SHIVAJI UNIVERSITY, KOLHAPUR

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Accredited by NAAC 'A' Grade

Syllabus for

Second Year, Bachelor of Technology (S.Y.B. Tech.)
Electronics & Telecommunication Engineering Program
(w. e. f. Academic Year: 2019-20)

Semester III

Sr. No	Code No.	Subject	Semester	Credits
1.	BSC-ETC301	Engineering Mathematics-III	3	4
2.	PCC-ETC-301	Electronic Circuit Design-I	3	5
3.	PCC-ETC302	Network Analysis	3	4
4.	PCC-ETC303	Transducers and Measurement	3	4
5.	PCC-ETC304	Analog Communication	3	4
6.	PCC-ETC305	Programming Lab-I	3	3
7.	MC-ETC-301	Environmental Studies	3	3
		Total		27

**over and above credit

Semester IV

Sr. No	Code No.	Subject	Semester	Credits
1.	PCC-ETC401	Electronic Circuit Design-II	4	5
2.	PCC-ETC402	Linear Integrated Circuits	4	5
3.	PCC-ETC403	Control System Engineering	4	3
4.	PCC-ETC404	Digital Communication	4	4
5.	PCC-ETC405	Data Structures	4	3
6.	PCC-ETC406	Programming Lab-II	4	3
		Total		23

*****For Theory CIE 30 marks,**

Two tests of 30 marks at college should be conducted and best of two marks should be communicated to university.

*****Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's based on complete syllabus. (Carries 14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 Marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 Marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 Marks)

Second Year ELECTRONICS & TELECOMMUNICATION ENGINEERING – CBCS PATTERN

Semester Examination

SEMESTER - III																								
Sr. No	Course (Subject Title)	TEACHING SCHEME									EXAMINATION SCHEME													
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM WORK		
		Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Credits	No. of Lecture	Hours	Hours	Mode	Marks	Total Marks	Min	Hours	Max	Min	Hours	Max	Min
1	BSC-ETC301	3	3	3	1	1	1	-	-	-		CIE	30	100	12	As per BOS Guidelines	-	-	2	25	10
												ESE	70		28						
2	PCC-ETC301	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
3	PCC-ETC302	3	3	3	1	1	1	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
4	PCC-ETC303	3	3	3	-	-	-	1	2	2		CIE	30	100	12				2	25	10
												ESE	70		28						
5	PCC-ETC304	3	3	3	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
6	PCC-ETC305	2	2	2	-	-	-	1	2	2		-	-	-	-		50	20	2	25	10
7	MC-ETC 301	3	3	3	-	-	-	-	-	-		CIE	30	100	12		-	-	-	-	-
												ESE	70		28						
	TOTAL	**21**	**21**	**21**	**2**	**2**	**2**	**4**	**8**	**8**				**600**			**150**			**150**	
SEMESTER –IV																								
1	PCC-ETC401	4	4	4	-	-	-	1	2	2		CIE	30	100	12	As per BOS Guidelines	50	20	2	25	10
												ESE	70		28						
2	PCC-ETC402	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
3	PCC-ETC403	3	3	3	-	-	-	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
4	PCC-ETC404	3	3	3	-	-	-	1	2	2		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
5	PCC-ETC405	3	3	3	-	-	-	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
6	PCC-ETC406	2	2	2	-	-	-	1	2	2							50	20	2	25	10
		-	-	-	-	-	-	-	-	-							-	-		-	-
	TOTAL	**19**	**19**	**19**	**2**	**2**	**2**	**4**	**8**	**8**				**500**			**150**			**150**	
	TOTAL	**40**	**40**	**40**	**2**	**2**	**2**	**8**	**16**	**16**				**1100**			**300**			**300**	

CIE- Continuous Internal Evaluation ESE – End Semester Examination

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for S.E. Sem III & IV : **1600**

• Theory and Practical Lectures : 60 Minutes	• Total Credits for S.E. Sem III & IV : **50**
• In theory examination there will be a passing based on separate head of passing for examination of CIE and ESE.	
• There shall be separate passing for theory and practical (term work) courses.	

Note:

1. **BSC-ETC**: Basic Science Course- Electronics & Telecommunication Engineering are compulsory.
2. **PCC-ETC:** Professional Core course – Electronics & Telecommunication Engineering are compulsory.
3. **MC-ETC:** Mandatory Course**:** Environmental Studies which is compulsory for theory 70 marks and project work 30 marks.

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ENGINEERING MATHEMATICS-III

Course Details

Class	**S. Y. B. Tech. Sem - III**
Course Code and Course Title	**BSC-ETC 301: Engineering Mathematics -III**
Prerequisites	**Basic Trigonometry, Derivative and Integration, Basic Probability.**
Teaching scheme :Lectures + Tutorial	**3 Hrs + 1 Hr**
Credits	**3 + 1**
Evaluation scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching scheme	**Examination scheme**
Lectures :3 Hrs/week	**Theory : 100 Marks,** **70 (ESE) + 30 (CIE)**
Tutorial : 1 Hr/week	**TW: 25 Marks**

Course Objectives: The course aims to :	
1	To develop mathematical skills and enhance thinking power of students
2	To give the knowledge to the students of fuzzy set theory, Linear Differential Equations probability ,Laplace transforms ,Fourier series with an emphasis on the application of solving engineering problems
3	To prepare students to formulate a mathematical model using engineering skills & interpret the solution in real world.

Course Outcomes: Upon successful completion of this course ,the students will be able to:	
1	Make use of Linear Differential Equations to solve the Electrical Engineering problems.
2	Apply knowledge of vector differentiation to find directional derivatives, curl and divergence of vector fields.

3	Define fuzzy sets using linguistic words and represent these sets by membership functions, convexity, Normality, support, etc.
4	Develop Fourier series expansion of a function over the given interval.
5	Find Laplace transforms of given functions and use it to solve linear differential equations.
6	Solve basic problems in probability theory, including problems involving the binomial, Poisson, and normal distributions

Course content		
Section I		
Unit No: 1	**Linear Differential Equations (LDE) and its Applications**: Linear Differential equations with constant coefficients. Rules to find complementary function. Methods to find particular Integral (e^{ax}, sinax or cosax, x^m, $e^{ax}x^m$, $e^{ax}sinax$ or $e^{ax}cosax$) Cauchy's homogeneous linear differential equations. Applications of linear differential equations with constant coefficients to Electrical engineering.	**7 Hrs**
Unit No: 2	**Vector Differential Calculus**: Differentiation of vectors. Gradient of scalar point function. Directional derivative. Divergence of vector point function. Curl of a vector point function. Irrotational, Solenoidal and Scalar potential function of a vector field.	**7 Hrs**
Unit No: 3	**Introduction to Fuzzy sets:** Crisp set and Fuzzy set. Basic concepts of fuzzy sets Basic operations on fuzzy sets. Properties of fuzzy sets.	**7 Hrs**
Section II		

Unit No: 4	**Fourier Series:** Introduction. Definition, Euler's formulae. Dirichlet's conditions. Change of interval. Expansions of odd and even functions. Half range series.	**7 Hrs**
Unit No: 5	**Laplace Transform and its Applications:** Laplace transform of elementary functions. Properties of Laplace transforms(First Shifting , Change of scale Property, Multiplication & Division by t). Laplace transforms of derivatives and integral. Inverse Laplace transforms by partial fractions & convolution theorem. Solution of Linear differential equation with constant coefficients using Laplace transform.	**7 Hrs**
Unit No: 6	**Probability Distribution:** Random variables. Discrete Probability distribution. Continuous probability distribution. Binomial Distribution. Poisson Distribution. Normal Distribution.	**7 Hrs**

Text Books

1	B. S. Grewal , "Higher Engineering Mathematics", Khanna Publication Delhi.
2	Wartikar P. N. and Wartikar J. N. , "Applied Mathematics", Pune Vidyarthi Grah Prakashan.
3	George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic: Theory and Applications", Prentice Hall of India Private Limited.

