Electronics & Telecommunication Engineering Department

Curriculum: SE (E&TC)

Approved in 13th Academic Council held on 01/07/2016

Electronics & Telecommunication Engineering Department

Program Educational Objective(s)	
After graduation and few years of graduation, the Electronics & Telecommunication Engineering graduates would	
PEO 1	Core Competency: Graduates will provide engineering solutions with strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.
PEO 4	Managerial Skills: Graduates will perform cohesively in group using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.

Electronics & Telecommunication Engineering Department

Programme Outcomes (PO's)

Programme Outcomes describe what students are expected to know or be able to do by the time of graduation from the programme. The POs for Under Graduate Course in Electronics and Telecommunication Engineering are able to

1. Apply knowledge of mathematics, science and technical fundamentals for solutions of domain problems
2. Identify, formulate, review the literature, analyze the complex engineering problems
3. Design and implement the systems' components and processes serving the needs of safety, environment and society
4. Perform experiment, analyze and interpret results
5. Use modern tools and technical skills necessary for electronic system development
6. Understand the impact of electronics in modern era
7. Explore the needs of society for sustainable development and human values
8. Understand professional, ethical and legal responsibilities
9. Work effectively in diverse and multidisciplinary tasks, to accomplish common goal
10. Communicate effectively
11. Engage in continuing educational / professional, entrepreneurship development
12. Apply electronics engineering and management principles / skills, as a member and leader in a team to solve social and industrial problems

Mapping of PEOs and POs:

Program Educational Objective(s)		Mapped Programme Outcomes
PEO 1	Core Competency: Graduates will provide engineering solutions with strong base of science and mathematics, subject domain knowledge for challenging problems in Electronics and allied disciplines.	1,2,3,4,5,6
PEO 2	Career Building: Graduates will fulfill professional responsibilities effectively by synergizing theoretical and practical skills.	6,7,8,9,10,11,12
PEO 3	Technical Proficiency: Graduates will practice analytical, creative, innovative skills for higher education, research, industrial development.	1,2,3,4,5,6,9,11
PEO 4	Managerial Skills: Graduates will perform cohesively in group using moral, ethical practice, managerial, entrepreneurial skills for welfare of society with global outlook.	7,8,9,10,11,12

GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Electronics & Telecommunication Engineering

Teaching and Evaluation Scheme

SE (Full-Time) in Electronics & Telecommunication Engineering

SEMESTER-I

THEORY COURSES														
Sr. No.	**Course Code**	**Subject**	**Programme Outcomes**	**Scheme of Teaching (Hrs /Week)**			**Total Credits**	**Scheme of Evaluation (Marks)**					
								Theory			**Term Work**	**Practical/ Viva-voce**	**Total**
				L	**T**	**P**		**Test**	**TA**	**ESE**			
1	GE 242	Environmental Studies	7,9,10	03	-	-	03	20	20	60	-	-	100
2	GE 241	Engineering Mathematics-III	1,2,10	03	01	-	04	20	20	60	-	-	100
3	ET 243	Electronic Devices & Circuits	1,2,3,4,5,10	03	-	-	03	20	20	60	-	-	100
4	ET 244	Signals & Systems	1,2	03	-	-	03	20	20	60	-	-	100
5	ET 245	Digital Electronics	1,2,5	03	-	-	03	20	20	60	-	-	100
6	ET 246	C Programming	1,2,3	01	01	-	02	--	--	50	-	-	050
		LABORATORY COURSES											
7	ET 247	Lab-Electronic Devices & Circuits	1,4,5	-	-	04	02	-	-	-	25	25	50
8	ET 248	Lab- Signals & Systems	1,2,4	-	-	02	01	-	-	-	25	25	50
9	ET 249	Lab-Digital Electronics	1,4,5	-	-	02	01	-	-	-	25	25	50
10	ET 250	Lab-C Programming	1,4,5,10,12	-	-	04	02	-	-	-	25	25	50
				16	**02**	**12**	**24**	**100**	**100**	**350**	**100**	**100**	**750**

SEMESTER-II

	THEORY COURSES												
Sr. No.	**Course Code**	**Subject**	**Programme Outcome**	**Scheme of Teaching (Hrs /Week)**			**Total Credits**	**Scheme of Evaluation (Marks)**					
								Theory			**Term Work**	**Practical/Viva -voce**	**Total**
				L	**T**	**P**		**Test**	**TA**	**ESE**			
1	GE 252	Engineering Mathematics-IV	1,2,10	03	01	-	04	20	20	60	-	-	100
2		Open Elective		03	-	-	03	20	20	60	-	-	100
	ET 258	Basics of Electronics Engineering	1,2,9,10										
	ET 259	Industrial Economics and Telecommunication Regulation	1,7,9,12										
3	ET 251	Network &Lines	1,2,4,5	03	01	-	04	20	20	60	-	-	100
4	ET 252	Linear Integrated Circuits	1,2,3	03	-	-	03	20	20	60	-	-	100
5	ET 253	Analog Communication Theory	1,2,3,4,6,7	04	-	-	04	20	20	60	-	-	100
	LABORATORY COURSES												
6	ET 254	Lab-Network & Lines	1,4,5	-	-	02	01	-	-	-	25	25	50
7	ET 255	Lab-Linear Integrated Circuits	1,4,5	-	-	04	02	-	-	-	50	25	75
8	ET 256	Lab-Analog Communication Theory	4,5,11	-	-	02	01	-	-	-	25	25	50
9	ET 257	Electronic Workshop - I	1,3,4,5,6	-	-	04	02	-	-	-	50	25	75
				16	**02**	**12**	**24**	**100**	**100**	**300**	**150**	**100**	**750**

L-Lectures, T-Tutorials, P-Practical, TA-Teacher Assessment, ESE-End-Semester Examination

General Electives (Students of all branches are eligible for following courses)

ET-258 Basics of Electronics Engineering

Approved in 13th Academic Council held on 01/07/2016

ET-259 Industrial Economics and Telecommunication Regulation

GOVERNMENT COLLEGE OF ENGINEERING, AURANGABAD

(An Autonomous Institute of Government of Maharashtra)

Department of Electronics & Telecommunication Engineering

Teaching and Evaluation Scheme

SE (Part-Time) in Electronics & Telecommunication Engineering

	THEORY COURSES													
S. No.	**Course Code**	**Subject**	**Program Outcomes**	**Scheme of Teaching (Hrs/Week)**			**Total Credits**	**Scheme of Evaluation (Marks)**					
								Theory			**Term Work**	**Practical/ Viva-voce**	**Total**
				L	**T**	**P**		**Test**	**TA**	**ESE**			
Semester I													
1	GE 242	Environmental Studies	7,9,10	03	-	-	03	20	20	60	-	-	100
2	ET 243	Electronic Devices & Circuits	1,2,3,4,5,10	03	-	-	03	20	20	60	-	-	100
3	ET 245	Digital Electronics	1,2,5	03	-	-	03	20	20	60	-	-	100
4	ET 246	C Programming	1,2,3	01	01	-	02	--	--	50	-	-	50
		LABORATORY COURSES											
5	ET 247	Lab-Electronic Devices & Circuits	1,4,5	-	-	04	02	-	-	-	25	25	50
6	ET 249	Lab-Digital Electronics	1,4,5	-	-	02	01	-	-	-	25	25	50
7	ET 250	Lab-C Programming	1,4,5,10,12	-	-	04	02	-	-	-	25	25	50
		Total for Sem I		**10**	**01**	**10**	**16**	**60**	**60**	**230**	**75**	**75**	**500**
Semester II													
1		Open Elective		03	-	-	03	20	20	60	-	-	100
	ET 258	Basics of Electronics Engineering	1,2,9,10										
	ET 259	Industrial Economics and Telecommunication Regulation	1,7,9,12										
2	GE 241	Engineering Mathematics-III	1,2,10	03	01	-	04	20	20	60	-	-	100
3	ET 244	Signals & Systems	1,2	03	-	-	03	20	20	60	-	-	100
4	ET 251	Network &Lines	1,2,4,5	03	01	-	04	20	20	60	-	-	100
		LABORATORY COURSES											
5	ET 248	Lab- Signals & Systems	1,2,4	-	-	02	01	-	-	-	25	25	50
6	ET 254	Lab- Network &Lines	1,4,5	-	-	02	01	-	-	-	25	25	50
		Total for Sem II		**12**	**02**	**04**	**16**	**80**	**80**	**240**	**50**	**50**	**500**
Semester III													
1	GE 252	Engineering Mathematics-IV	1,2,10	03	01	-	04	20	20	60	-	-	100
2	ET 252	Linear Integrated Circuits	1,2,3	03	-	-	03	20	20	60	-	-	100
3	ET 253	Analog Communication Theory	1,2,3,4,6,7	04	-	-	04	20	20	60	-	-	100
		LABORATORY COURSES											
4	ET 255	Lab-Linear Integrated Circuits	1,4,5	-	-	04	02	-	-	-	50	25	75
5	ET 256	Lab-Analog Communication Theory	4,5,11	-	-	02	01	-	-	-	25	25	50
6	ET 257	Electronic Workshop - I	1,3,4,5,6	-	-	04	02	-	-	-	50	25	75

L-Lectures, T-Tutorials, P-Practical, TA-Teacher Assessment, ESE-End-Semester Examination

General Electives (Students of all branches are eligible for following courses)

Approved in 13th Academic Council held on 01/07/2016

ET-258 Basics of Electronics Engineering
ET-259 Industrial Economics and Telecommunication Regulation

GE 242 Environmental Studies (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description: This course covers Natural Resources, Water resources, renewable and non-renewable energy sources, policies of government of India towards environmental pollution, urban problems related to water and energy, biodiversity at global national and local levels.

