CURRICULUM

FOR THE YEAR 2019-23

DEPARTMENT OF ELECTRONICS AND COMMUNICATION ENGINEERING

III and IV SEMESTER B.E.

POOJYA DODDAPPA APPA COLLEGE OF ENGINEERING
(Autonomous Engineering college Affiliated to VTU Belagavi)
KALABURAGI-585102

About the institution

The Hyderabad Karnataka Education (HKE) society founded by Late Shri Mahadevappa Rampure, a great visionary and educationist. The HKE Society runs 46 educational institutions. Poojya Doddappa Appa College of Engineering, Gulbarga is the first institution established by the society in1958.The college is celebrating its golden jubilee year, setting new standards in the field of education and achieving greater heights.

About the department

Department of Electronics & Communication Engineering was established in 1967 & is the pride of Karnataka. With an initial intake of 30 students the department has grown steadily and the present intake is 120 students for the UG programme. The graduates from this Department are playing a vital role in the IT revolution and are instrumental in placing Karnataka on the Global IT Landscape. These professionals have found placement in major industries and multinational corporations. Many of them are successful entrepreneurs.

The department also offers Post Graduate programs in 'Communication Systems' with an intake of 18. Active engagement of faculty in research has led to recognition of department as a Research center by the VTU.

The faculty strength of the department is 28, including 4 Professors, 4 Associate Professors, 20 Assistant Professors. The faculty always strives for imparting better knowledge to the students and works as a team in all departmental activities.

Students graduated from the department are well placed in India and abroad. Quite a few of them have pursued higher studies both in India and abroad. Some of them have qualified for Indian Engineering and Defense Services. Students of the department have bagged university ranks including the First rank on several occasions.
The department has state-of-the-art laboratories in the areas of Communication, DSP, Microwave, Microcontroller, Embedded system, VLSI design etc.

Vision of the Institute

To be an institute of excellence in technical education and research to serve the needs of industry and society at local and global levels.

Mission of the Institute

1. To provide a high-quality educational experience for students with values and ethics that enables them to become leaders in their chosen profession.
2. To explore, create and develop innovations in engineering and science through research and developmental activities.
3. To provide beneficial service to national and multinational industries and communities through educational, technical and professional activities.

Department of Electronics and Communication Engineering

Vision of the Department

To be a premier department in Electronics and Communication Engineering field by providing quality education through teaching, learning, research and innovations to serve the industry and society.

Mission of the Department

M1 Develop an environment for better teaching and learning in collaboration with industry, premier institutes and alumni.
M2 Produce competent engineers to meet the requirements of the industry and the society.
M3 Encourage students to pursue higher education, research work and to take up administrative responsibilities through leadership.

Program Educational Objectives

1. The graduates possess emergent technical skills to perform design and developmental activities in various areas of Electronics and Communication Engineering like Signal Processing, VLSI, Embedded Systems, Communication Systems and other engineering specializations.
2. The graduates indulge into entrepreneurial, higher learning/research activities to be in pace with the continuous developing environment.
3. The graduates exhibit effective communication skills, leadership and team work qualities in industry, research and development organizations maintaining ethical standards.

Program Outcomes:

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

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

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

4. Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

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

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

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

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

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

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

12. Life-long learning: Recognize the need for, and have the preparation and ability toengage in independent and life-long learning in the broadest context of technological change.

PSO-Program Specific Outcomes:

1. Apply the concepts of Electronics & Communication Engineering in various areas like Signal processing, VLSI, Embedded systems, Communication Systems, Digital & Analog Devices and other engineering specializations.

2. Solve complex Electronics and Communication Engineering problems with modern hardware and software tools, along with analytical skills to arrive at cost effective and appropriate solutions.

3. Possess social and environmental awareness along with ethical responsibility to adapt with the emerging technologies in Electronics and Communication Engineering for sustainable real-world applications to have a successful career.

Scheme of Teaching and Examination of III Semester B.E in Electronics and Communication Engineering

	Course	Hours / Week				Maximum Marks			
		Lecture	Tutorial	Practical	Duration	CIE	SEE	Total Marks	Credits
Code									
19MA31C	Mathematics-III	02	02	--	04	50	50	100	3
19EC32	Field Theory	04	--	--	04	50	50	100	4
19EC33	Electronic Devices and Circuits	04	--	--	04	50	50	100	4
19EC34	Network Analysis	04	--	--	04	50	50	100	4
19EC35	Digital Electronics	03	--	--	03	50	50	100	3
19HU36	Constitution of India and Professional Ethics	02	--	--	02	50	50	100	--
19ECL31	Electronics Devices and Circuits Lab	--	--	02	02	50	50	100	1
19ECL32	Network Analysis Lab	--	--	02	02	50	50	100	1
19ECL33	Digital Electronics Lab	--	--	02	02	50	50	100	1
		21	02	06	29	500	500	1000	21

Scheme of Teaching and Examination of IV Semester B.E in Electronics and Communication Engineering

	Course	Hours / Week				Maximum Marks			
		Lecture	Tutorial	Practical	Duration	CIE	SEE	Total Marks	Credits
Code									
19EC41	Transmission line and waveguide	03	--	--	03	50	50	100	3
19EC42	Signals and Systems	04	--	--	04	50	50	100	4
19EC43	Analog Electronics	04	--	--	04	50	50	100	4
19EC44	Microprocessors	04	--	--	04	50	50	100	4
19EC45	Analog Communication	04	--	--	04	50	50	100	4
19CV46	Environment Studies	02	--	--	02	50	50	100	--
19EC47	Kannada	02	--	--	02	50	50	100	1
19ECL41	Analog Electronics Lab	--	--	02	02	50	50	100	1
19ECL42	Analog Communication Lab	--	--	02	02	50	50	100	1
19ECL43	Microprocessors Lab	--	--	02	02	50	50	100	1
		21	--	06	27	450	450	900	23