Reference Books

1	Erwin Kreyszig, "Advance Engineering Mathematics", Wiley India.
2	Kanti B. Datta, "Mathematical Methods of Science and Engineering", Cengage Learning.
3	Jack Goldberg, "Advanced Engineering Mathematics", 3rd Edition, Oxford University Press.
4	V. Sundaram , "Engineering Mathematics", Vikas Publication.
5	B. V. Ramana, "Higher Engineering Mathematics", Tata McGraw-Hill.
6	H. K. Das, "Advanced Engineering Mathematics", S. Chand Publication.
7	Navneet D. Sangle, "Applied Mathematics", Cengage Publication

Note:

1) For the term work of 25 marks, batch wise tutorials are to be conducted. The number of students per batch per tutorial should be as per University rules.
2) Number of Tutorial should be at least six (All units should be covered).
3) **Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ELECTRONIC CIRCUIT DESIGN - I

Course Details:

Class	**S. Y. B. Tech. Sem-III**
Course Code & Course Title	**PCC-ETC 301: Electronic Circuit Design - I**
Prerequisites	**Basic Circuit Law's, Semiconductor diode, Zener diode, BJT details.**
Teaching scheme: Lecture + Practical	**4 Hrs + 2 Hrs**
Credits	**4 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 4 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Practical : 2 Hrs /week	**TW: 25 Marks** **POE: 50 Marks**

Course Objectives:	
The course aims to:	
1	Provide an introduction and basic understanding of Semiconductor Devices viz. diodes and BJT, JFET.
2	Provide basic analog electronic circuit design techniques using diodes and bipolar junction transistors and to develop analytical skills.
3	Develop student ability to apply basic engineering sciences to understand the operation & analysis of electronic circuits using diodes and bipolar junction transistors.
4	Design electronic circuits to meet the desired specifications.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
1	Analyze and design electronic circuits such as rectifiers & unregulated power supply.
2	Analyze and design electronic circuits such as regulated power supply.
3	Analyze & Design of BJT & FET Biasing.
4	Explain the hybrid model of transistor and analyze the transistor amplifier (CE, CB, CC) using h-parameters
5	Analysis of CE Amplifier for low frequency & High frequency response for sinusoidal & square wave input.
6	Analyze & Design LPF, HPF, Clipper, Clampers, Multipliers

Course Contents		
Unit No: 1	**Wave Shaping Circuits** Low pass & high pass RC circuits (analysis for step, square input), High pass RC circuit as a differentiator, Sag/Tilt calculation, Low pass RC circuit as integrator (Step & Square Input), Clipping circuits: Single Level & Double level Clipping, Transfer characteristics, Clamping circuits: Classification, clamping operations, Clamping circuit theorem, practical clamping circuits, voltage multipliers (Doubler & Tripler).	**8 Hrs**
Unit No: 2	**Unregulated Power Supplies** Rectifiers: Half wave, full wave: center tap and bridge type, analysis for different parameters: PIV, TUF, efficiency, ripple factor, regulation, form factor etc. Filters: Need of filters, Types: capacitor, inductor, LC, CLC, and Analysis for ripple factor. Design of unregulated power supply with filter using full wave rectifier.	**8 Hrs**
Unit No: 3	**Voltage Regulators** Need of voltage regulator, Stabilization factors, Analysis & Design of Shunt regulator (using Zener diode & BJT), emitter follower regulator, series pass voltage regulator (using BJT), Pre- regulator & Overload	**8 Hrs**

	protection circuit.	
Unit No: 4	**BJT & FET Biasing** Introduction to BJT, Need of Biasing, Stability factor, Biasing of CE Configuration- Fixed Bias, Collector to Base Bias & Voltage Divider Bias (Analysis & Design), FET: Introduction to JFET, Biasing of CS configuration- Fixed Bias, Self Bias (Analysis of the same).	**8 Hrs**
Unit No: 5	**Voltage Amplifiers** H-Parameters, Hybrid model for transistor (CE, CB& CC Configuration), CE Amplifier equations for Voltage Gain, Current gain, Input resistance & Output resistance taking Rs of source into account.	**8 Hrs**
Unit No: 6	**Frequency Response of Single Stage RC Coupled Amplifier** Low frequency response: Effect of Coupling capacitor(CC) & Emitter bypass capacitor(CE), High frequency response: Hybrid π model , Derivation for CE short circuit & resistive current gain, β cutoff, α cutoff frequency, amplifier high freq. response to square wave ,gain bandwidth product, (Numerical are expected). Design of single stage RC coupled amplifier.	**8 Hrs**

Text Books:

1	Allen Mottershed, “Electronic Devices & Circuits”, Prentice- Hall India
2	Salivahanan, N Sureshkumar, “Electronic Devices & Circuits”, Tata McGraw Hill Publication
3	Robert L. Boylsted, Louis Nashelsky, “Electronic Devices & Circuit Theory”, Pearson Education
4	J. Millman & C.Halkias, “Electronic Devices & Circuits”, Tata McGraw Hill Publication

Reference Books:

1	David A. Bell, “Electronic Devices & Circuits”, Oxford University
2	Millman Taub, “Pulse Digital And Switching Circuits”, Tata McGraw Hill 2nd edition
3	R. S. Sedha, “A Text Book Of Applied Electronics”, S. Chand

List of Experiments (Minimum 10 experiment):

1	Design and study the performance of Low pass filter: a. Frequency response for sinusoidal input b. Integrator for Square wave input
2	Design and study of High pass filter: a. Frequency response for sinusoidal input b. Differentiator for Square wave input
3	Study of clipper circuits (Series/ Shunt).
4	Study of clamping circuits (Positive & Negative Type).
5	Design and Study of full wave rectifier with capacitive filter.
6	Design and Study of full wave rectifier with inductive filter.
7	Design and Study of Zener shunt regulator
8	Design and Study of transistorized shunt regulator
9	Design and Study of emitter follower regulator
10	Design and Study of series pass voltage regulator
11	Determination of H-parameter for CE configuration using input and output Characteristics.
12	Simulation of FWR using C-filter
13	Design and Study of Single stage RC-Coupled Amplifier
14	Simulation of Single stage RC-Coupled Amplifier (eSim Software)

Note:

1) Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

NETWORK ANALYSIS

Course Details:

Class	**S. Y. B. Tech. Sem-III**
Course Code & Course Title	**PCC-ETC 302 : Network Analysis**
Prerequisites	**Fundamentals of Network Elements**
Teaching scheme: Lecture + Tutorial	**3 Hrs + 1 Hr**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Tutorial : 01Hr /week	**TW: 25 Marks**

Course Objectives:	
The course aims to:	
1	To understand basic theorems used for network analysis.
2	To understand two port networks and its parameters
3	To understand series and parallel resonance and its effects
4	To understand system behavior using pole zero plot
5	To understand and implement filter approximations

Course Outcomes: Upon successful completion of this course, the student will be able to:	
1	Analyze AC and DC circuits using different network Theorems and Apply graph theory to solve network equations
2	Identify and analyze the series, parallel resonance circuits, calculate the bandwidth, selectivity factor also
3	Evaluate two port parameters and Understand network transfer functions in s-domain
4	Analyze and design prototype LC filters.
5	Evaluate initial conditions and solve differential equation for RL, RC, and RLC circuits and carry out transient analysis.

