, TMH, July 2015.
3. Kennedy George et.al "Electronic Communication System", 5th edition, McGraw Hill June 2011.

REFERENCE BOOKS:
1. Haykin Simon,"Communication Systems", 4th edition, John Willey & Sons, Jan 2006.
2. Taub &Schillling,"Principles of Communication Systems", 4th edition, McGraw Hill, July 14.
5. Prokis J.J, "Digital Communications", 4th edition, McGraw Hill, April 2014.

CO-PO Articulation Matrix

EC37014 (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3		1									3
CO2	3		2									
CO3	3		2									
CO4	3		2									2
CO5	3		2									3
Average	3		1.8									2.67

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
Subject Code: EI37xxx SUBJECT NOMENCLATURE: SMART SENSORS

PERIOD PER WEEK			CREDITS			MAXIMUM MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	0	3	--	-	CW	END SEM	SW	END SEM	
						30	70			100

Course Objective: The subject focuses on the sensors used in instrumentation engineering. It aims in developing understanding of sensors design, classification, communication and intelligent sensors.

Course Outcomes: At the end of the course he student will be able to:
CO1. Analyze the concept of principle of operation of different sensors and their applications.
CO2. Analyze different Electro analytical sensors.
CO3. Compare and Contrast various wireless sensor network
CO4 Develop the logics about establishment of intelligent sensoring system
CO5. Evaluate design and modelling issue using complex engineering mathematics

Unit -1
Introduction to smart sensors, Principles of operation, design approach, interface design, configuration supports, Sensors Fundamental: Sensor classification, Thermal sensors, Humidity sensors, Capacitive sensors, Electromagnetic sensors, Light sensing technology, Moisture sensing technology, Carbon dioxide (CO2) sensing technology, Sensors parameters, Selection of sensors

Unit -2
Electro-analytical Sensors Introduction, Electro-chemical Cell, Cell potential, Sd. Hydrogen Electrode (SHE), Liquid Junction and Other potentials, Polarization, Reference Electrodes, Sensor Electrodes, Electro-Ceramics in Gas Media. Analyzers for different gas and laboratory testing of chemicals

Unit -3 Sensor Communication and MEMS:
Wireless Sensing Techniques: Wireless Sensor, principle and working, wireless sensing network, protocols used, Application of wireless sensor for weather monitoring. Communications for smart sensors – sources and standards and building automation, home automation, protocols in silicon, other aspects of network communications. Sensor technologies: MEMS sensor, Comparison between MEMS and Macro sensor, Fabrication and packaging issue in sensor design Thick film and thin film technique Physical sensors. Bio sensor, Silicon sensor, RF Sensor, sensors for robotics

Unit -4
Intelligent Sensors: General Structure of smart sensors & its components, Characteristic of smart sensors: Self calibration, Self-testing& self-communicating, Application of smart sensors: Automatic robot control & automobile engine control.
Unit -5

Design and modelling issue in advanced sensing technique. Introduction of different mathematical tools used in sensor design. Optimization techniques used in sensor design. The role of PCA, LDA, Neural network in designing sensor array

Assessment:

Continuous evaluation of students through: Class attendance, Assignments, organizingSeminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

Text Books:

1. D. Patranabis, "Sensors and Transducers", McGraw Hill Education 2nd Edition
2. A.K Sawhney, "Electrical & Electronics Measurements and Instrumentation" Dhanpat Rai & Sons.
3. Murthy D. V. S.,"Transducers and Instrumentation", Prentice Hall, 2nd Edition, 2011.

Reference Books:

1. John G. Webster, "Sensor and signal conditioning" Wiley Inter Science, 2nd edition, 2008

CO-PO Articulation Matrix

EI 37xxx (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	1										2
CO2	3	1										2
CO3	3	1	1									2
CO4	3	2	2									3
CO5	3	2	2	2								3
Average	3	1.4	1.67	2								2.4

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
EI 37xxx: PERIPHERALS & INTERFACING

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2	1	4	1	-					100
						30	70			

PRE-REQUISITE: Knowledge of interfacing & standards.

COURSE OBJECTIVES: The objective of this course is to provide deep understanding of computer architectures and organisation of memory in to them. Further it focused on interfacing cables between instruments and computer systems with applicable standards.

COURSE OUTCOMES: After the completion of this course, the student will able to:
CO1: Discuss architecture of computer systems for Uni-processing and parallel processing.
CO2: Apply the concept of memory systems like cache & virtual memory on memory segmentation.
CO3: Illustrate the construction & working principle of floppy disk controller & CRT controller.
CO4: Develop ability to identify specific peripherals related to computer system.
CO5. Describe the concept of applying memory organisation in computer systems.

COURSE CONTENTS: THEORY:

Unit-1. Computer Systems And Architecture, Storage Structure & Hierarchy, Hardware Protection, Network Structures, Parallel Processing, Uniprocessor Systems, Parallel Systems Classification.

Unit-2. Common Instrument Interface: Current Loop, RS232, RS 485, GPIB, System Buses, Interface Buses, I2c, USB, Networking Buses For Office & Industrial Applications (ISA,EISA, LOCAL, VLB, AGP, PCI), Bus Architecture, System Ports & Classification.

.

Unit-3. Architecture of different CPU like Intel 8088/8086/80286/80386, interfacing with 8086: semiconductor memory interfacing, interfacing I/O ports, interfacing with ADC & DAC, stepper motor.

Unit-4. Intel 8272, hard disk, hard disk controller 82064. CD, pen drive, zip drive. Concept of ADC - Successive Approximation & Interfacing, Concept of DAC R-2R (ladder) & Interfacing, Introduction to Sensors & Transducers, Keyboard Display & Centronics Printer Parallel Interfacing using 8255.

Unit-5., Memory System: Hierarchy, virtual and cache memory, Paging & Segmentation, Allocation Policies and management scheme. Micro architecture: Horizontal Micro architecture and Vertical Micro architecture

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weight-age of 30% of total marks. End semester theory exam. Weight-age is 70% of total marks.

TEXT BOOKS:

1. Neha Dutta, "computer peripherals & interfacing", 1st edition, S.K. Kataria & sons, 2015
2. Tanenbaum A.S., "Structured Computer Organization", 6th edition, Pearson Education India, June 2016.
3. IBM PC/XT/AT Technical Reference Manual.

REFERENCE BOOKS:

1. Hwang and Briggs, "computer Architecture and Parallel Processing" 1st Edition, TATA McGraw Hill Education, July 2017
2. Intel Data Book.

CO-PO Articulation Matrix

Peripherals & Interfacing EI37xxx												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3											
CO3	3											1
CO4	3	2	2									1
CO5	3	2	2									1
Average	3	2	2									1

OPEN ELECTIVE I

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
IP-37251: INDUSTRIAL ENGINEERING & MANAGEMENT

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	-	-	3	-	-	30	70			100

PRE-REQUISITE: Introductory about structure and operation of organization.

COURSE OBJECTIVES: This course introduces the concept of management and organizational structure. It further emphasizes on operational management techniques & quantitative and quality control strategies. Also it aims on:

1. To gain knowledge on work-study and allowances in work management.
2. To understand workplace designs.

COURSE OUTCOMES: after the completion of course, student will able to:
CO1: Identify work place design, work measurement tests & technology.
CO2: Apply the concept of operations & organization management.
CO3: Describe principles & structure of organization & personal management techniques.
CO4: Apply quantitative techniques: operational research, linear programming and transportation model for decision making.
CO5: Analyse & apply operations and economics for quality control.

COURSE CONTENTS: THEORY:

UNIT-I Methods Engineering:
(a) Introduction to methods engineering and productivity, method study, recording techniques, work measurement tools and techniques.

UNIT-II Operations Management:
(a) Introduction to production planning and control, functions, tools and techniques, types of production system
(b) Facilities planning, introduction to plant layout and material handling tools & techniques.

UNIT-III Organization and Management:
(a) Principles of management and management functions:
(b) Organization principles, structures, span of control, delegation, centralization and decentralization, formal and informal organizations.
(c) Personal management - Introduction, communication, motivation and leadership

UNIT-IV
Quantitative techniques for decision making: Introduction to operations research, linear programming, transportation and assignment, models and its applications, network techniques and its application.

UNIT-V Quality Control:
Quality planning and quality control operation, economics of quality control, process capability studies and control charts for variables and attributes, Sampling.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weight-age of 30% of total marks. End semester theory exam. Weight-age is 70% of total marks.

TEXT BOOKS:

1. Barnes Ralph. M., "Time and Motion study Design & measurement of work", 7th edition, Wiley, Jan-2009
2. Dr. Ravi Shankar, "Industrial Engineering & Management", 2nd edition, Galgotia Publications Pvt. Ltd., June 2000.
3. Mahajan M.," Industrial Engineering and Production Management", 1st edition, Dhanpat Rai & Co. Ltd., Jan 2015.
4. Work Study\ ILO

REFERENCE BOOKS:

1. R. Panneerselvam, "Production & operations Management", 3rd edition, Prentice Hall India Learning Private Limited, Jan 2012.
2. Koontz and O'Donnel, "Principles of Management: An analysis of managerial functions", 4th edition, McGraw-Hill Inc., US, May 1968.
3. Sharma S. D.," Operation Research Theory methods & applications", 2020th edition, Kedar Nath Ram Nath, Jan 2014.
4. Eugene L. Grant, Richard Leavenworth, " Statistical Quality Control", 7th edition, McGraw Hill Education, July 2017.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End Semester theory exam. Weight age is 70 % of total marks.

CO-PO Articulation Matrix

Industrial Production & Management IP37251												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											
CO2	3		2									
CO3	3	2	2									2
CO4	3	2	2									2
CO5	3	2	2									2
Average	3	2	2									2

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-A (4-YDC)
CO 37253: ARTIFICIAL INTELLIGENCE

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	-	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: NIL

COURSE OBJECTIVES: The main learning objectives of the course are to:

1. Identify problems where artificial intelligence techniques are applicable.
2. Apply selected basic AI techniques; judge applicability of more advanced techniques.
3. Participate in the design of systems that act intelligently and learn from experience

COURSE OUTCOMES: After the completion of the course, the student will able to:
CO1: Differentiate between Human and Artificial Intelligence.
CO2: Apply knowledge representation using logic and rules and reasoning.
CO3: Describe the basic of machine learning and performance parameters.
CO4: Elaborate the principle and application of regression and SVM and practice the training using the said method.
CO5: Classify and examine the process of decision trees and dimensionality reduction in Machine learning.

COURSE CONTENTS: THEORY:

UNIT-I: Introduction to Artificial Intelligence (AI) and problem-Solving agent:
AI Fundamentals: Definition, Comparison between Human Intelligent and Artificial Intelligence Types of AI techniques, Characteristics of AI applications, Intelligent Agents, agents & Environment, Nature of Environment, Structure of Agents Goal-Based Agents, Utility-Based agent s, Problem- solving, State Space Search and Heuristic Search Techniques.

UNIT-II: Knowledge and Reasoning:
Representations and Mappings, Approaches to Knowledge Representation, issues, First Order predicate logic, conversion to clause form, resolution, algorithm, forward and backward reasoning, Semantic Nets, Conceptual Dependency, frames and scripts, Statistical reasoning, Bayes Theorem and Rule based system.

UNIT-III: Machine Leaning (ML)
Introduction to Machine Learning: Importance of Machine leaning, Types of Machine Learning. Training, validation and testing of machine learning model, Performance Measures: Confusion Matrix, Precision and Recall, Precision / Recall Tradeoff, The ROC Curve, R squared.
UNIT-IV: Regression & Dimensionality Reduction

Linear Regression, Cost function, Gradient Descent, Problem of over fitting, Bias-Variance trade-off, and Logistic Regression. Support Vector Machines: Linear SVM Classification, Case Study 1- Predicting Atrial Fibrillation using the ECG data.

UNIT-V: Decision Tees & Dimensionality Reduction

Decision Tees: Decision Tree model, Measuring Purity and information gain, Learning process, Computational Complexity, Regularization, Regression tree, Random Forests and XGBoost. Dimensionality Reduction and Unsupervised learning: Principal component analysis, Clustering algorithms, Partition based, Hierarchical based, Divisive clustering, Optimization objective, Expectation-maximization algorithm-Case Study 2 – Defect detection in manufacturing with unsupervised learning.