FIELD THEORY		
Subject Code	19EC32	CIE: 50
Number of Lecture Hours/Week	4 (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Modules-1		**Teaching Hours**
Preliminaries: Vector analysis and coordinate transformation: vector algebra, coordinate systems, vector components, unit vector, dot & cross products. Cylindrical and spherical, coordinate system, coordinate transformations. **Coulomb's law electric field intensity**: Experimental coulombs law, electric field intensity, electric field due to continuous volume charge, line charge, sheet charge. Electric flux density, Gauss law and Divergence: electric flux density, Gauss law and its applications, divergence theorem.		**11 Hours**
Modules-2		
Energy and potential: Energy and potential in a moving point charge in an electric field, line integral, potential difference and potential, potential field of a point charge, The potential field of a system of charges-conservative property, potential gradient, the dipole, energy density in electric field. **Conductors, dielectric and capacitance**: Current and current density, continuity of current, Metallic conductors, conductor properties and boundary conditions, Capacitance, several capacitance examples. Capacitance of a two-wire line		**10 Hours**
Modules-3		
Poisson's and Laplace's equation: Poisson's and Laplace's equations, Uniqueness theorem, solution of Laplace's equation, examples of solutions of Poisson's equations **Magnetic Fields:** Steady Magnetic fields: Biot savart's law, Ampere's circuital law, Curl. Stokes theorem, magnetic flux and flux density, Magnetic forces, material and inductances: Scalar and vector magnetic potentials, magnetic force between differential current elements , force and torque on a closed circuit, magnetic boundary conditions , magnetic circuit, inductance.		**10 Hours**
Modules-4		
Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equations in point form and integral form, the retarded potentials. **Uniform plane wave**: Wave propagation in free space, wave propagation in dielectrics,		**11 Hours**

the Poynting vector & power considerations, propagation in good conductors-skin effect, wave polarisation.	
Modules-5	
Plane waves at boundaries & in dispersive media: Reflection of uniform plane waves at normal incidence, standing wave ratio, wave reflection from multiple interfaces, plane wave propagation in general directions, plane wave reflection at oblique incidence angles, plane wave propagation in dispersive media.	**10 Hours**

Course objectives

1. To appreciate the theory of vector analysis
2. To understand the concepts of electrostatics, electrical potential, energy density and their applications
3. To analyze the concepts of magneto statics, magnetic flux density, scalar and vector potential and its applications
4. To explore Biot-Savart's Law, Ampere's Law, Faraday's Laws, and Maxwell's equations

Question paper pattern:

• The question paper will have ten questions.
• Each full question consists of 20marks.
• There will be 2 full questions (with a maximum of four sub questions) from each module.
• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. William H Hayt Jr and John A Buck., Engineering electromagnetic, TMH 7th ed.
2. E C Jordon & K G . Balmain., electromagnetic waves and radiation system., PHI 2nd ed.

Reference Books:

1. Kraus J D and Carver K R., electromagnetic., (TMH)
2. J A Edminister., electromagnetic, TMH 2nd ed.
3. P V Gupta., An Introduction Course in electromagnetic.
4. P. N . O Sadiku, "Elements of electromagnetic" 4th ed. Oxford University press.

E books and online course materials:

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC32	**CO1**	Compute electric field intensity & potential using Coulomb's law & Gauss's law.
	CO2	Analysis of EM field using boundary conditions.
	CO3	Analysis of steady magnetic fields.
	CO4	Analysis of time varying fields using Maxwell's equations and wave propagation in different media.
	CO5	Analysis of wave reflection in different media.

19EC32: Field Theory

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Compute electric field intensity & potential using Coulomb's law & Gauss's law.	3	3	2					1		1		1	3	2	2
CO2	Analyze EM field using boundary conditions	3	3	2					1		1		1	3	2	2
CO3	Analyze steady magnetic fields.	3	3	2					1		1		1	3	2	2
CO4	Analyze time varying fields using Maxwell’s equations and wave propagation in different media.	3	3	2					1		1		1	3	2	2
CO5	Analyze wave reflection in different media.	3	3	2					1		1		1	3	2	2
Average		3	3	2					1		1		1	3	2	2

ELECTRONIC DEVICES AND CIRCUITS		
Subject Code	19EC33	CIE: 50
Number of Lecture Hours/Week	4 (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Module-1		**Teaching Hours**
Diode characteristics: Introduction, load line analysis, diode approximations, series diode configuration with DC inputs, parallel and series, parallel configurations, **Diodes applications**: AND / OR gates, half wave rectification, full wave rectification, clippers, clampers, zener diodes as regulators and voltage multiplier circuits.		**11 Hours**
Module-2		
Bipolar Junction transistor: Introduction, transistor construction, input output characteristics, operating point, transistor amplifying actions, common emitter configurations and common collector configurations, **Transistor biasing:** operating point, fixed bias circuit, emitter stabilized bias circuits and voltage divider bias. **Small signal analysis:** BJT transistor modeling and hybrid equivalent model of small signal amplifier configuration and deriving voltage gain, input impedance and output impedance.		**11 Hours**
Module-3		
Field Effect Transistors: Construction and characteristics of JFET's, transfer characteristics, depletion type of MOSFET, enhancement type MOSFET, **FET biasing:** fixed bias configurations, self bias configurations, voltage divider biasing. **Small signal analysis:** small signal model of JFET, FET amplifier design.		**10 Hours**
Module-4		
Feedback and Oscillator circuits: Feedback concepts, feedback connection types, practical feedback circuits, feedback amplifier, phase and frequency considerations, **Oscillators:** operation, phase shift oscillator, wien bridge oscillator, tuned oscillator circuits, crystal oscillator.		**10 Hours**
Module-5		
Multilayer devices: SCR, SCR characteristics and ratings, basic controlled rectifier, DIAC, TRIAC, UJT, programmable UJT, basic operation of chopper, operation of single phase inverters.		**10 Hours**
Course objectives: After studying this course, students will be able to: 1. Design of diode circuits 2. Biasing of BJTs and FETs 3. Construction of amplifiers using BJT and FET 4. Construction of oscillators. 5. Construction of SCR, DIAC and TRIAC		

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 20marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. Robert L Boylestad, "Electronic Devices and Circuit Theory", PHI, 6th edition 1999.
2. MilimanHalkias, "Electronic Devices and circuits", TMH.

