



# **SOLAPUR UNIVERSITY, SOLAPUR**

## **FACULTY OF ENGINEERING & TECHNOLOGY**

### **Electronics & Telecommunication Engineering**

#### **PROGRAM EDUCATIONAL OBJECTIVES AND PROGRAM OUTCOMES FOR**

#### **Electronics & Telecommunication Engineering Program**

**STRUCTURE OF S.E (Electronics & Telecommunication Engineering) W.E.F 2013-14**

**STRUCTURE OF T.E (Electronics & Telecommunication Engineering) W.E.F 2014-15**

**STRUCTURE OF B.E (Electronics & Telecommunication Engineering) W.E.F 2015-16**

## Solapur University, Solapur



### Program Educational Objectives (PEO's) and Program Outcomes (PO's)

#### for Electronics & Telecommunication Engineering Program.

#### Program Educational Objectives (PEO'S)

- 1 To prepare students to give good theoretical background with sound practical knowledge, enable them to analyze and solve Electronics and communication Engineering problems by applying basic principles of mathematics, science, and engineering and using modern tools and techniques.
- 2 To make students to test hardware components and software for offering solution to real life situations.
- 3 To inculcate students to be sensitive to ethical, societal and environmental issues while pursuing their professional duties.
- 4 To build strong fundamental knowledge amongst students to pursue higher education, and to enhance research and continue professional development in Electronics, communication and IT industries with attitude for lifelong learning.
- 5 To nurture students with technical and communication skills in order to be able to function on multidisciplinary fields and make them aware of contemporary issues at national and international levels.
- 6 To develop students for team working and managerial skills leading to entrepreneurship and leadership.

#### Program Outcomes (PO's)

- (a) an ability to apply knowledge of mathematics, science, and engineering,
- (b) an ability to design and conduct experiments, as well as to analyze and interpret data,
- (c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability,
- (d) an ability to function on multidisciplinary teams,
- (e) an ability to identify, formulate, and solve engineering problems,
- (f) an understanding of professional and ethical responsibility,
- (g) an ability to communicate effectively,
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context,
- (i) a recognition of the need for, and an ability to engage in life-long learning,
- (j) a knowledge of contemporary issues, and
- (k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.



## SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF ENGINEERING & TECHNOLOGY

STRUCTURE OF T.E (Electronics & Telecommunication Engineering) W.E.F 2014-15

### T. E. (Electronics & Telecommunication Engineering) Semester- I

Se mes	Subject	Teaching Scheme				Examination Scheme				
		L	Tut	P	Total	Th.	TW	POE	OE	Total
01	Electro Magnetic Engg. & Radiating System	3	--	2	5	100	25	----	--	125
02	Principles of Digital Communication	4	--	2	6	100	25	50	--	175
03	Software Engineering & Project Management System	3	1	--	4	100	25	--	--	125
04	Digital Signal Processing	4	--	2	6	100	25	25	--	150
05	Microprocessors	4	--	2	6	100	25	50	--	175
06	Electronic Software Lab-II	--	1	2	3	---	25	--	--	25
07	Self Learning (HSS)*	--	--	--	--	50		--	--	50
<b>Total</b>		<b>18</b>	<b>2</b>	<b>10</b>	<b>30</b>	<b>550</b>	<b>150</b>	<b>125</b>	<b>--</b>	<b>825</b>

\* Self Learning (HSS)

Humanity and Social Science (HSS) of Semester – I will be common for Engineering and Technology.

### T. E. (Electronics & Telecommunication Engineering) Semester- II

Sr. No.	Subject	Teaching Scheme				Examination Scheme				
		L	Tut	P	Total	Th.	TW	POE	OE	Total
01	Radar & Microwave Engineering	4	--	2	6	100	25	--	---	125
02	Microcontrollers & Applications	4	--	2	6	100	25	50	---	175
03	Electronics Applications & System Design	4	--	2	6	100	25	---	# 50	175
04	Optical Communication	4	--	2	6	100	25	---	25	150
05	Mobile Communication	3	1	--	4	100	25	---	---	125
06	Mini Project (Hardware)	--		2	2	---	25	---	---	25
07	Self Learning*	--	--	--	--	50		--	--	50
<b>Total</b>		<b>19</b>	<b>1</b>	<b>10</b>	<b>30</b>	<b>550</b>	<b>150</b>	<b>50</b>	<b>75</b>	<b>825</b>