Course Contents		
Unit No: 1	**Network Fundamentals** Network Elements & its types, Energy sources, KVL & KCL, series & parallel connection of passive elements (R, L, C) , Combination of energy sources, Current Division & Voltage division, source transformation, Star-Delta transformation, Mesh & Super mesh analysis, Node & super node analysis Graph Theory: graph of network & its parts, tree & co-tree, incidence matrix, Tie Set matrix, cut sets	**8 Hrs**
Unit No: 2	**Network Theorems** Superposition Theorem, Thevenin's Theorem, Norton's Theorem, Maximum Power Transfer Theorem, Reciprocity Theorem, Compensation theorem, Duality theorem, Millman's Theorem	**8 Hrs**
Unit No: 3	**Resonance**	**8 Hrs**

	Definition, Types: series & parallel resonance, Series resonance-resonant frequency, variation of impedance, admittance, current & voltage across L & C with respect to. Frequency, Effect of resistance on frequency response, Selectivity, B.W. & Quality factor. Parallel resonance: Anti resonance frequency, Resonant frequency for a tank circuit, variation of impedance &admittance with frequency, Selectivity, Quality factor. & B.W. Comparison of series and parallel resonant circuits.	
Unit No: 4	**Two Port Network & Network Functions** Two port network: Z, Y, ABCD, h parameters, Interrelation of different parameters, Interconnections of port network (Series, Parallel, Cascaded, Series-Parallel), Network Functions: Network functions for one port & two port networks, Driving point impedance and admittance of one port network, Driving point impedance & admittance function, Transfer function Concept of complex frequency, significance of poles & zeros. Restrictions on poles& zeros for transfer& drawing point's function, Pole zero diagram, Time response from pole zero plot.	**8 Hrs**
Unit No: 5	**Filters** Definitions, classification & characteristics of different filters, decibel & Neper. Filter fundamental such as attenuation constant (α),phase shift(β) propagation constant (γ) and characteristic impedance(Z_o) , Design & analysis of constant K, M derived (low pass, high pass, band pass & band stop filters): T & Pi sections.	**8 Hrs**
Unit No: 6	**Transient Response** Network Solution using Laplace transforms, Initial Conditions of elements. Steady state & transient response (Voltage & Current) DC response of RL, RC and RLC circuit	**8 Hrs**

Text Books:

1	A. Sudhakar ,Shyammohan, S.Palli, "Circuit & Network – Analysis & Synthesis", IIIrd Edition – Tata McGraw Hill Publication
2	A.Chakrabarti, "Circuit Theory (Analysis & Synthesis)", IIIrd Edition Dhanpat Rai& co.

3	Ravish Singh, "Networks Analysis & Synthesis" , Tata McGraw Hill Publication
4	William H Hayt, Jack E Kimmerly and Steven M.Durbin, "Engineering Circuit Analysis", Tata McGraw Hill

Reference Books:

1	D. Roy Choudhury, "Networks & Systems", New Age International Publisher
2	Soni Gupta, "Electrical Circuit Analysis", Dhanpat Rai & Co.
3	Boylestad, "Introductory Circuit Analysis", Universal book stall, New Delhi
4	M.E.VanValkenburg, "Network Analysis", IIIrd Edition , Pearson Education / PHI
5	Josheph Edministrar, "Theory & Problems of Electronic Circuit (Schaum's series)", Tata McGraw Hill, Publication
6	R.G .Kaduskar, S.O.Rajankar, T.S. Khatavkar, "Network Fundamentals and Analysis", Wiley India. India

Note:

1) Term Work:-

Minimum 06 tutorials based on above syllabus covering all units.

2) Note for Paper setter: 40% theory and 60% numerical are expected

3) Guidelines to paper setter:-

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

TRANSDUCERS AND MEASUREMENTS

Course Details:

Class	**S. Y. B. Tech. Sem-III**
Course Code & Course Title	**PCC-ETC 303: Transducers and Measurements**
Prerequisites	**Basics of Measurement, Unit System, Standards**
Teaching scheme: Lecture + Practical	**3 Hrs + 2 Hrs**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Practical : 2 Hrs /week	**TW: 25 Marks**

Course Objectives:	
The course aims to:	
1	Provide introduction to different types of Transducers and sensors
3	Study Signal Conditioning & measurement systems
3	Provide basic understanding of different measurement & display devices.
5	Study different types of bridges

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1	Explain principle of operation of different sensors & transducers and will be able to use it for measurement of digital parameters.
2	Describe signal conditioning & data acquisition system.
3	Demonstrate testing & measuring instruments
4	Compare various display devices for appropriate application
5	Distinguish AC & DC bridges.

Course Contents		
Unit No: 1	**Transducers** Definition, Various Types of Transducers, Classification of Transducers, Selection Factors and General Applications of Transducers, Detailed Study of Transducers: (i) Motion, (ii) Flow, (iii) Pressure, (iv) Temperature, (v) Force and Torque, (vi) Sound Transducer, Hall Effect Transducers, Digital Transducers: Shaft Encoder, Digital Resolver, Digital tachometer	**7 Hrs**
Unit No: 2	**Sensors** Proximity Sensors, optical Sensors, IR sensors, Piezo – electric sensors Smart Sensors: Fiber optic sensors, Film sensors, Nano sensors, Electrochemical sensors, biosensors, MEMS	**4 Hrs**
Unit No: 3	**Signal Conditioning & Data Acquisition System** Introduction, AC & DC Signal Conditioning, Chopper Stabilized Amplifier, Instrumentation Amplifier, Isolation And Programmable Gain Amplifier, Grounding And Shielding, principles and working of different types of ADC and DAC	**7 Hrs**
Unit No: 4	**Introduction to Measurement** Introduction, Performance Characteristics, Static Characteristics, Errorin Measurement, Types of Static Error, Sources of Error, Dynamic Characteristics, Statistical Analysis, Electrical Standards, Atomic Frequency and Time Standards, Graphical	**7 Hrs**

	Representation of Measurements as a Distribution, Digital voltmeters- Introduction, Types of DVM , general specifications of DVM, digital multimeter, digital measurements of time, digital frequency meter , Q meter, Instrument calibration	
Unit No: 5	**Measurement & Display Devices** CRO: Dual Beam, Dual Traces Sampling, Digital storage, measurement of phase and frequency using Lissajous pattern, CRO probes: active, passive, current, attenuators, LED, LCD, Graphics Display, Signal Generators, Function generators. Spectrum analyzer, logic analyzer	**7 Hrs**
Unit No: 6	**Bridges** Measurement of Resistance with Bridges, Wheatstone's Bridge, Kelvin Double Bridge, AC Bridges such as Hay's Bridge, Wein Bridge, Maxwell's-Wein Bridge, Maxwell' Bridge, Descourty's Bridge & Schering Bridge	**4 Hrs**

Text Books:

1	A.K. Sawhney , "A Course In Electrical, Electronics Measurement And Instrumentation" Dhanpat Rai & Co.
2	H. S. Kalsi, "Electronic Instrumentation", 3rd Edition, MGH

Reference Books:

1	Welfrick Cooper, "Electronic Instrumentation and Measurement Techniques" Dhanpat Rai & Sons.
2	John Turner, "Instrumentation for Engineers And Scientists" , IInd Edition , Wiley India.
3	David A Bell, "Electronic Instrumentation and Measurements", IIIrd Edition, Oxford
4	James W Dally, "Instrumentation for Engineering Measurements", IInd Edition , Wiley India.
5	Krzystof Iniewski, "Smart Sensors For Industrial Applications", CRC press, Tailor & Francis

6	Brian R Eggins, "Introduction To Electrochemical Transducer", Willey India.

List of Experiments (Minimum 10):

1	Weight measurement using Strain Gauge
2	Displacement measurement using LVDT / LDR
3	Temperature measurement using RTD PT100/LM 35/ Thermistor/ Thermocouple
4	Angular Displacement measurement using Capacitive Pick-up
5	Displacement measurement using Inductive Pick-up
6	Study of CRO & DSO for Measurement of amplitude and frequency.
7	Measurement of phase and frequency by Lissajous pattern using CRO.
8	Study of function generator
9	Study of spectrum analyzer
10	Study of AC bridges
11	Study of DC bridges
12	Study of Logic analyzer
13	Study of smart sensors

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ANALOG COMMUNICATION

Course Details:

Class	**S. Y. B. Tech. Sem-III**
Course Code & Course Title	**PCC-ETC 304: Analog Communication**
Prerequisites	**Basics of baseband communication**
Teaching scheme: Lecture + Practical	**3 Hrs + 2 Hrs**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Practical : 2 Hrs /week	**TW: 25 Marks** **POE: 50 Marks**

Course Objectives:	
The course aims to:	
1	Explain basic information of Analog Communication & AM,FM modulation techniques
2	Provide the performance of analog communication system in presence of noise
3	Use information about receiver system of Analog communication
4	Understand Sampling theorem and types of pulse modulation techniques

Course Outcomes:	
Upon successful completion of this course, the student will be able to:	
1	Explain and identify the fundamental concept of analog communication systems.
2	Compare various analog modulation schemes.