Reference Books:

1. Adel .S. Sedra, Kenneth C. Smith, "Micro Electronic Circuits", 6th Edition, Oxford University Press, 2010.
2. David A.Bell, "Electronic Devices and Circuits", Oxford Higher Education Press, 5thediton, 2010

E books and online course materials: NPTEL

Course Outcome:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC33	**CO1**	Design and analyze diode circuits.
	CO2	Analyze transistor biasing circuits and amplifiers using small signal model.
	CO3	Analyze FET biasing circuits and amplifiers using small signal model.
	CO4	Analyze feedback amplifiers and design oscillators.
	CO5	Analyze power devices and their applications.

19EC33: Electronic devices and circuits

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design and analyze diode circuits.	3	3	1					1		1		1	3	2	2
CO2	Analyze transistor biasing circuits andampliifiers using small signal model.	3	3	2					1		1		1	3	2	2
CO3	Analyze FET biasing circuits andampliifiers using small signal model.	3	3	2					1		1		1	3	2	2
CO4	Analyze feedback amplifiers and design oscillators.	3	3	3					1		1		1	3	2	2
CO5	Analyze power devices and their applications	3	3	2				2	1		1		1	3	2	2
Average		3	3	2				2	1		1		1	3	2	2

NETWORK ANALYSIS		
Subject Code	19EC34	CIE: 50
Number of Lecture Hours/Week	4 Hours (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS –4		
Module-1		**Teaching Hours**
Circuit analysis: Practical voltage and current sources, controlled and uncontrolled sources, source transformation, KCL and KVL analysis, nodal and mesh analysis, super node and super mesh analysis. **Graph Theory:** Topological description, topological structures, tree, tree branch and link, incidence matrix, cut set and tie set matrices.		**11 Hours**
Module-2		
Transient Analysis: Capacitive and inductive transients and equivalent circuits, transients in RL, RC and RLC circuits, initial and final conditions, time constants. steady state analysis general discussion, concepts of phasor and vector, impedances and admittance, complete sinusoidal steady state circuit solutions.		**11 Hours**
Module-3		
Network theorems: Thevenins and Norton's, Superposition, Reciprocity, Compensation, Substitution, Maximum power transfer, Millman's and Tellegen's theorems, problems with dependent and independent sources.		**10 Hours**
Module-4		
Network functions: Concepts of complex frequency, network and transfer functions for one port and two ports, significance of poles and zeros, stability analysis of networks.		**10 Hours**
Module-5		
Two port parameters: Z, Y, ABCD, hybrid parameters, their inverse and image parameters, relationship between parameters, interconnection of two port networks.		**10 Hours**

Course objectives:

1. To introduce KCL, KVL and Graph theory.
2. To introduce transient analysis.
3. To apply and analyze various network theorems in solving the problems related electrical circuits.
4. To describe and analyze Two-Port networks.
5. To describe Z,Y,A,B,C,D and hybrid parameters.

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 20marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions,

selecting one full question from each module.

Text books:

1. M. E. Van Valkanberg, “Network Analysis”, PHI
2. Hayt. W. H. & J. E. Kemmerly, “Engineering Circuit Analysis”, TMH

Reference Books:

1. William D Stanley, “Network Analysis with Applications”, Pearson Education
2. Roy Choudhary D, “Network and systems”, New age Publications

E books and online course materials: NPTEL

Course outcomes:On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC34	**CO1**	Apply circuit laws to reduce circuit complexity and to arrive at feasible solutions.
	CO2	Analyze RL, RC, RLC circuits under transient and sinusoidal steady state conditions.
	CO3	Apply Network theorems toanalyze AC and DC circuits.
	CO4	Compute transfer functions of circuits for analyzing stability.
	CO5	Compute Two-Port network parameters and their relationship.

19EC34: Network Analysis

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply circuit laws to reduce circuit complexity and to arrive at feasible solutions.	3	3	2					1		1		1	3	3	2
CO2	Analyze RL, RC, RLC circuits under transient and sinusoidal steady state conditions.	3	3	2					1		1		1	3	3	2
CO3	Apply Network theorems to analyze AC and DC circuits.	3	3	2					1		1		1	3	3	2
CO4	Compute transfer functions of circuits for analyzing stability.	3	3	2					1		1		1	3	3	2
CO5	Compute Two-Port network parameters and their relationship.	3	3	2					1		1		1	3	3	2
Average		3	3	2					1		1		1	3	3	2

DIGITAL ELECTRONICS		
Subject Code	19EC35	CIE: 50
Number of Lecture Hours/Week	4 (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Module-1		**Teaching Hours**
Boolean Algebra and Minimization techniques: Boolean postulates and laws, minimization of Boolean expressions, minterm maxterm, canonical forms, Karnaugh map minimization, VEM technique, Quine-McCluskey method of minimization. **Logic Gates:** Basic gates, universal gates, exclusive–OR and exclusive–NOR, implementations of logic functions using gates, NAND–NOR implementations,multi level gate implementations, multi output gate implementations,		**11 Hours**
Module-2		
Combinational Circuits: Design procedure, half adder, full Adder, half subtractor, full subtractor, parallel binary adder and subtractor, carry look ahead adder, BCD adder, binary multiplier, binary divider, multiplexer and demultiplexer, decoder and encoder, parity checker, parity generators, code converters, magnitude comparators.		**10 Hours**
Module-3		
Sequential Circuits: Latches and flip-flops, types of flip-flops, characteristic table and equation, realization of one flip flop using other flip flops, excitation table, edge triggering, level triggering, asynchronous/ripple counter, synchronous counters, synchronous up/down counters, design of synchronous counters: state table, state diagram, state minimization, state assignment, sequence generators.		**11 Hours**
Module-4		
Synchronous Sequential Circuits: General model, classification, design of algorithmic state machine, analysis of synchronous sequential circuits. **Asynchronous Sequential Circuits:** Design of fundamental mode and pulse mode circuits, problems in asynchronous circuits, design of hazard Free Switching circuits.		**10 Hours**
Module-5		
Memory devices: Registers, shift registers, universal shift registers, classification of memories, RAM organization, ROM organization, timing waveforms for read and write operation, address decoding and memory expansion **Programmable Logic Devices**: Programmable logic array (PLA), programmable array logic (PAL), field programmable gate arrays (FPGA), implementation of combinational logic circuits using ROM, PLA, PAL		**10 Hours**

Course objectives: This course will enable students to:

- To introduce basic postulates of Boolean algebra and shows the Correlation between Boolean expressions
- To introduce the methods for simplifying Boolean expressions
- To outline the formal procedures for the analysis and design of Combinational circuits and sequential circuits
- To introduce the concept of memories and programmable logic devices.
- To illustrate the concept of synchronous and asynchronous sequential circuits.