**\* Self Learning**

**Self learning subjects for Semester-II**

- 1. Computer Organization**
- 2. Operating System**
- 3. Robotics**

**Note:**

- In self learning student will select one subject from Semester-I and one subject from Semester-II on their own, study the prescribed syllabus of that subject and appear for a theory examination of 50 marks conducted by Solapur University.
- Department shall appoint the subject coordinator for self learning subject at semester I and semester II and the student should submit minimum four assignments to the subject coordinator for evaluation.
- Term work assessment shall be a continuous process based on student's performance in class tests, assignments, homework, subject seminars, quizzes, and laboratory books and their interaction and attendance for theory and lab sessions as applicable.
- Vocational Training (be evaluated at B.E. Part-I) of minimum 15 days should be completed in any vacation after S.E. Part-II but before B.E. Part-I & the report should be submitted in B.E. Part-I.
- The batch size for the practical's/tutorials be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch be formed.
- Mini Project shall consist of developing a small hardware project on PCB.
- # Practical and Oral Examination of Electronics Applications & System Design is combined with Mini Project (Hardware)



## Solapur University, Solapur

T.E. (Electronics and Telecommunication Engineering)

Semester-I

### 1. ELECTROMAGNETIC ENGINEERING & RADIATING SYSTEMS

#### Teaching Scheme:

Theory: 3 Hrs/Week

Practical : 2 Hr/Week

#### Examination Scheme:

Theory: 100 Marks

Term-Work: 25 Marks

#### Course Objectives

- 1) To interpret the concept of electrostatics and magnetostatics hence define electromagnetic waves.
- 2) To describe the Maxwell's equations and apply it for wave propagation.
- 3) To define radiating systems and develop skills to analyze it's characteristics.

#### Course Outcome

On completion of this course, students will be able to :

- 1) Able to derive wave equation.
- 2) Apply the fundamentals in Telecommunication Applications.
- 3) Succeed in different competitive examinations.

### SECTION I

#### Unit 1: Mathematical Fundamentals

[5 Hrs.]

Vector analysis, Coordinate systems & transformations, line, surface & volume integrals, DEL operator (gradient, divergence and curl in different co-ordinate systems).

#### Unit 2: Electrostatic field - I

[8 Hrs.]

Columbs law, electric field intensity, electric field due to continuous line charge, sheet charge, volume charge distribution, electric flux density, gauss law with applications, divergence theorem.

#### Unit 3: Electrostatic field - II

[8 Hrs.]

Work done due to point charge, electric potential, relation between E & V, electric dipole, electrostatic energy & energy density, boundary conditions for electrostatic field (conductor-free space, dielectric-dielectric), Divergence Theorem, capacitor and capacitance (parallel and spherical).

### SECTION II

#### Unit 4: Magneto static field

[7 Hrs.]

Biot-savart law & its Applications, Amperes circuital law & its application, Stroke's theorem, Magnetic flux density, Magnetic scalar & Vector Potential, boundary condition for magnetic field, energy stored in magnetic field.

**Unit 5: Electromagnetic waves****[7 Hrs.]**

Maxwell's equation in point form & integral form (Time varying field, harmonically varying fields), Helmholtz wave equation, plane waves in lossless & lossy medium, pointing vector and power flow in EM – field, polarization of plane waves.

**Unit 6: Antennas****[7 Hrs.]**

Basic principle of radiation, basic antenna parameters, Antenna field Zones, short dipole antenna and its radiation resistance, slot antenna, Micro strip Patch antenna, parabolic reflector antenna. Antenna Array- Pattern multiplication, Linear array of n isotropic point sources of equal amplitude & spacing, Broad side array, end-fire –array, Yagi Uda array (Problems on antenna array are not expected.)

