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, Properties of Fourier Transform, Fourier transform using properties, Limitations of Fourier Transform	**8 Hrs.**
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 Publication Publication, 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**	**3 Hrs.**

	Inconsistency of Ampere's law, Faraday's law, Maxwell's equations for static field, time varying field & harmonically varying fields, Comparison 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", Tata Mc Graw Hill
2	William Hayt, Buck, "Engineering Electromagnetics", Tata 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)

2) 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,	**7 Hrs.**

	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 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 TATA Tata McGraw Hill 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, Photo detector Noise, Detectors Response Time, Structure for InGaAsAPDs, Temperature effect of Avalanche Gain, Comparison of Photo detectors , Fundamental	**7 Hrs.**

	Receiver Operation, Digital Receiver Performance	
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, Tata Mcgraw Hill Publication.

Reference Books:

1	Senior, "Optical Communication", 3rd Edition, Pearson Education.
2	Agarwal, "Optical Fiber Communication", 3rd edition, Wiley India.
3	Ramaswamy, "Optical Networks" , Elsevier India
4	R. P. Khare, "Fiber optics and optoelectronics", Oxford University Press
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)

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ELECTRONICS AND TELECOMMUNICATION ENGINEERING

SUBJECT NAME: INDUSTRIAL AUTOMATION (Open Elective-I)

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**OEC-ETC 501: Industrial Automation**
Prerequisites	**Basics of Control System Engineering & Mathematics.**
Teaching scheme: Lectures + Tutorial	**3 Hrs. + 1 Hr.**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme

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	Understand the fundamentals and importance of industrial automation systems
2	Learn to develop a PLC program for an automatic control system and its applications
3	Understand the mechanism, architecture, working principles and applications of DCS and SCADA

Course Outcomes : **Upon successful completion of this course, the students will be able to:**	
1	Demonstrate the working of PLC,DCS and SCADA
2	Apply the concept; analyze the importance and application of industrial automation.
3	Compile ideas into new different solutions with the help of programming languages as per IEC 61131-3.
4	Apply the knowledge of automation for design and development of Graphical user interface for different process.
5	Use the advanced software tools for Industrial Automation such Codesys ,GX Works 2, RS logix 5000 , Delta V Explorer etc.

Course Content		
Unit No:1	**Introduction to PLC** Part A: Automation: fundamentals of industrial automation, need and role of automation, evolution of automation. PLC introduction :types of processes, comparison, evolution of PLC, definition, functions, advantages, Architecture, DI-DO-AI-AO examples and ratings, I/O module, working of PLC, scan time, Installation of PLC, Rack installation, Grounding and shielding, physical, electrical, maintenance requirements, planning, verifying. Troubleshooting, Fault diagnosis techniques. Part B: Choosing PLC for application, Types and Specifications of PLC	**8 Hrs.**
Unit No:2	**PLC Programming and Interfacing** Part A: PLC programming: Development of Relay Logic Ladder Diagram, Introduction to PLC Programming, Programming devices and	**7 Hrs.**

	languages as per IEC 61131-3 like IL, ST, FBD, CFC, SFC, PLC Timers and Counters, Installation and Troubleshooting. PLC Interfacing: PID Control using PLC, PID instruction. PLC Interface to Hydraulic/Pneumatic circuits, solid-state devices, Need of interfacing Part B: PLC Selection, PLC interface to temperature control loop.	
Unit No:3	**SCADA System** SCADA Concept of SCADA systems, Programming techniques for : Creation of pages, Sequencing of pages, Creating graphics & animation, Dynamos programming with variables, Trending, Historical data storage & Reporting, Alarm management, reporting of events and parameters. Comparison of different SCADA packages.	**7 Hrs.**
Unit No:4	**Introduction to DCS** Part A: DCS Introduction, Location of DCS in Plant, functions, advantages and limitations, Comparison of DCS with PLC,.DCS components/ block diagram, Architecture, Functional requirements at each level, Database management Part B: Latest trends and developments of DCS and its specifications.	**8 Hrs.**
Unit No:5	**DCS Hardware** Part A: Layout of DCS, Controller Details, Redundancy, I/O Card Details, Junction Box and Marshalling Cabinets, Operator Interface, Workstation Layout, different types of control panels, types of Operating Station,. Programming as per IEC 61131-3, Advantages, Overview of Programming Languages, Device Signal Tags, Configuration, Programming for Live Process Part B: Power supply cards details, various display configurations.	**7 Hrs.**

Text Books

1	John Webb, “Programmable Logic Controllers”, Prentice Hall of India.
2	Gary Dunning, “Introduction to Programmable Logic Controllers”, Delmar Thomson Learning.