Question paper pattern:

• The question paper will have ten questions.
• Each full question consists of 20marks.
• There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. M. Morris Mano, "Digital Design", 4th Edition, Prentice Hall of India Pvt. Ltd., 2008
2. John. M Yarbrough, "Digital Logic Applications and Design", Thomson Learning, 2006.

Reference Books:

1. Morris and Miller."Designing with TTL integrated circuits", McGrawHill
2. Fletcher, "An Engineering approach to digital Design", PHI
3. Kohavi, "Switching and Finite Automata Theory",TMH

E books and online course materials: NPTEL

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC35	**CO1**	Apply different methods for simplification of Boolean expressions and realize using gates.
	CO2	Design and realize Combinational circuits.
	CO3	Design and realize sequential circuits.
	CO4	Analyze synchronous and asynchronous sequential circuits.
	CO5	Analyze memory devices and memory organization.

19EC35: Digital Electronics

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Apply different methods for simplification of Boolean expressions and realize using gates.	3	2	3					1		1		1	3	3	2
CO2	Design and realize Combinational circuits.	3	3	3					1		1		1	3	3	2
CO3	Design and realize sequential circuits.	3	3	3					1		1		1	3	3	2
CO4	Analyze synchronous and asynchronous sequential circuits.	3	3	3					1		1		1	3	3	2
CO5	Analyze memory devices and memory organization.	1	1	2					1		1		1	3	3	2
Average		2.6	2.4	2.8					1		1		1	3	3	2

ELECTRONIC DEVICES AND CIRCUITS LABORATORY		
Subject Code	19ECL31	CIE: 50
Number of Lecture Hours/Week	02 Hours(Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03
CREDITS –1		

1. Fixed-bias amplifier circuit using BJT.
2. Design and construct BJT CE amplifier using voltage divider bias with and without bypassed emitter resistor.
3. Darlington amplifier
4. Differential amplifier using BJT.
5. Series and Parallel clipping circuits
6. Series and Parallel clamping circuits
7. Half-wave rectifier with/without capacitor filter.
8. Full-wave rectifier with/without capacitor filter.
9. Oscillators.
10. Design of a single stage voltage series feedback amplifier and draw frequency response.
11. Zener voltage regulator
12. Characteristics of SCR, UJT.
13. Power electronics circuits

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total ma rks.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19ECL31	**CO1**	Design of transistor amplifier circuits.
	CO2	Analyze and design wave shaping circuits.
	CO3	Design of DC power sources.
	CO4	Design of oscillators.
	CO5	Design of power circuits.

19ECL31: Electronic devices and circuits lab

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Design of transistor amplifier circuits	3	3	1			1	1	2	3	2		1	3	2	2
CO2	Analyze and design wave shaping circuits	3	3	1			1	1	2	3	2		1	3	2	2
CO3	Design of DC power sources	3	3	2			1	1	2	3	2		1	3	2	2
CO4	Design of oscillators	3	3	2			1	1	2	3	2		1	3	2	2
CO5	Design of power circuits	3	3	2			1	1	2	3	2		1	3	2	2
Average		3	3	1.6			1	1	2	3	2		1	3	2	2

NETWORK ANALYSIS LABORATORY		
Subject Code	19ECL32	CIE: 50
Number of Lecture Hours/Week	02 Hours (Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03
CREDITS –1		

1. Study of KCL, KVL
2. Network theorems:
   i) Thevenin and Norton
   ii) Superposition
   iii) Maximum power theorem
3. Resonance and tuned circuits
   i) Series resonance
   ii) Parallel resonance
3. Transient analysis
4. Steady state analysis
5. Measurement of impedance and admittance using two port network
6. Filters
   i) low pass
   ii) high pass

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total ma rks.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19ECL32	**CO1**	Verification of KCL and KVL.
	CO2	Verification of network theorems.
	CO3	Design of resonance circuits.
	CO4	Analyze transient and steady state response.
	CO5	Implementing different analog filters.

19ECL32: Network Analysis lab

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Verification of KCL and KVL	3	3	1			1	1	2	3	2		1	3	2	2
CO2	Verification of network theorems	3	3	1			1	1	2	3	2		1	3	2	2
CO3	Design of resonance circuits	3	3	1			1	1	2	3	2		1	3	2	2
CO4	Analyze transient and steady state response	3	3	2			1	1	2	3	2		1	3	2	2
CO5	Implementing different analog filters	3	3	1			1	1	2	3	2		1	3	2	2
Average		3	3	1.2			1	1	2	3	2		1	3	2	2

DIGITAL ELECTRONICS LAB		
Subject Code	19ECL33	CIE: 50
Number of Lecture Hours/Week	02Hours (Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03
CREDITS –1		

1. Design and implementation of Adder and Subtractor using logic gates.
2. Design and implementation of code converters using logic gates
3. Design and implementation of 4 bit binary Adder/ subtractor and BCD adder using IC 7483
4. Design and implementation of 2 bit Magnitude Comparator using logic gates and 8 Bit Magnitude Comparator using IC 7485
5. Design and implementation of 16 bit odd/even parity checker generator using IC74180.
6. Design and implementation of Multiplexer and De-multiplexer using logic gates and realization Boolean functions using MSI MUX/DEMUX
7. Design and implementation of encoder and decoder using logic gates and realization Boolean functions using MSI Encoders/Decoder.
8. Design and realization of 2-bit, 3-bit and 4-bit ripple counters.
9. Design and implementation of synchronous counters.
10. Implementation of SISO, SIPO, PISO and PIPO shift registers using flip-flops.
11. Realization of ring counters using 7495.

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
  5. Change of experiment is allowed only once and will be evaluated for 85% of the total marks.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code:	CO #	Course Outcome (CO)
19ECL33	**CO1**	Simplification of Boolean expressions and realization using gates.
	CO2	Design and realize combinational circuits using MSI ICs.
	CO3	Design and realize asynchronous counters.
	CO4	Design and realize synchronous counters.
	CO5	Design and realize sequential circuits using shift registers.

