SHIVAJI UNIVERSITY, KOLHAPUR

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Accredited by NAAC 'A' Grade

Syllabus for

Third Year, Bachelor of Technology (T.Y.B. Tech.)
Electronics & Telecommunication Engineering Program
(w. e. f. Academic Year: 2020-21)

Semester V

Sr. No	Code No.	Subject	Semester	Credits
1.	PCC-ETC501	Signal and Systems	5	5
2.	PCC-ETC502	Electromagnetic Engineering	5	4
3.	PCC-ETC503	Digital and VLSI Design	5	5
4.	PCC-ETC504	Optical Communication	5	5
5.	OEC-ETC501	Open Elective – I	5	4
6.	PCC-ETC505	Simulation and Modeling	5	2
		Total		25

Semester VI

Sr. No	Code No.	Subject	Semester	Credits
1.	PCC-ETC601	Digital Signal Processing	6	5
2.	PCC-ETC602	Microprocessor and Microcontrollers	6	5
3.	PCC-ETC603	Power Electronics	6	5
4.	PCC-ETC604	Antenna and Wave Propagation	6	5
5.	OEC-ETC601	Open Elective – II	6	4
6.	PCC-ETC605	Mini Project	6	1
		Total		25

- **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)

Third Year ELECTRONICS & TELECOMMUNICATION ENGINEERING – CBCS PATTERN

SEMESTER – V																						
Sr. No	Course (Subject Title)	TEAETCING SETCEME									EXAMINATION SETCEME											
		THEORY			TUTORIAL			PRACTICAL			THEORY					PRACTICAL			TERM		
		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	PCC-ETC501	4	4	4	1	1	1	-	-	-		CIE	30	100	12	As per BOS Guidelines	-	-	2	25	10
												ESE	70		28						
2	PCC-ETC502	3	3	3	1	1	1	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
3	PCC-ETC503	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
4	PCC-ETC504	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
5	OEC-ETC501	3	3	3	1	1	1	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
6	PCC-ETC505	1	1	1	-	-	-	1	2	2							50	20	2	25	10
	TOTAL	**19**	**19**	**19**	**3**	**3**	**3**	**3**	**6**	**6**				**500**			**150**			**150**	
SEMESTER –VI																						
1	PCC-ETC601	4	4	4	-	-	-	1	2	2		CIE	30	100	12	As per BOS Guidelines	-	-	2	25	10
												ESE	70		28						
2	PCC-ETC602	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
3	PCC-ETC603	4	4	4	-	-	-	1	2	2		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
4	PCC-ETC604	4	4	4	-	-	-	1	2	2		CIE	30	100	12		50	20	2	25	10
												ESE	70		28						
5	OEC-ETC601	3	3	3	1	1	1	-	-	-		CIE	30	100	12		-	-	2	25	10
												ESE	70		28						
6	PCC-ETC605	-	-	-	-	-	-	1	2	2							50	20	2	25	10
	TOTAL	**19**	**19**	**19**	1	1	1	**5**	**10**	**10**				**500**			**150**			**150**	
	TOTAL	**38**	**38**	**38**	**4**	**4**	**4**	**8**	**16**	**16**				**1000**			**300**			**300**	

CIE- Continuous Internal Evaluation
ESE – End Semester Examination

Note:

1. **PCC-ETC:** Professional Core course –Electronics & Telecommunication Engineering are compulsory.
2. **OCE-ETC:** Open Elective Course – Electronics & Telecommunication Engineering**:**
3. **Winter/Summer Internship/Industrial Training of minimum 15 day's compulsory and evaluation of the same will be carried out in Final year Project Phase internal assessment by respective Guide**

• Candidate contact hours per week : 30 Hours (Minimum)	• Total Marks for T.Y. Sem V& VI: **1600**
• Theory and Practical Lectures : 60 Minutes	• Total Credits for T.Y. Sem V & VI : **50**
• There shall be separate passing for theory and practical (term work) courses.	
(A) Non-Credit Self Study Course : Compulsory Civic Courses (CCC) For Sem I: CCC – I : Democracy, Elections and Good Governance **(B) Non-Credit Self Study Course : Skill Development Courses (SDC) For Sem II: SDC – I :** Any one from following (i) to (v) i) Business Communication & Presentation ii) Event management iii) Personality Development, iv) Yoga & Physical Management v) Resume, Report & proposal writing	

SHIVAJI UNIVERSITY, KOLHAPUR

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SUBJECT NAME: SIGNALS AND SYSTEMS

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**PCC-ETC 501: Signals and Systems**
Prerequisites	**Engineering Mathematics**
Teaching scheme :Lectures + Tutorial	**4 Hrs. + 1 Hr.**
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)**
Tutorial : 1 Hr. / Week	**TW: 25 Marks**

Course Objectives:	
The course aims to :	
1	To understand basic of CT & DT signals and their representation.
2	To understand basic of CT & DT system and their representation
3	To analyze CT & DT signals using Fourier transform
4	To compute DFT and IDFT
5	To analyze signals using Z-transform
6	To apply realization techniques for systems

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Demonstrate use of signals and their representation.
2	Represent CT & DT system
3	Use Fourier transform for analysis of CT & DT signals
4	Compute DFT and IDFT
5	Analyze signals using Z-transform
6	Realize the systems