3	Popovik -Bhatkar, "Distributed Computer Control for Industrial Automation", Dekkar Publications.
4	S. K. Singh, "Computer Aided Process Control", Prentice Hall of India.
5	Krishna Kant, "Computer Based Process Control", Prentice Hall of India.

References Books

1	Richard Cox, "Programmable Controllers", International Thomson Computer Press
2	B. G. Liptak, "Instrument Engineer's Handbook – Process Software and Digital Network", CRC Press

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: BIOMEDICAL INSTRUMENTATION (Open Elective-I)

Course Details

Class	**T. Y. B. Tech. Sem - V**
Course Code and Course Title	**OEC-ETC 501: Biomedical Instrumentation**
Prerequisites	**Fundamentals of Anatomy & Physiology, Scientific Knowledge of Sensors & Actuators**
Teaching scheme: Lectures + Tutorial	**3 Hrs. + 1 Hr.**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme

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	Understand the anatomy and physiology of human body.
2	Study biomedical and physiological information.
3	Implement the application of electronics in diagnostic and therapeutic processes by considering all safety measures.

Course Outcomes: **Upon successful completion of this course, the students will be able to,**	
1	Express the anatomy and physiology of human body.
2	Explain the process to capture Bioelectric signal.
3	Apply knowledge of Diagnostic and Therapeutic equipment's.
4	State medical safety aspects

Course Content		
Unit No:1	**Anatomy And Physiology** Human Anatomy & Physiology: Anatomy & Physiology Of Heart And Brain. Principles Of Generation And Propagation Of Bioelectric Potentials. Electrical Activity Of Heart, Propagation Of Action Potential. Study Of Bioelectric Signals ECG,EMG, ERG,EOG, EEG	**7 Hrs.**
Unit No:2	**Medical Instrumentation System** Generalized Medical Instrumentation System, Basic Requirements Of Bio Potential Amplifiers, Bio Potential Amplifiers For ECG, EMG And EEG. Biopotential Electrodes: Polarizable & Non Polarizable Electrodes, Body Surface Recording Electrodes, Internal Electrodes, Microelectrodes, Electrodes For Electric Stimulation Of Tissue, Ph-Electrodes Theory Of Electrode-Skin Interface And Motion Artifact, Transducers: Classification, Transducers For Biomedical Applications.	**7 Hrs.**
Unit No:3	**Bioelectric Signal Capture Process** ECG: working principles, electrode systems and clinical applications:	**7 Hrs.**

	EEG: working principles lead systems and clinical applications EMG: working principles and clinical applications. Evoked potential systems, Phono cardiology graph – principle and clinical applications, bio potential recording- noise, motion artifact.	
Unit No:4	**Diagnostic Equipment** Diagnosis and therapeutic equipment's: diagnostic equipment- electronic BP monitors, pulse monitors, electro cardio scope , Spiro meter, pulse oxy-meter, ECG machine, EEG machine, EMG machine, EOG machine, ERG machine, PH meter, auto analyzer, gas analyzer.	**6 Hrs.**
Unit No:5	**Therapeutic Equipment** Therapeutic equipment's- pacemakers, defibrillator, heart- lung machine, nerve and muscle stimulators, dialysis machines surgical diathermy equipment, micro wave- short wave and ultrasound diathermy equipment's, nebulous, inhalator, aspirator humidifier and ventilators.	**6 Hrs.**
Unit No:6	**Safety Aspects of Patient** Electric shock hazards, leakage currents, Testing of Biomedical Equipment, biological effects of X-rays and precautions	**6 Hrs.**

Text Books

1	Leslie Cromwell, "Biomedical instrumentation and Measurements", 2nd Edition, Pearson Prentice Hall.
2	RS Khandpur, "Handbook of Biomedical Instrumentation", 3nd Edition, Tata McGraw Hill Publication.
3	John G. Webster , "Medical Instrumentation Application and Design", 3rd Edition, Wiley

References Books

1	Tatsuo Togawa, Toshiyo Tamura, P.Ake Oberg, "Biomedical Transducers and Instruments", CRC.
2	Jacob Klime, "Handbook of Biomedical Engineering", Academic press Inc.