19ECL33: Digital Electronics Lab

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Simplification of Boolean expressions and realization using gates.	2	2	1			1	1	2	3	2		1	3	2	2
CO2	Design and realize combinational circuits using MSI ICs	3	3	1			1	1	2	3	2		1	3	2	2
CO3	Design and realize asynchronous counters.	3	3	1			1	1	2	3	2		1	3	2	2
CO4	Design and realize synchronous counters	3	3	1			1	1	2	3	2		1	3	2	2
CO5	Design and realize sequential circuits using shift registers.	3	3	1			1	1	2	3	2		1	3	2	2
	Average	2.8	2.8	1			1	1	2	3	2		1	3	2	2

IV SEMESTER

TRANSMISSION LINES AND WAVE GUIDES			
Subject Code	**19EC41**	CIE	50
Number ofLecture Hours/Week	03 Hours	SEE	50
Total Number ofLecture Hours	42	SEE Hours	03
CREDITS –3:0:0:0			

Course objectives: This course will enable students to:

- To study the transmission line parameters.
- To study fundamentals concepts of transmission lines at higher frequency.
- To expose the learners to waveguide their types & modes of transmission.

Modules	Teaching Hours
Module -1	
Transmission line parameters: Line parameters**,** inductance of a line of two parallel line conductors, inductance of the coaxial line, skin effect, capacitance of two parallel line conductors, capacitance of coaxial line. A line of cascaded T sections, The transmission line –general solution, Physical significance of the equations, the infinite line, Wavelength, velocity of propagation, Waveform distortion.	**08 Hours**
Module -2	
Low and high frequency Transmission line: The distortion less line, Reflection on a line not terminated in Zo, Reflection coefficient, Open & short-circuited lines, Reflection factor & reflection loss, Insertion loss, Constants for the line of zero dissipation, Voltages &currents on the Dissipation less line, Standing waves, nodes, standing-wave ratio, Input Impedance of the dissipation less line, Input impedance of open &short circuited lines, constants for the line with small dissipation, OC and SC impedances	**09 Hours**
Module -3	
Impedance matching in high frequency lines: The quarter-wave line, impedance matching, the half-wave line, the exponential line for impedance transformation, Single & double stub impedance matching on a line, Smith chart & its applications.	**08 Hours**
Module -4	
Guided waves between parallel planes: Application of the restriction to Maxwell's equations, Types of propagation: TM, TE &TEM waves, Transmission of TM Waves between parallel planes, Transmission of TE waves between parallel planes, Transmission of TEM waves between parallel planes.	**08 Hours**
Module -5	
WAVE GUIDES: Application of Maxwell's equations to the rectangular wave guide, The TEm,n and TMm,n wave in the rectangular guide, cylindrical wave guides, The TEM wave in the coaxial line, Cavity resonator	**09 Hours**

Question paper pattern:
The question paper will have ten questions.
Each full question consists of 20marks.
There will be 2 full questions (with a maximum of four sub questions) from each module.
Each full question will have sub questions covering all the topics under a module.
The students will have to answer 5 full questions, selecting one full question from each module.

Reference Books:
1. J.D. Ryder, Network lines & fields, PHI
2. Jordan. E.C and Balmain., Electromagnetic waves and radiating systems, PHI.
3. Sanjeev Gupta., Microwave Engineering.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code:	**CO #**	**Course Outcome (CO)**
19EC41	**CO1**	Determine the Line parameters.
	CO2	Determine the propagation characteristics of transmission lines under different conditions.
	CO3	Analyze different impedance matching methods.
	CO4	Analyze propagation characteristics of electromagnetic waves in parallel planes.
	CO5	Analyze the behavior of different modes of propagation in various wave guides.

19EC41: Transmission lines and waveguides

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Determine the Line parameters.	3	3	2	1				1		1		1	3	3	2
CO2	Determine the propagation characteristics of transmission lines under different conditions.	3	3	2	2				1		1		1	3	3	2
CO3	Analyze different impedance matching methods.	3	3	3	2				1		1		1	3	3	2
CO4	Analyze propagation characteristics of electromagnetic waves in parallel planes	3	3	2	2				1		1		1	3	3	2
CO5	Analyze the behavior of different modes of propagation in various wave guides.	3	3	3	2				1		1		1	3	3	3
		3	3	2.4	1.8				1		1		1	3	3	2.8

SIGNALS AND SYSTEMS		
Subject Code	19EC42	CIE: 50
Number of Lecture Hours/Week	4 Hours (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Module-1		**Teaching Hours**
Continuous-Time and Discrete-Time Signals: Classification of signals – even and odd, periodic and non-periodic, energy and power signals, deterministic and random signals, basic operations on signals, elementary signals, singularity functions, interconnection of systems and system properties,		**10 Hours**
Module-2		
Linear Time-Invariant Systems: Discrete-time LTI systems, the convolution sum, continuous-time LTI systems, convolution integral, properties of LTI systems, causal LTI systems described by differential and difference equations, block diagram representation of systems.		**11 Hours**
Module-3		
Signal Analysis and Fourier representation of Continuous-Time signals: Analogy between vectors and signals, approximation of a function by set of mutually orthogonal functions, trigonometric Fourier series, exponential Fourier series, properties of Fourier series, The continuous-time Fourier transform, Fourier transform of periodic signals, properties of Fourier transforms.		**10 Hours**
Module-4		
Fourier representation of Discrete-Time signals: Sampling theorem, recovery of signal from its samples, discrete-time Fourier series (DTFS), properties of DTFS, discrete-time Fourier transform (DTFT), properties of DTFT, applications of continuous-time Fourier transform and discrete-Time Fourier transform.		**11 Hours**
Module-5		
Z-Transform: The Z-Transform, region of convergence (ROC) and its properties, inverse Z-transform, geometric evaluation of the Fourier transform from the pole-zero plot, properties of Z-transform, analysis and characterization of LTI systems using Z-Transforms, unilateral Z-transform.		**10 Hours**
Course objectives: After studying this course, students will be able to: • To understand basics of signals and systems, sampling theorem. • To learn Linear Time Invariant systems and properties of LTI systems. • To understand Fourier representation of Continuous Time signals. • To understand Fourier representation of Discrete Time signals. • To learn Transform and its applications.		
Question paper pattern: • The question paper will have ten questions.		