Course Objectives:

- Become aware of the importance of soil, water and air for humans and other life forms on the Earth.
- Become aware of the species extinction and loss of biodiversity.
- Become aware of the various national and international efforts that are in place for conserving the environment get acquainted with national laws and global environmental conservation guidelines

Course Outcomes
After completing the course, students will be able to:

CO1	Understand and appreciate the physical and chemical foundations of the Earth and its environment
CO2	Understand the origin and definition of life
CO3	Understand the origin and evolution of human societies and the major transformations brought by industrialization
CO4	Learn about the basics of environmental economics

Detailed Syllabus:

Unit 1	Natural Resources, Water resources: Use and over utilization of surface andground water, Floods, drought, conflicts over water, dams: benefits and problems, Energy resources: Growing energy needs, renewable and non-renewable energy sources use of alternate energy sources. Land resources: land degradation, soil erosion and desertification. Role of an individual in conservation of natural resources.
Unit 2	Global level efforts towards environment conservation and pollution control.Role of India at Global level pollution, conservation and policies of Government of India towards control of river pollution. Policy of Government of Maharashtra towards control of various pollution. Environment Protection Act, Vehicular emission standards, Noise Pollution (Regulation and Control) Rules, Concept of ISO 14000.
Unit 3	Biodiversity and its conservation, Bio-geographical classification of India,Biodiversity at global, National and local levels. India as a mega diversity nation, Hot spots of biodiversity, Endangered and endemic species of India, Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity, Forest Conservation Act.
Unit 4	Environmental Pollution: Definition, Cause, effects and control measures of Airpollution, Water pollution, Noise pollution, Thermal pollution, Nuclear hazards, Electronic Waste. Solid waste Management: Causes, effects and control measures of urban and industrial wastes. - Municipal solid-waste (management and handling) rules.

Unit 5	Urban problems related to water and energy, Water conservation, rain waterharvesting, and watershed management, Climate change, nuclear accidents. Role of an individual in prevention of pollution. Disaster management: floods, earthquake, cyclone and landslides

Text and Reference Books

1. Textbook of Environmental Studies for Undergraduate Courses by ErachBharucha, University Grants Commission, New Delhi.
2. Environmental Studies by R. Rajagopalan, Oxford University Press.
3. Environment Protection Act 1986.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO 12
CO1							3			3		
CO2										3		
CO3							3		3	3		
CO4							3			3		

1 – High 2 – Medium 3 - Low

Teacher's Assessment:

Teachers Assessment of 20 marks is based on

1) Power point presentation of case studies
2) Question & answer
3) Study of Industry processes and its presentation

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	10	00	20
K2	Understand	10	20	40
K3	Apply	00	00	00
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	K2	K2	K2	K2
	C01	C02	C03	CO4
Class Test (20 Marks)	10	10	00	00
Teachers Assessment (20 Marks)	05	05	05	05
ESE Assessment (60 Marks)	15	15	15	15

Designed by

GE241: Engineering Mathematics-III (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Tutorial: 1 Hrs /Week** **Total Credits : 04**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment: 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description:

Engineering Mathematics-III (GE241) is a one-semester course compulsory to all second year engineering students of the institute and it is continuation of some contents of previous year courses viz. Engineering Mathematics-I (GE141) and Engineering Mathematics-II (GE151) or applied mathematics at diploma in Engineering. This course is intended to provide engineering students a coherent and balanced account of major mathematical techniques (Differential equations, Laplace Transform and Vector calculus) and concepts that form the basis of many engineering analysis tools.

Course Objectives:

This course intends to provide an overview of higher order linear differential equations, partial differential equations which helps in many Engineering problems related to mechanical vibrations, bending of beams, simple electrical circuits, one dimensional and two dimensional heat flows .It also provides an overview of vector calculus which helps in many Engineering problems related to electromagnetic fields ,gravitational fields, fluid flows

Course Outcomes:

After completing the course, students will be able to:

CO1	Classify,formulate the differential equations, determine the solution to higher order homogeneous and non-homogeneous linear differential equation used in civil, mechanical and electrical engineering problems and partial differential equations particularly for one/two dimensional heat flow equations in heat transfer.
CO2	Demonstrate a good understanding of the Laplace transform and use it for solving linear differential equations, simultaneous differential equations
CO3	Execute gradient of scalar point functions, divergence and curl of vector fields, Green's theorem, Stokes's theorem, and Guass-divergence theorem

Detailed Syllabus:

Unit 1	**n^{th} order Linear differential equations** Methods of finding general solution of homogeneous and non- homogeneous linear differential equation with constant coefficients (General method, shortcut method, method of variation of Parameter) General solution of homogeneous and non-homogeneous linear differential equations with variable coefficients Simultaneous Linear differential equations
Unit 2	**Partial Differential equations** Introduction of partial differential equations, Formation of partial differential equations, Solution of linear and nonlinear partial differential equations (Char pit's method, method of separation of variables)**,** Boundary value problems.
Unit 3	**Applications of differential equations** a)**Applications of ordinary differential equations:** Mechanical oscillations: Free oscillations, Damped free Oscillations, Forced Oscillation, Electrical circuits: LCR circuits, RL circuit, RC circuit , Deflection of beams **b)Applications of partial differential equations:** One dimensional heat flow, Two dimensional heat flow under steady state condition.
Unit 4	**Laplace transform and its applications** Definition, Laplace transform of some basic functions, Properties of Laplace transform , Laplace transform of Unit step function, Unit impulse function, error function, and periodic function, Use of Laplace transform to solve Linear differential equations and simultaneous linear differential equations.
Unit 5	**Vector calculus** Vector differentiation, Tangential and normal components of velocity and acceleration, Gradient of scalar point function, Divergence and Curl of vector point function and their applications. Line, surface and volume integrals, Stoke's theorem and Gauss-Divergence theorem.

Text and Reference Books

1. A Text Book of engineering Mathematics (Vol.1 &2) by P.N.Wartikar & J.N.Wartikar, Pune Vidhyarthi Griha Prakashan, Pune.
2. Advanced Engineering Mathematics by Erwin Kreyszig, Willey Eastern Ltd. Mumbai.
3. Engineering Mathematics-A Tutorial Approach by Ravish R Singh, Mukul Bhatt.
4. Higher Engineering Mathematics by B. S. Grewal, Khanna publication, New Delhi.
5. Advanced Engineering Mathematics by H. K. Dass, S. Chand and Sons.
6. Advanced Engineering Mathematics by Michael Greenberg,2/e, Pearson
7. Calculus by G. B. Thomas and R. L. Finney, Addison- Wesley, 1996
8. Elements of Partial Differential Equations by I.N.Sneddon

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1								3		
CO2	1	1								3		
CO3	1	1								3		

1 – High, 2 – Medium, 3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1. Home Assignments
2. Tutorials
3. Surprise written Test with multiple choice questions

Assessment table

Assessment Tool	K1,K2,K3	K1,K2,K3	K1,K2,K3
Course outcomes	C01	C02	C03
Class Test (20 Marks)	20	0	0
Teachers Assessment (20 Marks)	08	06	06
ESE Assessment (60 Marks)	36	12	12

Designed by:

1. **Prof. S.D. Ahirrao**
2. **Prof.S.P.Atipamalu**

ET243: Electronics Devices and Circuits (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Knowledge of Applied Science, Engineering Mathematics, Basics of Electrical Engineering

Course description: This course covers fundamentals of electronic circuit components such as diode, transistor and FET. It covers different applications of these components such as rectifiers, clippers, clampers, filters, amplifiers, oscillators etc.

Course Objectives:

- To acquaint the students with construction, theory and characteristics of various electronic devices
- To lay a strong fundamental base of discrete electronics.
- To emphasis on design of basic electronic circuits.
- To develop capacity to analyze and interpret different electronics circuits.