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End Semester theory exam. Weight age is 70 % of total marks.

TEXT BOOKS:

1. Rich & Knight, "Artificial Intelligence", 2nd Edition, Tata Mcgraw Hill 2011.
2. Stuart Russell and Peter Norvig, "Artificial Inteligence- A Modern Approach", Third Edition Prentice Hall Series, 2010.
3. Aurelien Geron, "Machine Learning with Scikit- Learn & TensorFlow", O'Reilly USA, Education India, 2017

REFERENCE BOOKS:

1. Andreas Muller and Sarah Guido, "Introduction to Machine Learning with Python: A Guide for Data Scientists", Shroff/O' Reilly, 2016
2. Dan W Patterson, Introduction to Artificial Intelligence and Expert Systems, 1st Edition, PHI., 2015

CO-PO Articulation Matrix

Artificial Intelligence CO37253												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	1									
CO2	2	1	2	1								
CO3	3	2	2	1								1
CO4	3	2	1	1								1
CO5	2	2	2	2								1
Average	2.6	1.8	1.6	1.25								

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37511: FILTER DESIGN AND SIMULATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of Op-amp and simple mathematical approach

COURSE OBJECTIVES: This course aims to familiarize student with the concept of analog filter design, passive filters, RC active filters and switched-capacitor filters. It further focuses on realization techniques in synthesis process of filters.

COURSE OUTCOMES: After the completion of this course, student will able to,
CO1: Analyze frequency response & plot Bode plot using design equations for various filters.
CO2: Compare and contrast Elliptical, Butterworth, chebyshev and Cauer filters using approximation theory.
CO3: Realize Butterworth filters up-to second order using Op-amp.
CO4: Analyse active networks using different approaches.
CO5: Design & Realize LC ladder, Kerwins circuit and other passive filter circuits

COURSE CONTENTS: THEORY:

UNIT-I
Active Network elements and its Two-port representation, Asymptotic Bode plot for first and second order filter. Frequency responses, realization of design equations Trans-conductance amplifier and current conveyors. Switched capacitor filter and Filter ICS

UNIT-II Fundamentals of approximation theory, Butterworth's and Chebyshev approximation Introduction to elliptical filter Comparison of various approximations. Design parameters of active filters.

UNIT-III Realization of Butterworth's filters of first order& second order using Op-Amps. Active Low-pass, High pass, all pass, Band pass and Band reject type of filters. LP-HP transformation Active resonant band pass filters and Friend's circuit, Gain boost & Gain Dip circuit. Introduction to Delay filters. Sallen and Key filters and their realization, simulator software .various Design parameter. Selectivity and desensitivity.

UNIT-IV
Analysis of Active networks using IAM approach, reduction of multipole and its implementation. Parallel connections of multipoles, analysis of Transmission zeros for networks containing active elements like operational amplifiers. Voltage-feed-forward and component - lifting. Scaling. Properties and circuits of GIC, NIC, CNIC&VNIC Gyrators, FDNR & FDN Cusing Op-Amp

UNIT-V Application of Passive filters LC ladder simulation, cascade realization, Kerwin's circuit, constant K-filters and their analysis, M-derived filters, composite filters, attenuators

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars / Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks

TEXT BOOKS:

1. Temes G. C. and Lapatra J.W., "Introduction to Circuit Synthesis and Design" 2nd edition, McGraw-Hill Education, August 1977.
2. Mitra S.K., "Analysis and Synthesis of linear Active Networks", 1st edition, John Wiley & Sons, January 1985.
3. Van Valkenburg and R.Schaumann, "Design of Analog Filters" 2nd edition, Oxford University Press Inc, Jan 2001.

REFERENCE BOOKS:

1. .Gray, Hurst, Lewis, and Meyer, Analysis and Design of Analog Integrated Circuits, John Wiley & Sons, 5th edition, 2009
2. Arthur B Williams, "Analog Filter and Circuit Design Handbook", 1st Edition, McGraw-Hill Education, 2014

CO-PO Articulation Matrix

Filter Design and Simulation EI37511												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2									2
CO2	2	3	2									2
CO3	3	2	3									2
CO4	2	2	3									1
CO5	2	2	1									1
Average	2.4	2.2	2.2									1.6

LABORATORIES OBJECTIVES: This lab introduces filter design of various active filters & provide deeper understanding of the filter realization techniques. This also introduces hardware implementation of the filtering techniques.

LABORATORY OUTCOMES: after the completion of this laboratory sessions, Student will able to design, realize and verify frequency response of
CO1: Butterworth Low Pass & High pass filters, Band Pass & All pass filters
CO2: Butterworth Second order Low Pass & High pass filters
CO3: Butterworth Notch and band Reject Filters
CO4: Chebyshev 2nd order Low pass & other various filter topologies
CO5: To develop the meaning from oral, written, and graphical plotting through the experiments.

LIST OF EXPRIMENTS:

1. To demonstrate Butterworth active Low Pass Filter and plot its frequency response.
2. To demonstrate Butterworth active High Pass Filter and plot its frequency response.
3. To verify Butterworth active Band Pass Filter and plot its frequency response.
4. To verify Butterworth All Pass Filter and plot its frequency and phase response.
5. To analyse Butterworth second order High Pass Filter and plot its frequency response.
6. To analyse Butterworth second order Low Pass Filter and plot its frequency response.
7. To analyse Butterworth Notch Filter and plot its frequency response.
8. To demonstrate Butterworth Band Reject Filter and plot its frequency response.
9. To realize Chebyshev active second order Low Pass Filter and plot its frequency response.
10. To compare various filter topologies for Band Pass Filter operation.

ASSESMENT:

Evaluation of students done through-experiment performance, internal viva, external viva, File preparation and submission. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab. The end-term practical examination weightage is 60%.

CO-PO Articulation Matrix for LAB

Filter Design and Simulation EI37511 (P)												
Course Outcomes	**PO 1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	1	1						1			2
CO2	3	1	1						1			2
CO3	3	1	1						1			2
CO4	3	2	1						1			2
CO5									3	3		2
Average	3	1.25	1						1.4	3		2

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37xxx: MICROCONTROLLER & EMBEDDED SYSTEM

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
4	2		3	1	-	30	70	40	60	200

PRE-REQUISITE: Basic Microprocessor, I/O Devices, Memories etc.

COURSE OBJECTIVES: The student will able to:

1. To analyze the basic concepts and architecture associated with different microcontrollers families and embedded systems.
2. To design assembly language programs for Different scenarios and calculations.
3. To illustrate interfacing of different I/O devises with 8051 microcontroller

COURSE OUTCOMES: After the completion of this course, the student will able to:

CO 1: Analyze the basic concepts and architecture associated with microcontrollers family
CO 2: Design assembly language programs for different scenarios and calculations.
CO 3: Design of microcontroller (8051) based system by interfacing various types of I/O devices.
CO 4: Analyze the Hardware Architecture of embedded system, by using few case studies.
CO5: Compare various software architecture of embedded systems and RTOs.

COURSE CONTENTS: THEORY:

UNIT-I Introduction to microcontrollers, Features of various families of microcontrollers. Similarities & Difference between general purpose & application specific, Van Neumann and Harvard Architecture. Applications of Microcontrollers in real-world.

UNIT-II 8051/ ARM Controllers Family of Microcontroller. Features and Architecture, Programming model, GPRs & SFRs ,timer, interrupts, instruction set & timing diagram, Assembly language programming, 8051-Timer/Counter and Programming, External Memory Interfacing.

UNIT-III Applications and design of microcontroller (8051) based systems: Interfacing of LEDs, 7 Segment display device, LCD display, DIP Switches, Push Button switches, Key denounce techniques, Keyboard connections load per key and matrix form, Interfacing A/D converter, D/A converter, Relay, stepper motor and DC motor.

UNIT-IV Introduction to Embedded systems, Functional unit of embedded system, Categories of embedded systems, Characteristics and their applications.

UNIT-V Hardware architecture of Embedded system- Design Process step& Design cycle, System planning and development of project (life cycle models- waterfall, V-model, spiral & rapid prototype).Few case studies

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Muhammad Ali Mazidi, "The 8051 microcontroller and embedded systems", 2 edition, Pearson Education, 2001
2. Douglas V. Hall, "Microprocessor and Interfacing, Programming and hardware", 2nd edition, McGraw Hill, 1996.
3. Dr. Raj Kamal, "Embedded Systems: Architecture, programming & Design", 2 edition, McGraw-Hill Education (India), 2012.

REFERENCE BOOKS:

1. David E. Simon, "An Embedded software premier", 1st edition, Addison-Wesley, 2002
2. Jonathan.W.Valvano, "Embedded Microcomputer Systems" Brooks-Cole Publishers.

CO-PO Articulation Matrix

Microcontroller & Embedded Systems EI37xxx (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	3	3	2									3
CO3	3	3	2									3
CO4	3											2
CO5	3	2	1									2
Average	3	2.67	1.67									2.5

LABORATORIES OBJECTIVES:

1. To develop programs to implement algorithms of engineering problems using microcontrollers.
2. In this lab, students are expected to get hands-on experience on simulator for solving stated programs.
3. To get exposure for various interfacing techniques using simulator.

LABORATORY OUTCOMES: After the completion of this laboratory sessions, student will able to:

CO1: Design Assembly language program (or C language) using Arithmetic, logical instructions using Keil software
CO2: Evaluate delay for various operations and write assembly language program (or C language) for 8051 using Keil software.
CO3: Interfacing of various devises using Keil and Proteous software.
CO4: To develop communication skill through laboratory note book with written descriptions of code, flowchart and results.

LIST OF EXPRIMENTS:

1. Write Assembly language program to perform Arithmetic operations in 8051 (ADD, SUB, MUL, DIV, SWAP, INR etc) using Keil software.
2. Write Assembly language program to perform Logical operations in 8051 (OR, AND, XOR, CPL, etc) using Keil software.

3. Write Assembly language program to copy data form one RAM location to another RAM location in 8051 using Keil software.
4. Write Assembly language program to generate a square wave of a given frequency(Timer mode 1 and Mode 2) using Keil software
5. Write Assembly language program to glow one LED connected at port 1 and 8 LEDs connected on port 2 using Keil software.
6. Interface LED with 8051 micro controller at port 1 and Write Assembly language program to glow it, using Keil and Proteous software.
7. Interface LCD with 8051 micro controller and Write Assembly language program to display name using Keil and Proteous software.
8. Interface stepper motor with 8051 micro controller and Write Assembly language program to rotate it in steps of 90 degrees(or 45 degree) using Keil and Proteous software.
9. Interface DC motor with 8051 micro controller and Write Assembly language program to rotate it in CW or ACW direction using Keil and Proteous software.
10. Interface LED and push button switch on Aurdino board and program it in Assembly language (or C language).
11. Interface 7 segment display with 8051 micro controller and Write Assembly language program to display name using Keil and Proteous software.

ASSESMENT:
Evaluation of students done through-experiment performance, internal viva, external viva, File preparation and submission. Continuous evaluation of laboratory journals with a weightage of 40%. It includes lab attendance as well as experiments performed in the lab. The end-term practical examination weightage is 60%.

CO-PO Articulation Matrix for LAB

Microcontroller & Embedded Systems EI37xxx (P)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	2	2		3							
CO2	3	2	2	2	3							2
CO3	3	3	2	2	3							2
CO4	2								3	3		1
Average	2.75	2.33	2	2	3				3	3		1.67

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EE37xxx: CONTROL SYSTEM

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of network analysis.

COURSE OBJECTIVES: This course focuses on
1. Mathematical tools to develop control systems model, time and frequency responses of dynamical systems, performance specifications.
2. Techniques for determining stability of systems.
3. Basic design aspects of various controllers and compensators.
4. Dynamical system analysis using state space model..

COURSE OUTCOMES: After completing the subject student will be able to:
EE32009(T).1: Develop mathematics models (TF and state space) of various physical systems.
EE32009(T).2: Define time domain and frequency domain specifications of a control system.
EE32009(T).3: Determine stability of a control system using time domain techniques and design appropriate controller for a given problem.
EE32009(T).4: Propose alternate solution via compensator design to get desired frequency domain specifications.
EE32009(T).5: Explain concepts of controllability and observability as well design of state feedback controller.