• Each full question consists of 20marks.
• There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson Education, 2007.
2. B. P. Lathi, "Linear Systems and Signals", Oxford University Press, 2005

Reference Books:

1. Simon Haykin and Barry Van Veen "Signals and Systems", John Wiley & Sons, 2001
2. Miichael J Roberts, Govind Sharma, "Fundamentals of Signals and Systems", 2nd Edition, McGrawHill 2010

E books and online course materials: NPTEL

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC42	**CO1**	Analyze different signals and operations on signals.
	CO2	Analyze LTI systems and determine properties of LTI systems.
	CO3	Analyze Continuous-Time signals in Fourier Domain.
	CO4	Analyze Discrete-Time signals in Fourier domain.
	CO5	Analyze Discrete-Time signals using Z-Transform.

19EC42: Signals and Systems

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze different signals and operations on signals	3	3		2				1		1		1	3	3	2
CO2	Analyze LTI systems and determine properties of LTI systems	3	3		2				1		1		1	3	3	2
CO3	Analyze Continuous-Time signals in Fourier Domain.	3	3		2	2			1		1		1	3	3	2
CO4	Analyze Discrete-Time signals in Fourier domain.	3	3		2	2			1		1		1	3	3	2
CO5	Analyze Discrete-Time signals using Z-Transform.	3	3		2	2			1		1		1	3	3	2
		3	3		2	2			1		1		1	3	3	2

ANALOG ELECTRONICS		
Subject Code	19EC43	CIE: 50
Number of Lecture Hours/Week	4 (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Module-1		**Teaching Hours**
Op-amp Basics: Analysis of differential amplifier. common mode and differential mode gains, transfer characteristics, CMRR, I/P & O/P impedances, ideal op-amp characteristics, cascading of differential amplifier, I/P ,O/P stages and level translators. **Linear operational amplifier Applications**: Inverting, non–inverting, differential bridge amplifiers, summer, integrator, differentiator, V to I & I to V converters, op–amp feedback limiters using diodes, log and antilog amplifiers, analog multipliers, dividers, sample and hold circuits, peak detectors, precision rectifiers, instrumentation amplifier.		**11 Hours**
Module-2		
Non linear operational amplifier Applications: Monostable and astable multivibrators, comparators, Schmitt trigger using operational-amplifier. **Waveform generation:** Signal generators, triangular/rectangular, wave generator, phase shift oscillator **Timers:** Basic timer circuit, 555 timer used as monostable and astable multivibrators, timer others applications.		**10 Hours**
Module-3		
Data converters: Performance parameters, D/A converters, weighted binary type, ladder R–2R converters, **A/D converters:** Performance parameters, types of ADC, V/t, V/f counter ramp, continuous ramp, flash type ADC, successive approximation type converter.		**10 Hours**
Module-4		
PLL: Basic principles, phase detector/comparator, VCO, low pass filter, monolithic phase locked loop **PLL applications:** Frequency multiplication/division, frequency translation, AM detection, FM detection		**11 Hours**
Module-5		
DC voltage regulators: Analysis and design of series and shunt regulators using op-amp, some commercial voltage regulators, fixed and variable, current boosting **Switching regulators**: Basic concepts and its applications.		**10 Hours**
Course objectives: After studying this course, students will be able to: 1. Design op-amp circuits 2. Understand generation of various waveforms 3. Understand working and operation of data converters 4. Working of regulators and its applications		

Question paper pattern:

- The question paper will have ten questions.
- Each full question consists of 20marks.
- There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
- Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. D Roy Choudhary, "Linear Integrated Circuits", New Age Publications 5th edition 2018.
2. Ramakant A Gayakwad, "Op-Amps and Linear Integrated Circuits", PHI, 4th edition, 2014

Reference Books:

1. David A.Bell, "Operational Amplifiers and Linear ICs", PHI, 2nd edition, 2009.

E books and online course materials: NPTEL

Course Objectives:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC43	**CO1**	Analyze Op-amp circuits and their applications.
	CO2	Design of waveform generators using Op-amp and timers.
	CO3	Determine performance parameters of data converters.
	CO4	Analyze PLL operation and its applications.
	CO5	Design of voltage regulators.

19EC43: Analog Electronics

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze Op-amp circuits and their applications	3	3	3	2				1		1		1	3	2	2
CO2	Design of waveform generators using Op-amp and timers	3	3	3	2				1		1		1	3	2	2
CO3	Determine performance parameters of data converters	3	3	2	2				1		1		1	3	2	2
CO4	Analyze PLL operation and its applications	3	3	2	2				1		1		1	3	2	2
CO5	Design of voltage regulators	3	3	2	2				1		1		1	3	2	2
	Average	3	3	2.4	2				1		1		1	3	2	2

MICROPROCESSORS AND INTERFACES		
Subject Code	19EC44	CIE: 50
Number of Lecture Hours/Week	4 Hours (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
CREDITS- 4		
Module-1		**Teaching Hours**
INTRODUCTION TO MICRO PROCESSORS: Historical background, general microcomputer and microprocessor operation, Harvard vs Von-Neuman architecture, RISC and CISC machines, pipelining. Intel's 8086 CPU architecture, pin configuration, memory segmentation, physical and logical address generation and examples.		**10 Hours**
Module-2		
INSTRUCTION SET OF 8086: Addressing Modes of 8086,delay calculation using T-states, assembler instruction format, data transfer, arithmetic, branch type, logical, shift and rotate instructions, string instructions, machine control and flag manipulation instructions. Illustration of these instructions with example programs.		**11 Hours**
Module-3		
DIRECTIVES AND OPERATORS: Introduction to assembler directives and DOS functions, programming examples involving assembler directives, DOS Functions for read keyboard, display (01, 08, 06, 02, 09,0A) **MODULAR PROGRAMMING:** concepts of macros (near and far) and procedures (near and far), programming examples. **8086 INTERRUPTS:** 8086 Interrupts and interrupt responses.		**11 Hours**
Module-4		
8086 BASED MULTIPROCESSING SYSTEMS: Coprocessor configurations, 8087 numeric data processor, data types, processor architecture, instruction set and examples. **SYSTEM BUS STRUCTURE:** Basic 8086 configurations: minimum mode, maximum mode. Memory interfacing to 8086, design examples.		**10 Hours**
Module-5		
BASIC I/O INTERFACES AND APPLICATIONS: Study of 8255 PPI, 8253 timer, 8251 USRAT and programming, interfacing microprocessor to keyboard, stepper motor , ADC, DAC, LED. a brief comparative study of important features of80386, 80486 and Pentium microprocessors.		**10 Hours**
Course Objectives o To introduce 8086 Microprocessor architecture, Pin configuration and memory segmentation. o To describe instruction set of 8086.		