Course Outcomes
After completing the course, students will be able to:

CO1	Fundamentals of semiconductor devices
CO2	Understand working of semiconductor devices
CO3	Explain applications of semiconductor devices
CO4	Analyze semiconductor devices' models for different frequencies
CO5	Develop the circuit boards of simple experimentation for given task

Detailed Syllabus:

Unit 1	**Diode and Circuits** PN junction diode and its characteristics, load line concept, piecewise linear diode model, Diode applications:Rectifier Circuits, Filter, Voltage Multiplier, Clipper and Clamper Circuits, Zener Diode Circuits.
Unit 2	**BJT (Bipolar Junction Transistor)** NPN Transistor, PNP Transistor, Current–Voltage Characteristics, Transistor Configuration, Biasing and stability, h-parameters, transistor amplifier, Hybrid – π parameter.
Unit 3	**FET(Field Effect Transistor)** JFET Characteristics, small signal model, MOSFET, low frequency Common Source and Common Drain amplifiers.
Unit 4	**Transistor Applications** Classification of Amplifiers, Frequency response of cascaded amplifier, Feedback Amplifiers: classification of feedback amplifiers, concept, general characteristics of negative feedback amplifier, Oscillators: Barkhausen Criteria, Oscillators and Multi vibrators.
Unit 5	**Power Amplifiers** Power Amplifiers, Power Transistors, Power BJTs, Power MOSFETs, Heat Sinks, design of heat sinks, Classes Of Amplifiers, ClassA Operation, ClassB Operation, ClassAB Operation,ClassC Operation, ClassA Power Amplifiers, ClassAB Push Pull Complementary Output Stages.

Text and References

1. Boylestad & Nashelsky, Electronics Devices & Circuits, Pearson Education
2. Millman & Halkias, Electronic Devices & Circuits, TMH
3. A.P. Malvino, Electronics Principles, McGrawHill
4. Streetman, Solid State Electronics Devices Pearson Education, (Module I to IV)
5. D.A.Neamen, Electronic circuit analysis and design, TMH, (Second edition)

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	2			2							
CO3	2	2	3		2							
CO4	1	2			2							
CO5	1	2	3	2	1					1		

1 – High 2 – Medium 3 - Low

Teacher's Assessment:

Teachers Assessment of 20 marks is based on

a) Mini project for developing circuit board to attain CO5

&

b) One of the / or combination of few of following
   1) Simulation
   2) Application development
   3) Power point presentation of case studies
   4) Question & answer / Numerical solution
   5) Study of Industry processes and its presentation

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	10	00	18
K2	Understand	10	05	36
K3	Apply	00	15	06
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	K1	K2	K2	K3	K3
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	10	05	05	00	00
Teachers Assessment (20 Marks)	00	02	03	05	10
ESE Assessment (60 Marks)	18	18	18	06	00

Designed by

1. **Prof. P. H. Bhagat**

ET-247: Lab Electronics Devices and Circuits	
Teaching Scheme **Practical: 4 Hrs/Week** **Total Credits : 02**	**Examination Scheme** **Term Work : 25 Marks** **Practical Examination** **& Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Perform and plot characteristics of semiconductor devices
CO2	Execute frequency response of amplifiers
CO3	Implement semiconductor devices circuits for various parameter measurements
CO4	Demonstrate applications of BJT

List of Experiments

Sr. No.	Details
1	To study Voltage Regulation using Zener Diode and Transistor.
2	To calculate Efficiency and Ripple Factor in case of Half Wave, Full Wave & Bridge Rectifier and to observe the effect of different loads and filters on output voltage and current.
3	To calculate h Parameter of PNP Transistor in Common Emitter mode.
4	To Implement Biasing Techniques of Transistor (BJT) (Fixed Bias Method, Collector to base bias, Emitter Resistor and Potential Divider Bias methods.)
5	To Plot Transistor Characteristics in CE configuration.
6	To plot frequency response of Common Emitter Transistor Amplifier and calculate Bandwidth.
7	To plot transfer characteristics of FET Amplifier.
8	To plot VDS *vs* ID for different values of VGS MOSFET Characteristics Amplifier.
9	To study Frequency response of a FET in common source amplifier
10	To Implement Oscillators circuits.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2	2							
CO2	2			2	2							
CO3	2			2	2							
Co4	2			2	1							

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S2	S2	S2	S3
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	10	05	05	05
Practical Examination & Viva Voce (25 Marks)	10	05	05	05

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**Term Work**	**Practical Examination & viva voce**
S1	Imitation	00	00
S2	Manipulation	20	20
S3	Precision	05	05
S4	Articulation	00	00
55	Naturalization	00	00
Total		25	25

Preparation (S1)	00	00
Conduct of Experiment (S2)	10	10
Observation and Analysis of Results (S3)	05	05
Mini-Project / Presentation/ Viva-Voce (S2)	10	10
Total	**25**	**25**

Designed by

1. **Prof. P. H. Bhagat**

ET244: Signals and Systems (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Knowledge of Engineering Mathematics

Course description: Signals and Systems is an introduction to analog and digital signal processing, a topic that forms an integral part of engineering systems in many diverse areas. The course presents and integrates the basic concepts for both continuous-time and discrete-time signals and systems. Signal and system representations are developed for both time and frequency domains. Representations of Fourier representations, Laplace and Z .Applications are drawn broadly from engineering and physics, including feedback and control, communications, and signal processing.

Course Objectives:

- To explain the fundamental properties of linear systems.
- To know CT & DT Signals and Systems and their mathematical representation
- To use FT, LT and ZT to understand signal in frequency domain
- To Develop mathematical skill for solving problem
- To Illustrate the Concept of random signals

Course Outcomes :
After completing the course, students will able to:

CO1	Identify the importance of signals and systems, its properties, the role of convolution in the analysis of linear time invariant systems
CO2	Understand System Analysis in Frequency Domain
CO3	Understand the concepts of stability, causality, Laplace transforms, Z Transform
CO4	Understand the fundamentals of sampling, including the implications of the sampling theorem
CO5	Analyze the Probability, Random Variables, Random Signals and their practical Applications

Detailed Syllabus:

Unit 1	Continuous time (CT) signals, Discrete time (DT) Signals, Classification of CT and DT Signals, CT and DT Systems, Basic Properties of the systems- Linear Time-Invariant Systems and properties. Transfer function, frequency response, Ideal vs realizable LPF, HPF and BPF characteristics
Unit 2	Sampling theorem, Graphical and analytical proof for Band Limited Signals, Impulse-train sampling, Natural and Flat-top Sampling, Reconstruction of signal from its samples, Under-sampling and Aliasing, Band-pass Sampling Theorem, DT signal characteristics.
Unit 3	Fourier Analysis of Continuous Time Signals and Systems, Fourier Series, Fourier Transform and properties, Frequency response of LTI systems. Fourier Analysis of Discrete Time Signals and Systems, Discrete Time Fourier series, Discrete Time Fourier Transform and properties. Frequency response of discrete time LTI systems.
Unit 4	Laplace Transform and its properties, Application of Laplace transform Z Transform and its properties, stability criteria, Application of Z Transform
Unit 5	Introduction to probability, Bayes Theorem, concept of random variable, probability density and distribution functions, function of a random variable. Moments, Independence of random variables, Introduction to random process, Auto and cross correlation, wide-sense stationary, power spectral density, White noise, Random processes through LTI systems.

TEXT AND REFERENCE BOOKS

1. Simon Haykins and Barry Van Veen, Signals and Systems, 2nd Edition, Wiley India.
2. Ravikumar, Introduction to signals and systems, PHI.
3. B.P. Lathi, Linear Systems and Signals, 2nd Edition, Oxford University Press, 2004.
4. Peyton Peebles, Probability, Random Variable, Random Processes, 4th Edition, Tata McGraw Hill.
5. A.V. Oppenheim, A.S. Willsky and I.T. Young, Signals and Systems, Prentice Hall, 1983.
6. M. J. Roberts, Signals and Systems - Analysis using Transform methods and MATLAB, Tata McGraw Hill Edition, 2003.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2	1										
CO3	2	3										
CO4	3											
CO5	1	2										

1 – High 2 – Medium 3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Simulation
2) Power point presentation of case studies
3) Question & answer / Numerical solution

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	05	05	12
K2	Understand	10	05	36
K3	Apply	05	10	12
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	K1	K2	K2	K1	K3
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	03	07	08	02	00
Teachers Assessment (20 Marks)	03	07	08	02	00
ESE Assessment (60 Marks)	06	18	18	06	12

Special Instructions if any: Nil

Designed by

1. **Prof N. R. Kolhare**

ET248: Lab Signal and Systems	
Teaching Scheme **Practical: 2 Hrs/Week** **Total Credits : 01**	**Examination Scheme** **Term Work : 25 Marks** **Practical Examination & Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course using MATLAB/LABVIEW/PSPICE, students will able to:

CO1	Build mathematical modeling of signals and systems
CO2	Simulate continuous and discrete time system
CO3	Execute frequency response of FT/DFT/filters, transfer order.