COURSE CONTENTS: THEORY:

UNIT-I
Modelling of Dynamic Systems and Simulation – Intergo- differential equations of linear systems such as mechanical, hydraulic pneumatic and electrical systems. Block diagram and signal flow graph method of representing the dynamic equations. Analogue simulation, linearity, impulse response and concept of transfer function, Mason's gain formula, control system components- Error detectors, a-c and d-c Servomotors, servo- Amplifiers (a-c & d-c) using operational amplifiers, Gyro, Resolver. Typical study of characteristics of these components. Concept of feedback as control theory – mathematical theory of feedback, return ration, return difference, open and closed loop, understanding the necessity of feedback as real control action supplemented by a small example.

UNIT-II
Time Domain Analysis of Feedback Control Systems – Typical reference test signals and their significance, transient behaviour of closed loop systems under feedback control. Proportional plus derivative and rate feedback control actions for improving the transient response. Steady state behaviour of closed loop

feedback control systems. Types of open loop transfer functions. Steady state errors. Proportional plus integral control action for the improvement of steady state errors.

UNIT-III
Frequency –Domain Analysis of Feedback Control System – Concept of frequency-domain analysis, Bode plots, polar plots. Bode of closed loop transfer function MP and Bode plots of error transfer functions. Principle of Argument, Nyquist criteria, conditionally stable closed loop systems, Transportation lag. Constant M and constant N loci of closed loop poles (root loci).

UNIT-IV
Compensation Techniques – Need for Frequency – domain compensation, Different types of compensation, phase-lead and phase – leg compensation, Design of compensating network for the desired frequency domain closed loop performance.

UNIT-V
State Space Method of Analysis – Fundamentals of state space: concept of state and state variable. Representation of linear system through state dynamics, Calculation of Eigen-values and Eigenvectors, Modal matrix, Modal transformation, Elementary understanding controllability and observability, state feedback control. Stability analysis of feedback control systems- concepts of stability, BIBO stability asymptotic stability, Routh-Hurwitz stability analysis. Nyquist stability analysis and relative stability, gain margin and phase margin.

ASSESMENT: Students will be assessed on
(a)Continuous evaluation through two mid-term test with a weightage of 30% of the total marks. It includes class attendance as well as assignments on the course topics.
(b) The end-term theory examination weightage is 70%

TEXT BOOKS:
1. B. C. Kuo, “Automatic Control Systems”, ninth edition, Wiley India, 2009.
2. K. Ogata, “Modern Control Engineering”, fifth edition, Prentice-Hall, 2010.

REFERENCE BOOKS:
1. J. L. Melsa & D. G. Schultz, “Linear Control Systems”, McGraw Hill, New York, 1969.
2. I. J. Nagrath & M. Gopal, “Control Systems Engineering”, fifth edition, New Age International (P) Ltd, New Delhi, 2009.
3. Joseph J. DiStefano, Allen R. Stubberud, Ivan J. Williams. “Schaum's outline of theory and problems of feedback and control systems”, McGraw-Hill, 2011.

CO-PO Articulation Matrix for Theory

EE37xxx Control System (T)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1							
CO2	3	3	2	2								
CO3	3	3	2	2	1							
CO4	3		2	2	1							
CO5	3	3			1							
Average	3	3	2	2	1							

LABORATORIESOBJECTIVES:

1. Students will be able to use the laboratory techniques, tools and practices of control engineering.
2. To families with the modeling of dynamical system and the characteristics of control components like servo motor, synchros.
3. To understand time and frequency responses of control system with and without controllers and compensators.
4. To simulate and analyse the stability using MATLAB software and design the compensators.

LABORATORY OUTCOMES:

CO1: Develop professional quality systems, textual and graphical tools to obtain the results in obtaining the expected data analysis.
CO2: Evaluate the error and compare different error detectors, according to their performance requirement in control systems.
CO3: Determine the performance characteristics and speed control of various servo motors.
CO4: To create the optimal results by using different types of controller for systems of first and second order system.
CO5: Make use of standard inputs for steady state error analysis via IT tools.

LIST OF EXPRIMENTS:

1. To determine the performance characteristics of an angular position error detector using potentiometers.
2. To determine the characteristics of a Synchro Transmitter Receiver pair and use as a torque synchro and angular error detector.
3. To find the transfer function of an A.C Servomotor.
4. To find the transfer function of a D.C servomotor.
5. To Control the angular position of an AC servo motor as a carrier control system.
6. To perform closed loop speed control of a D.C Servomotor.
7. To perform closed loop Speed control of a D.C Servomotor.
8. To determine the performance characteristics of a DC motor speed control with PWM type power driver.
9. To determine the performance characteristics of a DC motor speed control with SCR type power driver.
10. Analysis of Proportional + Integrator + Derivative (PID) control actions for First and second order systems.

ASSESMENT: Students will be assessed on
(a) Continuous evaluation of LABORATORY journals with a weightage of 40% of the total marks. It includes lab attendance as well as experiments performed in the lab.
(b) The end-term practical examination weightage is 60%.

CO-PO Articulation Matrix for LAB

EE37xxx Control System (P)												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1				1		1	1
CO2	3		2									
CO3	3	3	2	2								
CO4	3	3		2	1					1		
CO5	3	3			1				1	1	1	1
Average	3	3	2	2	1				1	1	1	1

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37991: MINI PROJECT

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	4		-	2	-					100
								40	60	

PRE-REQUISITE: Hands on PCB designing/electronic workshop & basics of microcontroller.

COURSE OBJECTIVES: The student will able to implement & verify functionality of microcontroller based projects. Further it incorporates:

1. To plan for various activities of the project and distribute the work amongst team members.
2. To inculcate electronic hardware implementation skills by –
   - Learning PCB artwork design using an appropriate EDA tool.
   - Imbibing good soldering and effective trouble-shooting practices.
   - Following correct grounding and shielding practices.
3. To develop student‘s abilities to transmit technical information clearly and test the same by delivery of Presentation based on the Mini Project.
4. To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

COURSE OUTCOMES: After the completion of this laboratory schedules, the students will able to:
CO1: Plan, Structure and execute a Mini Project with team.
CO2: To interpret data sheets & specifications of various logic families & IC‘s
CO3: Implement electronic hardware by interfacing sensors with controllers, learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CO4: Deliver technical presentational based on the Mini Project work carried out
CO5: Prepare a technical report based on the Mini project.

CO-PO Articulation Matrix

Mini Project EI37991												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	3	2	3		1		2		3	3
CO2	3	2	3	2	3		1		2		3	3
CO3	3	2	3	2	3	3	1		2		3	3
CO4	1								2		3	2
CO5	1								2	3	3	2
Average	2.2	2	3	2	3	3	1		2	3	3	2.6

PROGRAM ELECTIVE II

1	**EI37XXX**	**High Frequency Engineering**
2	**EI37XXX**	**Analog Integrated Circuits**
3	**EI37XXX**	**Analytical Instrumentation**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37xxx: HIGH FREQUENCY ENGINEERING

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	**P**	**TU**	**T**	**P**	**TU**	**THEORY**		**PRACTICAL**		**TOTAL MARKS**
4	**-**	**-**	**3**	**-**	**-**	**CW**	**END SEM**	**SW**	**END SEM**	**100**
						30	**70**	**-**	**-**	

PRE-REQUISITE: Knowledge of Electronics devices and circuits, Basic electronics

COURSE OBJECTIVES: The main objectives of the course are to:

1. Introduce students to a physical understanding of the main principles and fundamental laws on which electromagnetic wave propagation is based.
2. Introduce the concept of transmission line and provide the tools (Smith Chart) that can be used for solution of such problems.
3. Provide the deep understanding of wave propagation inside the waveguide including reference to cavity resonator.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** To interpret and apply Maxwell's equation & wave equation for RF circuits.
2. **CO2:** To differentiate lossy, lossless and distortion less transmission lines.
3. **CO3:** To apply concept of impedance matching in transmission line.
4. **CO4:** Classify the waveguides and their modes of excitation.
5. **CO5:** To discuss working principle and operation of high frequency components like Magnetron, Klystron & TWT.

COURSE CONTENTS: THEORY:

UNIT-I

Review of Wave Propagation: Maxwell's equations and its importance at high frequency, Wave, Propagation through various media, behavior of passive components at high frequency, equivalent circuit of R, L, C Skin effect, Skin depth.

UNIT-II

Introduction to Transmission lines-I: Two wire transmission line, its equivalent circuit, equation for voltage and current of transmission line, characteristics impedance, reflection coefficient, input impedance of

transmission line, lossy and loss-less transmission lines, primary and secondary constants of transmission line Standing waves and VSWR.

UNIT-III

Transmission lines-II: Open and Short-circuited transmission lines, their voltage and current equations, input impedance of short and open circuited transmission line, Concept of impedance matching, perfectly matched transmission line, Stub matching, Single and double stub technique, causes of attenuation in transmission. Smith chart and its applications, calculations using Smith chart, importance of Smith chart at high frequency.

UNIT-IV

Wave Guides: Waves between parallel planes of perfect conductors, types: Parallel plate, rectangular, circular wave guides, Field equations, modes in wave guides, excitation of modes, field patterns, cut-off wavelength and phase velocity, dominant mode, transverse Electric and Transverse Magnetic (TE and TM) waves, Wave impedances, attenuation in wave guides.

UNIT-V

High frequency device: High frequency Transistor and their equivalent circuit analysis, microwave semiconductor devices. Klystron, Magnetron and TWT. Microwave instrumentation in air traffic control. IOT (Inductive Output Tube) IOT (Inductive Output Tube) Construction & operating principle. Comparison of IOT with Klystron

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Jordan E.C., "EM Fields and wave propagation systems", Second Edition, Pearson Education.
2. Edward F Kuester, "Theory of Waveguides and Transmission Lines", First Edition, CRC Press.
3. Reinhold Ludwig and Gene Bogdanov, "RF Circuit Design: Theory and Applications", Second Edition, Pearson Education India, 2011.

REFERENCE BOOKS:

1. K. D. Prasad, "Antenna and Wave Propagation", Third Edition, Satya Prakashan, New Delhi.
2. N. N. Rao, "Elements of Electromagnetism", Second Edition, Pearson Education.
3. Matthw M. Radmanesh, "Advanced RF and Microwave Circuit Design: The Ultimate Guide to Superior Design", Author House Publisher, 2009.

CO-PO Articulation Matrix

High Frequency Engineering EI37xxx (T)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	3	2								
CO2	3	3	2	2								
CO3	3	2	2	1								
CO4	3	2	1	1								
CO5	3	2	1	1								
Average	3	2.4	1.8	1.4								

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
M. Tech. I Year I SEM (MICROELECTRONICS & VLSI DESIGN)
EI37xxx: ANALOG INTEGRATED CIRCUITS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
4	-	-	3	-	-	CW	END SEM	SW	END SEM	100

PRE-REQUISITE: Knowledge of CMOS and analog circuits.

COURSE OBJECTIVES:
1. To prepare the students to gain understanding of CMOS Analog circuits and Systems.
2. To make students familiar with Analog circuit analysis and simulation tool flow.
3. To prepare students to tackle advanced analog IC topics like Op-amp, PLL, ADC, DAC, VCO etc.

COURSE OUTCOMES: After completion of course, student will be able to:
CO1: Identify and compare the topologies for CMOS amplifier design.
CO2: Design and Analyze CMSO differential amplifiers with various loads.
CO3: Design and Analyse various feedback amplifiers.
CO4: Design CMOS single stage op-amp, two stage op-amp for various performance parameters like slew rate, CMRR, gain, etc.
CO5: Design CMOS Op-amp comparators, regenerative and high-speed comparators.

COURSE CONTENTS
THEORY:
UNIT-I Review of MOS devices, Low frequency MOSFET Models, High frequency MOSFET Models, Single-Stage Amplifiers: Basic concepts, common-source stage, common- source stage with resistive load, CS stage with diode-connected load, CS stage with current-source load, CS stage with triode load, CS stage with source degeneration, source follower, common-gate stage, cascade stage, folded cascode, choice of device models.

UNIT-II Differential Amplifiers: Single-ended and differential operation, basic differential pair, qualitative analysis, quantitative analysis, common-mode response, differential pair with MOS loads, gilbert cell.