**Text Books:**

1. Electromagnetics by John D. Kraus - Mc Graw Hill Third Edition
2. Electromagnetic Engineering by William Hyte - Mc Graw Hill
3. Electromagnetic field theory & transmission lines by G.S.N. Raju - Pearson Education
4. Antennas and Wave Propagation by G.S.N. Raju- Pearson Education
5. Antenna and Wave Propagation by K.D. Prasad-Tech India

**Reference Books:**

1. Electromagnetic Schaum's outline series by J.A.Edminister -TATA Mc Graw Hill Second Edition
2. Electromagnetic waves & transmission lines by R.S. Rao – PHI
3. Antenna for all applications by John D. Kraus, Marhefka, Khan - Mc Graw Hill Third Edition
4. Applied Electromagnetics by F. Ulaby (2001 Media Edition) - PHI
5. Antenna theory analysis and design by C.A. Balanis (second edition) - Wiley

**Term work:**

Term work should consist of minimum 4 experiments & 6 Tutorials based on above syllabus

**List of Practicals (Minimum four Practicals)**

1. Verification of characteristics of different types of antenna
2. Plotting polar plot of an antenna
3. Measuring Gain of an antenna
4. Measuring Beamwidth of an antenna
5. Measuring front to back ratio of an antenna
6. Modulation test
7. Antenna radiation with distance
8. SWR Measurement



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-I**  
**2. PRINCIPLES OF DIGITAL COMMUNICATION**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Practicals/Oral Exam:** 50 Marks

**CourseObjectives**

- 1) To explain the concept of Information theory and baseband data transmission.
- 2) To compare pulse modulation, digital modulation and demodulation techniques.
- 3) To implement Entropy coding procedure.
- 4) To introduce the concept of multichannel and multicarrier communication system.

**CourseOutcome**

On completion of this course, students will be able to :

- 1) Solve and analyze problems related to entropy coding.
- 2) Distinguish between pulse and digital modulation techniques.
- 3) Identify the modulation techniques for different applications.

**SECTION I**

**Unit 1: Information Theory and Channel capacity.-**

**[8 Hrs.]**

Introduction to information theory, average and mutual information, Entropy, Joint Entropy and conditional entropy, Rate of information, redundancy, channel capacity, Shannon's Theorem, Shannon – Hartley theorem, bandwidth, S/N trade off, entropy coding- Shannon Fano Coding, Huffman Coding.

**Unit 2: Pulse Modulation Techniques:**

**[4 Hrs.]**

Introduction to Sampling theorem, Introduction to pulse modulation techniques, PAM, Natural sampling, Flat top sampling PAM modulator and demodulator, TDM PAM system, PTM modulation and demodulation techniques, Direct and indirect method of PTM signal generation.

**Unit 3: Pulse Code Modulation Techniques:**

**[6 Hrs.]**

Basic block diagram of digital communication system, Quantization – Uniform & Non uniform, PCM System, Differential PCM, ADPCM, Bandwidth requirement of PCM, TDM-PCM Telephone system, Delta Modulation – Noise in DM, ADM.

**Unit 4: Baseband Data Transmission:****[6 Hrs.]**

Binary and M-ary signaling scheme, Duo-binary baseband PAM system – use of controlled ISI in duo binary signaling scheme, Shaping of transmitted signal spectrum, Effect of precoding, Pulse shaping by Digital Methods, Equalization, Eye Diagrams, Synchronization, Scrambler & unscramble, ISI.

**SECTION II****Unit 5: Binary Digital Modulations Techniques:****[7 Hrs.]**

Binary ASK, PSK, FSK, Coherent PSK & FSK, Differential coherent PSK, Non coherent FSK, Probability of error, Comparison of digital modulation schemes–Bandwidth, power requirements & Equipment complexity.

**Unit 6: M-ary Digital Modulations Techniques:****[7 Hrs.]**

M-ary coherent PSK, QPSK transmitter and Receiver, M-ary differential PSK transmitter and Receiver, M-ary wideband FSK, structure of the receiver for an orthogonal (wideband FSK) signaling scheme, QAM modulation and demodulation, Minimum shift keying transmitter and receiver.

**Unit 7: Optimum receiver for digital Modulation****[6 Hrs.]**

Matched filter receiver, Correlation receiver, Synchronization- Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

**Unit 8: Multichannel and Multicarrier systems****[4 Hrs.]**

Multichannel Digital Communication in AWGN channels, M-ary Orthogonal signals, multicarrier Communication System, FFT Based multicarrier system, Minimizing Peak-to-average ratio in multicarrier system.