List of Experiments

Sr. No.	Details
1	Signals and their properties: Demonstration of different signals and their properties. There are five sub experiments within this experiment.
2	System and their property: Demonstration of salient properties systems. There are three sub-experiments within this experiment.
3	Fourier analysis of signals: Analysis of Fourier properties of signals. There are six sub-experiments within this experiment.
4	Sampling and signal reconstruction: Demonstration of sampling/reconstruction of signals and spectral analysis using DFT. There are five sub-experiments within this experiment.
5	Analysis of LTI system response: Time domain convolution autocorrelation and cross correlation of sequences(signal manipulation, continuous and discrete time convolution)
6	Fourier Transform/ DFT and signal Analysis find the Fourier transform of a signal. Plot its amplitude and phase spectrum.
7	Compute probability and random signal.
8	Write a program to find the trigonometric Fourier series coefficients of a periodic signal. Reconstruct the signal by combining the fourier series coefficients with appropriate weightings
9	Laplace Transform and Inverse Laplace transform, ZT and IZT.
10	Verification of wiener-khinchin relation.
11	Frequency response of Filters (Transfer function usage, filter types and bode plots)
12	Filtering of audio signal processing in MATLAB (Manipulation of .wav file), introduction to digital image processing using MATLAB lab, introduction to communication using MATLAB.

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3		2								
CO2	2	3		2								
CO3	2	1		2								

1 – High 2 – Medium 3 – Low

Assessment Table

Assessment Tool	S2	S1	S3
	CO1	CO2	CO3
Term Work (25 Marks)	05	10	10
Practical Examination & Viva Voce (25 Marks)	05	10	10

Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	05	00
S2	Manipulation	15	15
S3	Precision	05	10
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Designed by:

1. **Prof N. R. Kolhare**

ET245: Digital Electronics (Compulsory)	
Teaching Scheme **Lectures: 03 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description: After completing this course, students will have a clear and fundamental understanding of Digital systems. Topics range from an overview of Basics of Digital Electronics, Types of digital logics, different logic families and Finite State Machine

Course Objectives:

- To lay a strong base in basic principles of Numbering Systems, logic gates
- To use basic components for digital electronics design
- To Design combinational and Sequential Circuits
- To develop conceptual understanding of Logic Families

Course Outcomes
After completing the course, students will able to:

CO1	Understand fundamentals of Number Systems, Boolean algebra and minimization techniques
CO2	Design combinational and sequential digital circuits
CO3	Comprehend the Logic families and Semiconductor Memories
CO4	Illustrate and Design State Machines

Detailed Syllabus:

Unit 1	**Boolean Algebra and Logic Simplification** BCD, Octal, Hexadecimal Number systems, Conversions from one to other type, De Morgan's Theorem, 1's compliment 2'compliment of a number, BCD codes, EXCESS-3,Grey code and ASCII codes, Reduction of logic function using Boolean algebra, SOP & POS forms, canonical forms of SOP and POS equation. Karnaugh map up to 4 variables
Unit 2	**Combinational Logic Design** Code conversion, Half, Full Adders and sub tractor circuits, Binary Serial and Parallel Adder, Carry Look Ahead Adder, IC 7483, BCD Adder, Digital Comparator, Multiplexer, Demultiplexer, Encoder, Decoder, Decoder driver and multiplexed Display, other applications. Study of ALU
Unit 3	**Sequential Logic Design** S-R, clocked S-R,J-K and Master-Slave J-K flip-flops, excitation table of flip-flop, flip flop Conversions, shift registers their types and applications, Counters, Design of ripple and synchronous counters
Unit 4	**Logic Families, Interfacing and Semiconductor Memories:** TTL NAND gate, specifications, tri-state TTL, ECL, MOS, CMOS families and their interfacing, MOSFET as switch, CMOS transmission gate, Static and Dynamic RAM cell, ROM, PROM, EPROM, FLASH. Introduction to ADC and DACs
Unit 5	**Finite State Machine** Clocked synchronous state machine analysis, Clocked synchronous state machine design, Mealy and Moore machine, designing state machines using state diagrams and state table.

Text and Reference Books

1. A.P. Malvino, Digital Electronics, Mc-Graw Hill
2. W.H. Gothman, Digital Electronics-An introduction to theory and practice, PHI
3. Douglas V. Hall, Digital Circuits and Systems, McGraw Hill
4. R.P.Jain, Digital Electronics, Tata McGraw Hill
5. William I Fleatcher, An Engineering approach to digital design, PHI

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3										
CO2	2				1							
CO3	2											
CO4					2							

1 – High2 – Medium3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Simulation
2) Application development
3) Power point presentation of case studies
4) Question & answer / Logic problem solving
5) Mini projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	06	05	12
K2	Understand	10	05	30
K3	Apply	04	10	18
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	**K1**	**K3**	**K2**	**K2**
	C01	**C02**	**C03**	**C04**
Class Test (20 Marks)	06	10	00	04
Teachers Assessment (20 Marks)	05	10	00	05
ESE Assessment (60 Marks)	12	18	10	20

Designed by:

1. Prof. S.R.Hirekhan

ET249: Lab-Digital Electronics	
Teaching Scheme **Practical: 2Hrs/Week** **Total Credits : 01**	**Examination Scheme** **Term Work : 25 Marks** **Practical Examination & Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Implement logical operations using basic and universal logic gates
CO2	Perform and realize arithmetic, logic circuits using gates, ICs
CO3	Execute and realize the combinational logic circuits using gates, ICs
CO4	Perform and realize sequential logic, state machine circuits using ICs

List of Experiments

Sr. No.	Details
1	To verify of logic gates such as AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR
2	To realize logic operations using NAND /NOR
3	To reduce Karnaugh Map (SOP/POS) • Realize a code converter binary to gray • Realize a circuit to detect prime numbers in a 4-bit binary numbers • Realize a circuit to detect the numbers divisible by 03 in 4-bit binary numbers
4	To develop Adder/ Subtractor Study of 4-bit adder using IC7483
5	Multiplexer- Demultiplexer Study of 4-bit Adder using 4:1 MUX
6	To study Decoder 3:8, 4:16
7	To study Encoder 8:3, 16:4
8	To study Flip-flops D, R-S, J-K Realize conversion of JK to T, JK to D flip flop
9	To design Asynchronous counter using J-K Flip-flops
10	To study Shift Register
11	To study Decade counter/Ring counter
12	To design Synchronous Counter using J-K Flip –flops
13	To study A.L.U. such as 74181

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2				2							
CO2				2								
CO3				1	2							
CO4				1	2							

1 – High 2 – Medium 3 – Low

Assessment Table

Assessment Tool	S1	S2	S3	S2
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	05	05	10	05
Practical Examination & Viva Voce (25 Marks)	10	05	05	05

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**Term Work**	**Practical Examination & viva voce**
S1	Imitation	05	10
S2	Manipulation	10	10
S3	Precision	10	05
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Preparation (S1)	05	05
Conduct of Experiment (S2)	10	10
Observation and Analysis of Results (S3)	05	05
Mini-Project / Presentation/ Viva-Voce (S2)	05	05
Total	**25**	**25**

Designed by :

1. Prof. S.R.Hirekhan

ET246: C Programming (Compulsory)	
Teaching Scheme **Lectures: 1 Hr/Week** **Tutorials: 1 Hr/Week** **Total Credits : 02**	**Examination Scheme** **End Semester Exam : 50 Marks**

Course description: This course covers to write simple C language programs and to build skills to handle files and arrays. Topics include variables, data types, functions, control structures, pointers, strings, arrays, structures and file handling.

Course Objectives:

- To familiarize students with the means of writing efficient, maintainable, and portable code.
- To develop the concept of modular programming.
- To learn the fundamentals of C-programming language.

Course Outcomes:

After completing the course, students will able to:

CO1	Describe the C language fundamentals.
CO2	Familiarize C language for writing and executing of programs.
CO3	Apply C programming language knowledge to solve real world problems.

Detailed Syllabus:

UNIT 1	**Introduction to C Language fundamentals** Introduction to language, The C character set variables and constants, data types, keywords, Expressions, statements, Operations: Arithmetic operators, Unary operators Relational and Logical operators, The conditional operators, type conversions, casts.
UNIT 2	**Conditional execution** if, nested if, if else, switch, go to Loop execution for loop, while loop, do while loop, break, and continue. Functions - Defining a function, passing arguments to functions returning values from function, Local and Global concept.
UNIT 3	**Arrays** Definition, passing array to function, searching an element in an array, sorting an array, multidimensional array. Pointers, pointer as a variable, pointer to array, pointer as argument to function. String operation: String copy, string length, concatenation of string, string compare, String I/O, String Manipulation Functions, File handling - various file handling modes, File open, File close, File Update, File copy.