3	Interpret the performance of analog communications systems under the presence of noise and Explain the operations of various receiver systems
4	Define Sampling theorem & differentiate between various pulse modulation techniques

Course Contents		
Unit No: 1	**Amplitude Modulation** Elements of electronic communication systems, Need for modulation, channel, frequency spectrum, time and frequency domain signals, Amplitude Modulation principles, AM envelope, frequency spectrum & BW, Modulation index, % modulation, AM transmitters: Block of low level DSBFC, High level DSBFC, Trapezoidal patterns Evolution and descriptions of SSB, Suppression of carrier using balanced modulator, Suppression of unwanted sideband, Methods: Filter system, phase shift & third method Vestigial sideband (VSB).	**8 Hrs**
Unit No: 2	**Angle Modulation** Instantaneous frequency, Concept of angle modulation, frequency spectrum, Narrowband & Wide Band FM, Modulation Index, Bandwidth, Phase modulation, Bessel's Function and it's mathematical Analysis, Generation of FM (Direct and Indirect Method)	**6 Hrs**
Unit No: 3	**Noise** Sources of noise, Types of noise: White noise, shot noise, thermal noise, partition noise, low frequency or flicker noise, burst noise, avalanche noise, signal to noise ratio, Noise Figure, Noise Temperature, FRISS formula for noise figure.	**4 Hrs**
Unit No: 4	**AM Receiver** Simplified block diagram of AM receiver, receiver parameters: Sensitivity, Selectivity, dynamic range, Tracking, fidelity, Types of AM receiver: TRF and Super heterodyne (block diagram), AM detection types: using diode detector, distortion in diode detector. Negative peak clipping & diagonal clipping, Demodulation of SSB, Automatic Gain Control (AGC).	**6 Hrs**

Unit No: 5	**FM Receiver** Double conversion FM receivers, block diagram, FM demodulator, tuned circuit frequency discriminators, slope detectors, fosters seeley discriminator, ratio detectors, PLL-FM demodulators, FM noise suppression.	**6 Hrs**
Unit No: 6	**Pulse Modulation** Introduction, Sampling theorem: Occurrence of aliasing error, PAM: Channel BW for PAM, Natural Sampling, Flat-top Sampling, PAM & TDM, Signal Recovery, PWM: Uses of PWM, Generation of Analog Waveform using PWM, PPM: Generation of PAM, Generation of PWM, Generation of PPM.	**6 Hrs**

Text Books:

1	George Kennedy, "Electronic Communications", McGraw Hill Kennedy.
2	Wayne Tomasi, "Electronics Communication System Fundamentals through Advanced", Vth Edition, Pearson Education.
3	V. Chandra Shekhar, "Analog Communication", Oxford University press.

Reference Books:

1	B.P. Lathi, "Analog and Digital Communication", Oxford University press.
2	Simon Haykin, "An Introduction To Analog & Digital Communications", John Wiley India. & Sons
3	R P Singh, S D Sapre, "Communication System- Analog & Digital", IInd Edition,TMH
4	Blake, "Electronic Communication Systems", IInd Edition, CENGAGE learning
5	Louis E. Frenzel, "Principals Of Electronic Communication System", IIIrd Edition., TMH

List of Experiments (Minimum 08):

1.	Practical implementation of Amplitude modulation and demodulation.
2.	SSB modulation using any method (filter method, Phase shift method) and its

	detection.
3	Performance and analysis of AM system using trapezoidal method
4.	Practical implementation of frequency modulation and demodulation.
5.	Experiment on Sampling and reconstruction and also observe aliasing effect by varying sampling frequency.
6.	Practical implementation of PAM system
7.	Practical implementation of PWM system
8.	Practical implementation of PAM-TDM systems.
9.	Practical implementation of PPM system
10.	Envelope detector- Practical diode detector.
11	Experiment on Pre-emphasis and De-emphasis.
12	Visit to AIR

Note:

1) There should be compulsory one **Industrial Visit** related to this subject & submission of visit report.

2) Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS & TELECOMMUNICATION ENGINEERING

PROGRAMMING LAB-I

Course Details:

Class	**S.Y. B. Tech. Sem-III**
Course Code & Course Title	**PCC-ETC 305: PROGRAMMING LAB-I**
Prerequisites	**Computer fundamentals**
Teaching scheme: Lecture + Practical	**2 Hrs + 2 Hrs**
Credits	**2+1**
Evaluation Scheme ESE + CIE for Theory	**NA**

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hrs /week	**Theory : NA**
Practical : 2 Hrs /week	**TW: 25 Marks** **POE: 50 Marks**

Course Objectives: The course aims to:	
1	Design the flowchart and algorithms for procedure oriented programs.
2	Develop programming skills using the fundamentals and basics of C Language, control structures and looping statements.
3	Enable the effective usage of arrays, structures, functions, pointers and to implement the memory management concepts.
4	Design and implement programs using files handling and user defined types.
5	Understand the concept of strings and relevant operations on it.
6	Understand the file and relevant operations on it.

Course Outcomes:

Upon successful completion of this course	
1	Student will be able to understand the basic concepts of procedure oriented programming language.
2	Student will be able to implement the control statements, looping statements and functions concepts.
3	Student will be able to design programs using user defined functions and data type.
4	Student will be able to design & apply the skills for solving the engineering problems.
5	Students will be able to understand the concept string & relevant operations on it.
6	Students will be able to understand the concept of file & relevant operations on it.

Course Contents		
Unit No: 1	**Programming Fundamentals** Flow chart, Algorithm, Standard notations, Selection Procedure, Loops, Sub Algorithms, Compilers, Interpreters, The Library and Linking, concept of Data Storage (Memory Concept)	**4 Hrs**
Unit No: 2	**Introduction to C** Introduction to Constants, Variables, Data Types, Operators, Expressions, Structure of C Programming, Identifiers, Decision & Loop control statements	**5 Hrs**
Unit No: 3	**Arrays and Structures** Arrays::Introduction to 1-Dimensional arrays, Declaration and Initialization of 1-Dimensional arrays, Declaration and Initialization of 2-Dimensional arrays, Declaration and Initialization of Multi-Dimensional arrays. Structures-Declaring of Structures, Accessing Structure elements, arrays of structures.	**4 Hrs**
Unit No: 4	**Functions and Pointers** Introduction of functions, Need for functions,, Multifunction Programming, Elements of functions, Definition and declaration of functions, return values and their types, function call, arguments, return	**5 Hrs**

	value, nesting and recursion Pointers- Introduction to pointers, pointer variables, Declaration and initialization of pointer variable, accessing pointer	
Unit No: 5	**Strings** Declaration and Initialization of string, Reading from Terminal, Writing to screen, Standard library string functions	**3 Hrs**
Unit No: 6	**File handling** File operation, counting character tabs, spaces, file copy program, file opening modes, text file- binary file, Real time case study.	**3 Hrs**

Text Books:

1	Yashawant Kanetkar, "Let Us C", XIIIth Edition BPB Publications
2	E Balagurusamy, "Programming in ANSI C" , Vth edition, Tata Mc Graw Hill

Reference Books:

1	Brian W. Kernighan, Dennis M. Ritchi , "The C Programming Language", IInd edition, Prentice Hall of India.

List of Experiments (Minimum 10 + Mini project):

1	Develop Program using decision control statements
2	Develop Program using control statements
3	Develop Program using loop control statements
4	Develop Program using functions
5	Develop Program using pointers
6	Develop Program using array
7	Develop Program using two dimensional arrays
8	Develop Program using structures
9	Develop Program using dynamic memory allocation
10	Develop Program using strings
11	Develop Program using any sorting technique

12	Develop Program using file handling.
13	Mini project

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ENVIRONMENTAL STUDIES

Course Details:

Class	**S. Y. B. Tech. Sem-III**
Course Code & Course Title	**MC-ETC 301: Environmental Studies**
Prerequisites	**Basic knowledge about natural process and fundamentals of environmental aspects.**
Teaching scheme: Lecture/Practical	**3 lectures/week**
Credits	**3****
Evaluation Scheme Environmental mini Project + ESE for Theory	**30 + 70**

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs /week	**Total : 100 Marks** **70 (ESE) + 30 (Environmental Project report)**

Course Objectives:
The course aims to

1	To apply measures to Protect the environment, to maintain the quality of life
2	Environmental Education is important in conservation of natural resources and minimize or stops its over exploitation.
3	Design and evaluate strategies, technologies& methods for sustainable management of Environmental system and for the remediation or restoration of degraded environment.
4	Social problems as well as social issues such as population explosion, exploitation on natural resources, Global warming, Acid rain, Ozone layer depletion, various natural disaster and its management, local level environmental problems, Water conservation ,Environmental pollution and throws light on the methods of solution.

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

1	To develop ability to protect the environment through ecofriendly lifestyle.

2	To give knowledge of natural resource conservation
3	To make able to implement sustainable technologies for environmental restoration .
4	To understand social issues and suggest solution

Course Contents		
Unit No: 1	**Nature of Environmental Studies.** Definition, Scope and Importance of Environment. Multidisciplinary nature of environmental studies .Need for public awareness.	**2 Hrs**
Unit No: 2	**Natural Resources and Associated Problems** Definition and Types of Natural Resources. a) Forest resources: Use and over-exploitation, deforestation, dams benefits and problems. b) Water resources: Use and over-utilization of surface and ground Water, floods. Drought, conflicts over water. c) Mineral resources: Usage and exploitation. Environmental effects of Extracting and using mineral resources. D)Food resources: World food problem, changes caused by agriculture effect of modern agriculture, fertilizer-pesticide Problems E) Energy resources: Growing energy needs, renewable and non-renewable Energy resources, use of alternate energy sources. Solar energy, Wind energy, Hydal energy, Tidal energy, Biomass energy, Nuclear energy. F) Land resources: Land as a resource, land degradation, man induced Landslide, Soil erosion. Role of individuals in conservation of natural resources.	**6 Hrs**
Unit No: 3	**Ecology and Biodiversity** Concept of an ecosystem. Structure and function of ecosystem.-Producers, consumers and decomposers. Food chains, food webs .Energy flow in the ecosystem. Ecological pyramids. Ecological Succession. Introduction, types, characteristics features, structure and	**10 Hrs**

	function of the following ecosystem :- a)Forest ecosystem, b) Grassland ecosystem, c) Desert ecosystem, Aquatic ecosystems (ponds, streams, lakes). d)Aquatic ecosystems (rivers, oceans, estuaries). Introduction- Definition: genetic, species and ecosystem diversity. Bio-geographical classification of India. Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values. India as a mega- diversity nation. Hot Spots of Biodiversity. Endangered and Endemic Species of India. Threats to Biodiversity: - Habitat Loss, Poaching of Wildlife and Man-wild life Conflicts. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	
Unit No: 4	**Environmental Pollution** Definition: Causes, effects and control measures of: Air pollution Water pollution, Marine pollution, Soil Pollution. Noise pollution, Thermal Pollution, Nuclear hazards, Solid waste Management: Causes, effects and control measures of urban and industrial wastes Role of an individual in prevention of pollution.	**6 Hrs**
Unit No: 5	**Social Issues and the Environment** Disaster management: Floods, Earthquake, Cyclone Tsunami and Landslides. From Unsustainable to Sustainable Development. Water conservation, rain water harvesting, watershed management Resettlement and rehabilitation of people; its problems and concerns. Environmental ethics: Issue and possible solutions. Global warming, acid rain, Ozone layer depletion Waste Land Reclamation.	**7 Hrs**
Unit No: 6	**Environmental protection and Environmental field work (mini project)** Environment Protection Act – 1986, Air (Prevention and Control of Pollution) Act. 1981, Water (Prevention and control of Pollution) Forest Conservation Act. 1980. Act. Wildlife Protection Act. 1972 **Environmental Field Project Report**	**9 Hrs**

Text Books:

1	Dr. Jay Samant, "Environmental studies", Shivaji University, Kolhapur.
2	Anubha Kaushik & C.P.Kaushik., "Perspectives in Environmental studies", New Age international Publisher, 2004.
3	Gouri Suresh, "Environmental studies & Ethics", I. K. International Publishing House, Pvt. Ltd.
4	Erach Barucha, "Environmental studies"

Reference Books:

1	Sharma B.K., "Environmental Chemistry", Goel Publication House, Meerut, 2001
2	Agarwal, K.C., "Environmental Biology", Nidi Pub. Ltd., Bikaner. 2001
3	Bharucha Erach, "The Biodiversity of India", Mapin Publishing Pvt. Ltd.
4	De A.K., "Environmental Chemistry", Wiley India. Western Ltd.
5	Rao M. N. and Datta, A.K., Waste Water Treatment, Oxford & IBH Publ. Co. Pvt. Ltd., 345p. 1987
6	Trivedi R.K. and P.K. Gokel, "Introduction to air pollution", Tecgbi-Science Publications (TB)

List of Experiments (Minimum 08):

1	Practical implementation of Amplitude modulation and demodulation.
2	CalculationofmodulationindexbygraphicalmethodofDSBFCsignal&measurement of power of AM wave for different modulating signal.
3	SSB modulation using any method (filter method, Phase shift method)and its detection.
4	Performance and analysis of AM system using trapezoidal method
5	Practical implementation of frequency modulation and demodulation.
6	ExperimentonSamplingandreconstructionandalsoobservealiasingeffect byvarying sampling frequency.

7	Practical implementation of PAM system
8	Practical implementation of PWM system
9	Practical implementation of PAM-TDM systems.
10	Practical implementation of PPM system
11	Envelope detector- Practical diode detector.
12	Experiment on Pre-emphasis and De-emphasis.
13	Visit to AIR

Note:

1) There should be compulsory one industrial visit related to this subject.

2) Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1. MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q. 3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q. 5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

ELECTRONIC CIRCUIT DESIGN – II

Course Details:

Class	**S. Y. B. Tech. Sem-IV**
Course Code & Course Title	**PCC-ETC 401: Electronic Circuit Design - II**
Prerequisites	**Basic Circuit Law's, Single Stage RC coupled amplifier**
Teaching scheme: Lecture + Practical	**4 Hrs + 2 Hrs**
Credits	**4 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	Examination Scheme
Lectures : 04 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30(CIE)**
Practical : 02 Hrs /week	**TW: 25 Marks** **POE: 50 Marks**

Course Outcomes:	
Upon successful completion of this course, the student will be able to:	
1	Analyze & Design Multistage and Feedback Amplifier
2	Analyze & Design Power Amplifier
3	Describe & Design Different types of Oscillators using BJT
4	Describe & Design Different types of Multivibrator using BJT
5	Describe & Design IC voltage Regulators

Course Contents

Course Objectives:	
The course aims to:	
1	Provide an introduction and basic understanding of feedback amplifiers, power amplifiers, oscillators, Multivibrators
2	Develop student ability to apply basic engineering sciences to understand the operation & analysis of electronic circuits using diodes, bipolar junction transistors.
3	Provide analog electronic circuit design techniques using diodes, bipolar junction transistors and to develop analytical skills.
4	Design electronic circuits to meet desired specifications.
5	Apply knowledge of mathematics, science, and engineering to design, analyze and implement electronic circuits.