**Text Books:**

1. Communication System Analog & Digital by R. P. Singh & S. D. Sapre., TMH, 3<sup>rd</sup> Edition.
2. Analog and Digital Communication Systems by Martin S. Roden., PHI, 3<sup>rd</sup> Edition.
3. Digital Communication by John G. Proakis, Mc Graw Hill International Edition, 4<sup>th</sup> Edition.
4. Communication Systems (Analog and Digital) by Sanjay Sharma - Katsons

**Reference Books:**

1. Taub's Principles of Communication System by Herbert Taub, Donald Schling, Goutam Saha, Mc Graw Hill Education (India) Pvt. Ltd., 4<sup>th</sup> Edition.
2. Digital & Analog Communication systems by K. Sam Shanmugan, Wiley Publications.
3. Digital communication by Bernard Sklar, Pearson Education, 2<sup>nd</sup> Edition.
4. Contemporary Communication system using MATLAB by John G. Proakis, Masoud Salehi, Gerhard Bauch., Cengage Learning, 2<sup>nd</sup> Edition



**Term work:**

**List of Practicals**

(Minimum 8 Experiments based on above syllabus and at least two expt. on MATLAB)

- 1) Sampling and reconstruction
- 2) PAM, PWM, PPM
- 3) TDM / FDM
- 4) Data Formats
- 5) PCM, DPCM /ADCM
- 6) PAM TDM / PCM TDM
- 7) Companding
- 8) DM
- 9) ADM
- 10) ASK, FSK
- 11) BPSK, DPSK / QPSK
- 12) Eye Diagram
- 13) MATLAB Based Experiment.

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-I**

**3. SOFTWARE ENGINEERING & PROJECT MANAGEMENT SYSTEM**

**Teaching Scheme:**

**Theory: 3 Hrs/Week**

**Tutorial : 1 Hr/Week**

**Examination Scheme:**

**Theory: 100 Marks**

**Term-Work: 25 Marks**

**Course Objectives**

- 1) To understand software engineering and process models for development of software Projects.
- 2) To analyze the requirements for project and testing to implement software product design, for real life situation.
- 3) To widen managerial skills for planning, implementing and risk management of software Project.

**Course Outcome**

On completion of this course, students will be able to :

- 1) Interpret software processes and their models.
- 2) Identify different tasks of project managers and need for Project planning in Project completion.
- 3) Visualize progress of software project.
- 4) Work in multidisciplinary project as a part of team.

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**SECTION I**

**Unit 1: Software Processes – [5Hrs.]**  
Software process models, process iteration, Process activities, the rational Unified process.

**Unit 2: Software Requirement – [4Hrs.]**  
Functional and non-functional, user requirement, system requirement, Interface specification, Requirement document.

**Unit 3: Software Life Cycle & Models - [8Hrs.]**  
Software life cycle concept, models -Water fall, V, prototyping, System models, context model, behavioral model, object models, Structured models.

**Unit 4: Software Testing – [4Hrs.]**  
System testing, component testing, test case design, Test automation.

## SECTION II

**Unit 5: Project Management -** [5Hrs.]  
Concept of general management, project planning, program management & project evaluation.

**Unit 6: Activity Planning -** [5Hrs.]  
Project scheduling, project & activities, Network planning model & formulation, Forward & backward pass, critical path analysis, resource planning.

**Unit 7: Risk Management –** [6Hrs.]  
Risk & its categories, risk identification, assessment, planning & management, PERT (Only problem solving method), Monte Carlo & critical chain concept in Risk management (Only application)

**Unit 8: Monitoring and Control –** [5Hrs.]  
Framework, data collection, visualizing methods, cost monitoring, change control.

### Text Books:

1. Software Engineering - Summerville- Pearson Education (8th Edition)
2. Software Project Management – Bob Hughes & Cottrell – TMH (4th Edition)

### Reference Books:

1. Software Engineering – (Theory & Practice) – Pfleeger, Alleger, Atlee- Pearson (3rd Edition)
2. Software Engineering – Rajani Kanta Malu, Scitech publication
3. Software Engineering A Practitioner’s Approach, 6th Edition- ROGER S. PRESSMAN, TMH
4. Software Project Management- S.A. Kelkar, PHI Publication (3<sup>rd</sup> Edition)

### Term work:

Case Study: (Any 3)

1. Study Software Testing with practical example.
2. Management activities in a firm.
3. Elaborate any type of system model with example.
4. How to prepare a requirement document with example.
5. Risk management in Software Company.
6. Plan activity network model for any project.