Text and Reference Books:

1. Yashwant Kanetkar," Let Us C" BPB Publications
2. E Balagurusamy, "Programming in ANSI C" Tata McGraw Hill
3. Yashwant Kanetkar, "Test Your C Skills" BPB Publications
4. Herbert Schildt,"C-The Complete Reference" Tata McGraw Hill

Mapping of Course outcome with Program Outcomes:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3	3										
CO2	2	3										
CO3	1	2	3									

1-High 2-Medium 3-Low

Assessment Pattern:

Assessment Pattern Level No.	**Knowledge Level**	**End Semester Examination**
K1	Remember	10
K2	Understand	30
K3	Apply	10
K4	Analyze	00
K5	Evaluate	00
K6	Create	00
Total Marks 50		50

Assessment table:

Assessment Tool	**K1**	**K2**	**K3**
	CO1	CO2	CO3
ESE Assessment (50 Marks)	10	30	10

Designed by-

1. **Prof. A. S. Kalambe**

ET250- Lab C Programming	
Teaching Scheme **Practical: 4 Hrs/Week** **Total Credits : 02**	**Examination Scheme** **Term Work : 25 Marks** **Practical/Viva-Voce : 25 Marks**

Laboratory Course Outcomes:

As an outcome of completing the Laboratory course, students will able to:

CO1	Perform programs on conditional and looping expressions, Arrays, Strings, Pointers and File handling.
CO2	Implement modular programs using functions.
CO3	Design and test programs to solve a given problem.

List of Experiments:

Sr. No.	Details
1	Write a program to find area, perimeter of a rectangle entered through keyboard.
2	Write a program to convert a given temperature in Celsius to Fahrenheit.
3	Write a program to find average of ten given numbers
4	If a five digit number is input through keyboard, write a program to reverse the number.
5	Write a program to find roots of a quadratic equation
6	Write a program to display Fibonacci series
7	Write a program to find Armstrong number.
8	Write a program to find factorial of a given number
9	Write a program for bubble sort.
10	Write a program for addition, subtraction and multiplication of two matrices.
11	Write a program for string operations like strlen, strcmp, strcpy
12	Write a program to compute sum of array elements using pointer.
13	Write a program to swap two numbers using pointers.
14	Write a program to count number of words, digits and vowels using pointer.
15	Write a program to count the length of string based on user defined function
16	Write a program to compare two strings based on user defined function.
17	Write a program to compute x^n based on user defined function.
18	Write a program to compute average of n numbers. (User defined function).
19	Create a file called student, add the student information in that file. Create function to update, delete and modify student's data
20	Write a program to copy the contents of one file into another.
21	Write a program to solve given problem.

Mapping of Course outcome with Program Outcomes:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2	2							
CO2	3			2	2							
CO3	2			1	1					1		3

1 – High 2 – Medium 3 - Low

Assessment Pattern:

Assessment Pattern Level No.	**Skill Level**	**Term Work**	**Practical/Viva-voce**
S1	Imitation	10	10
S2	Manipulation	10	10
S3	Precision	05	05
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Assessment Table:

Assessment Tool	S1	S2	S3
	CO1	CO2	CO3
Term Work (25 Marks)	10	10	05
Practical/Viva-voce(25 Marks)	10	10	05

Designed by-

1. **Prof. A. S. Kalambe**

GE252: Engineering Mathematics-IV (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs /Week** **Tutorial: 1 Hrs /Week** **Total Credits : 04**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description:

Engineering Mathematics-IV (GE252) is one semester course designed for second year Electronics & telecommunication Engineering, students to prepare them for use of essential mathematical concepts and techniques for engineering applications.

Course Objectives:

This course intends to provide

i) an overview of functions of complex variable which helps to solve problems in heat conduction, fluid dynamics and electrostatics.
ii) an overview of integral transform such as Fourier transform, Inverse Fourier transform and discrete transform such as Z-transform which helps them to understand the basic concepts of image processing ,analog and digital signal processing, heat transfer.
iii) an overview of statistical tools such as curve fitting, correlation and regression .

Course Outcomes:

After completion of this course students are able

CO1	To analyze harmonic and analytic functions,
	To evaluate complex integration by using Cauchy's Integral / Residue theorem
	To evaluate Contour Integrations
	To use bilinear Transformation to find the Mapping of variables.
CO2	To find Fourier Transform of non periodic functions
CO3	To apply Z-transform to solve difference equations
CO4	To find linear dependence and independence of set of vectors.
	To find Basis and dimension of a vector space.
	To find rank, nullity of a of Linear Transformation
CO5	To find best fit curve by using least square method and regression analysis.

Detailed Syllabus:

Unit 1	**Complex Variables** - Function of Complex Variables - Analytic functions, Harmonic functions, C-R equations, - Singularities and its types - Complex Integration, Cauchy's integral formula, Residues and Cauchy's residue theorem - Conformal and Bilinear transformation.
Unit 2	**Fourier transforms** - Fourier integrals, Fourier sine and cosine integrals - Fourier transform, Properties of Fourier Transform, Fourier sine and cosine transform, Inverse Fourier transform - Finite Fourier transform, Finite Fourier sine and cosine transform, Inverse Finite Fourier

	transform
Unit 3	**Z-transform** - Z- transform- definition and properties, Z- transform of elementary functions - Inverse Z- transform- definition and properties, Inverse Z- transform - Application to difference equation.
Unit 4	**Linear Algebra** - Vector spaces, Subspaces - Linear combinations and subspaces spanned by a set of vectors - Linear dependence and Linear independence - Spanning Set and Basis, Finite dimensional spaces, Dimension - Linear transformations – definition and properties, examples.
Unit 5	**Statistics** - Regression analysis: Curve fitting, least squares method, multiple regressions - Correlation analysis: Coefficient of correlation

Text Books and Reference Books:

1. Higher Engineering Mathematics by B.S.Grewal, Khanna Publication, New Delhi.
2. Advanced Engineering Mathematics by H.K.Dass, S.Chand Publication, New Delhi.
3. Advanced Engineering Mathematics (8^{th} Edition) by Erwin Kreyszing, Willey Eastern Ltd.Mumbai.
4. A text book of Engineering Mathematics (Vol-I and II) by P.N.Wartikar and J.N.Wartikar,Pune Vidhyarthi Griha Prakashan,Pune

Mapping of Course outcome with program outcomes

Corse outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1	1								3		
CO2	1	1								3		
CO3	1	1								3		
CO4	1	1								3		
CO5	1	1								3		

1- HIGH2- MEDIUM 3- LOW

Teaching Strategies:

The teaching strategy is planed through the lectures, tutorials and team based home works. Exercises are assigned to stimulate the students to actively use and revise the learned concepts which also help the students to express their way of solving the problems fluently in written form. Most critical concepts and mistakes are emphasized.

Teacher's Assessment: Teacher's Assessment of 20 marks is based on the following

1. Home Assignments
2. Tutorials
3. Surprise written Test with multiple choice questions

Assessment pattern:

Assessment Tool	K1,K2,K3	K1,K2,K3	K1,K2,K3	K1,K2,K3	K1,K2,K3
Course outcomes	C01	C02	C03	CO4	CO5
Class Test 20 Marks	10	00	00	10	00
Teachers Assessment 20 Marks	04	04	04	04	04
ESE Assessment 60 Marks	12	12	12	12	12

Designed By:

1. Prof. S.D.Ahirrao
2 . Prof. S.P.Atipamalu

ET 258: Basics of Electronics Engineering (Open Elective)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course Educational Objectives:

- To Introduce Basics of Electronics Engineering to the students from all branches of engineering
- To understand the scope of the different fields of Electronics Engineering.
- To study different sensors for better understanding the applications

Course Outcome :

Upon completion of this Course, students will be able to:

CO1	Understand the basic concept of electronics engineering
CO2	Assist in the design, operation, and troubleshooting of electronic systems.
CO3	Analyzing electronics devices and circuits.
CO4	Get knowledge of operation of various Electronics Measuring Instruments
CO5	Demonstrate proficiency in the use of electronic equipment and devices

Detailed Syllabus:

Unit 1	**Study of Electronic Components:** Study of Resistor, Types of Resistor and their construction, Color Coding of Resistor, Study of Capacitors, Types of Capacitors and their construction,Study of Various types of Inductors (Air core, Ferrite Core etc.). Study of Semiconductor Devices such as Diode, Transistor, SCR, Diac, Triac, IGBT, MOSFET, JEFET Construction, Working and Applications. Optoelectronics Devices: - LED, LED, Case study of MET2E Opt- coupler with data sheet &Application.
Unit 2	**Voltage Regulation:** Definition of rectifier, Need of rectifier, Types of rectifiers, Filters and their types. Block diagram of Voltage regulator, Zener diode as a voltage regulator, Transistorized Voltage regulator .Three terminal Voltage regulator such as IC 78XX, IC79XX. Adjustable Voltage Regulator using LM317.
Unit 3	**Digital Electronics:** Number System: Decimal, Binary, Octal, Hexadecimal & their conversions. Binary addition, subtraction, 2'S complement method for binary subtraction Logic Gates: - Study of Basic logic gate, Universal Logic Gate and their truth table. Boolean Algebra: - Study of Boolean theorems , De-Morgan's Theorem Case Study: - IC 7400, IC 7406 – Study of data sheet & Electrical Characteristics
Unit 4	**Introduction to measurements**: Units and standards of measurement and their classification, Sensing and Transduction, Measurement system, Functional elements of instruments, Signal conditioning, Sensors Measurement of Motion, Force, Torque, Power, Temperature, Acoustics, Vibration,

	Acceleration, Strain Displacement, Pressure, Flow, Level, Viscosity, Humidity, Moisture, Conductivity, Photo devices.
Unit 5	**General Purpose Electronic Equipment's:** Display devices and recorders, Data acquisition systems, , such as CRO, DVM, Counters, , Wave & Spectrum Analyzers (Block Diagrammatic Study)

Text and Reference Books

1. Cooper and Helfrick, Modern Electronic Instrumentation and Measurements, Prentice-Hall of India
2. Kalsi, Electronic Instrumentation and Measurements, TMC
3. Oliver & Cage, Electronic Measurements and Instrumentation, McGraw Hill
4. B.C. Nakra and K.K. Chaudhary, Instrumentation Measurement and Analysis,Tata McGraw Hill, 2nd Edition
5. A.K. Sawhany, Electrical and Electronic Measurements and Instrumentation, DhanpatRai& sons

Teacher Assessment:

Teachers Assessment of 20 marks is based on one of the or combination of few of following:

1) Power point presentation of case studies

2) Question & answer / Numerical solution

3) Mini Project

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3							3	3		
CO2	3	3								3		
CO3		3							3			
CO4		3							3			

1 – High2 – Medium3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Power point presentation of case studies
2) Question & answer / Numerical solution

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	10	00	20
K2	Understand	10	20	40
K3	Apply	00	00	00
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	**K2**	**K2**	**K1**	**K2**
	C01	**C02**	**CO3**	**CO4**
Class Test (20 Marks)	10	10	00	00
Teachers Assessment (20 Marks)	10	05	00	05
ESE Assessment (60 Marks)	20	20	10	10

Designed by:

1. Prof.

ET 259 : Industrial Economics and Telecommunication Regulations (Open Elective)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Course description: After completing this course, students will now the rapid growth in the telecommunication sector which has made it essential to regulate the functioning of various modes of communication and provide a thorough understanding of the basic industrial economic concepts and national telecommunication policy in an easy to comprehend style.

Course Objectives:

- To Introduce basic concepts of Economics
- To understand theories of management
- To give exposure to telecom regulation and national telecom Policy of India

Course Outcomes
After completing the course, students will able to:

CO1	Know the fundamentals of economics.
CO2	Explain management theories.
CO3	Identify of telecom policies implemented in India.
CO4	Interpret the challenges to existing International/National relationships introduced by new technologies and competition.

Detailed Syllabus:

Unit 1	**Basic Concept of Economics** Demand, supply, elasticity of demand and supply, competition, monopoly, oligopoly, monopolistic competition, causes creating categories of monopoly organization, price determination under perfect competition and monopoly, price discrimination, equilibrium of firm under competition and monopoly. Functions of money, supply and demand for money, money price level and inflation, black money, consequences, meaning, magnitude
Unit 2	**Basic Concept of Management** Planning, organization, communication, Leadership & Marketing management and marketing Mix-Product, Place, price and promotion
Unit 3	**Background to Regulation** Overview, the economics of market, privatization of publically owner enterprise, regulation, task of regulation, markets & market failure, abuse of market power and rules of regulation
Unit 4	**Framework for Regulation & Regulation Strategy** Market strategies & structure, price control, engineering and technology, legal framework, styles of regulation, instruments of regulation, funding & accountability
Unit 5	**Telecom Policies.** National Telecom policy 1994, New Telecom Policy 1999, Guidelines for Uplinking From India, Broadband policy 2004, Guidelines for Obtaining License for Providing Direct To Home(DTH) Broadcasting Services in India. TRIA Act 1997, Cable Network Act, TRIA Regulation. ITU role in global communications

Text and Reference Books

1 Patrick Welch and Gerry Welch, Economics: Theory and Practice, wiley Samuelson Economics
2 Dewt&Warma, Modern Economic theory
3 A.N Agrawal, Indian Economy
4 V.S Ramaswamy, Marketing Management
5 B.K Chatterji, Finance for non-finance mangers:
6 P. Kotler, K. Keller, A.Koshy and M. Jha, Marketing Management, a South Asian perspective
7 John Buckley, Telecommunications Regulation, Institution of Electrical Engineers © 2003, Published by: The Institution of Electrical Engineers, London, United Kingdom. (ISBN:0852964447)
8 http://www.trai.gov.in/Default.asp
9 http://www.itu.int/net/home/index.aspx
10 http://www.itu.int/net/about/index.aspx
11 Black, Telecommunications Law In The Internet Age, 2002, Elsevier

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1						3					
CO2												2
CO3												1
CO4									1			

1 – High2 – Medium3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

3) Power point presentation of case studies
4) Question & answer / Numerical solution

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	10	10	30
K2	Understand	10	10	30
K3	Apply	00	00	00
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	**K1**	**K2**	**K2**	**K2**
	C01	**C02**	**CO3**	**CO4**
Class Test (20 Marks)	10	10	00	00
Teachers Assessment (20 Marks)	00	05	10	05
ESE Assessment (60 Marks)	05	25	25	05

Designed by:

1. Prof. P.H.Bhagat

ET251 - : Network and Lines (Compulsory)	
Teaching Scheme	**Examination Scheme**
Lectures: 3Hrs/Week	**Test : 20 Marks**
Tutorial: 1 Hrs/Week	**Teachers Assessment : 20 Marks**
Total Credits : 04	**End Semester Exam : 60 Marks**

Prerequisites: Knowledge of Basics of Electrical Engineering

Course description: On completion of this course, students will have a basic and comprehensive understanding of network analysis and synthesis methods. It includes the Kirchhoff's voltage law, current law, source transformation, network analysis methods, and properties of symmetric and asymmetric network, passive filter design, attenuator, network functions, transmission line and synthesis of passive network.

Course Objectives:

To offer a basic understanding for solving circuits using KCL, KVL and network Theorems.

To know properties of symmetric and asymmetric passive network, passive filters and attenuators.

To give knowledge about network functions, stability and transmission line.

To familiarize with synthesis of networks.

Course Outcomes
After completing the course, students will able to:

CO1	Define network theorems, passive filters, network functions and stability.
CO2	Understand network analysis methods for simplifying the complex networks.
CO3	Express classification of passive networks based on function, two port parameters, network functions and synthesis of network.
CO4	Explain the parameters of transmission line.
CO5	Apply the knowledge of network analysis/ synthesis methods for a given problem.

Detailed Syllabus:

Unit 1	Voltage and Current laws (KVL/KCL). Network Analysis: Mesh, Super mesh, Node and Super Node analysis. Source transformation and source shifting. Network Theorems: Superposition, Thevenin's, Norton's and Maximum Power Transfer Theorems, Millers Theorem and its dual. (for Ac circuits)
Unit 2	Properties of two port Network: (i) Symmetrical Networks (T and Π only). Z0 and γ in terms of circuit components, open and short circuit parameters (ii) Asymmetrical Networks: Image Impedance and Iterative Impedance (L-Section only). Filters: Filter fundamentals, Constant K-LPF, HPF, BPF and BSF, m derived LPF and HPF, Concept of composite filters Attenuators: Introduction to Neper and Decibel, Relation between Neper and Decibel, Symmetrical T and Π type attenuators.
Unit 3	Terminal characteristics of network: Z, Y, h, ABCD Parameters; Reciprocity and Symmetry conditions, Applications of the parameters. Network functions for one port and two port networks, Pole-zeros of network functions and network stability.