Course Contents		
Unit No: 1	**Signals and Classification of Signals** Continuous time signals & discrete time, analog & digital, even &odd signals, periodic &non-periodic, deterministic &non-deterministic, energy & power, Basic CT & DT signals: unit impulse, unit step, unit ramp, complex exponential & sinusoidal, Basic operations on signals, sampling and reconstruction of signal	**8 Hrs.**
Unit No: 2	**System and Classification of Systems** System Representation, properties of systems : continuous time Systems & discrete Systems, system with and without memory, causal and non-causal system, linear and nonlinear system, Time invariant and time variant system, Stability of system, Impulse response representation, convolution integral , convolution sum, properties of convolution .	**8 Hrs.**
Unit No: 3	**Fourier Transform** Fourier Transform , Fourier Transform of CT and DT signals,	**8 Hrs.**

	Properties of Fourier Transform, Fourier transform using properties, Limitations of Fourier Transform	
Unit No: 4	**Discrete Fourier Transform** Discrete Time Fourier Transform , Discrete Fourier Transform , Inverse Discrete Fourier Transform(IDFT): Direct method, DFT using Twiddle factor, Properties,	**7 Hrs.**
Unit No: 5	**Z transform:** Introduction of Z-transform, ROC, properties of ROC, Unilateral Z-transform, properties of Z transform, Inverse Z-transform: long division method, PFE method, residue method.	**7 Hrs.**
Unit No: 6	**System Realization** Continuous time system representation by differential equation, discrete time system representation by difference equation , transfer function in Z-domain, Realization of discrete time systems by Direct from I and Direct Form II	**6 Hrs.**

Text Books:

1	S. Palani, " Signals and Systems", Ane Books Pvt. Ltd
2	P. Ramesh Babu, R. Anandanatarajan, " Signals and Systems " 4th Edition, SCITECH publication
3	A.Anand Kumar, "Signals and Systems", PHI publication

Reference Books:

1	Alan Oppenheim, Alan S. Willsky , "Signals and Systems ", 2nd Edition , PHI Publication.
2	Simon Haykin, Barry Van Veen, "Signals and Systems", 2nd Edition, Wiley Publication
3	Michael J. Roberts, "Fundamentals of signals & systems", Tata McGraw Hill, 2007.

Note: Minimum Ten Tutorials based on above syllabus.

Guidelines to paper setter:

In theory ESE examination of 70 marks following points should be considered:

Question paper should contain 70% numerical and 30% theory.

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

SUBJECT NAME: ELECTROMAGNETIC ENGINEERING

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**PCC-ETC502: Electromagnetic Engineering**
Prerequisites	**Engg. Mathematics, Physics**
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	Explain basic of Vector calculus & co-ordinate systems.
2	Define & derive different laws in steady electric & magnetic fields.
3	Apply Maxwell's equations in different forms to Develop wave equations.
4	Explain concepts of transmission lines

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Explain the fundamentals of mathematical skills related with differential, integral and vector calculus.
2	Apply and analyze the concepts of steady electric & magnetic fields.
3	Develop field equations from understanding of Maxwell's Equations.
4.	Extend the knowledge of basic properties of transmission lines to analyze electromagnetic wave propagation in generic transmission line geometries.

Course Contents		
Unit No: 1	**Vector Algebra** Review of vector Analysis and coordinate systems, Basic vector algebra, Dot product, Cross product, curl, divergence, Gradient	**4 Hrs.**
Unit No: 2	**Electrostatics** Coulomb's law & electric field (Numerical Expected) , field due to distributed charges (Numerical Expected), Flux density (Numerical Expected), Gauss's law, divergence theorem, Electrostatic potential, potential gradient, electric dipole, Electrostatic energy density, Boundary conditions for electrostatic field.	**6 Hrs.**
Unit No: 3	**Steady Magnetic Field** Biot Savarts law (Numerical Expected), Ampere's circuital law (Numerical Expected), Stoke's Theorem, Magnetic flux density & Vector magnetic potential ,Current carrying conductors in magnetic fields, Torque on loop, Energy stored in magnetic field, Boundary conditions for magneto static field.	**7 Hrs.**
Unit No: 4	**Maxwell's Equations** Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, time varying field & harmonically varying fields, Comparison	**3 Hrs.**

	of field & circuit theory.	
Unit No: 5	**Electromagnetic Waves** Wave equation for free space and conducting medium, uniform plane wave equation ,general solution of uniform plane wave equation, intrinsic impedance, wave equation in phasor form, wave propagation in lossless medium, propagation characteristics of EM waves in free space ,conducting medium, good dielectrics and good conductors.	**8 Hrs.**
Unit No: 6	**Transmission Lines** Transmission line equations, Transmission line parameters, Infinite line, terminated uniform transmission line, Reflection coefficient, VSWR, group velocity, phase velocity, Smith chart (Numerical expected on Reflection coefficient, VSWR and impedance matching using Smith chart)	**8 Hrs.**

Text Books:

1	John D. Kraus, "Electromagnetics", Mc Graw Hill
2	William Hayt, Buck, "Engineering Electromagnetics", Mc Graw Hill.
3	G.S.N. Raju, "Antenna and Wave Propagation", Pearson Education.
4	Sadiku, "Elements of Electromagnetics", 4th edition, Oxford University Press

Reference Books:

1	Jordan & Balmain, "Electromagnetic Fields & Radiation Systems", 2nd edition, PHI
2	G.S.N. Raju, "Electromagnetic field theory & Transmission lines", 1st edition, Pearson Education.