UNIT-III Frequency Response of Amplifiers: General considerations, Miller effect, association of poles with nodes, common-source stage, source followers, common-gate stage, cascode stage, differential pair. Feedback: General considerations, properties of feedback circuits, types of amplifiers, feedback topologies, voltage-voltage feedback, current-voltage feedback, voltage-current feedback, current-current feedback, effect of loading, two-port network models, loading in voltage-voltage feedback.

UNIT-IV
Operational Amplifiers-I: General considerations, performance parameters, one- stage op amps, two-stage op amps, gain boosting, comparison, common-mode feedback, input range limitations, slew rate, power

supply rejection. Stability and Frequency Compensation: General considerations, multiple systems, phase margin, frequency compensation, compensation of two stage op amps.

UNIT-V

Operational amplifier-II : CMOS Comparator: Characteristic of a comparator, Two stage open loop comparator, Special purpose comparator, Regenerative comparator, High output current amplifier, High speed comparator; Introduction to Switched Capacitor Circuits: Switched capacitor circuits, Switched capacitor amplifiers, Switch capacitor integrators.

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. B. Razavi, "Design of Analog CMOS Integrated Circuits", Second Edition, McGraw Hill, 2000.
2. Tertulien Ndjountche, "CMOS Analog Integrated Circuits- High Speed and Power Efficient Design", CRS Press.
3. P. R. Gray & R. G. Meyer, "Analysis and Design of Analog Integrated Circuits", 5/e, John Wiley, 2012.

REFERENCE BOOKS:

1. Ken Martin, "Analog Integrated Circuit Design", 2/e, Wiley Publications, 2012.
2. Sedra and Smith, "Microelectronic Circuits", 6/e, Oxford Publications, 2014.
3. Jean-Michel Redoute, Michiel Steyaert, "EMC of Analog Integrated Circuits", Springer, 2010.

CO-PO Articulation Matrix

EI37xxx: ANALOG INTEGRATED CIRCUITS												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3	3	2	1	2							
CO2	3	3	2	1	2							
CO3	2	2	2									
CO4	2			2	2							
CO5			1	2	2							
Average	2	1.6	1.4	1.2	1.6							

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37xxx ANALYTICAL INSTRUMENTATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3		-	CW	END SEM	SW	END SEM	100
						30	70			

PRE-REQUISITE: Fundamentals of Measurement & Sensors/transducers.

COURSE OBJECTIVES: This course intending to provide the knowledge of industrial instrumentation i.e how the machines & instruments work for the industries dealing in pharmacy, mechanical/Production etc.

COURSE OUTCOMES: After the completion of course, student will able to:
CO1: Analyse methods &Techniques for various colorimetric & spectrometry
CO2: Compare & Contrast unique methods of separation of closely similar materials through chromatography
CO3: Describe important methods of analysis of industrial gases. Awareness and control of pollution in the environment is of vital importance.
CO4: Describe different pH meters & their measurement methods.
CO5: Choose appropriate Electro Magnetic Resonance & Microscopic Techniques for NMR.

COURSE CONTENTS: THEORY:

UNIT I COLORIMETRY AND SPECTROPHOTOMETRY
Special methods of analysis : Beer-Lambert law, Colorimeters , UV Visible spectrophotometers , Single and double beam instruments ,Sources and detectors – IR Spectrophotometers: Types, Attenuated total reflectance flame photometers, Atomic absorption spectrophotometers – Sources and detectors– FTIR , spectrophotometers – Flame emission photometers – Fluorescence spectrophotometer

UNIT II CHROMATOGRAPHY Different techniques: Gas chromatography, Detectors, Liquid chromatographs, Applications, High pressure liquid chromatographs, Applications.

UNIT III INDUSTRIAL GAS ANALYZERS AND POLLUTION MONITORING INSTRUMENTS Types of gas analyzers: Oxygen, NO2 and H2S types, IR analyzers, thermal conductivity analyzers, analysis based on ionization of gases. Air pollution due to carbon monoxide, hydrocarbons, nitrogen oxides, sulphur dioxide estimation - Dust and smoke measurements.

UNIT IV pH METERS AND DISSOLVED COMPONENT ANALYZERS Principle of pH measurement, glass electrodes, hydrogen electrodes, reference electrodes, selective ion electrodes, ammonia electrodes,cyclic voltametry, biosensors, dissolved oxygen analyze r –Sodium analyzer – Silicon analyzer.

UNIT V ELECTRO MAGNETIC RESONANCE AND MICROSCOPIC TECHNIQUES NMR – Basic principles – NMR spectrometer, Applications. Electron spin Resonance spectroscopy – Basic principles, Instrumentation and applications. Scanning Electron Microscope (SEM), - Basicpr inciples, Instrumentation and applications.Transmission Electron Microscope (TEM) – Basic principl es –Instrumentation and applications. Mass spectrometers – Different types – Applications.

ASSESMENT:

The assessment is continuous evaluation process, which includes two mid-semester test, assignment/Quiz & regularity with 30% weightage of total marks. The end-term theory examination weightage is 70%.

TEXT BOOKS:

1. G.W. Ewing, 'Instrumental Methods of Analysis', McGraw Hill, 1992.
2. R.K.Jain, Mechanical and Industrial Measurements, Khanna Publishers, New Delhi, 1999
3. H.H. Willard, L.L. Merritt, J.A. Dean, F.A. Settle, 'Instrumental Methods of Analysis', CBS

CO-PO Articulation Matrix (T)

EI:37xxx												
Course Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										1
CO2	3	3										1
CO3	3	2	2									1
CO4	3	2	2									1
CO5	3	3	2									1
Average	3	2.6	2									1

OPEN ELECTIVE II

1	**IT37XXX**	**Web Engineering**	**IT Board**
2	**EC37XXX**	**Mobile Communication**	**EC Board**
3	**EC37XXX**	**Digital Signal Processing**	**EC Board**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. III Year SEM-B (4-YDC)
EI37xxx: DIGITAL SIGNAL PROCESSING

HOURS PER WEEK			**CREDITS**			**MAX. MARKS**				
T	**P**	**TU**	**T**	**P**	**TU**	**THEORY**		**PRACTICAL**		**TOTAL MARKS**
4	**-**	**-**	**3**	**-**	**-**	**CW**	**END SEM**	**SW**	**END SEM**	**100**
						30	**70**	**-**	**-**	

PRE- REQUISITE: Basic knowledge of Network Theory, Control System and Signal & Systems.

COURSE OBJECTIVES: This course emphasises on:
1. Identification of the type signals and systems.
2. How to apply the principles of discrete-time signal analysis to perform various signal operations.
3. Applying z-transforms to finite difference equations.
4. Fourier transform to describe the frequency characteristics of discrete-time signals and systems.
5. Necessity principles of signal analysis to filtering.

COURSE OUTCOMES:
After completing this course, the student will be able to:
CO1: Compare & contrast various kinds of signals, their properties and significance.
CO2: Evaluation of System functions and frequency response by using Z-Transforms.
CO3: Design Digital FIR filters using window techniques, Fourier methods and frequency sampling techniques.
CO4: Design Digital filters from analog filters using various techniques.
CO5: Develop Fast Fourier Transform (FFT) algorithms for faster realization of signals and systems.

COURSE CONTENTS:
THEORY:

UNIT-I. Discrete time signals &systems : Introduction, types of signals, discrete time signal sequences, discrete time systems, linear shift invariant systems, Stability & causality, linear constant coefficient difference equation, frequency domain representation of discrete time systems & signals, properties of the Discrete Time Fourier transform (DTFT), Sampling and discrete time processing of continuous-time

UNIT-II.Z-Transform and Transform analysis of LTI systems: Z-transform, Inverse Z-transform, properties of Z-transform, one sided Z-transform and its applications, system function, frequency response of LTI systems, minimum phase and linear phase systems.

UNIT-III. Discrete Fourier transform(DFT), and its computation: Discrete Fourier Series, Discrete Fourier Transform, Linear convolution using Discrete Fourier Transform, Computation of DFT, Goertzel's Algorithm, Decimation in time FFT algorithms, Decimation in frequency algorithms, FFT algorithms for N (a composite number), chirp Z-transform algorithm.

UNIT-IV. Implementation of digital filters: Signal flow graph representation, Realization of IIR & FIR systems, direct form, Transposed form, Parallel form, Cascade form, Lattice structure for IIR and FIR filters, Parameter quantization effect.

UNIT-V. Digital filter design techniques: Design of IIR digital filters using Impulse-invariant and bilinear transformation methods, Design of FIR filter using Windowing methods, Design examples.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:
1. Proakis, "Digital Signal Processing", Prentice-Hall of India edition 2012.
2. Alan V. Oppenheim & Ronald W. Schafer, "Discrete-Time Signal Processing", second edition, Prentice-Hall, 2007.
3. Vallavaraj and Salivahanan, "Digital Signal Processing", Tata McGraw Hill, 2007.

REFERENCE BOOKS:
1. S.K Mitra, "Digital Signal Processing", fourth edition Tata McGraw Hill, 2011.
2. Schaum's outlines, "Digital Signal Processing", Tata McGraw Hill 1999.
3. L. R. Rabiner & B. Gold, "Theory and Application of Digital Signal Processing", Prentice Hall Englewood Cliffs, NJ, 1975.

CO-PO Articulation Matrix

Digital signal Processing EC37xxx/37xxx (T)												
Course Outcomes	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	3											1
CO2	3											3
CO3	3	2										2
CO4	3	2	2									2
CO5	3	2	2									2
Average	3	2	2									2

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI47053: PROCESS INSTRUMENTATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	1	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of Sensors and Transducers, Control Systems.

COURSE OBJECTIVES: The purpose of this course is to
1. Apply key concepts of automatic control and instrumentation to process plants.
2. Expose the students to the advanced control methods used in industries and research.
3. Familiarize the students with PID tuning and PLC ladder diagram used in process plants.

COURSE OUTCOMES: After completion of course, the students should be able to:
1. **CO1:** Analyse process control system and evaluation.
2. **CO2:** Explain the application of pneumatic, hydraulic & controller in control systems.
3. **CO3:** To describe PLC and ladder programming for designing various logics.
4. **CO4:** To discuss final control elements.
5. **CO5:** To employ PLC and ladder programming to real world scenario.

COURSE CONTENTS:
THEORY:

UNIT-I: Introduction to process control. Control system Evaluation, Objective. ON-OFF control. Time proportional control, proportional control, Integral control, Derivative control, Typical PID controller characteristics and related terminology.

UNIT-II: Pneumatic controller: P, PD, PI, PID controllers. Hydraulic controller: P, PI, PD, PID controller, electronic controller. Complex control schemes: ratio control systems, split range controls, cascade controls, feed forward control. Tuning of controllers: Ziegler-Nicolas methods and other methods.

UNIT-III Introduction to programmable logic controllers: Evolution, basic block diagram, characteristics, advantages, types, PLC Vs PC. Ladder diagram, Ladder design, development of Ladder diagrams for various logic gates, logics. PLC timers and counters, Application of PLCs: Industrial applications.

UNIT-IV: Final control elements: Mechanical, Electrical, Fluid valves: control valve principles, valve sport and plug and characteristics, control valve types, Valve sizing and selection. Type of actuators: Pneumatic actuators, Hydraulic actuators.

UNIT-V: Feedback and connecting elements in the loop flow, pressure level and temperature control loop, Pneumatic transmission, electric transmission, Thermal element lag, pressure element lag.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

TEXT BOOKS:
1. Donald P. Eckman, "Automatic Process Control", Wiley India Pvt. Ltd., 2009.
2. D. Patranabis, "Principles of Process Control", Third Edition, Tata McGraw Hill, 2012.
3. Curties D. Johnson, "Process Control Instrumentation Technology", Eighth Edition, Pearson, 2005.