Unit No: 1	**Multistage Amplifiers**	**7 Hrs**

	Need of cascading, Parameter evaluation such as Ri ,Ro, Av, Ai & bandwidth for general multistage amplifier, Design of two stage RC coupled, Direct coupled amplifier.	
Unit No: 2	**Feedback Amplifiers** General theory of feedback, Need of negative feedback, Feedback Topology, Analysis of Voltage series, Current series, Voltage shunt, Current shunt feedback amplifiers (Using block schematic & Circuit), Design of two stage Voltage series feedback amplifier.	**8 Hrs**
Unit No: 3	**Power Amplifiers** Need of Power amplifier, classification of power amplifier, Power considerations, Distortion in power amplifiers: Phase, Frequency, amplitude/ harmonic / nonlinear distortion, amplitude harmonic distortion using Three point methods. Transformer coupled Class A amplifier, Class B: Push pull amplifier & Complementary symmetry power amplifier, crossover distortion & methods to eliminate.	**10 Hrs**
Unit No: 4	**Oscillators** Barkhausen's criteria, Frequency and amplitude stability, Classification, RC oscillators: analysis & design of RC phase shift Oscillator & Wein bridge oscillator. LC oscillators: analysis & design of Colpitt's & Hartley's oscillators, Crystal oscillator.	**9 Hrs**
Unit No: 5	**Multivibrators** Transistor as a switch, Different transistor switching parameters, overdrive factor, classification of multivibrators, Analysis and design of collector coupled: Astable, Bistable, Monostable, fixed bias and self-bias binary Multivibrator, Triggering methods for Multivibrators, Schmitt trigger / Emitter Coupled Binary.	**9 Hrs**
Unit No: 6	**IC voltage regulator** Fixed voltage regulators (78XX, 79XX), Adjustable voltage regulators (LM317, LM337, LM723).	**5 Hrs**

Text Books:

1	N.C. Goyal & R.K. Khetan, "A Monograph on Electronics Design Principles", Khanna Publishers
2	Allen Mottershed, "Electronic Devices & Circuits", Prentice- Hall India
3	G. K. Mittal, "Electronic Devices & Circuits"
4	Salivahanan, N Sureshkumar, "Electronic Devices & Circuits", Tata McGraw Hill Publication

Reference Books:

1	David A. Bell, "Electronic Devices & Circuits", Oxford University
2	Robert L. Boylsted, Louis Nashelsky, "Electronic Devices & Circuit Theory", Pearson Education

List of Experiments (Minimum 08 experiment + 01 Mini-project compulsory):

1	Design and study of frequency response of direct coupled amplifier.
2	Design and study of frequency response of two stage RC coupled amplifier.
3	Design and study of frequency response of voltage series feedback amplifier.
4	Design and study of transformer coupled class A amplifier.
5	Design and study of RC phase shift oscillator using BJT
6	Design and study of wein bridge oscillator using BJT
7	Design and study of colpitts oscillator using BJT
8	Design and study of Hartley oscillator using BJT
9	Design and study of Astable multivibrator
10	Design and study of Monostable multivibrator using BJT
11	Design and study of Bistable multivibrator using BJT
12	Design and study of Schmitt trigger using BJT
13	Design and study of voltage regulator using LM317
14	Design and study of voltage regulator using IC723
15	Simulation of Oscillator (eSim Software)
16	Simulation of Multivibrator (eSim Software)
17	Mini-project based on above syllabus. (Maximum two students in each group)

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1. MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q. 3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q. 5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

LINEAR INTEGRATED CIRCUITS

Course Details:

Class	**S. Y B. Tech. Sem- IV**
Course Code & Course Title	**PCC-ETC 402: Linear Integrated Circuits**
Prerequisites	**Basic knowledge of electronics components**
Teaching scheme: Lecture + Practical	**4 Hrs + 2 Hrs**
Credits	**4 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 4 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Practical : 2 Hrs /week	**TW: 25 Marks** **POE: 50 Marks**

Course Objectives:

The course aims to:

1	Understand the internal circuit of operational amplifier and its parameters
2	Study the application of Op-amps.
3	Design various Active filters.
4	Analyze and design of various wave generators

Course Outcomes:

Upon successful completion of this course, the student will be able to:

1	Explain operational amplifier with its parameters
2	Classify different configuration of op-amp
3	Identify and explain different applications of op-amp
4	Design and implement various filters
5	Analyze different waveform generator circuits
6	Apply knowledge of op-amp in various industrial applications

Course Contents		
Unit No: 1	**Introduction to Op-amp** Block diagram of op-amp in detail, Differential Amplifier configurations, Differential amplifier analysis using h-parameter (AC and DC) for dual-input balanced-output configuration, level shifter, current mirror circuits, ideal and practical parameters of op-amp. (Numerical expected)	**9 Hrs**
Unit No: 2	**Op-Amp Configurations & Frequency Response** Virtual ground concept, Open loop configuration, closed loop configuration, unity gain amplifier, frequency response of both configuration, slew rate: causes, expression.	**6 Hrs**
Unit No: 3	**Applications of Op-amp** Summing, Scaling & Averaging Amplifiers(Inverting & Non-Inverting configuration), Differential amplifier, Subtractor Circuit, Instrumentation amplifier (Using three Op-amp), V to I & I to V Converter, Precision Rectifiers, Log & Anti-log Amplifiers, Comparator, Zero Crossing Detector, Schmitt Trigger, Window Detector, Peak Detectors, Sample & Hold Circuits.	**9 Hrs**
Unit No: 4	**Active Filters** Introduction, Butterworth filters: High Pass filter & Low Pass filter (First & Second order), Band Pass filter, Band Reject filter, All Pass Filter (Numerical expected)	**9 Hrs**
Unit No: 5	**Waveform Generators** Square wave generator, Triangular wave generator, Sawtooth wave generator. RC phase shift oscillator, Wein bridge oscillator, V-F, F-V	**7 Hrs**

	converter using Op-amp.	
Unit No: 6	**Monolithic IC Applications** IC 555 (Timer): Block Diagram, Multivibrators and Applications. PLL- Introduction, Block Diagram, Operating Principles & description of individual blocks, IC 566 VCO , IC 565 PLL & Applications. IC 8038 Waveform generator	**7 Hrs**

Text Books:

1	Ramakant A. Gaikwad, "Op Amps and Linear Integrated Circuits", IInd and latest edition, Pearson Education
2	David Bell, "Operational Amplifiers and Linear IC's", IIIrd edition, Oxford University Press

Reference Books:

1	Robert Coughlin, Fredric Driscoll, "Operational Amplifiers and Linear Integrated Circuits", VIth edition, PE, 2006.
2	B. Somanathan Nair, "Linear Integrated Circuits- Analysis, Design & Applications", Wiley India. India.
3	S. Salivahanan & Bhaskaran, "Linear Integrated Circuits", Ist Edition, TMH

List of Experiments:

Any 10 experiments based on bellow list:

1.	Study of Data sheets of following IC's (Compulsory) µA 741, OP 07, LM324, LM 308, LM380, CA 3140, LM 311.
2.	Measurement of op-amp parameters Using IC 741 a) Input offset voltage b) Input

	offset current c) slew rate d) CMRR.
3.	Study of Inverting amplifier for DC & AC inputs using IC 741
4.	Study of Non-Inverting amplifier for DC & AC inputs using IC 741
5.	Frequency Response of Inverting & Non-Inverting amplifier using IC 741
6.	Study of op-amp as Summing, Scaling, & Averaging amplifier in Inverting & Non-Inverting Configuration using IC LM 308
7.	Study of Instrumentation Amplifier using LM 324
8.	Study of V-I & I-V Converter using IC 741
9.	Study of Schmitt Trigger using IC 741 & Windowdetector using LM 311
10.	Study of Comparator & ZCD using LM324/OP 07
11.	Study of Precision Rectifier using IC 741
12.	Study of Butterworth Filter using IC 741
13.	Study of Triangular & square wave generator using IC 741
14.	Study of IC 555 Timer as Astable & Monostable Multivibrator (NE/SE 555)
15.	Study of Weins Bridge Oscillator using IC 741

Note:

1) Some experiment should base on (eSim Software)
2) **Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

Q.1. MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q. 3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q. 5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

CONTROL SYSTEM ENGINEERING

Course Details:

Class	**S. Y. B. Tech. Sem- IV**
Course Code & Course Title	**PCC-ETC 403: Control System Engineering**
Prerequisites	**Knowledge of Laplace transform & differential equation, Network analysis**
Teaching scheme: Lecture + Tutorials	**3 Hrs**
Credits	**3**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Tutorial: Nil	**TW: 25 Marks**

Course Objectives:	
The course aims to:	
1	To provide an introduction and basic understanding of Control System
2	To develop time & frequency domain analysis
3	To analyze & compare different control systems
4	To understand the concept of stability & state space variables

Course Outcomes:	
Upon successful completion of this course, the student will be able to:	
1	Apply knowledge of mathematics, science, and engineering to design, analyze and control the different systems

2	Explain time & frequency domain analysis for different control systems
3	Demonstrate & compare different control systems
4	Describe state variables
5	Design model for control system

Course Contents		
Unit No: 1	**Introduction** Need & classification of control system, Effects of feedback, Mathematical model (Mechanical & Electrical systems) Differential equations, Transfer function, Block diagram algebra, Block diagram reduction, Representation by Signal flow graph, Reduction using Mason's gain Formula.	**7 Hrs**
Unit No: 2	**Time Domain Analysis** Standard test signals, Time response of first& second order systems for Step input, Characteristic Equation of Feedback control systems, Transient response of second order systems, Time domain specifications, Steady state response, Steady state errors and error constants.	**6 Hrs**
Unit No: 3	**Stability Analysis** The concept of stability, Routh's stability criterion, qualitative stability and conditional stability, limitations of Routh's stability. Root Locus Technique**:** The root locus concept, construction of root loci, effects of adding poles and zeros on the root locus.	**5 Hrs**
Unit No: 4	**Frequency Domain Analysis** Introduction, Frequency domain specifications-Bode plots, Determination of Frequency domain specifications and transfer function from the Bode Plot, Phase margin and Gain margin-Stability Analysis from Bode Plots, Polar Plots, Nyquist Stability Criterion, Nyquist plot & stability analysis.	**9 Hrs**

Unit No: 5	**Compensators & Controllers** Compensation techniques, Lag, Lead, Lead-Lag Controllers design in frequency Domain, Design of PID control system.	**4 Hrs**
Unit No: 6	**State Space Analysis** Concept of state, state variable & state model, state model for linear continuous time systems, Decomposition of Transfer Function, Transfer function from state model, Computation of state transition matrix, Controllability & Observability	**5 Hrs**

Text Books:

1	I .J. Nagrath and M. Gopal, "Control Systems Engineering", Vth Edition, Anshan Publishers.
2	A. Anandkumar, "Control System Engineering", IInd edition, PHI Publication
3	R.Aanand natarajan, P. Rameshbabu, "Control System Engineering", Scitech Publications.

Reference Books:

1	Norman S Nise, "Control System Engineering", VIIIth edition, Wiley India.
2	Sanarjjet Ghosh, "Control System Theory & Application", Ist edition, Pearson Education.

Note:

1) Paper setters: Theory 40% Numerical & Derivations 60%
2) **Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

Q.1 MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q.5 Based on unit no 4, 5, 6 (Carries 14 marks)

3)Term work based on assignments on all chapters

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

DIGITAL COMMUNICATION

Course Details:

Class	**S. Y. B. Tech. Sem-IV**
Course Code & Course Title	**PCC-ETC 404: Digital Communication**
Prerequisites	**Analog communication**
Teaching scheme: Lecture/Practical	**3 Hrs + 2 Hrs**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 03 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Practical : 02 Hrs /week	**TW: 25 Marks**

Course Objectives: The course aims to:	
1	Study the random signal theory and concept of information theory
2	Elaborate the different source coding techniques with the help of their block diagrams and function.
3	Explain the different digital modulation techniques.
4	Describe the baseband transmission and reception system.

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

1	Describe the probability of random signal
2	Solve the problem based on information theory
3	Classify different source coding & line coding techniques.
4	Compare different digital modulation technique

Course Contents		
Unit No: 1	**Probability Theory** Introduction to digital communication system, probability and sample space, Baye's rule, Joint & conditional Probability, PDF & CDF, Statistical averages	**6 Hrs**
Unit No: 2	**Information Theory** Measure of Information, Entropy, Information Rate, Shannon's encoding theorem, communication channels –Discrete & Continuous, Shannon–Hartley theorem, Entropy Coding: Huffman's coding & Shannon-Fanno Coding techniques.	**7 Hrs**
Unit No: 3	**Source Coding** Quantization–Uniform, Non-Uniform. Study of PCM, DM, ADM DPCM, ADPCM.	**5 Hrs**
Unit No: 4	**Digital Carrier Line Encoding** Line codes: Unipolar, Bipolar, NRZ, RZ, RZ-AMI, Manchester Baseband pulse Shaping, Duo binary	**5 Hrs**
Unit No: 5	**Band Pass Modulation Techniques** ASK, FSK, PSK, DPSK, QPSK, & QAM. Coherent, Non- Coherent detection. Introduction to Spread Spectrum techniques: DSSS, FHSS.	**7 Hrs**
Unit No: 6	**Baseband Transmission Of Digital Signals** M-ary Signaling, eye diagram, ISI, Scrambler, Unscramble. Optimum Receivers-Matched Filters, Correlation receivers, Optimum detection using ML criteria.	**6 Hrs**

Text Books:

1	K. Sam Shanmugam, "Digital & Analog Communication", John Wiley India..

2	Simon Haykin, "Digital Communication", Wiley India.
3	Singh & Sapre, "Communication Systems-Analog & Digital", IInd Edition TMH

Reference Books:

1	Wayne Tomasi, "Electronic Communications Systems", Vth edition, Pearson publication
2	John Proakis, " Digital Communication", IVth Edition, TMH

List of Experiments (Minimum 8 Experiments):

1.	Study of Pulse Code Modulation
2.	Study of Delta Modulation
3.	Study of Adaptive Delta Modulation
4.	Study of Data Formats
5.	Study of Amplitude Shift Keying
6.	Study of Frequency Shift Keying
7.	Study of Phase Shift Keying
8.	Study of Quadrature Phase Shift Keying
9.	Study of Any Modulation Technique using MATLAB/SCILAB
10.	Study of CDF & PDF for Random signals using MATLAB/SCILAB
11.	Study of Standard Random Variables Density Distribution Function

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following pointes should be considered,

Q.1. MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q. 3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q. 5 Based on unit no 4, 5, 6 (Carries 14 marks)

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS AND TELECOMMUNICATION ENGINEERING

DATA STRUCTURES

Course Details:

Class	**S. Y. B. Tech. Sem-IV**
Course Code & Course Title	**PCC-ETC 405: Data Structures**
Prerequisites	**Knowledge of mathematics, computer resources.**
Teaching scheme: Lecture + Tutorial	**3 Hrs**
Credits	**3**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme	**Examination Scheme**
Lectures : 3 Hrs /week	**Theory : 100 Marks** **70 (ESE) + 30 (CIE)**
Tutorial: Nil	**TW: 25 Marks**

Course Objectives:	
The course aims to:	
1	Understand the basic concept of data structure & it's types.
2	Implement the knowledge of arrays & records as well as relevant operations on it.
3	Implement the knowledge of linked list & relevant operations on it.
4	Understand the concept of stacks, queues & it's applications.
5	Implement the knowledge of various types of trees & relevant operations.
6	Understand the Knowledge of Graphs & Hashing techniques.