Note: Minimum Eight Tutorials based on above syllabus.

1) Guidelines to paper setter:

A) In theory ESE examination of 70 marks following points 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)

B) Question paper should include 70% theory and 30% numerical.

SHIVAJI UNIVERSITY, KOLHAPUR

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SUBJECT NAME: DIGITAL AND VLSI DESIGN

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**PCC-ETC503 : Digital and VLSI Design**
Prerequisites	**Fundamentals of Electronics**
Teaching scheme : Lectures + 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 principles and operations of combinational & sequential logic circuits.
2	Design & implement digital circuits (combinational & sequential) using VHDL
3	Explain students the fundamental concepts of Hardware Description Language and design flow of digital system design.

Course Outcomes:

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

1	Apply Boolean laws/K-Map-method, to reduce a given Boolean function
2	Design & realize combinational logic circuits using logic gates.
3	Demonstrate the operation of flip-flops, counters , shift registers Synchronous sequential machine using Moore and Mealy machine
4	Design combinational and sequential logic circuits using various description techniques in VHDL

Course Contents		
Unit No: 1	**Basics of digital systems:** Generation of Switching Equations from Truth Table , Canonical forms ,K-map(Karnaugh map) 2,3,4 and 5 variables, K map with Don't care terms - Quine Mc-Cluskey minimization technique, Quine Mc-Cluskey using Don't Care Terms ,Binary codes, Code Conversion.	**7 Hrs.**
Unit No: 2	**Introduction to VHDL:** Level of abstraction. Need of HDL,VLSI Design flow, Features and capabilities of VHDL, Elements of VHDL (Entity Architecture, Library, Package, and Configuration), Modeling styles in VHDL, Identifiers, operators , Data objects, data types, literals, Delay Models, Concurrent and sequential statement.	**7 Hrs.**
Unit No: 3	**Combinational logic Design :** Adder, Subtractor, Code converters (binary to gray & gray to binary, BCD to Excess 3 and vice versa, BCD to 7 segment display),Multiplexer and Demultiplexer , Encoder, Priority encoder, Decoder, Comparator , ALU, Barrel shifter. VHDL coding for combinational circuits.	**7 Hrs.**
Unit No: 4	**Sequential logic Design:** 1-Bit Memory Cell, Latches (SR, JK, D and T), Clocked latches (SR, JK, D and T), flips flop (SR, JK, T and D). Use of preset and clear, Excitation Table for flip flops, and Conversion of flip flops, Timing	**7 Hrs.**

	parameters of FF, Shift registers (SISO, SIPO, PIPO, and PISO). VHDL coding for Sequential circuits.	
Unit No: 5	**Counters and Finite State Machines:** Counter – ripple counters ,synchronous counters , Up/down counters, Ring counters, Johnson Counter, MOD-N counter, FSM, Moore/Mealy machines, state diagram, state table, state assignment and state reduction, Sequence detector. VHDL coding for Counters and FSM.	**7 Hrs.**
Unit No: 6	**Semiconductor Memories and Programmable Logic Devices** Memory devices: ROM, PROM, EPROM, EEPROM, RAM, SRAM, DRAM, NVRAM, Programmable logic devices: PAL ,PLA,CPLD and FPGA .Logic implementation using Programmable Devices (ROM, PLA)	**7 Hrs.**

Text Books:

1	A. Anand Kumar, "Fundamentals of digital circuits", 4th edition, PHI publication, 2016
2	Stephen Brown and ZvonkoVranesic, "Fundamentals of Digital Logic with VHDL design", Tata Mc-graw Hill

Reference Books:

1	Wakerly, "Digital Design Principles and Application", Pearson Education
2	M. Morris Mano, " Digital Design", 3rd Edition , Pearson Education
3	Roth John, "Principals of Digital System Design using VHDL", Cengage Learning.
4	R. P. Jain, "Modern digital electronics", 3rd edition, 12th reprint TMH Publication, 2007

List of Experiments (Minimum 8 experiment):

1	Implementation of Boolean function using IC.
2	Design and simulate half adder and full adder using VHDL.

3	Design and simulate Multiplexer and Demultiplexer using VHDL.
4	Design and simulate Comparator adder using VHDL.
5	Design and simulate 3to8 decoder using VHDL.
6	Design and simulate flip-flops using VHDL.
7	Design and simulate 4-bit up-down counter using VHDL.
8	Design and simulate Shift register using VHDL.
9	Design and simulate Sequence detector using VHDL.
10	Mini project based on above syllabus.

Note:

1) **Guidelines to paper setter: (30 % weightage to VHDL codes and 70% theory)**

2) **In theory ESE examination of 70 marks following points 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

SUBJECT NAME: OPTICAL COMMUNICATION

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**PCC-ETC504:Optical Communication**
Prerequisites	**Physics, Optoelectronics**
Teaching scheme : Lectures + 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	Describe the basics optical communication along with optical fiber structure and light propagating mechanisms in detail.
2	Analyze the signal degradation mechanisms
3	Explain the construction and working of optical sources and detectors.