REFERENCE BOOKS:
1. S. K. Singh, "Industrial Instrumentation and Control", Third Edition, Tata McGraw Hill, 2010.
2. Madhuchhanda Mitra and Samarjit Sen Gupta, **"**Programmable Logic Controller and Industrial Automation: An Introduction" Penram International Publishing, 2008.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**2**	**2**	**-**	**1**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**2**	**1**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO3	**3**	**1**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO4	**3**	**2**	**1**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**2**	**1**	**2**	**3**	**-**	**1**	**-**	**-**	**-**	**-**	**2**
Avg.	**3**	**1.8**	**1.4**	**2**	**1.8**	**-**	**1**	**-**	**-**	**-**	**-**	**1.75**

LABORATORIES OBJECTIVES:
1. To familiarize the students with the measurement and control of various process loops like flow, level, temperature etc.
2. To provide hands-on experimentation of PID controller tuning for various parameters.
3. To enable the student to gain knowledge of ladder programming with PLC.

LABORATORY OUTCOMES: After completing the lab session, **t**he student will be able to:
1. CO1: Analyse pressure-displacement characteristics of Flapper-Nozzle system.
2. CO2: Perform the measurement and control of flow, level and temperature loops using PID controller.
3. CO3: Analyse the cascade control loop of Flow-level.
4. CO4: Analyse the feedback pressure control loop.
5. CO5: Design the ladder diagram for PLC based lift elevator, bottle filling system.

LIST OF EXPRIMENTS:
1. To obtain Pressure-displacement characteristics of Flapper Nozzle amplifier.
2. To measure flow of liquid in flow control loop and to maintain constant flow using PID control.
3. To measure level of liquid in level control loop and to maintain constant level in a tank using PID control.
4. To measure and control the temperature of heating fluid in heat exchanger loop using PID control.
5. To perform the analysis of cascade control loop of Flow-level.
6. To perform the analysis of feedback pressure control loop.
7. To perform the analysis of feedback level control loop.

8. Implement the different logic functions using PLC ladder diagram.
9. Implement the rotary bottle filling logic using ladder diagram on PLC.
10. Design ladder diagram for ON-OFF level control and verify it using PLC.
11. Design and implement PLC based Lift simulator using ladder diagram.

ASSESMENT:

Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	2	-	-	-	-	-	-	-
CO2	3	3	2	2	2	-	-	-	-	-	-	-
CO3	3	2	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	2	1	1	-	--	-	--	-	--	--
Avg.	3	2.4	2.2	1.6	1.4	-	-	-	-	-	-	-

B. Tech. IV Year SEM-A (4-YDC)
EE47002: POWER ELECTRONICS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Basic knowledge of Electronics and semiconductor devices.

COURSE OBJECTIVES:

1. To provide students a deep insight into the operational behaviour of practical power switching devices with respect to their static and dynamic characteristics.
2. To learn the working principle of classified topologies of Thyristor based AC/DC, AC/AC, DC/DC and DC/AC converters.
3. To design and analyse the operation of above converters considering their applications.
4. To understand design of firing circuits for Thyristor based line commutated converters.

COURSE OUTCOMES:

1. **CO1:** EE47002(T).1: Acquire knowledge about fundamental concepts and switches used in power electronics.
2. **CO2:** EE47002(T).2: Ability to analyse various single phase and three phase line commutated power converter circuits and understand their applications.
3. **CO3:** EE47002(T).3: Nurture the ability to identify basic requirements for line commutated converter-based design application.
4. **CO4:** EE47002(T).4: To develop skills to build and troubleshoot power electronics circuits.
5. **CO5:** EE47002(T).5: Understand the firing circuit design for line commutated converters.
6. **CO6:** EE47002(T).6: Foster ability to understand the use of line commutated converters in professional engineering.

COURSE CONTENTS:
THEORY:

UNIT-I
Static power devices: Thyristor family, two transistor analogy of SCR, construction, characteristics, parameters, turn on and turn off methods, firing circuits, isolation and amplifier circuits, synchronization circuits.

UNIT-II
Static power devices: Thyristor family, two transistor analogy of SCR, construction, characteristics, parameters, turn on and turn off methods, firing circuits, isolation and amplifier circuits, synchronization circuits.

UNIT-III
DC to DC converter: Basic principle of chopper circuits, various chopper circuits and their working, step up chopper, performance analysis.

UNIT-IV

Inverters: CSI and VSI inverters, single phase inverters, principle of operation, voltage and frequency control techniques.

UNIT-V
Industrial Application of Power Electronics, SMPS, UPS, AC and DC drives, Power Supplies.

ASSESMENT:
A. Continuous evaluation through two mid-term tests with a weightage of 30% of the total marks. It includes class attendance as well as assignments on the course topics. B. The end-term theory examination weight age is 70%.

TEXT BOOKS:
1. M H Rashid, "Power Electronics Circuits, Devices, and Applications", Third edition Pearson/Prentice Hall, 2009.
2. Ned Mohan, "Power Electronics: Converters, Applications, and Design", Third edition, John Wiley & Sons Inc, 2007.
3. Joseph Vithayathil, "Power Electronics Principles and applications", Tata McGraw-Hill, 1995.

REFERENCE BOOKS:
1. C. M. Pauddar, "Semiconductor Power Electronics (Devices and Circuits)", First edition, Jain Brothers New Delhi, 1999.
2. M. H. Rashid, "Handbook of Power Electronics‖", Pearson Education India, 2008.
3. M. D. Singh, K. B. Khanchandani, "Power Electronics", Tata McGraw-Hill, 2008.

CO-PO Articulation Matrix

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

LABORATORIES OBJECTIVES: Following are the objective of the course:
1. Show awareness about operating behaviour of various static switches used in converters.
2. Understand the basic requirements in design of power converters.
3. Analyse performance parameters of various power converters.

LABORATORY OUTCOMES: Students will be able to:
1. **CO1:** EE42007 (P).1: Recognize the functions of CRO, identify and select proper instruments to observe and record performance on different experimental set ups of power electronics laboratory.
2. **CO2:** EE42007 (P).2: Establish wiring and device connections to assemble experiments of static switches, line commutated, DC-DC converters and record their performances.
3. **CO3:** EE42007 (P).3: Analyse and compare the performance of various firing pulse generation circuits for triggering and Commutation circuit of SCR.

4. **CO4:** EE42007 (P).4: Apply professional quality textual and graphical tools to sketch and computing results, incorporating accepted data analysis and synthesis methods, mathematical software, and word-processing tools.
5. **CO5:** EE42007 (P).5: Ability to work in individual and in group following engineering practices. Ability to interact effectively on a social and interpersonal level, divide up and share task responsibilities to complete assignments.

LIST OF EXPRIMENTS:

1. Verification of steady state characteristics of different static switches.
2. Phase control of TRIAC using DIAC and RC circuit in light dimming circuit.
3. Firing pulse generation using UJT based relaxation oscillator.
4. Observe the performance of a TCA-785 based triggering circuit used for single phase-controlled converter.
5. Performance evaluation of single-phase uncontrolled converter for R, RL load
6. Performance evaluation of single-phase controlled converter for R, RL load.
7. Performance Analysis of step-down chopper.
8. Performance evaluation of current commutation circuit for SCR.
9. Performance evaluation of voltage commutation circuit for SCR.
10. Effect of duty cycle on the output voltage of buck-boost converter.

ASSESMENT:

A. Continuous evaluation of laboratory journals with a weightage of 30%. It includes lab attendance as well as experiments performed in the lab. B. The end-term practical examination weightage is 70%.

CO-PO Articulation Matrix for LAB

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

B. Tech. IV Year SEM-A (4-YDC)

EI47055: VLSI DESIGN

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	2	-	3	1	-	CW	END SEM	SW	END SEM	200
						30	70	40	60	

PRE-REQUISITE: Knowledge of Digital Circuit and Basics of Semiconductors is required.

COURSE OBJECTIVES:

1. To nurture the students with CMOS digital logic design.
2. To provide the students with the knowledge of trade-off between speed, power and area in CMOS digital VLSI design.
3. To provide enough knowledge to students for digital logic design with FSM.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** Explain importance of MOS transistor in designing VLSI circuits.
2. **CO2:** Implement and analyse CMOS Inverter for static & dynamic characteristics.
3. **CO3:** Design and analyse Dynamic and Domino logic.
4. **CO4:** Design FSM using Mealy and Moore machines.
5. **CO5:** Classify memory systems and differentiate between custom and semi-custom design.

COURSE CONTENTS:
THEORY:

UNIT-I Review of MOS, PMOS, NMOS, MOS device design equations, Short Channel and Narrow Channel Width Effects. MOS small signal and large signal model, MOS capacitances, Technology Scaling.

UNIT-II Basics of CMOS: Analysis of different types of inverter circuit, CMOS inverter, transfer characteristic, calculation of propagation delay, rise time, fall time, noise margin and power dissipation for CMOS Inverter. Effect of threshold voltage and supply voltage on Delay and power dissipation.

UNIT-III CMOS logic structures: Domino logic, NP Zipper Logic, CVSL, DVSL. Basics of VLSI Design, implementation of Logic functions, rise time/ fall time/ delay time considerations. Fan-in, fan-out, standard cell design, cell libraries.

UNIT-IV FSM Design: State machines, Mealy & Moore machines, state diagrams, state table reduction techniques for state tables, transition tables, design of sequential circuits using FSMs, VHDL coding for FSMs.

UNIT-V Memory based subsystem design, Static RAM, Dynamic Ram, Full custom and Semi-custom design, Clocking strategies, Clocked system, Latch and Resistors, System timing, two phase clocking, four phase clocking.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

TEXT BOOKS:

1. Neil H. E. West and Kamran Eshraghain, "Principles of CMOS VLSI Design: A Systems Perspective", Second Edition, Pearson, 1993.
2. Wayne Wolf, "Modern VLSI Design: Systems on Silicon", Second Edition, Prentice Hall, 1998.
3. Jan M Rabaey, Anantha Chandrakasan and Borivoje Nikolic, "Digital Integrated Circuits: A Design Perspective", Second Edition, Pearson, 2016.

REFERENCE BOOKS:

1. Charles H. Roth and Larry L. Kinney, "Fundamentals of Logic Design", Seventh Edition, Cl Engineering Publishers, 2013.
2. Adel S. Sedra and Kenneth C. Smith, "Microelectronic Circuits", Seventh Edition, Oxford University Press, 2017.
3. S. Brown and Z. Vranesic, "Fundamentals of Digital Logic with VHDL", Third Edition, Mc-Graw Hill, 2017.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**-**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.2**	**2**	**2**	**2.5**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

LABORATORIES OBJECTIVES:

1. Demonstrate the ability to use Cadence EDA tool for CMOS circuit design.
2. Students will be given hands-on of Virtuoso schematic and layout of CMOS circuits.
3. Students will be provided with a hands-on Spectre simulator for simulation and Assura for physical verification (DRC, LVS, and RCX) of CMOS circuits.

LABORATORY OUTCOMES: On completion of lab course, the student will be able to:

CO1: Able to use the Cadence EDA tools for CMOS circuits design.
CO2: Design CMOS logic circuits using Virtuoso Schematic editor of Cadence.
CO3: Able to use Spectre simulator to analyze functional and timings of logic circuits.
CO4: Design the layout of CMOS circuits using Virtuoso layout editor tool.
CO5: Demonstrate the use of Assura tool for physical verification of layout.

LIST OF EXPRIMENTS:

1. Introduction to Cadence Virtuoso EDA tools design flow.
2. To simulate the VI characteristics of NMOS and PMOS to obtain various performance parameters.
3. To obtain voltage transfer characteristics of CMOS inverter and observe the effect to varying W/L ratio on VTC.
4. To obtain the dynamic characteristics of CMOS inverter.
5. To design and verify performance parameters of 2 input NAND & NOR gates based on inverter sizing.
6. To implement two input NAND & NOR gates using domino logic and compare its performance with CMOS logic.
7. To implement and simulate 4-bit full adder using CMOS transistors.
8. Study the various design rules for layout using 180 nm technology.
9. Design the layout of CMOS inverter using 180nm technology & observe the effect of parasitics on its performance.
10. Design the Layout of 4-bit Full adder using 180 nm technology.

ASSESMENT:
Evaluation of students through Continuous performance analysis of students based on experiment performance, File preparation, internal viva and file submission with weightage of 40% of total marks and End Semester practical Examination (external viva) with weightage of 60% of total marks.

CO-PO Articulation Matrix for LAB

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**2**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**2**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**3**	**2.4**	**2.4**	**2**	**1.2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI-47257: FIBER OPTICS & PHOTONICS (Elective-III)

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70			

PRE-REQUISITE: Fundamentals of Semiconductors and Basic Communication.