- To introduce directives, DOS functions and Modular programming.
- To introduce the Multi-processing using 8086.
- To introduce interfacing of 8255 PPI, 8253 Timer and 8251 USART to 8086.

Question paper pattern:

• The question paper will have ten questions.
• Each full question consists of 20marks.
• There will be 2 full questions (with a maximum of four subquestions) from each module, there will be five modules.
• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions selecting one full question from each module.

Text books:

1. Douglas V Hall**, "**MICROPROCESSOR AND INTERFACING- PROGRAMMING & HARDWARE", 2nd edition , TMH, 2006.

Reference Books:

1. Y.C. Liu and G. A. Gibson,"MICROCOMPUTER SYSTEMS-THE 8086 / 8088 FAMILY**"**, 2nd edition, PHI-2003
2. Barry B. Brey **, "**THE INTEL MICROPROCESSOR, ARCHITECTURE, PROGRAMMING AND INTERFACING", 6TH EDITION, Pearson Education / PHI, 2003

E books and online course materials: NPTEL

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC44	**CO1**	Study the architecture and basic concepts of 8086.
	CO2	Write assembly language programs.
	CO3	Use DOS functions and Directives in ALP.
	CO4	Study and interface coprocessor and memory devices.
	CO5	Interface different peripheral devices to 8086.

19EC44: Microprocessors and Interfaces

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Study the architecture and basic concepts of 8086	3	3	2					1		1		1	3	3	3
CO2	Write assembly language programs	3	3	2	2				1		1		1	3	3	3
CO3	Use DOS functions and Directives in ALP	3	3	2	2				1		1		1	3	3	3
CO4	Study and interface coprocessor and memory devices.	3	3	2	3				1		1		1	3	3	3
CO5	Interface different peripheral devices to 8086	3	3	2	3				1		1		1	3	3	3
	Average	3	3	2	2				1		1		1	3	3	3

ANALOG COMMUNICATION		
Subject Code	19EC45	CIE: 50
Number of Lecture Hours/Week	4 Hours (Theory)	SEE: 50
Total Number of Lecture Hours	52	SEE Hours: 03
Credits-4		
Module-1		**Teaching Hours**
Random Signals and Noise: Probability and random variables, expectation, transformation of random variables, Gaussian random variables, the central limit theorem, random processes, correlation of Random Processes, Spectra of random signals, Gaussian processes, white noise, narrow band noise		**11 Hours**
Module-2		
Amplitude Modulation: Amplitude modulation, double sideband, double sideband suppressed carrier modulation, SSB modulation, vestigial sideband modulation, costas receiver, quardrature-amplitude modulation,		**10 Hours**
Module-3		
Angle Modulation: Basic definitions, properties of angle-modulated waves, relationship between PM and FM waves, narrow-band frequency modulation, wide-band Frequency Modulation, transmission bandwidth of FM waves, generation of FM waves, demodulation of FM signals, effect of noise in FM.		**11 Hours**
Module-4		
System and Noise Calculation: Electrical noise, noise figure, equivalent noise temperature, cascade connection of two port network, free space link calculations. **Noise in Analog Communications:** Noise in communication systems, signal to noise ratio, band-pass receiver structures, noise in linear receivers using coherent detection, noise in AM receivers using envelope detection, noise in SSB receivers, detection of frequency modulation.		**10 Hours**
Module-5		
Radio Receivers: Tuned radio frequency receiver, super heterodyne receiver- RF section, frequency mixers, tracking, intermediate frequency, AGC. Receiver parameters & characteristics, FM receiver and its comparison with AM receiver. **Pulse modulation**: Types of pulse modulation, PAM generation (Single polarity, double polarity) and demodulation. PWM generation & demodulation, PPM generation and demodulation.		**10 Hours**
Course objectives: • To introduce the concepts of analogue communication systems • To equip students with various issues related to analogue communication such as modulation, demodulation		

- To understand effect of noise on the performance of communication system To understand basics of noise calculation

Question paper pattern:

• The question paper will have ten questions.
• Each full question consists of 20marks.
• There will be 2 full questions (with a maximum of four sub questions) from each module, there will be five modules.
• Each full question will have sub questions covering all the topics under a module. The students will have to answer 5 full questions, selecting one full question from each module.

Text books:

1. Simon Haykin, 'Introduction to Analog and Digital Communications', Second Edition.
2. Herbert Taub, Donald L.Schiling' Principles of communication systems, Second Edition

Reference Books:

1. Bruce Carlson, 'Communication Systems', McGraw Hill
2. Ziemmer, 'Principles of Communication', Wiley India, Ed., 2009
3. Dennis Roddy and John Coolen, 'Electronic Communication Systems' PHI.

E books and online course materials: NPTEL

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19EC45	**CO1**	Analyze random variables and random process.
	CO2	Analyze different amplitude modulation and demodulation techniques.
	CO3	Analyze different angle modulation and demodulation techniques.
	CO4	Analyze Noise in Analog communication systems.
	CO5	Analyze the working of Radio receivers, pulse modulation and demodulation techniques.

19EC45: Analog Communication

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Analyze random variables and random process	3	2	2	2				1		1		1	3	2	2
CO2	Analyze different amplitude modulation and demodulation techniques	3	3	2	2				1		1		1	3	2	2
CO3	Analyze different angle modulation and demodulation techniques	3	3	2	2				1		1		1	3	2	2
CO4	Analyze Noise in Analog communication systems	3	3	2	2				1		1		1	3	2	2
CO5	Analyze the working of Radio receivers, pulse modulation and demodulation techniques	3	2	2	2				1		1		1	3	2	2
		3	2.6	2	2				1		1		1	3	2	2

ANALOG ELECTRONICS LABORATORY		
Subject Code	19ECL41	CIE: 50
Number of Lecture Hours/Week	02 Hours(Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03
CREDITS –1		

1. Linear applications of Op-amp
   i) Inverting and Non inverting amplifier
   ii) Adder/Subtractor
   iii) Differentiator
   iv) Integrator
2. Non linear application of Op-amp
   i) Comparator
   ii) Schmidt trigger
   iii) Monostable and Astable operation
3. Monstable operation using 555 timer
4. Astable operation using 555 timer
5. DAC
6. ADC
7. PLL applications
8. Voltage regulators

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total ma rks.