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-I**  
**4. DIGITAL SIGNAL PROCESSING**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Practicals/Oral Exam:** 25 Marks

**Course Objectives**

- 1) To examine the properties of DSP system.
- 2) To calculate Discrete Fourier Transform & verify it's properties.
- 3) To design Analog and digital filters.

**Course Outcome**

On completion of this course, students will be able to :

- 1) Apply transform techniques for various applications.
- 2) Evaluate Discrete Fourier Transform.
- 3) Design filters for given applications.

**SECTION I**

**Unit 1: Introduction**

**[3 Hrs.]**

Introduction to DSP System, co-relation & its properties, Digital transfer function, stability consideration.

**Unit 2: Discrete Fourier Transform**

**[8 Hrs.]**

Frequency Domain Sampling and Reconstruction of Discrete Time Signals, DFT as linear Transformation, relation between DFT and Z transform, Properties of DFT, Computation of DFT & IDFT, multiplication of two DFTs and circular convolution.

**Unit 3: Linear Filtering Method Based on DFT**

**[5 Hrs.]**

Use of DFT in linear filtering, Filtering of long data sequences such as Overlap-save and Overlap-add method, Frequency analysis of signals using DFT.

**Unit 4: FFT Algorithm**

**[8 Hrs.]**

Divide & conquer approach to computation of DFT. Radix-2 FFT algorithm for the computation of DFT and IDFT, decimation in- time and decimation in frequency algorithms. Goertzel algorithm and chirp-z transform.

## SECTION II

### **Unit 5: FIR Filter Design** [7 Hrs.]

FIR filter design: Introduction to FIR filters, design of FIR filters using -Rectangular, Hamming, Bartlet and Kaiser windows, FIR filter design using frequency sampling technique, finite word length effects in FIR filters, FIR Implementation techniques.

### **Unit 6: IIR Filter Design** [7 Hrs.]

IIR Filter Design by Impulse Invariance, IIR Filter Design by Bilinear Transformation, Characteristic of commonly used Analog Filters(Butterworth Filter), Some examples of Digital Filter Design Based on above Transformation, finite word length effects in IIR filter, IIR implementation technique.

### **Unit 7: Realization of Digital Linear Systems** [7 Hrs.]

Structures for realization of Discrete time systems

Structures for FIR Filters: Direct form, Cascade form & Lattice Structure.

Structures for IIR Filters: Direct form, Cascade form & parallel form.

### **Unit 8: Application of DSP in Audio processing, Telecommunication & Image processing.** [3 Hrs.]

#### **Text Books:**

1. Digital Signal Processing – Principles, Algorithms and Applications by John G Proakis-4<sup>th</sup> edition, Pearson Education.
2. Digital Signal Processing by S. Palani & D. Kalaiyarasi, Ane's Student Edition, Ane Books Pvt. Ltd New Delhi.
3. Digital Signal Processing by S Salivahanan, A Vallavaraj & C Gnanapriya –2<sup>nd</sup> edition, TMH.
4. Digital Signal Processing by Ramesh Babu -4<sup>th</sup> Edition, Scientific Publication.
5. Discrete time signal Processing by A.V. Oppenheim & R.W. Schafer.- Low price edition, John Wiley

#### **Reference Books:**

1. Digital Signal Processing by Dr. Shaila D. Apte, Second edition, Wiley India.
2. Essentials of Digital Signal Processing using MATLAB by Vinay K. Ingle & John G. Proakis, Cengage Learning, 2012.
3. Digital Signal Processing- A Practical Approach, by E. C. Ifleachor and B. W. Jervis, Second Edition, Pearson education.
4. Theory and Application of Digital Signal Processing Digital by Rabiner & Gold-First edition, Prentice Hall.

#### **Term work:**

#### **List of Practicals (Minimum Eight Practicals)**

1. Introduction to MATLAB.
2. Waveform generation using discrete time signals using MATLAB.
3. Z-transform, pole zero plot and frequency response of a system.
4. To implement linear convolution using MATLAB and C-language.
6. To implement auto co-relation and cross co-relation using MATLAB.
5. Implementation of DFT and IDFT using MATLAB and C-language.