Unit 4	Transmission line: General Equation of a transmission line, infinite line, wavelength, velocity of propagation ,distortion less line, inductance loading, reflection coefficient, reflection factor, reflection loss ,insertion loss, standing wave ratio, Impedance matching**:** quarter wave line, single stub & double stub matching using smith chart.
Unit 5	Stability theory, Hurwitz polynomials, and Positive real function, Synthesis of One Port Passive Networks: Properties of LC immittance functions, Synthesis of LC driving point immittances, Properties of RC driving point impedances, Synthesis of RC impedance or RL admittances, Properties of RL driving point impedances and RC admittances and synthesis of them.

TEXT AND REFERENCE BOOKS

1. Franklin F. Kuo, Network Analysis and Synthesis, Wiley Publications
2. M.E. Van Valkanburg, Network Analysis, PHI Publications
3. M.E. Van Valkanburg, Introduction to Modern Network Synthesis, Wiley Publications
4. C.L. Wadhawa, Network Analysis and Synthesis, New Age International Publications
5. D. Roy Chaudhary, Networks and Systems, New Age International Publications
6. Network Lines and Fields by John D Ryder; PHI, New Delhi.
7. Network Filters and Transmission Lines by AK Chakarvorty; Dhanpat Rai and Co. Publication

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3											
CO2	2	3										
CO3	2	3			3							
CO4	2											
CO5	1	2		2	2							

1 – High 2 – Medium 3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Simulation
2) Application development
3) Power point presentation of case studies
4) Question & answer / Numerical solution
5) Mini projects

Assessment Pattern

Assessment Pattern Level No.	Knowledge Level	Test	Teachers Assessment/ Assignment	End Semester Examination
K1	Remember	04	00	12
K2	Understand	16	15	42
K3	Apply	00	05	06
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	K1	K2	K2	K2	K3
	C01	C02	C03	CO4	CO5
Class Test (20 Marks)	04	16	00	00	00
Teachers Assessment (20 Marks)	00	00	13	02	05
ESE Assessment (60 Marks)	12	12	18	12	06

Special Instructions if any: Nil

Designed by:

1. **Dr. S. D. Bharkad**

ET254-Lab Network and Lines	
Teaching Scheme **Practical: 2 Hrs/Week** **Total Credits : 01**	**Examination Scheme** **Term Work : 25 Marks** **Practical Examination & Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Build circuit to verify network theorems.
CO2	Perform two port parameters measurements for given circuit.
CO3	Show characteristics of passive networks using hardware/simulation tool.
CO4	Execute frequency response of driving point functions of one port networks.

List of Experiments

Sr. No.	Details
1	To verify Thevenin's theorem for a two port network
2	To verify Maximum Power Transfer theorem
3	To plot Frequency response of low pass filters and find out, cut of frequency
4	To plot Frequency response of band pass filters and find out, cut of frequency
5	To design, build and test symmetrical T attenuator
6	To measure the 'Z' parameters of two port network
7	To measure the 'Y' parameters of two port network
8	To measure the 'h' parameters of two port network
9	To plot the frequency response of one port RC driving point function in Foster's Form
10	To plot the frequency response of one port RC driving point function in Caur's Form
11	Study experiment on driving point function of one port network
12	Study experiment on driving point function of two port network

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2			2								
CO2	2			2								
CO3	2			2	1							
CO4	2			2	2							

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S2	S2	S3	S2
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	05	05	10	05
Practical Examination & Viva Voce (25 Marks)	05	05	10	05

Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	00	00
S2	Manipulation	15	15
S3	Precision	10	10
S4	Articulation	00	00
S5	Naturalization	00	00
Total		25	25

Designed by:
1. Dr. S. D. Bharkad

ET-252 : Linear Integrated Circuits (Compulsory)	
Teaching Scheme **Lectures: 3 Hrs/Week** **Total Credits : 03**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Knowledge of Electronic Devices and Circuits

Course description: This course covers a fundamentals of Linear Integrated Circuits. It deals with characteristics of Operational amplifiers. It covers applications such as summing, precision rectifying, filtering as well as timer, PLL *etc.*

Course Objectives:

To impart knowledge of working principles of Op-amp & its applications.
To emphasize the features and advantages of integrated circuits.
To introduce the theoretical concepts and applications of analog multipliers & PLL.
To design simple filter circuits for particular application.

Course Outcomes
After completing the course, students will able to:

CO1	Define the basic concepts related to Op-amp.
CO2	Explain the working of op-amp based circuits.
CO3	Describe the working of PLL & its applications in communication.
CO4	Illustrate linear ICs to generate waveforms..

Detailed Syllabus:

Unit 1	**Op-Amp Fundamentals** Analysis & circuit design in Op-amp, DC level shifter, Output stage. An overview of different types of OPAMP, their peculiarities and application areas. Review of Op-amp parameters, Frequency response, offset nulling techniques, inverting, and non-inverting configurations.
Unit 2	**Op-Amp Applications** Summing amplifier, Difference amplifier, Instrumentation amplifier and applications, Integrator, Differentiator and applications. V to I and I to V converter, Comparators, Limitations of Op-amp as Comparator, Schmitt trigger, Comparator IC such as LM339, Bandwidth and slew rate limitations, Precision rectifiers, Peak detector.
Unit 3	**Signal Generators** Sine wave generators, Triangular wave generators, Saw tooth generators, V to F and F to V converters, function generator IC 8038 , Multi vibrators using IC 555
Unit 4	**Active Filter Design** All types of filter responses, First order active filters LP and HP, BPF, band reject and bi quad filters, sensitivity analysis.
Unit 5	**Non-linear Applications and Phase Locked Loops** Introduction to Log/Antilog amplifiers and Analog multipliers, Block diagram of PLL Phase Detector, LPF, VCO ,Block diagram of PLL IC 565 free running frequency, lock range, capture range, Transfer characteristics of PLL, Applications of PLL - Frequency synthesizer, FM demodulator, AM demodulator, FSK demodulator

Text and Reference Books

1. D.RoyChoudhary, Shail Jain, Linear Integrated Circuits, New Age International
2. MilimanHykin, Integrated Circuits, TMH.
3. GovindDaryanani, Principles of Active Network Synthesis and Design, John Wiley and Sons
4. Ramakant A. Gaikwad, Op-Amps and Linear Integrated Circuits, PHI
5. Sergio Franco, Design with Operational Amplifiers and Analog Integrated Circuits, TMH, Third Edition

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2											
CO2	2		3									
CO3	2	3										
CO4	2	3	2									

1 – High2 – Medium3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Simulation
2) Application development
3) Power point presentation of case studies
4) Question & answer / Numerical solution
5) Mini projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	05	05	12
K2	Understand	15	15	48
K3	Apply	00	00	00
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	K1	K2	K2	K2
	C01	C02	C03	CO4
Class Test (20 Marks)	05	15	00	00
Teachers Assessment (20 Marks)	00	15	05	00
ESE Assessment (60 Marks)	12	18	12	18

Special Instructions if any: Nil

Designed by:

1. **Prof. S.B.Gundre**

ET-255: Lab Linear Integrated Circuits Laboratory	
Teaching Scheme **Practical: 4 Hrs/Week** **Total Credits : 02**	**Examination Scheme** **Term Work : 50 Marks** **Practical Examination & Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Imitate measurement of op-amp parameters & its applications.
CO2	Execute wave generator circuit.
CO3	Demonstrate the working of multivibrator using IC555.

List of Experiments

Sr. No.	Details
1	To measure operational amplifiers parameters.
2	To build Inverting, noninverting amplifier based on OPAMP
3	To design Summing amplifier / subtractor based on OPAMP
4	To design Integrator / Differentiator based on OPAMP.
5	To build Frequency response of active filter (LP/HP)
6	To design Voltage to current converter
7	To design Waveform generator 8038
8	To assemble and plot the output waveform for multivibrators using IC555
9	To assemble Zero crossing detector and observe the input output waveforms.
10	To study PLL 565

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	3			2								
CO2	3			2	2							
CO3	3			2	2							

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S1	S2	S3
	CO1	CO2	CO3
Term Work (50 Marks)	25	20	05
Practical Examination & Viva Voce (25 Marks)	10	10	05

Assessment Pattern

Assessment Pattern Level No.	Skill Level	Term Work	Practical Examination & viva voce
S1	Imitation	25	10
S2	Manipulation	20	10
S3	Precision	05	05
S4	Articulation	00	00
55	Naturalization	00	00
Total		50	25

Designed by:
1. Prof. S.B.Gundre

ET253: Analog Communication Theory (Compulsory)	
Teaching Scheme **Lectures : 04Hrs/Week** **Total Credits : 04**	**Examination Scheme** **Test : 20 Marks** **Teachers Assessment : 20 Marks** **End Semester Exam : 60 Marks**

Prerequisites: Nil

Course description: After completing this course, students will have a clear and fundamental understanding of Communication theory. Topics range from an overview of Basics of Digital Electronics, Types of digital logics, different logic families and Finite State Machine

Course Objectives:

- To provide students with basics of analog communication principles
- To emphasize Analog modulation and demodulation techniques.
- To emphasize Performance of communication circuits in presence of noise
- To emphasize Modern trends in communication systems and transmitter/receiver circuits.