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 and script mode. Variables, Operators and Operands in Python. Arithmetic, relational and logical operators, Operator precedence, Taking input using raw_input() and input() method and displaying 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. Composition User Define Function : Defining , invoking functions, passing parameters, Intra-package References, Packages in Multiple Directories	**2Hrs.**
Unit No: 4	**List:** Lists Concept of mutable lists, creating, initializing and accessing the elements of list, List operations, Concatenation, Membership, list slices,	**2Hrs.**

	List comprehensions List functions & methods: len, insert, append, extend, sort, remove, reverse, pop functions	
Unit No: 5	**Tuples& sets**: Immutable concept, creating, initializing and accessing the elements in a tuple; Tuple functions: cmp(), len(), max(), min(), tuple() Sets Concept of Sets , creating, initializing and accessing the elements of Sets operation Membership, 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	**2Hrs.**
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", Tata McGraw Hill Publication, 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", 4th edition, Developers library.
2	Web reference SimPy: https://simpy.readthedocs.io/

List of Experiments (Minimum 8 experiment):

1	Write a python program to demonstrate basic data types 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. Introduction to DSP processors: TMS320C67XX, Architecture, Functional Units, pipelining, Registers, Addressing modes.	**8 Hrs.**
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", Tata McGraw Hill Publication.
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", Tata McGraw Hill Publication.

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 Microcontroller** Keyboard, Seven Segment display, ADC, DAC, stepper motor .	**6 Hrs.**
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]", Tata McGraw Hill Publication.

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	**7 Hrs.**

	converters with R & RL Load, effect of Freewheeling Diode. 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	**9 Hrs.**

	antenna, the log periodic antenna, the composite yagi-uda corner-log-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	**6 Hrs.**

	systems, moving target indication, radar beacons, CW Doppler radar, frequency modulated CW radar, phase array radars, planar array radars	

Text Books:

1	John D Kraus, "Antenna for all Application", 3rd edition, Tata McGraw Hill 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, Tata McGraw Hill 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 AND TELECOMMUNICATION ENGINEERING

SUBJECT NAME: ROBOTICS ENGINEERING (Open Elective-II)

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**OEC-ETC601:Robotics Engineering**
Prerequisites	**Basics of Sensors, Fundamental Knowledge of Electronics**
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	Understand the history, concept development and key components of robotics technologies
2	Understand implementation of control strategy , sensors & electronics devices
3	Understand different types of effectors and actuators
4	Understand methods of robot programming
5	Development of Robot for particular applications

Course Outcomes: On completion of the course of this course, the students will be able to:	
1	Understand the concept, development and key components of robotics technologies.
2	Select different sensors, electronics systems for Robot
3	Classify different types of effectors and actuators
4	Analyze the system & develop software for particular robotic applications
5	Understand robot applications & develop robot for particular applications

Course Contents		
Unit No: 1	**Introduction To Basic Concepts** Definition; Automation and robotics, a brief history of Robotics, Anatomy of robot, Classification of robot. Overview of robot subsystems, specifications of different industrial robots.	**5 Hrs.**
Unit No: 2	**Robotic Technology and Machine Vision** Drives: Electric, hydraulic and pneumatic. Sensors: Non optical position sensors, Optical position sensors, Velocity sensors, Accelerometers, Proximity sensors, Touch and Slip sensors Vision: Introduction to techniques, Image processing and Analysis	**6 Hrs.**

Unit No: 3	**End Effectors and Actuators** Different types of grippers- Mechanical ,Magnetics, vacuum, Adhesive, Gripper force Analysis &Gripper Design , overview of actuators, Power and torque, Acceleration and velocity Specifications and characteristics of Stepper motors, AC motors, DC motors and servomotors.	**7 Hrs.**
Unit No: 4	**Workspace Analysis and Trajectory planning** Introduction to Workspace Analysis and Trajectory Planning, General overview on trajectory planning, one-dimensional trajectory and multi-dimensional trajectory, Work Envelop and examples, Pick and place operations, Continuous path motion	**6 Hrs.**
Unit No: 5	**Programming methods** Robot Programming Method of Robot programming, Lead through programming methods, Robot program as a path and space, Motion Interpolation, WAIT, SIGNAL, and DELAY commands, Branching, Capabilities and Limitation of Lead through methods, Textual Robot language, Generation of Robot programming language.	**6 Hrs.**
Unit No: 6	**Applications of Robotics** Robot Application in material handling, Material Transfer, Machine loading and unloading, Spot welding, Spray coating, Other processing operations using robots.	**6 Hrs.**

Text Books:

1	Mikell P Groover, Nicholas G Odrey, et.al "Industrial Robotics, Technology programming and Applications", Tata McGraw Hill Publication, 2012.