COURSE OBJECTIVES:

1. To introduce the students to various optical fiber modes and configurations.
2. To provide the essential knowledge of fiber optic communication system.
3. To impart the knowledge of optical sensors, materials for various applications.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** To identify modes in optical fibres and define attenuation dispersion optical fibres and also identify numerical aperture measurement techniques.
2. **CO2:** To classify various Optical sensors for measurement of parameters like temperature, flow etc.
3. **CO3:** To design and implement fibre optic communication system for desired BER, link & power budget and time budget.
4. **CO4:** To classify optoelectronics materials & their characteristics required for photonics integrated circuits.
5. **CO5:** Identify the behaviour and functionality of different optoelectronic devices.

COURSE CONTENTS:
THEORY:

UNIT-I Optical fiber: Transmission characteristics, attenuation, modes, dispersion effects in optical fibres material, waveguide dispersions, wavelengths for communication, Attenuation measurement, Cut back method, Numerical Aperture measurement, multiple wavelength measurement, Fabrication of Optical fiber.

UNIT-II Optical Instrumentation: Types of Optical fibre sensors, Intrinsic and extrinsic sensor, measurement of Temperature, Flow, Displacement etc. using optical fiber sensors, OTDR, Optical power meter, Optical spectrum analyzer.

UNIT-III Optical Communication: Optical Transmitter and Receiver, Basic optical data and voice communication, Intensity modulation/Direct detection, BER, Link design power budget, rise time budget, WDM and DWDM systems, Optical Networking, Optical modulators for WDM 40 G bit/s optical network, Free Space communication systems. New Raman design rules for high-speed network.

UNIT-IV Optoelectronic materials (III-V) and Technology: Growth and Characterization of Ternary and Quaternary materials. Photonic Integrated Circuits: Modelling, Design & development and its applications.

UNIT-V Semiconductor lasers, Light Emitting Diodes, strained quantum well-laser, Distributed feedback laser, Distributed Bragg Reflector laser, and vertical cavity Surface Emitting Laser, Semiconductor Optical Amplifiers, EDFA, Junction photodiode, PIN, APD, responsively, quantum efficiency etc.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weight age of 30% of total marks. End semester theory exam. Weight age is 70%of total marks.

TEXT BOOKS:

1. John M. Senior, "Optical Fiber Communication: Principles and Practice", Third Edition, Pearson Education, 2014.
2. Gerd Keiser, "Optical Fiber Communications", Fifth Edition, Mc-Graw Hill, 2017.
3. Bhattacharya Pallab, "Semiconductor Optoelectronic Devices", Second Edition, Pearson Education, 2017.

REFERENCE BOOKS:

1. C. K. Sarkar and D. C. Sarkar, "Opto Electronics and Fiber Optic Communication", Second Edition, New Age International Pvt. Ltd., 2012.
2. S. C. Gupta, "Textbook on Optical Fiber Communication and Its Applications", Third Edition, PHI.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**1**
CO2	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**2**
CO3	**2**	**2**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**3**
CO4	**2**	**1**	**3**	**-**	**-**	**-**	**-**	**-**	**-**	**-**		**1**
CO5	**3**	**1**	**2**									**1**
Avg.	**2.6**	**1.8**	**2.2**									**1.6**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
IT47201: DATA STRUCTURES (Program Elective-III)

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	--	--	

PRE-REQUISITE: Basic computer

COURSE OBJECTIVES:

1. To make the students to understand data structure stack queues, lists, trees, complexity etc. in detail.
2. Study memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.

COURSE OUTCOMES: After completing the course, the student should be able to:

1. **CO1:** Define the data structure & solve problems involving stack queues, lists, trees.
2. **CO2:** Explain the concept of memory hierarchy, management techniques partitioning, segmentation, paging and comparison of techniques.
3. **CO3:** Explain the CPU scheduling and multiprogramming.
4. **CO4:** List the file systems and its organization.
5. **CO5:** Case studies on MS-DOS, UNIX and WINDOWS NT.

COURSE CONTENTS:
THEORY:

UNIT-I Data structures: Stacks Queues, Lists, Trees, Definition of complexity, Sorting, Theory of sorting, Searching, Matrix manipulations, sets of strings, OS: Evolution, different types, features of OS.

UNIT-II Memory: Hierarchy, management techniques partitioning, swapping, paging, segmentation, paged segmented memory, comparison of techniques, virtual memory, demand paging & replacement policies.

UNIT-III CPU Scheduling: Scheduling Criteria, Types of schedulers, process & processor scheduling, Types of CPU Scheduling, Multiple Processor Scheduling, Multicore Processor, Multi Programming.

UNIT-IV Files systems: User & systems view of file system, disk organization, disk allocation method, Contiguous, linked, indexed methods. File protection, system calls, disk scheduling.

UNIT-V Input/Output: Asynchronous operation, speed gap, programmed I/O, Interrupt driven I/O, Deadlock prevention, avoidance, recovery. Case study: MS-DOS, UNIX & WINDOWS NT. Introduction to system administration

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weight age is 70% of total marks.

TEXT BOOKS:

1. Abraham Silberschatz, Greg Gene and Peter Baer Galvin, "Operating system & concepts" Wiley India, 2006.
2. Godbole, "Operating Systems and core studies of UNIX and WINDOWS NT",
3. Yedidyah Langsam, Moshe J. Augenstein, Aaron M. Tenenbaum, "Data structure using C/C++", Second Edition, Pearson, 2015.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO2	**3**	**3**	**1**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO5	**3**	**2**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
Avg.	**3**	**2.4**	**1.6**	**2**	**2**							**1**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI47322: (PROGRAM ELECTRIVE-IV)
VLSI TECHNOLOGY

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: - Basic Knowledge of Electronic Devices, Semiconductor materials.

COURSE OBJECTIVES:

1. To provide the students the in-depth knowledge of steps involved in chip fabrication processes.
2. To encourage the students to learn about wafer preparation, oxidation and ion implantation and photolithography.

COURSE OUTCOMES:

1. **CO1:** To describe crystal growth and wafer preparation methods.
2. **CO2:** To list different layering & oxidation methods in terms of chip fabrication.
3. **CO3:** To illustrate various patterning and doping methods.
4. **CO4:** To design Floor-planning using EDA tools along with layout design rules check and stick diagrams.
5. **CO5:** To discuss various subsystem design and memories.

COURSE CONTENTS:
THEORY:

UNIT-I Crystal Growth and Wafer preparation: Wafer terminology, Different crystalline orientations, CZ method, CMOS IC Design flow, Crystal Defects. Fabrication processes of FETs, MOSFETs, and BIMOS etc

UNIT-II Layering: Epitaxial growth methods, Liquid phase epitaxy, Vapor phase epitaxy, Molecular beam epitaxy, Oxidation, Types of oxidations, Horizontal and vertical tube furnace for oxidation, Kinetics of oxidation, Thin film fabrication, Metallization; Physical Vapor Deposition, Sputtering.

UNIT-III Patterning: Lithography; Optical Lithography, Electron Lithography, X-ray Lithography, Ion Lithography. Photo masking steps, Resists. Doping: Diffusion; Diffusion Models, Ion Implantation; Implantation Equipment, Channelling.

UNIT-IV VLSI process techniques and Integration: Floor planning, layout, Design rules, stick diagrams, Test generation, Logic simulation, Introduction to EDA tools. Contamination Control; Clean rooms, HEPA, ULPA Filters and Class numbers.

UNIT-V Memory; NVRWM, Flash memories,6-Transistor RAMs Dynamic RAM, Read Write Cycle, Brief review of subsystem design using memory and processors and their fabrication aspects, Latch up in CMOS Circuits.

ASSESMENT:
Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weight age of 30% of total marks. End semester theory exam. Weight age is 70%of total marks.

TEXT BOOKS:

1. Sorab K. Gandhi, "VLSI Fabrication principles: Silicon and Gallium Arsenide", Second Edition, Wiley, 2008.
2. S. M. Sze, "VLSI Technology", Second edition, McGraw Hill, 2017.
3. Peter Van Zant, "Microchip Fabrication, A Practical Guide to Semiconductor Processing", Sixth Edition, McGraw Hill, 2013.

REFERENCE BOOKS:

1. James D. Plummer, Micheal D. Deal and Peter B. Grifin, "Silicon VLSI Technology: Fundamentals, Practice, Modeling", Prentice Hall, 2000.
2. C. Y. Chang and Simon Sze, "VLSI Technology", Mc-Graw Hill, 2000.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**3**	**2**	**2**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO3	**3**	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1**
CO4	**3**	**2**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
CO5	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**2**
Avg.	**3**	**2.2**	**2.4**	**1.4**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**1.5**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI-47301: (PROGRAM ELECTIVE-IV)
INTELLIGENT INSTRUMENTATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Basics of Sensors and transducers.

COURSE OBJECTIVES:

1. To make students acquire the knowledge of robotics and its mechanism.
2. To acquaint students with software and technical equipment of intelligent instrumentation, its internal structures and properties.
3. To familiarize the students with artificial intelligence required in Instrumentation.

COURSE OUTCOMES: After completion of course, the student will be able to:

1. **CO1:** Realization of concepts of robotics, robot mechanism and its functional analysis.
2. **CO2:** Design the smart systems and analyse in terms of interfacing and intelligent instrumentation.
3. **CO3:** Establish the real time systems and its scheduling.
4. **CO4:** Evaluate the expert system for real time control applications.
5. **CO5:** Analyse artificial intelligence and its requirement in instrumentation

COURSE CONTENTS:
THEORY:

UNIT-I Introduction to Robotics: Robot classification, Robot mechanism, Mechanical & Electrical elements. Kinematics: Forward & Inverse Kinematics. Dynamics: Kinetic energy, potential energy, motion equation. Robot Sensors: Range, Proximity, Force, Torque, Ultrasonic, Optical sensors. Vision system: High level, Low level, medium level vision, Edge detection method, Region growing method. Various Actuators: Hydraulic, Pneumatic, Electrical actuators. Principles of programmable robots, multiple robot control & Adaptive robots. Field applications of robot manipulator, Robot simulation & computer control.

UNIT-II Smart Systems: Various techniques of Interfacing with Smart instrumentation systems, Stepper motor Interfacing, Smart cards, Smart buildings, Smart cars etc.

UNIT-III Real time system: Hard & Soft RT'S, static & dynamic scheduling of RT'S e.g. of RT'S like railway reservation system, rocket launching system, pacemaker etc., Programmable Controller & their use in Instrumentation.

UNIT-IV Expert system for real time control application. Knowledge base system: facts, rules, frames, inheritance. Fuzzy Logic: crisp logic, fuzzification, defuzzification, mamdani's method.

UNIT-V Artificial Intelligence & its requirement in Instrumentation: state space problem water jug problem, chess problem, production system, Problem characteristics, searching a tree: Uninformed search, informed search, Prolog programming: Marcus problem, family tree problem.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. King-Sun Fu, C. S. Gorge Lee and Ralph Gonzalez, "Robotics: Control, Sensing, Vision and Intelligence", Mc-Graw Hill, 1987.
2. John J. Craig, "Introduction to Robotics: Mechanics and Control", Third Edition, Pearson, 2004.
3. Kevin M. Lynch and Frank C. Park, "Modern Robotics: Mechanics, Planning and Control" Second Edition, Cambridge University Press.

REFERENCE BOOKS:

1. Patterson, "Artificial Intelligence & Expert system", Second Edition, Pearson Education

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO2	**2**	**2**	**3**	**1**	**2**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO3	**2**	**2**	**3**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO4	**3**	**3**	**3**	**1**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
CO5	**3**	**3**	**2**	**2**	**1**	**-**	**-**	**-**	**-**	**-**	**-**	**-**
Avg.	**2.6**	**2.6**	**2.8**	**1.4**	**1.4**	**-**	**-**	**-**	**-**	**-**	**-**	**-**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI47499 (AB-Group): MAJOR PROJECT PHASE-I

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	6	-	-	3	-	-	-	40	60	100

PRE-REQUISITE: Knowledge of working on different measuring devices & components, some software simulations.