Course Outcomes:	
Upon successful completion of this course, the student will be able to:	
1	Elaborate the basic concept of data structure & its types.

2	Design and Implement the various algorithms on arrays & records.
3	Implement algorithms on linked list.
4	Understand the concept of stacks, queues & its applications.
5	Construct various types of trees & their applications.
6	Understand the concept of Graph & Hashing.

Course Contents		
Unit No: 1	**Introduction & Overview** Introduction to theory of data structures, data types, Classification of data structure, Algorithms: complexity, time space trade-off with example.	**2 Hrs**
Unit No: 2	**Arrays, Records & Pointers** Introduction, linear arrays, representation of linear array in memory, Algorithm for traversing linear arrays, inserting & deleting, Sorting: bubble sort, searching: linear search, binary search, Multi-dimensional arrays, Pointers: pointer arrays, Records: Record structures, representation of records in memory, parallel arrays, matrices, sparse matrices.	**6 Hrs**
Unit No: 3	**Linked Lists** Introduction, linked lists & its representation, Traversing & searching a linked list, memory allocation, Garbage collection, insertion & deletion of nodes of linked list, header linked list, two-way lists.	**6 Hrs**
Unit No: 4	**Stacks & Queues** Introduction to stacks, stack as an Abstract Data type, representation through Arrays & linked lists, arithmetic expressions, polish notation, Applications of stacks, stacks & recursion, Queue, representation of queue as an array and as a linked list, circular, double ended, priority, application of queues.	**7 Hrs**
Unit No: 5	**Trees** Binary Tree: introduction, types, definition, properties, representations, operations, binary tree traversal, reconstruction, counting number of binary trees, applications. Advanced trees: AVL trees or height balanced trees, representation operation, Threaded binary trees, Expression trees. Multi way trees: trees, multi way search trees, B+ trees, Heaps, construction of a Heap.	**7 Hrs**

Unit No: 6	**Graphs & Hashing** Introduction, Graph theory terminology, sequential representation of graphs: Adjacency Matrix, Path matrix, Warshall's Algorithm, shortest paths, linked representation. Operations, Traversing, Posets, Topological sorting. Hashing, Hash functions, collision, chaining.	**8 Hrs**

Text Books:

1	ISRD group , "Data Structure Using C", Tata McGraw Hill
2	Seymour Lipschutz, "Data Structures", Tata McGraw Hill

Reference Books:

1	Mark Allen Weiss, "Data Structure & Algorithm Analysis In C", Pearson Education (LPE)
2	A.N. Kathie, "Introduction to Data structure in C", Pearson Education (LPE)

Note:

1) **Minimum Ten Tutorials based on above syllabus**
2) **Guidelines to paper setter:**

In theory ESE examination of 70 marks following pointes should be considered,

Q.1. MCQ's Based on complete syllabus. (14 Marks)

Q.2 Based on unit no 1, 2, 3 (Carries 14 marks)

Q. 3 Based on unit no 1, 2, 3 (Carries 14 marks)

Q.4 Based on unit no 4, 5, 6 (Carries 14 marks)

Q. 5 Based on unit no 4, 5, 6 (Carries 14 marks)

3)Term work based on assignments on all chapters

SHIVAJI UNIVERSITY, KOLHAPUR
ELECTRONICS & TELECOMMUNICATION ENGINEERING

PROGRAMMING LAB-II

Course Details:

Class	**S. Y. B. Tech. Sem-IV**
Course Code & Course Title	**PCC-ETC 406: PROGRAMMING LAB-II**
Prerequisites	**Computer fundamentals**

Teaching scheme: Lecture + Practical	**2 Hrs + 2 Hrs**
Credits	**2+1**
Evaluation Scheme ESE + CIE for Theory	**NA**

Teaching Scheme	**Examination Scheme**
Lectures: 2 /week	**Theory : NA**
Practical : 2 /week	**TW: 25 Marks** **POE: 50 Marks**

Course Objectives: The course aims to:	
1	Understand features of object-oriented programming and design C++ classes
2	Understand overloading of functions and operators in C++.
3	Implement copy constructors and class member functions.
4	Understand the concept of inheritance, virtual functions, dynamic binding & polymorphism.
5	Design inheritance for code reuse in C++.
6	Design and implement generic classes with C++ templates and exception handling.

Course Outcomes: Upon successful completion of this course, the student will be able to:	
1	Understand the basic concepts of procedure oriented programming language.
2	Identify the function and operator overloading concepts.
3	Understand and implement the concept of inheritance, template and exception handling applications.
4	Identify the concept of inheritance, virtual functions, dynamic binding & polymorphism.
5	Identify the types of inheritance & its design for code reuse in C++.

6	Design and implement generic classes with C++ templates and exception handling.

Course Contents		
Unit No: 1	**Introduction To Object Oriented Programming** Difference between procedure oriented programming and object oriented programming, basic concepts and features of object oriented programming, structures and classes, declaration of class, member functions, defining the object of class, accessing member of class, and array of class objects**.**	**4 Hrs**
Unit No: 2	**Overloading** Function overloading, assignment operator overloading, binary operator overloading, unary operator overloading.	**4 Hrs**
Unit No: 3	**Constructors And Destructors** Constructors- copy constructor, default constructors, destructors, inline member function, friend function, dynamic memory allocation.	**4 Hrs**
Unit No: 4	**Polymorphism** Polymorphism, early binding, polymorphism with pointers, virtual functions, late binding, pure virtual functions, abstract base classes, constructor under inheritance, destructor under inheritance, virtual destructors, virtual base classes.	**4 Hrs**
Unit No: 5	**Inheritance** Introduction, Single Inheritance, Types Of Base Classes- Direct, Indirect, Array Of Class Object And Single Inheritance, Multiple Inheritances.	**4 Hrs**
Unit No: 6	**Template And Exception Handling** Function template, class template, exception handling.	**4 Hrs**

Text Books:

1	D Ravichandran, "Programming With C++", IInd edition, Tata Mc Grow Hill
2	E Balagurusamy, "Object Oriented Programming With C++", Mc Grow Hill

Reference Books:

1	Brian W. Kernighan, Dennis M. Ritchi , "The C++ Programming Language", IInd edition, Prentice Hall of India.

List of Experiments (Minimum 10 + Mini project):

1	Develop a Program for implementation of array a. One-dimensional array b. Multi-dimensional array
2	Develop a Program for implementation of classes and Objects.
3	Develop a Program for implementation of types of constructor a. Default constructor b. Parameterized constructor c. Copy constructor
4	Develop a Program for implementation of polymorphism
5	Develop a Program for implementation of Friend Functions in Class
6	Develop a Program for implementation of types of inheritance a. Single level Inheritance b. Multi-level Inheritance c. Multiple Inheritance d. Hybrid Inheritance e. Hierarchical inheritance
7	Develop an Object oriented Program to Insert the Number in an Array
8	Develop an Object oriented program to Delete the Number in an Array
9	Develop an Object oriented program on Bubble Sort
10	Develop an Object oriented program to Perform Linear or binary search
11	Develop an Object oriented program to Insert and delete a Node in Link List
12	Develop an Object oriented program to implement stack using linked list.
13	Mini project.