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Differentiate the different types of optical fiber structures and light propagating mechanisms.
2	Acquire knowledge of signal degradation mechanism in optical fiber.
3	Understand the construction of and working of optical sources and detectors.

Course Contents		
Unit No: 1	**Overview of Optical Fiber Communication** Motivation for light wave communication, Basic Network Information Rates, The evolution of Optic System, Elements of Optical Fiber Transmission Link, optical spectral band, The nature of Light, Basic Optical Laws and Definitions, Single Mode Fibers, Graded Index fiber structures.	**6 Hrs.**
Unit No: 2	**Optical Fibers: Structures and Wave guiding** Optical Fiber Modes and Configurations, Mode theory for waveguides, Fiber Materials, Fiber Optic cables.	**6 Hrs.**
Unit No: 3	**Transmission characteristics of optical fibers.** Attenuation, material absorption losses, Scattering losses, bending losses, dispersion, polarization, nonlinear effects.	**8 Hrs.**
Unit No: 4	**Optical Sources** Attenuation, material absorption losses, Scattering losses, bending losses, dispersion, polarization, nonlinear effects.	**7 Hrs.**
Unit No: 5	**Optical Receiver** Physical Principal of Photodiodes, Photodetector Noise, Detectors Response Time, Structure for InGaAsAPDs, Temperature effect of Avalanche Gain, Comparison of Photodetectors , Fundamental Receiver Operation, Digital Receiver Performance	**7 Hrs.**

Unit No: 6	**Advances in Optical Fiber System** Operational Principles of WDM, Passive Components, Tunable Sources, Tunable Filters, optical switching, SONET/SDH, Performance of WDM+EDFA Systems, optical CDMA	**8 Hrs.**

Text Books:

1	Gerd Keiser, "Optical Fiber Communication", 5th Edition, TMH.

Reference Books:

1	Senior, "Optical Communication", 3rd Edition, Pearson.
2	Agarwal, "Optical Fiber Communication", 3rd edition Wiley.
3	Ramaswamy, "Optical Networks" , ELSEVIER INDIA
4	R. P. Khare, "Fiber optics and optoelectronics", Oxford university
5	Anuradha, "Optical fiber and laser principles and applications", New Age Publications.
6	Dr .R .K .Singh "Fiber optic communication systems", Willey India.

List of Experiments (Minimum 8 experiment):

1	Study of optic fiber communication system.
2	Transmission and reception of analog signal using optical fiber.
3	Transmission and reception of digital signal using optical fiber.
4	Frequency modulation using optic fiber link.
5	Calculation of bending loss in the optic fiber link.
6	Study of numerical aperture.

7	Study & calculation of attenuation loss in optic fiber link.
8	PC to PC communication by using optical cable
9	Study of characteristics of LED.
10	Study of characteristics of LASER.
11	Frequency modulation by using voice link.
12	Study of Pulse width modulation using optic fiber.
13	Two experiment based on simulation.
14	Study of coupling light into fiber.

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following points 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

SUBJECT NAME: SIMULATION & MODELING

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**PCC-ETC505:Simulation and Modeling**
Prerequisites	**C, C++ Programming**
Teaching scheme : Lectures + Practical	**1 Hr. + 2 Hrs.**
Credits	**1 + 1**
Evaluation Scheme ESE + CIE for Theory	**NIL**

Teaching scheme	**Examination scheme**
Lectures : 1 Hr. / Week	**Theory :NIL**
Practical: 2 Hrs. / Week	**TW: 25 Marks** **OE: 50 Marks**

Course Objectives:	
The course aims to :	
1	To develop problem solving skills and their implementation through basic Python
2	To understand and implement concepts of decision making statements
3	To implement programs based on looping statements
4	To understand & implement programs based on built in functions
5	To develop simulations using python Simpy package

Course Outcomes:	
Upon successful completion of this course,the students will be able to:	
1	Understand the python programming basics

2	Able to solve programs on decision making & looping statements in python
3	Understand python list, tuple, and dictionary collection concepts
4	Understand simulation programs using SimPy Library
5	Design & Apply Simpy library functions to model real time problems.

Course Contents		
Unit No: 1	**Introduction to Python** Introduction to Python: Why high level language, Scope of python, interactive mode andscript mode.Variables, Operators and Operands in Python.Arithmetic, relational and logical operators, Operator precedence, Taking input using raw_input() and input() method anddisplaying output - print statement, Comments in Python.	**2Hrs.**
Unit No: 2	**Conditional and Looping** if - else statement and nested if – else while, for, use of range function in for, Nested loops, break, continue, pass statement Use of compound expression in conditional constructs, Nested conditional statements, Nested Looping structures	**2Hrs.**
Unit No: 3	**Functions** Built-In Function, Functions from math, random, time & date module. CompositionUser Define Function : Defining , invoking functions,passing parameters, Intra-packageReferences, Packages in Multiple Directories	**2Hrs.**
Unit No: 4	**List:** Lists Concept of mutable lists, creating, initializing andaccessing the elements of list List operations Concatenation,Membership, list slices, List comprehensions List functions & methods: len, insert, append, extend, sort, remove, reverse, pop functions	**2Hrs.**
Unit No: 5	**Tuples& sets**: Immutable concept, creating, initializing andaccessing the elements in a tuple;Tuple functions: cmp(), len(), max(), min(), tuple()	**2Hrs.**