COURSE OBJECTIVES:

1. To provide the students with opportunity to apply the skills and knowledge acquired in their courses to a specific problem.
2. To allow the students to extend their academic experience into areas of interest and working with new idea.
3. To take on the challenges of teamwork, prepare a presentation in a professional manner and document all aspects of work.

COURSE OUTCOMES: After completing the Project Phase-I, students will be able to:

1. **CO1:** Demonstrate a sound technical knowledge of their selected project topic.
2. **CO2:** Perform the literature survey of selected topic to explore the new idea.
3. **CO3:** Identify the problem and formulate problem statement and provide solution with expected outcomes.
4. **CO4:** Work in team to develop the system using hardware and software during time bound frame and provide testing methodology.
5. **CO5:** List the findings, prepare technical report and give presentation.

ASSESMENT: Internal assessment- will be done on the following Rubrics.

1. Maximum Marks: 40

Sr. No.	Rubrics	Marks	CO
1.	Problem formulation / Statement of Problem	05	CO1
2.	Literature Review / State of Art.	10	CO2
3.	Proposed Methodology with Expected outcomes	10	CO3
4.	Findings, Test methodology and results	10	CO4
5.	Report writing and Presentation	05	CO5

ASSESMENT: External assessment- will be done on the following Rubrics.

1. Maximum Marks: 60

Sr. No.	**Rubrics**	**Marks**	**CO**
1.	Problem Selection & Specifications.	10	CO1
2.	Literature Review & new feature added.	15	CO2
3.	Project Outcomes	10	CO3
4.	Testing, Results and Conclusions.	15	CO4
5.	Report writing and Viva	10	CO5

CO-PO Articulation Matrix

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**-**	**-**
Avg.	**3**	**3**	**3**	**3**	**3**	**3**	**2.4**	**1.8**	**2**	**3**	**3**	**3**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-A (4-YDC)
EI-47999: MAJOR PROJECT PHASE-II

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	10	-		5	-	CW	END SEM	SW	END SEM	100
								40	60	

PRE-REQUISITE: In-depth knowledge of electronic components, devices (Hardware) and Software tools.

COURSE OUTCOMES: After completion of Major Project Phase-II, students will able be to:

1. Work in group as team to identify and formulate problem statement.
2. Provide the solution methodology to implement the problem statement.
3. Proposed the test methodology and obtain the desired results.
4. Perform the analysis and provide comparison with existing work and future scope.
5. Demonstrate the writing skills for technical report and presentation.

ASSESMENT: Internal assessment- will be done on the following Rubrics.

1. Maximum Marks: 40

Sr. No.	Rubrics	Marks	CO
1.	Problem formulation / Statement of Problem	05	CO1
2.	Literature Review / State of Art.	10	CO2
3.	Proposed Methodology with Expected outcomes	10	CO3
4.	Findings, Test methodology and results	10	CO4
5.	Report writing and Presentation	05	CO5

ASSESMENT: External assessment- will be done on the following Rubrics.

1. Maximum Marks: 60

Sr. No.	**Rubrics**	**Marks**	**CO**
1	Problem Selection & Specifications.	10	CO1
2	Literature Review & new feature added.	15	CO2
3	Project Outcomes	10	CO3
4	Testing, Results and Conclusions.	15	CO4
5	Report writing and Viva	10	CO5

CO-PO Articulation Matrix

CO-PO	**PO1**	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**
CO1	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**-**	**-**
Avg.	**3**	**3**	**3**	**3**	**3**	**3**	**2.4**	**1.8**	**2**	**3**	**3**	**3**

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-B (4-YDC)
BM-47613/BM47613 (Program Elective-V): MEDICAL INSTRUMENTATION

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70			

PRE-REQUISITE: Knowledge of Basic aspects of Op-Amp and measuring devices.

COURSE OBJECTIVES:

1. To introduce students to basic engineering technology.
2. To introduce students to different biological signals, their acquisition, measurement and related constraints.
3. To provide the students the knowledge of instrumentation involved in Bio-medical engineering.

COURSE OUTCOMES: After completing the course, the students will be able to:

1. **CO1:** Identify the concepts of Bio signal generation and transduction.
2. **CO2:** Discuss the basic concepts of Recording & analysis of physiological signals.
3. **CO3:** Identify compare and differentiate between various therapeutic instruments.
4. **CO4:** Distinguish between medical imagining modalities.
5. **CO5:** Report different analytical techniques.

COURSE CONTENTS:
THEORY:

UNIT-I Review: general human physiology, generation and transmission of action potential, Depolarization and repolarisation, Evoked potentials. Physiology of heart, heart as pump, various typed of electrodes and their construction, performance and application, bioelectrical signals and their recording & Physiological transducers.

UNIT-II. Measurement and recording of physiology signals: Signal condition and processing circuits for medical recording system. Bedside monitor, ECG machine and cardio scope Blood flow meters, Blood pressure and cardiac output measurement, Measurement of heart sounds, Plethysmography, Patient care and monitoring, central monitoring systems. Electrical safety of medical equipments.

UNIT-III Therapeutic equipments: pacemakers –Theory and design aspects Defibrillators, Laser applications in biomedical field. Artificial kidney and dialyzers, X-ray machines and competent tomography, Magnetic resonance and Ultrasonic imaging systems, Ultrasound in medicines, Introduction to Thermography.

UNIT-IV. Advanced Microprocessor and PC based biomedical instruments. Biomedical Telemetry. Introduction about Body area network,

UNIT-V Analytical Techniques: Electromagnetic radiation and its interaction with matter. Various components of optical spectroscopic instruments. Laws of spectroscopy. Absorption spectroscopy for UV, Visible and IR region. Various sources and detectors and instrument designs. FTIR and its distinct applications. NMR spectroscopy and X- ray analysis, Ion sensitive electrodes and their measurement Chemistry analyzers. Introduction to Chromatography: Gas & Liquid.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Cromwell L., Weilbell F. J. and Pfeiffer E. A., "Biomedical instrumentation and measurement", Second Edition, Pearson Education, 2015.
2. Khandpur R.S., "Handbook of Biomedical Instrumentation", Third Edition, Tata Mc-Graw Hill, 2014.
3. Joseph J. Carr and John M. Brown, "Introduction to medical equipment technology", Fourth Edition, Pearson education, 2000.

REFERENCE BOOKS:

1. Willard Merritt and Dean Settle, "Instrumental methods of analysis", Seventh Edition, CBS Publisher, 2004.
2. John G. Webster and Amit J. Nimunkar, "Medical Instrumentation: Application and Design, An Indian Adaptation", Fifth Edition, Wiley, 2021.
3. K. N. Scott and A. K. Mathur, "Textbook of Biomedical Instrumentation", First Edition, CBS Publisher, 2013.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	2	2	1	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	1	1	-	-	-	-	-	-	-
CO4	3	2	3	1	1	-	-	-	-	-	-	-
CO5	3	2	3	2	1	-	-	-	-	-	-	-
Avg.	3	2.4	2.4	1.6	1	-	-	-	-	-	-	-

Shri G. S. Institute of Technology and Science
Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-B (4-YDC)
EI-47611 (Program Elective-V): DIGITAL IMAGE PROCESSING

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Knowledge of Signals and Systems, Digital signal Processing

COURSE OBJECTIVES:

1. To introduce the concept of image processing and basic analytical methods to be used in image processing.
2. To familiarize the students with image enhancement and restoration techniques.
3. To introduce the different image compression techniques.

COURSE OUTCOMES: After completing the course, the student will be able to:

1. **CO1:** Define the visual perceptions, image sensing and image sampling.
2. **CO2:** To apply image, transform for 2D image and analyse using DFT, Haar, Hadamard.
3. **CO3:** To classify image enhancement techniques and image sharpening filters in image processing.
4. **CO4:** To explain different types of image reconstruction process.
5. **CO5:** To identify and apply image compression algorithms.

COURSE CONTENTS:
THEORY:

UNIT-I

Digital Image Processing (DIP) Introduction, examples of fields that use DIP, fundamental steps in DIP, components of an image processing system. Digital Image Fundamentals: elements of visual perception, image sensing and acquisition, image sampling and quantization, basic relationships between pixels.

UNIT-II

Image Transforms Two-dimensional (2D) impulse and its shifting properties, 2D continuous Fourier Transform pair, 2D sampling and sampling theorem, 2D Discrete Fourier Transform (DFT), properties of 2D DFT. Other transforms and their properties: Cosine transform, Sine transform, Walsh transform, Hadamard transform, Haar transform, Slant transform, KL transform.

UNIT-III

Image Enhancement Spatial domain methods: basic intensity transformation functions, fundamentals of spatial filtering, smoothing spatial filters (linear and non-linear), sharpening spatial filters (unsharp masking and high boost filters), combined spatial enhancement method. Frequency domain methods: basics of filtering in frequency domain, image smoothing filters

(Butterworth and Gaussian low pass filters), image sharpening filters (Butterworth and Gaussian high pass filters), selective filtering.

UNIT-IV

Image Restoration Image degradation/restoration, noise models, restoration by spatial filtering, noise reduction by frequency domain filtering, linear position invariant degradations, estimation of degradation function, inverse filtering, Wiener filtering, image reconstruction from projection.

UNIT-V

Image Compression Fundamentals of data compression: basic compression methods, Huffman coding, Golomb coding, LZW coding, Run-Length coding, Symbol based coding. Digital image watermarking, representation and description- minimum perimeter polygons algorithm (MPP).

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Gonzalez and Woods, "Digital Image Processing", Pearson Education.
2. Anil Jain, "Fundamentals of Digital Image Processing", PHI Learning.
3. Annadurai, "Fundamentals of Digital Image Processing", Pearson Education.

REFERENCE BOOKS:

1. Chanda and Majumder, "Digital Image Processing and Analysis", PHI Learning.
2. Jayaraman, Esakkirajan and Veera kumar, "Digital Image Processing", TMH.
3. William K. Pratt, "Digital Image Processing", Wiley Ind.

CO-PO Articulation Matrix

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

Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-B (4-YDC)
EI-47612 (Program Elective-V): COMPUTER NETWORKS

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Basics knowledge of computer programming, Data Structure.

COURSE OBJECTIVES:

1. To make the students understand the fundamental concepts of computer networking.
2. Familiarize the students with basic terminology and taxonomy of computer networking.

COURSE OUTCOMES: After completion of course, the students will be able to:

1. **CO1:** Analyse the concepts of networks, types and architectures.
2. **CO2:** Identify error free transmission of data and analyse data collision with various protocols.
3. **CO3:** Apply various routing algorithms over a network to provide an optimal path.
4. **CO4:** Illustrate the real time applications of networks.
5. **CO5:** Examine the addressing entities of a network with implementation of TCP, UDP protocols.

COURSE CONTENTS:
THEORY:

UNIT-I
Introduction to computer network: Network uses, Hardware and software. Types of network .Structure and architecture. Seven layers OSI reference model & TCP-IP reference model. Services and interfaces. Circuit switching, packet switching and hybrid switching.

UNIT-II
Data transmission and its types, Wireless transmission, Characteristic, Capacity Speed & Delay of transmission, Bandwidth, Data rate, Throughput serial and parallel communication, Synchronous and Asynchronous communication. Simplex and Duplex communication.

UNIT-III
Physical layer: Transmission media, Terminals modems. Digital transmission, switching methods. Multiplexing, Medium access sub layers, Local area networks protocols. IEEE standards 802.3, 802.4 & 802.5.

UNIT-IV
Data link layer & network layer, Design issues, Elementary data link protocol, Sliding window protocol. Routing algorithms. Traffic monitoring, Bridge and gateways. ATM.

UNIT-V
Design and Performance issues and protocols of Transport layer, Session layer, Presentation layer & Application layer. DNS, SNMP (Simple network management protocol), Network security.

ASSESMENT:

Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. A. S. Tanenbaum, "Computer networks", Fourth Edition, Pearson Education.
2. James Martin, "Computer Network and Distributed processing: Software, Techniques, Architecture", Prentice Hall, 1981
3. Michael A. Gallo and Willam M. Hancock, "Computer Communication and Networking Technologies," Brooks/Cole Publisher, 2001.