Course Outcomes
After completing the course, students will able to:

CO1	Understand and explain AM, SSB systems and their quantitative analysis
CO2	Comprehend angle modulation and demodulation circuits
CO3	Understand the effects of noise in angle modulation circuits and noise reduction techniques
CO4	Understand and illustrate radio transmitter/receiver circuits and basic digital communication techniques

Detailed Syllabus:

Unit 1	**Amplitude Modulation** Introduction to communication system, Need for modulation, Frequency Division Multiplexing, Amplitude Modulation, Definition, Time domain and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves, Switching modulator, Detection of AM Waves; Square law detector, Envelope detector, Double side band suppressed carrier modulators, time domain and frequency domain description, Generation of DSBSC Waves, Balanced Modulators, Ring Modulator
Unit 2	**SSB Modulation** Frequency domain description, Frequency discrimination method for generation of AM SSB Modulated Wave, Time domain description, Phase discrimination method for generating AM SSB Modulated waves. Demodulation of SSB Waves, Vestigial side band modulation: Frequency description, Generation of VSB Modulated wave, Time domain description, Envelope detection of a VSB Wave pulse Carrier, Comparison of AM Techniques, Applications of different AM Systems.
Unit 3	**Angle Modulations** Basic concepts, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Waves, Direct FM, Detection of FM Waves: Balanced Frequency discriminator, Zero crossing detector, Comparison of FM and AM.

Unit 4	**Noise in Analog Modulation** Noise in Analog communication System, Noise in DSB and SSB System, Noise in AM System, Noise in Angle Modulation System, Threshold effect in Angle Modulation System, Pre-emphasis and de-emphasis.
Unit 5	**Pulse Modulation and Radio Transmitters & Receivers** Types of Pulse modulation, PAM (Single polarity, double polarity) PWM: Generation and demodulation of PWM, PPM, Generation and demodulation of PPM, Time Division Multiplexing. Radio Receiver & Frequency Synthesis –Receiver Types - Tuned radio frequency receiver, Super-heterodyne receiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, AGC, FM Receiver, Comparison with AM Receiver, Amplitude limiting.

Text and Reference Books

1. 1 Simon Haykin, Analog and Digital Communications, John Wiley, 2005
2. George F. Kennedy, Electronic Communication System, Tata McGraw Hill.
3. F.E.Terman, Electronics and Radio Engg, Mc- Graw Hill.
4. R. Coolen, Electronic Communications, PHI
5. K. Sam Shanmugam ,Analog and Digital Communication, Willey ,2005
6. Wayne Tomasi, Electronics Communication Systems-Fundamentals through Advanced, PHI, 5th Edition, 2009

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	2	3	2									
CO2	2			1								
CO3							2					
CO4	2		2			3						

1 – High, 2 – Medium, 3 - Low

Teacher's Assessment: Teachers Assessment of 20 marks is based on one of the / or combination of few of following

1) Simulation
2) Application development
3) Power point presentation of case studies
4) Question & answer / Numerical solution
5) Study of Industry processes and its presentation
6) Mini projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Test**	**Teachers Assessment/ Assignment**	**End Semester Examination**
K1	Remember	08	05	10
K2	Understand	12	15	50
K3	Apply	00	00	00
K4	Analyze	00	00	00
K5	Evaluate	00	00	00
K6	Create	00	00	00
Total Marks 100		20	20	60

Assessment table

Assessment Tool	**K1**	**K2**	**K2**	**K2**
	C01	**C02**	**C03**	**CO4**
Class Test (20 Marks)	14	06	00	00
Teachers Assessment (20 Marks)	05	10	00	05
ESE Assessment (60 Marks)	10	30	10	10

Designed by:
1.Prof. S.R.Hirekhan

ET256: Lab-Analog Communication Theory	
Teaching Scheme **Practical: 2Hrs/Week** **Total Credits : 01**	**Examination Scheme** **Term Work : 25 Marks** **Practical Examination & Viva Voce: : 25 Marks**

Laboratory Course Outcomes

As an outcome of completing the Laboratory course, students will able to:

CO1	Implement and realize AM/SSB modulation/demodulation circuits
CO2	Demonstrate and realize angle modulation and demodulation circuits
CO3	Perform and implement basic digital communication circuits
CO4	Develop and implement radio transmitter/receiver circuits

List of Experiments

Sr. No.	Details
1	Amplitude Modulation and Demodulation
2	DSB SC Modulation and Demodulation
3	SSB SC Modulation and Demodulation
4	Frequency Modulation and Demodulation
5	Pre Emphasis - De Emphasis Circuits
6	Verification of Sampling Theorem
7	PAM generation and Reconstruction
8	PWM and PPM: Generation and Reconstruction
9	Frequency Division Multiplexing
10	Design of Mixer
11	Synchronous Detector
12	Phase Locked Loop
13	Diode Detector Characteristics
14	AGC Characteristics

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1				2	3							
CO2				1	2						3	
CO3				2	3							
CO4				2	3							

1 – High 2 – Medium 3 - Low

Assessment Table

Assessment Tool	S1	S2	S3	S2
	CO1	CO2	CO3	CO4
Term Work (25 Marks)	05	10	05	05
Practical Examination & Viva Voce (25 Marks)	10	05	05	05

Assessment Pattern

Assessment Pattern Level No.	**Skill Level**	**Term Work**	**Practical Examination & viva voce**
S1	Imitation	05	10
S2	Manipulation	15	10
S3	Precision	05	05
S4	Articulation	00	00
55	Naturalization	00	00
Total		25	25

Preparation (S1)	05	10
Conduct of Experiment (S2)	15	10
Observation and Analysis of Results (S3)	05	05
Mini-Project / Presentation/ Viva-Voce (S3)	00	00
Total	**25**	**25**

Designed by:
1. Prof. S.R.Hirekhan

ET 257 : Electronics Workshop-I	
Teaching Scheme **Lectures: 4 Hrs/Week** **Total Credits : 02**	**Examination Scheme** **Termwork : 50 Marks** **Practical /Viva-voce : 25 Marks**

Prerequisites: Nil

Course description: The aim of this course is to enable the student to comprehend the principles of modern manufacturing processes and to acquire competency in the design, construction and documentation of electronic equipment.

Course Objectives:

- Understand the design processes and production methods
- Understand the use of software techniques and thermal analysis techniques in the design, simulation and manufacture of an electronic circuit
- Understand the use and application of surface mount technology in the manufacture of an electronic circuit
- Be able to design and manufacture a prototype printed circuit board and use it to assemble and test an electronic circuit

Course Outcomes
After completing the course, students will able to:

CO1	Identify electronic components and study their specifications.
CO2	Build a printed circuit board for given specifications.
CO3	Execute PCB design with new software techniques.

Detailed Syllabus:

A group of three or four students shall select a topic from the field of Electronics and Telecommunication engineering. They have to build a system and test it.
Term Work: It will consist of a report based on the study and actual work done on the selected topic, which will cover theoretical and analytical study of the system, specifications, applications, results etc.
The term work shall consist of following
1 Software Approach for PCB Design
2 PCB Artwork and Layout Design
3 PCB Fabrication
4 Mini Project

Mapping of Course outcome with Program Outcomes

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	1											
CO2			1	2								
CO3					1	3						

1 – High2 – Medium3 - Low

Teacher's Assessment: Teachers Assessment of 50 marks is based on one of the / or combination of few of following

1) Simulation
2) Application development
3) Question & answer / Numerical solution
4) Study of Industry processes and its presentation
5) Mini projects

Assessment Pattern

Assessment Pattern Level No.	**Knowledge Level**	**Term 98work**	**Practical/ Viva-voce**
S1	Imitation	10	10
S2	Manipulation	40	15
S3	Precision	00	00
S4	Articulation	00	00
55	Naturalization	00	00
S1	Imitation	00	00
Total Marks 75		50	25

Assessment table

Assessment Tool	**S1**	**S2**	**S2**
	C01	**C02**	**C03**
Termwork	10	20	20
Practical / Viva-voce	10	10	05

Preparation (S1)	10	10
Conduct of Experiment (S2)	25	10
Observation and Analysis of Results (S3)	00	00
Record (S2)	15	05
Mini-Project / Presentation/ Viva-Voce (S3)	00	00
Total	**50**	**25**

Designed by:

1. **Prof. P. H. Bhagat**