	Sets Concept of Sets , creating, initializing and accessing the elements ofSets operationMembership, union, intersection, difference, and symmetric difference Dictionaries Concept of key-value pair, creating, initializing and accessing the elements in a dictionary, Traversing, appending, updating and deleting elements	
Unit No: 6	**Simulations using Simpy** Basic Concepts, understanding of SimPy's capabilities, Process Interaction, Waiting for a Process,Interrupting Another Process, Real-time simulations.	**2Hrs.**

Text Books:

1	Martin C. Brown , "Python: The Complete Reference", McGraw hill 2018
2	Mark Lutz, "Learning Python" , O'Reilly Publication edition 2013
3	Michael Dawson, "Python Programming for Absolute Beginner", Cengage Learning edition 2010

Reference Books:

1	David Beazley, "Python Essential Reference", Developers library 4th edition
2	Web reference SimPy: https://simpy.readthedocs.io/

List of Experiments (Minimum 8 experiment):

1	Write a python program to demonstrate basic datatype in python
2	Write python program to study Arithmetic, relational and logical operators and Operands in Python.
3	Write python programs to study if, if else , if else if statements
4	Write python programs to study looping statements while & for
5	Write python programs to study built in functions of string and math packages
6	Write python programs to study list access using membership operators.

7	Write python programs to study tuple using inbuilt functions
8	Write python programs to study set operations and dictionary traversing
9	Write python programs to study Discrete event simulation using SimPy

SHIVAJI UNIVERSITY, KOLHAPUR

ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SUBJECT NAME: DIGITAL SIGNAL PROCESSING

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**PCC-ETC 601: Digital Signal Processing**
Prerequisites	**Signals and Systems**
Teaching scheme :Lectures + 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**

Course Objectives: The course aims to :	
1	To understand Fast Fourier Transform and Fast Convolution
2	To understand design of digital FIR filters using various methods
3	To understand design of digital IIR filters using various methods
4	To understand the key architectural features of DSP Processor
5	To understand the basic concept of Multirate digital signal processing
6	To understand the basic concept of wavelet transform

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Make use of FFT algorithm for filtering of long duration sequences
2	Design digital FIR filters
3	Design digital IIR filters
4	Implement FIR and IIR filters using DSP Processor
5	Apply the basic concept of Multirate digital signal processing
6	Apply the basic concept of wavelet transform

Course Contents		
Unit No: 1	**Discrete Fourier Transform & FFT Algorithms** Computational Complexity of DFT, Fast Fourier transform algorithms – Radix -2 DIT and DIF for DFT and IDFT computations, Circular convolution, Fast Convolution : Overlap-Add and Overlap-save algorithm.(Numerical)	**8 Hrs.**
Unit No: 2	**FIR Filter Design** Characteristic of FIR filter, properties of FIR filter, type of FIR filter Fourier series method, frequency sampling, Fourier series & windowing method.	**8 Hrs.**
Unit No: 3	**IIR Filter Design** Analog filters approximations, mapping of S-plane to Z-plane, Design of IIR using Impulse Invariance Method, Bilinear Transformation method, Frequency Transformation, Filter design methods: Butterworth filters, Chebyshev filters and its conversion to digital filter.	**8 Hrs.**
Unit No: 4	**Realization of Digital filters** FIR and IIR filter realization in cascade form and parallel form .Effect of finite word length on realization.	**8 Hrs.**

	Introduction to DSP processors: TMS320C67XX, Architecture, Functional Units, pipelining, Registers, Addressing modes.	
Unit No: 5	**Multirate digital signal processing** Need of Multirate digital signal processing , decimation by factor D, two stage decimator, interpolation by factor I , two stage Interpolator , sampling rate conversion by rational factor I/D , applications of multirate signal processing	**6 Hrs.**
Unit No: 6	**Wavelet Transform** Fourier Transform and its limitations , short time Fourier transform, continuous wavelet Transform , Discretization of the continuous wavelet Transform, Multiresolution Approximations ; mother wavelet and Scaling functions, Haar wavelets and Daubechies wavelets, Applications of wavelet transform	**6 Hrs.**

Text Books:

1	John G Prokis, Manolakis, "Digital Signal Processing Principles, Algorithms and Application", Pearson Education publication
2	Salivahanam, A Vallavaraj, C. Guanapriya, "Digital Signal Processing", TMH
3	A. Anand Kumar, " Digital Signal Processing", PHI Publications

Reference Books:

1	P. Ramesh Babu, "Digital Signal Processing" , Scitech publication
2	Sanjeet Mitra, " Digital Signal Processing", MGH
3	Alan Oppenheim, Schafer, "Digital Signal Processing ", PHI Publication

List of Experiments (Minimum 8 Experiments)

1	Generation of DT signals a) Study of Unit impulse sequence b) Study of Unit step sequence c) Study of Exponential sequence d) Study of Sinusoidal sequence
2	Convolution and correlation of signals
3	Computation of DFT & IDFT using standard formula
4	Computation of DFT using FFT algorithms
5	Computation of circular convolution
6	Design of FIR LPF, HPF, BPF, BRF filter using Kaiser window
7	Design of FIR filter using frequency sampling method
8	Design of IIR LPF, HPF, BPF, BRF filter using impulse invariance method
9	Design of IIR LPF, HPF, BPF, BRF filter using bilinear transformation method
10	Computation of DCT
11	Computation of DWT
12	To implement FIR & IIR filter using TMS320C67XX processor

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following points should be considered:

Question paper should contain 50% numerical and 50% theory.