Course outcomes:
On completion of the course, the student will have the ability to:

Course Code:	CO #	Course Outcome (CO)
19ECL41	CO1	Implementation of linear applications of op-amp.
	CO2	Implementation of non-linear applications of op-amp.
	CO3	Implementation of 555 timer application.
	CO4	Implementation of data converters.
	CO5	Design of voltage regulators.

19ECL41: Analog Electronics lab

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Implement linear applications of op-amp	3	2	2		1	1	1	2	3	2		1	3	2	2
CO2	Implement non-linear applications of op-amp	3	2	2		1	1	1	2	3	2		1	3	2	2
CO3	Implement 555 timer application	3	2	2		1	1	1	2	3	2		1	3	2	2
CO4	Implement data converters	3	2	2		1	1	1	2	3	2		1	3	2	2
CO5	Design of voltage regulators	3	2	2		1	1	1	2	3	2		1	3	2	2
		3	2	2		1	1	1	2	3	2		1	3	2	2

ANALOG COMMUNICATION LAB		
Subject Code	19ECL42	CIE: 50
Number of Lecture Hours/Week	02 Hours(Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03

CREDITS- 1

1. Amplitude modulation and demodulation using envelop detector
2. Balanced modulation and SSB generation.
3. Frequency modulation and Demodulation using PLL
4. Pre-emphasis and De-emphasis circuits.
5. Automatic Gain Control in AM
6. PAM modulation and Demodulation
7. PPM Modulation and Demodulation
8. PWM Modulation and Demodulation
9. Analog Mixer Circuit.
10. Second order active high/low pass filters.
11. Second order active band pass and band stop filters.

Course objectives:

After studying this course, students will be able to:

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer Script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total ma rks.

Course outcomes:

On completion of the course, the student will have the ability to:

Course Code	CO #	Course Outcome (CO)
19ECL42	**CO1**	Implementation of various second order active filters.
	CO2	Implementation of AM and demodulation.
	CO3	Implementation of FM and demodulation.
	CO4	Implementation of pre-emphasis and de-emphasis.
	CO5	Implementation of pulse modulation techniques.

19ECL42: Analog Communication lab

		PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	Implement various second order active filters	3	2	2		1	1	1	2	3	2		1	3	2	2
CO2	Implement AM and demodulation	3	2	2		1	1	1	2	3	2		1	3	2	2
CO3	Implement FM and demodulation	3	2	2		1	1	1	2	3	2		1	3	2	2
CO4	Implement pre-emphasis and de-emphasis	3	2	2		1	1	1	2	3	2		1	3	2	2
CO5	Implement pulse modulation techniques	3	2	2		1	1	1	2	3	2		1	3	2	2
		3	2	2		1	1	1	2	3	2		1	3	2	2

MICROPROCESSOR AND INTERFACES LAB		
Subject Code	19ECL43	CIE: 50
Number of Lecture Hours/Week	02 Hours(Practical)	SEE: 50
Total Number of Lecture Hours	--	SEE Hours: 03
CREDITS- 1		

8086 BASED PROGRAMMING

1. Data transfer instructions:

i. Byte and word data transfer in different Addressing Modes.

ii. Block move (with and without overlap).

iii. Block interchange.

2. Arithmetic & logical operations:

i. Addition and Subtraction of n- bit numbers.

ii. Multiplication and Division of signed and unsigned Hexadecimal nos.

iii. ASCII adjustment instructions

iv. Code conversions

v. Arithmetic programs to find square cube, LCM, GCD, factorial.

3. Bit manipulation instructions:

i. Whether given data is positive or negative

ii. Whether given data is odd or even

iii. Counting Logical 1's and 0's in a given data

iv. 2 out of 5 codes

v. Bit wise and nibble wise palindrome.

4. Branch/Loop instructions:

i. Arrays: addition/subtraction of 'N' no's.

ii. Finding largest and smallest nos.

iii. Arranging numbers in Ascending / descending order

ii. Near and Far Conditional and Unconditional jumps, Calls and Returns.

5. Programs on String manipulation: string transfer, string reversing, searching for a string.

6. Programs involving Software interrupts

Programs to use DOS interrupt INT 21h Function calls for

Reading a Character from keyboard, Buffered Keyboard input,

Display of character/ String on console

7. EXPERIMENTS ON INTERFACING 8086

i. Matrix keyboard interfacing

ii. Seven segment display interface

iii. Logical controller interface

iv. Stepper motor interface

Conduct of Practical Examination:

- All laboratory experiments are to be included for practical examination
- Students are allowed to pick one experiment from the lot.
- Strictly follow the instructions as printed on the cover page of answer Script for breakup of marks.
- Change of experiment is allowed only once and will be evaluated for 85% of the total ma rks.

Course outcomes: **On completion of the course, the student will have the ability to:**		
Course Code	**CO #**	**Course Outcome (CO)**
19ECL43	**CO1**	Program 8086 for data transfer.
	CO2	Program 8086 for arithmetic and logic control application.
	CO3	Program 8086 for bit and string operations.
	CO4	Program 8086 using DOS functions.
	CO5	Program to interface 8086 with external peripheral devices.

icroprocessors and interfaces lab

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	
ram 8086 for data transfer	3	3	3	2	2	1	1	2	3	2		1	3	
ram 8086 for arithmetic and control application	3	3	3	2	2	1	1	2	3	2		1	3	
ram 8086, implementing upts	3	3	3	2	2	1	1	2	3	2		1	3	
ram timer applications	3	3	3	2	2	1	1	2	3	2		1	3	
face 8086 with external heral devices	3	3	3	3	2	1	1	2	3	2		1	3	
	3	3	3	2.8	2	1	1	2	3	2		1	3	