REFERENCE BOOKS:

1. Behrouz A. Forouzen, "Data communication and Networking", Fifth Edition, Mc-Graw Hill, 2012.
2. Douglas E. Comer, "Computer Networks and Internets", Sixth Edition, Pearson Education, 2018.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	2	1	-	-	-	-	-	-	-
CO2	3	2	2	2	1	-	-	-	-	-	-	-
CO3	3	3	2	2	1	-	-	-	-	-	-	-
CO4	3	2	2	1	1	-	-	-	-	-	-	-
CO5	3	2	1	1	1	-	-	-	-	-	-	-
Avg.	3	2.4	2	1.6	1	-	-	-	-	-	-	-

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Sensor & Transducers

COURSE OBJECTIVES:

1. The course is designed to give solid grounding of fundamental concepts of industrial automation systems and their control.
2. The course specifically focusses on architecture, components and techniques for automation in industries.
3. The level of the course is chosen such that the students aspiring to be part of industrial advancements directly or indirectly in future should acquire these concepts.

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

1. **CO1:** Define automation, classify its types and application in instrumentation.
2. **CO2:** To identify components of data loggers, explain its operation and characteristics, needs for industry.
3. **CO3:** Illustrate the concepts of Microcomputer based numerical control system.
4. **CO4:** To analyse evolution of electronic system and instrumentation in terms of automation.
5. **CO5:** Illustrate the concepts of Virtual instrumentation with a few case studies.

COURSE CONTENTS:
THEORY:

UNIT-I: Automation: Definition of automation, types of automation, merits & demerits, application in instrumentation. Automatic test system configuration: GPIB bus talker/ listener/ controller, IEEE compatible programmable instruments, specification & operation. PC based instrument controller, computer-controlled instruments system Programmable oscilloscope. Programmable function generator.

UNIT-II. Automatic performance evolution of electronic system & instrumentation: Data logger, programmable data logger configurations, SCADA & PLC systems. Operation of data logger, applications of data logging systems. Condition monitoring, failure of plants/ components.
Logical fault finding, maintenance logging, vibration monitoring, noise level, thermal sensing, infrared, ultrasonic condition monitoring, Quality control & automated inspection: Sensor technology for automated inspection, machine vision.

UNIT-III. Microcomputer based numerical control system: Types of numerical control machines Part programming. Computer numerical control machine tools.

UNIT-IV. Automatic testing of electronic components: Operational amplifier. Digital integrated circuits. Sample & hold circuit/ switches/multiplexers. Instrumentation amplifier Switches in automated test systems. Virtual instruments: Basic components of virtual components, using virtual instruments.

UNIT-V Case studies: Hardware & software design of Bottle filling plant. Automated guided vehicle system. Automated milk & food processing system.

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. John Stenerson, "Industrial Automation and Process Control", Illustrated Edition, Prentice Hall, 2003.
2. Frank Lamb, "Industrial Automation: Hands-on", Mc-Graw Hill Professional, 2003.
3. Kocher A. K. and Burns N. D., "Microprocessors and their manufacturing applications", PHI.

REFERENCE BOOKS:

1. Mikell P. Groover, "Automation, Production system and Computer integrated manufacturing", Pearson Education.
2. Himanshu Kumar, "Advanced Industrial Automation", Notion Press, 2020.
3. S. Mukhopadhyay, "Industrial Instrumention, Control and Automation", Jaico Publishing House, 2012.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	2	1	3	-	-	-	-	-	-	-	-
CO2	3	3	2	1	-	-	-	-	-	-	-	-
CO3	3	3	1	1	-	-	-	-	-	-	-	-
CO4	3	3	1	3	-	-	-	-	-	-	-	-
CO5	3	3	3	2	-	-	-	-	-	-	-	-
Avg.	3	2.8	1.6	2	-	-	-	-	-	-	-	-

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
3	-	-	3	-	-	CW	END SEM	SW	END SEM	100
						30	70	-	-	

PRE-REQUISITE: Basics of Analog & Digital communication & signal Processing

COURSE OBJECTIVES:

1. To understand the concept of acquiring data from transducers/input devices.
2. To help the students to understand the fundamentals of real time embedded data acquisition system.
3. To provide the concept of interfacing and instrumentation system design in DAS.

COURSE OUTCOMES:

1. **CO1:** Identify the building blocks of Data Acquisition System.
2. **CO2:** Design the signal conditioning circuits for Data Acquisition Systems.
3. **CO3:** Analyse the DAQ system for Power Management & Timing.
4. **CO4:** Analyse DAQ system using DFT, FFT and DTFT algorithms.
5. **CO5:** Design the Data Acquisition Systems for static and dynamic accuracy.

COURSE CONTENTS:
THEORY:

UNIT-I Fundamentals of Data Acquisition Systems, Introduction, Sensors and Transducers, Temperature Sensors, Magnetic Field Sensors, Potentiometers, Light Detection, DAQ Hardware, DAQ Software, Communications Cabling, Noise

UNIT-II Data Acquisition Systems: Hardware, Introduction, Plug-in DAQ Systems, Signal Conditioning, Example of Design of a Signal Conditioning Circuit.

UNIT-III Power Management, Automotive Power-Management MAX16920, Power-Management ICs for Single-Cell, MAX8662/MAX8663, Timing System, Limitation of RS232, and MAX220-MAX249 for Serial Applications.

UNIT-IV Signal Processing, Discrete Fourier Transform (DFT) and Fast Fourier Transform (FFT), Frequency Spacing and Symmetry of the DFT/FFT, Power Spectrum, About Spectral Leakage and Smoothing Windows.

UNIT-V Design of Data Acquisition Systems, Introduction to the Design, Functional Design of High-Speed Computer Based DAS, Requirements, Analysis of Accuracy (Static), Analysis of Accuracy (Dynamic).

ASSESMENT: Continuous evaluation of students through: Class attendance, Assignments, organizing Seminars/Quizzes and two mid Semester Tests Exam with weightage of 30% of total marks. End semester theory exam. Weightage is 70% of total marks.

TEXT BOOKS:

1. Maurizio Di Paolo Emilio, "Data Acquisition "Systems from Fundamentals to Applied Design", Springer, New York.
2. Taylor, H.R, "Data Acquisition for Sensor Systems", Springer US.
3. John Park, 'Practical Data Acquisition for Instrumentation and Control Systems", ASD, IDC Technologies, Perth, Australia.

REFERENCE BOOKS:

1. Data Acquisition and Signal Conditioning Course Manual, National Instruments Corporate Headquarters, Texas, USA
2. Arnold H. Van Doren, "Data Acquisition Systems", Bradly Co US, 1982.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3	3	1	--	--	--	--	--	--	--	--
CO2	3	2	2	1	-	-	-	-	-	-	-	-
CO3	3	2	2	1	-	-	-	-	-	-	-	-
CO4	3	3	1	2	--	--	--	--	--	--	--	--
CO5	3	3	1	2	-	-	-	-	-	-	-	-
Avg.	3	2.6	1.8	1.4	--	--	--	--	--	--	--	--

B. Tech. IV Year SEM-B (4-YDC)
EI-47881: INDUSTRIAL TRAINING/INTERNSHIP/SEMINAR

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
						CW	END SEM	SW	END SEM	
-	-	-		8	-					100
								100	-	

PRE-REQUISITE:

COURSE OBJECTIVES:

1. To provide the opportunity to students to learn more about the career while gaining meaningful on-the-job experience.
2. Help the students getting acquainted with current trends in industry.
3. To explore career opportunities prior to graduation and to integrate theory and practice.

COURSE OUTCOMES:

CO1: Explore career alternatives prior to graduation.
CO2: Develop work habits and attitudes necessary for job success.
CO3: Identify, write down, and carry out performance objectives.
CO4: Develop communication, interpersonal and other critical skills in the job interview process.
CO5: Develop Argumentative Skills and Critical Thinking.

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	3	1									
CO2	1	1	1		3	2		3		1	2	1
CO3		2	3	3	1	2	3	2	1	2	3	2
CO4	2	1	1	3	2	3			3	2	3	2
CO5	3	2	2	1	2	2	1	2	2	3	3	3
Avg.	1.75	1.8	1.6	2.33	2	2.25	2	2.33	2	2	2.75	2

B. Tech. IV Year SEM-B (4-YDC)
EI-47999: MAJOR PROJECT PHASE-II

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	10	-		5	-	CW	END SEM	SW	END SEM	100
								40	60	

PRE-REQUISITE: In-depth knowledge of electronic components, devices (Hardware) and Software tools.

COURSE OUTCOMES: After completion of Major Project Phase-II, students will able be to:

1. Work in group as team to identify and formulate problem statement.
2. Provide the solution methodology to implement the problem statement.
3. Proposed the test methodology and obtain the desired results.
4. Perform the analysis and provide comparison with existing work and future scope.
5. Demonstrate the writing skills for technical report and presentation.

ASSESMENT: Internal assessment- will be done on the following Rubrics.

1. Maximum Marks: 40

Sr. No.	Rubrics	Marks	CO
1.	Problem formulation / Statement of Problem	05	CO1
2.	Literature Review / State of Art.	10	CO2
3.	Proposed Methodology with Expected outcomes	10	CO3
4.	Findings, Test methodology and results	10	CO4
5.	Report writing and Presentation	05	CO5

ASSESMENT: External assessment- will be done on the following Rubrics.

1. Maximum Marks: 60

Sr. No.	Rubrics	Marks	CO
1	Problem Selection & Specifications.	10	CO1
2	Literature Review & new feature added.	15	CO2
3	Project Outcomes	10	CO3
4	Testing, Results and Conclusions.	15	CO4
5	Report writing and Viva	10	CO5

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**-**	**-**
Avg.	**3**	**3**	**3**	**3**	**3**	**3**	**2.4**	**1.8**	**2**	**3**	**3**	**3**

Department of Electronics and Instrumentation Engineering
B. Tech. IV Year SEM-B (4-YDC)
EI47499 (BA-Group): MAJOR PROJECT PHASE-I

HOURS PER WEEK			CREDITS			MAX. MARKS				
T	P	TU	T	P	TU	THEORY		PRACTICAL		TOTAL MARKS
-	6	-	-	3	-	CW	END SEM	SW	END SEM	100
						-	-	40	60	

PRE-REQUISITE: Knowledge of working on different measuring devices & components, some software simulations.

COURSE OBJECTIVES:

1. To provide the students with opportunity to apply the skills and knowledge acquired in their courses to a specific problem.
2. To allow the students to extend their academic experience into areas of interest and working with new idea.
3. To take on the challenges of teamwork, prepare a presentation in a professional manner and document all aspects of work.

COURSE OUTCOMES: After completing the Project Phase-I, students will be able to:

1. **CO1:** Demonstrate a sound technical knowledge of their selected project topic.
2. **CO2:** Perform the literature survey of selected topic to explore the new idea.
3. **CO3:** Identify the problem and formulate problem statement and provide solution with expected outcomes.
4. **CO4:** Work in team to develop the system using hardware and software during time bound frame and provide testing methodology.
5. **CO5:** List the findings, prepare technical report and give presentation.

ASSESMENT: Internal assessment- will be done on the following Rubrics.

1. Maximum Marks: 40

Sr. No.	Rubrics	Marks	CO
1.	Problem formulation / Statement of Problem	05	CO1
2.	Literature Review / State of Art.	10	CO2
3.	Proposed Methodology with Expected outcomes	10	CO3
4.	Findings, Test methodology and results	10	CO4
5.	Report writing and Presentation	05	CO5

ASSESMENT: External assessment- will be done on the following Rubrics.

1. Maximum Marks: 60

Sr. No.	Rubrics	Marks	CO
1.	Problem Selection & Specifications.	10	CO1
2.	Literature Review & new feature added.	15	CO2
3.	Project Outcomes	10	CO3
4.	Testing, Results and Conclusions.	15	CO4
5.	Report writing and Viva	10	CO5

CO-PO Articulation Matrix

CO-PO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**-**	**-**	**-**	**-**
CO2	**3**	**3**	**3**	**3**	**-**	**-**	**3**	**1**	**3**	**3**	**3**	**3**
CO3	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**1**	**-**	**-**	**3**	**3**
CO4	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**-**	**-**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**	**2**	**3**	**1**	**3**	**-**	**-**
Avg.	**3**	**3**	**3**	**3**	**3**	**3**	**2.4**	**1.8**	**2**	**3**	**3**	**3**