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

SUBJECT NAME: MICROPROCESSOR AND MICROCONTROLLER

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**PCC-ETC 602: Microprocessor and Microcontroller**
Prerequisites	**Digital Electronics, Fundamentals of 'C' Programming**
Teaching scheme :Lectures + 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 fundamentals of 8085 Architecture and Programming.
2.	To apply the knowledge of Interrupts and interfacing of memory, 8255with 8085.
3.	Understand fundamentals of 8051 Architecture and Programming.
4.	Analyze Real time requirements using ON-Chip resources of 8051.
5.	Evaluate need of I/O peripherals to satisfy system design requirements.
6.	Develop Embedded 'C' Programs for I/O Peripherals

Course Outcomes:

Upon successful completion of this course, the students will be able to:	
1.	Describe Architecture of 8085 and write various Programs.
2.	Implement Interrupts and interfacing of memory, 8255 with 8085.
3.	Describe Architecture of 8051 and write various Programs.
4.	Perform experiment using ON-Chip resources of 8051.
5.	Select I/O peripherals to satisfy system design requirements.
6.	Design Embedded 'C' Programs for I/O Peripherals

Course Contents		
Unit No: 1	**Introduction to 8085 Microprocessor** Functional Pin out, CPU Architecture, Register Organization, Reset Circuit, Clock Circuit, De- multiplexing of Address/Data bus, Generation of control signals, Addressing Modes, Instruction set and programming, Timing diagrams.	**9 Hrs.**
Unit No: 2	**8085 Stack, Interrupts and Interfacing** Stack &Subroutines, Interrupts structure of 8085, Memory mapped I/O, I/O mapped I/O, Memory interfacing with 8085, Study of 8255 PPI : Block diagram, I/O and BSR Mode and Interfacing to 8085	**7 Hrs.**
Unit No: 3	**Introduction to MCS51** Introduction to MCS51Family, Functional Pin out diagram, Architecture, Register Organization, Memory Organization, Reset Circuit, Machine Cycle, Oscillator Circuit, Addressing Modes, Instruction Set, Assembly Language Programming.	**9 Hrs.**
Unit No: 4	**Hardware overview** Input / Output Ports, Interrupts, Timers/Counters, Serial Communication (Mode-1), (Structure, Related S.F.R and Programming).	**7 Hrs.**
Unit No: 5	**Interfacing & Assembly Language Programming with 8051**	**6 Hrs.**

	Microcontroller Keyboard, Seven Segment display, ADC, DAC, stepper motor .	
Unit No: 6	**Embedded 'C' Programming for 8051** Data types, Programs on Arithmetic & Logical operations, Input / Output Ports, Timer/Counter, Serial communication, ADC, LCD	**6 Hrs.**

Text Books:

1	Ramesh Gaonkar " Microprocessor Architecture Programming and Applications with the 8085", , 5th Edition , Penram International Publication
2	Muhammad Ali Mazidi, Janice Gillispie, Rolin D. McKinlay "The 8051 Microcontroller & Embedded Systems Using Assemble and C", 2nd Edition, Pearson Education,
3.	Kenneth Ayala, "The 8051 Microcontroller" , 3rd Edition , Cengage Learning India Private Limited

Reference Books:

1	Douglas V Hall, "Microprocessors and Digital Systems"
2	I.Scott Mackenzie, Raphael C.W.Phan, "The 8051 Microcontroller" , 4th Edition, Pearson
3	Ajay V. Deshmukh "Microcontrollers [Theory and Applications]", TMH

List of Experiments (Minimum 10 experiment):

1	Arithmetic & Logical operations using 8085
2	Data transfer & Exchange using 8085
3	Data conversions using 8085

4	Interrupt's Programming for 8085
5	Arithmetic & Logical operations using 8051
6	Ascending/ Descending order sorting using 8051
7	Interface ADC using 8051
8	Interface DAC using 8051
9	Interface Stepper motor using 8051
10	Use of Timer & counter operation in 8051 using Embedded C
11	Serial Communication with 8051 using Embedded C
12	Interface LCD to 8051 using Embedded C

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following points 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

SUBJECT NAME- POWER ELECTRONICS

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**PCC-ETC603: Power Electronics**
Prerequisites	**Semiconductor Theory**
Teaching scheme :Lectures + 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**

Course Objectives:	
The course aims to :	
1	Make students aware of semiconductor power devices with its firing circuits.
2	Prepare students to design and simulate Controlled rectifier circuits.
3	Make students aware to the Utilization of Choppers and Inverters
4	Explain Industrial applications of Power Electronics Circuits.