2	S.K.Saha , "Introduction to Robotics", Tata McGraw Hill Publication
3	K.S. Fu, R.C .Gonzalez, C.S.G.Lee , "Robotics Control ,Sensing ,Vision and Intelligence", Tata McGraw Hill Publication
4	R.K. Mittal & I.J. Nagrath, "Robotics & Control",Tata McGraw Hill Publication, 2007.

Reference Books:

1	John J Craig, "Introduction to Robotics", Pearson, 2009.
2	S.R. Deb, "Robotics Technology and flexible automation", Tata McGraw-Hill Education, 2009.
3	P.A. Janaki Raman, "Robotics and Image Processing an Introduction", Tata McGraw Hill Publication 1995
4	Carl D. Crane and Joseph Duffy, "Kinematic Analysis of Robot manipulators", Cambridge University press, 2008

Note:

2) 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: MOBILE TECHNOLOGY (Open Elective-II)

Course Details

Class	**T. Y. B. Tech. Sem - VI**
Course Code and Course Title	**OEC-ETC 601: Mobile Technology**
Prerequisites	**Analog and Digital Communication**
Teaching scheme: Lectures + Tutorial	**3 Hrs. + 1 Hr.**
Credits	**3 + 1**
Evaluation Scheme ESE + CIE for Theory	**70 (ESE) + 30 (CIE)**

Teaching Scheme

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	Realize importance of cellular concepts and its propagation mechanism.
2	Nurture students with knowledge of traffic engineering in cellular networks.
3	Understand the importance of services and Channels in GSM.
4	Understand architecture of GSM, 4G and 5G.

Course Outcomes : **Upon successful completion of this course, the students will be able to:**	
1	Apply multiple access techniques to mobile communication.
2	Explore the architecture of GSM.
3	Apply and make use of GSM Services.
4	Differentiate thoroughly the routing protocols and generations of mobile technologies

Course Content		
Unit No:1	**Introduction to Mobile Communication & Multiple Access Technique** Mobile and Personal Communication, mobile and wireless devices, Specialized packet and mobile radio networks, circuit switched data services on cellular networks, packet switched data services on cellular networks, Multiple Access Technique- FDMA, TDMA, SDMA, and CDMA.	**6 Hrs.**
Unit No:2	**Cellular Concept** Introduction to cellular telephone system: Expansion of mobile system capacity through frequency reuse, Cell geometry, Selection of cluster size, Cell splitting and sectoring, Coverage and capacity in cellular system and Handoff strategies. Propagation Mechanism: Free space and two ray propagation model, Basic propagation mechanism. Hata outdoor propagation model. Small Scale Fading and Multipath: Types of Small-scale fading, Small scale multipath	**8 Hrs.**

	propagation, Impulse response model of multipath channel and Small-scale multipath measurements.	
Unit No:3	**Introduction to GSM** Introduction, Architecture of GSM, characteristics of GSM standards, services, Radio transmission parameters in GSM System.	**4 Hrs.**
Unit No:4	**GSM Services and Channels** Traffic and Logical Channels in GSM, GSM time hierarchy, Description of call setup procedure, Handover mechanism in GSM, Security in GSM. Data transmission in GSM: Data Services, SMS, HSCSD, GPRS, EDGE.	**7 Hrs.**
Unit No:5	**Routing Protocols** Design issues, goals and classification. Proactive Vs reactive routing, Unicast routing algorithms, Multicast routing algorithms, hybrid routing algorithm.	**5 Hrs.**
Unit No:6	**Evolution of Mobile Technologies** Evolution of Mobile Generation and its comparison (GSM & CDMA) LTE basics, LTE frame structure, LTE Design parameters with Standardization and Architecture of LTE. Overview of 5 G Networks, Comparison of 4G and 5G technology, Opportunities and requirements in 5G network, Open Wireless Architecture of 5G network.	**6 Hrs.**

Text Books

1	Jachen Schiller, "Mobile Communications", Pearson Education.
2	Theodore Rappaport, "Wireless Communications Principles and Practice‖", Pearson Education.
3	Savo Glisic, "Advanced Wireless Networks", Wily India.

References Books

1	William Stallings , "Wireless Communication & Networks", Pearson Education
2	Manvi , "Wireless and Mobile Network", Wiley India
3	Sudip Misra, Sumit Goswami, "Network Routing: Fundamentals, Applications, and Emerging Technologies", Wiley India

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 & 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. This 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.