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Understand the characteristics of various power electronics devices and Compare the different firing circuits.
2	Analyze converters, Inverters and Choppers.
3	Understand the Industrial applications of Power circuits.

Course Contents		
Unit No: 1	**Semiconductor Power Devices** Construction and V-I Characteristics, Dynamic Characteristics during turn on, turn off, SCR Turn off methods: Class A, Class B, Class C, Class D, Class E, & Class F, dv/dt & di/dt protection circuits. Construction, working, & V-I Characteristics of Diac, Triac, GTO, Power MOSFET and IGBT.	**8 Hrs.**
Unit No: 2	**Firing Circuits of SCR** Turn On methods of SCR, UJT triggering circuits with design, PUT, Diac and Triac triggering circuits, Cosine based firing for bridge controlled converter. Need of Isolation. Pulse transformer & Opto-coupler based isolation techniques.	**6 Hrs.**
Unit No: 3	**Controlled Rectifiers** Single Phase Half wave, Full wave, Half controlled and Full controlled converters with R & RL Load, effect of Freewheeling Diode.	**7 Hrs.**

	Calculations of performance parameters and Numerical expected.	
Unit No: 4	**Inverters using MOSFET/IGBT's** Principle and operation of Single phase half bridge and full bridge inverters. Harmonic reduction techniques of inverter: Quasi square wave, Multiple PWM and sine wave PWM. (Analytical treatment not expected)	**6 Hrs.**
Unit No: 5	**Choppers and its Applications** a)Basic principles of choppers, time ratio control and current limit control techniques, voltage commutated chopper circuit, Jones chopper, Morgan's chopper, step-up chopper and AC chopper. b) Speed control of DC series motors using chopper, speed control of DC shunt motor using phase controlled rectifiers.	**8 Hrs.**
Unit No: 6	**Industrial Applications** Static circuit breakers, over voltage protectors, zero voltage switch, integral cycle triggering, time delay method, soft start method. Non-drive applications using induction heating and Dielectric heating, Switched mode power supply (SMPS), Uninterrupted power supply (UPS), Battery charger, light dimmer using triac and diac, A.C. voltage stabilizer –Relay type, Servo type	**8 Hrs.**

Text Books:

1	P. S. Bhimbra , "Power Electronics", Khanna Publication.
2	P. C. Sen, "Power Electronics", MGH publication

3	M. D. Singh & Khan Chandani, "Power Electronics", McGraw Hill publication,

Reference Books:

1	Ned Mohan: Power Electronics; Wiley Pub.
2	M. H. Rashid, "Power Electronics", Pearson.
3	V. R. Moorthi, "Power Electronics: Devices, Circuits and Industrial Applications", Oxford University Press

List of Experiments (Minimum 8 experiments):

1	Study of V-I Characteristics of SCR TRIAC, DIAC.
2	Study of V-I Characteristics of MOSFET/IGBT/GTO
3	Study of Firing circuits using UJT as relaxation oscillator/RAMP- Pedestal Circuit
4	Study of Firing circuits using TRIAC, DIAC
5	Study of Half controlled Bridge rectifier
6	Study of Fully controlled Bridge rectifier
7	Study of AC voltage Regulator
8	Study of Jones chopper and Morgan's chopper
9	Study of Single phase Inverter
10	Study of SMPS/UPS

11	Study of Light dimmer using Diac/Triac
12	Study of A.C. Voltage stabilizer

Note:

Guidelines to paper setter:

In theory ESE examination of 70 marks following points 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

SUBJECT NAME: ANTENNA AND WAVE PROPAGATION

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**PCC-ETC604: Antenna and Wave Propagation**
Prerequisites	**Basics of Electromagnetic theory, Maxwell's equations and concepts of transmission lines**
Teaching scheme : Lectures + Practical	**4 Hrs. + 2 Hrs.**
Credits	**4 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching scheme	**Examination scheme**
Lectures : 4Hrs. / 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	Basic parameters of antennas and their principle of operation
2	Different Antenna types to know their applications in various domains.
3	Different types of wave propagation Techniques

Course Outcomes: Upon successful completion of this course, the students will be able to:	
1	Realize the importance of basics of antenna systems to differentiate the applicability of each type of antenna
2	Analyze the utilization of Antenna systems in wide areas like wireless communication, fixed line communication, computer communication etc.
3	Discuss radio wave propagation

Course Contents		
Unit No: 1	**Fundamentals of Antenna** Basic Antenna parameters, pattern , beam area, radiation intensity, beam efficiency, directivity, gain and resolution, antenna aperture, effective height, radio communication link, field from oscillating dipole, field zones. Linear, Elliptical and Circular polarization, Front to back ratio, Antenna impedance.	**7 Hrs.**
Unit No: 2	**Antenna array and Frequency independent antenna** Array of two isotropic point sources, non-isotropic but similar point source and the principle of pattern multiplication, examples of pattern synthesis by pattern multiplication, non-isotropic and dissimilar point sources, linear array of isotropic point source of equal amplitude and spacing. Broadband basics, frequency-independent concept: Rumsey's principle, the frequency independent planner log-spiral antenna, frequency independent conical-spiral antenna, the log periodic antenna, the composite yagi-uda corner-log-	**9 Hrs.**

	periodic array.	
Unit No: 3	**Antenna Measurement and Microstrip Antenna:** Antenna measurement: Antenna ranges, Radiation pattern, Gain measurements, Directivity measurements Microstrip Antenna: Introduction, Basic characteristics, Feeding methods, Rectangular patch, Circular patch	**6 Hrs.**
Unit No: 4	**Ground Wave Propagation** Potential Functions and the Electromagnetic Field, Potential Functions for sinusoidal oscillations, Plane earth reflection, space wave and the surface wave, elevated dipole antennas above a plane earth, wave tilt of the surface wave, spherical earth propagation, troposphere wave	**8 Hrs.**
Unit No: 5	**Ionospheric Wave Propagation** The ionosphere, effective permittivity and conductivity of an ionized gas, reflection and refraction of the waves by the ionosphere, regular and irregular variations of ionosphere, attenuation factor, sky wave transmission calculations, effect of earth magnetic field, wave propagation in ionosphere, Faraday rotation and measurement of total electron content, other ionosphere phenomena.	**8 Hrs.**
Unit No: 6	**Radar System:** Fundamentals, RADAR performance factors, basic pulsed radar system, antennas and scanning, display methods, pulsed radar systems, moving target indication, radar beacons, CW Doppler radar, frequency modulated CW radar, phase array radars, planar array	**6 Hrs.**

	radars	

Text Books:

1	John D Kraus, "Antenna for all Application", 3rd edition, TMH publication
2	Constantine A. Balanis, "Antenna Theory", 3rd edition, Wiley Publication
3	Jordan and Balmain, "Electromagnetic Waves and Radiation Systems", 2nd edition, PHI publication
4	Kennedy Davis, "Electronics Communication System", 5th edition, TMH publication

Reference Books:

1	G. S. N. Raju, "Antennas and Wave Propagation", 4th edition, Pearson publication
2	K.D. Prasad, "Antennas and Wave Propagation", 3rd edition, Satya prakashan publication

List of Experiments (Minimum 8 experiment):

1	Calculation of beam width, front to back ratio & gain of simple dipole antenna..
2	Calculation of beam width, front to back ratio & gain of log periodic antenna
3	Calculation of beam width, front to back ratio & gain of Yagi-Uda antenna.
4	Calculation of beam width, front to back ratio & gain of Horn antenna
5	Calculation of beam width, front to back ratio & gain of micro strip /patch antenna.
6	To determine effect of varying distance between transmitter & receiver on received power

7	Calculation of angle of reflection for varying angle of incidences
8	Calculation of angle of refraction for varying angle of incidences
9	Observe standing waves and measure the wavelength of microwave
10	Determination of velocity of object moving in RADAR range.
11	Measurement of time & frequency of RADAR using moving pendulum
12	Write a program to find radiation pattern of Broadside array antenna using MATLAB
13	Write a program to find radiation pattern of End fire array antenna using MATLAB
14	Write a program to compare radiation pattern of uniform linear array and non-uniform linear array using MATLAB

Note:

1) Guidelines to paper setter:

In theory ESE examination of 70 marks following points 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)

2) 40% theory and 60% numerical and Design.

SHIVAJI UNIVERSITY, KOLHAPUR

ELECTRONICS & TELECOMMUNICATION ENGINEERING

SUBJECT NAME: MINI PROJECT

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**PCC-ETC605: Mini Project**
Prerequisites	**Basics of Electronics**
Teaching scheme : Practical	**2 Hrs.**
Credits	**1**
Evaluation Scheme	**-**

Teaching scheme	**Examination scheme**
Practical : 2 Hrs. / Week	**OE: 50 Marks**
	TW: 25 Marks

Course Objectives:	
The course aims to :	
1	Provide students for knowledge of Electronics Components and soldering techniques and its package information for electronics circuit design
2	Provide students for knowledge of the assembling of electronics circuit with components on PCB (Printed Circuit Board) of circuit design.
3	Design and development of Small electronic project based on hardware and software for electronics systems**.**

Course Outcomes:	
Upon successful completion of this course, the students will be able to:	
1	Practice acquired knowledge within the chosen area of technology for project development.
2	Identify, discuss and justify the technical aspects of the chosen project with a

	comprehensive and systematic approach.
3	Reproduce, improve and refine technical aspects for engineering projects
4	Work as an individual or in a team in development of technical projects.
5	Communicate and report effectively project related activities and findings.

Mini project work should consist of following steps.

1. Students should propose project ideas & finalize the project idea in consultation with guide.

2. Students should submit implementation plan in the form of PERT/CPM chart. Which will cover weekly activity of project report.

3. Problem definition and specification development in the form of synopsis.

4. Design of circuit with calculation & should include a) Analog part b) digital part c) Power supply d) Test strategy if firmware is required produce flow chart.

5. Simulation of design using tools like OrCAD, Matlab, etc.

6. Design of enclosure & PCB.

7. Fabrication & assembly of PCB & enclosure.

8. Testing & calibration.

9. Measurement of specifications.

Note:-

1. Project report should include report of all above steps and conclusion.

2. Project group should demonstrate and deliver seminar on project.

3. A mini project should not exceed three students per group.