6. To implement circular convolution using MATLAB and C-language.
7. Fast convolution using Overlap add/Overlap save method using MATLAB.
8. Realization of FIR system.
9. Realization of IIR system.
10. Design of FIR filter using frequency sampling method.
11. Design of FIR filter using windowing technique.
12. Design of IIR filter using impulse invariant technique.
13. Design of IIR filters using Bilinear transformation/Butterworth Technique.

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-I**  
**5. MICROPROCESSORS**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Practicals/Oral Exam:** 50 Marks

**CourseObjectives**

- 1) To become familiar with the architecture and the instruction set of an Intel microprocessor.
- 2) To describe both hardware and software aspects of integrating digital devices (such as memory and I/O interfaces) into microprocessor-based systems.
- 3) To analyze the operating principles and gain hands-on experience with general microprocessor peripherals such as UARTs, timers, and analog-to-digital and digital-to-analog converters.
- 4) To explain and practice assembly language programming techniques.

**CourseOutcome**

On completion of this course, students will be able to :

- 1) Identify the basic element and functions of microprocessor.
- 2) Describe the architecture of microprocessor and its peripheral devices.
- 3) Explain fundamental understanding on the operation between the microprocessor and its interfacing devices.
- 4) Apply the programming techniques in developing the assembly language program for microprocessor applications.

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**SECTION I**

**Unit 1: Fundamentals of Microprocessors**

**[10 Hrs.]**

Basic block diagram and operation of microcomputer system, INTEL 8085A- Features, Functional Pin Configuration, Architecture, Demultiplexing of address & data bus, Generating different control signals. Instruction Set-Addressing Modes, Timing diagrams, Programming with Assembly language, Single stepping and single cycle execution, Stack and subroutine

**Unit 2: Introduction to Memories Memory Interfacing**

**[5 Hrs.]**

Memory Classification-RAM, ROM, PROM, EPROM, EEPROM, Memory organization, memory expansion. Interfacing different memory chips (RAM/ROM) with 8085, Address decoding techniques.

**Unit 3: Basics of I/O Interfacing & Interrupts**

**[9 Hrs.]**

Concepts of I/O Ports, Data transfer techniques, Memory mapped I/O & I/O Mapped I/O Schemes, Serial I/O lines of 8085 and the implementation asynchronous serial data communication using SID and SOD lines. Basic concepts, Classification-Hardware & Software Interrupts, Interrupt Structure

of 8085, Interrupt service routine and Instructions related to interrupts, Programming using interrupts.

## SECTION II

### **Unit 4: Interfacing Chips & applications** [13 Hrs.]

8255 Programmable Peripheral Interface(PPI), Interfacing of Keyboard, 7 Segment display, Stepper motor with 8255 PPI. Programming and applications of - 8253/54 Programmable Interval Timer, 8251 USART.

### **Unit 5: Data converters** [5 Hrs.]

DAC techniques -Weighted register type DAC, R-2R Ladder type DAC, ADC techniques -Counter type ADC, Successive approximation type ADC, Interfacing ADC (0808/0809), DAC-(0808) using 8255.

### **Unit 6: Introduction to Advanced Microprocessors** [6 Hrs.]

Architecture and Register organization of 8086, Basic architectures and features of 80286, 80386 and Pentium Processor.

#### **Text Books:**

1. Microprocessors Architecture, Programming and Applications, with the 8085A: Ramesh S Gaonkar, 5<sup>th</sup> Edition Wiley Eastern Ltd. New Delhi, 2006.
2. Microprocessors and Programmed Logic: Kenneth L Short, 2<sup>nd</sup> Edition, Pearson Education.
3. INTEL- Microprocessor Peripheral hand book, application notes, Manual.
4. Microprocessor and Interfacing: Barry B. Brey, 8<sup>th</sup> Edition Prentice Hall.
5. Microprocessor Architecture, Programming and System Featuring 8085: Willam A Rout, 1<sup>st</sup> Edition, Cenage Learning Publication.

#### **Reference Books:**

1. Microprocessor 8085 and Its Interfacing: Sunil Mathur, 2<sup>nd</sup> edition, Prentice Hall India, 2011.
2. Fundamentals of Digital Circuits: A. Anand Kumar, Prentice Hall India, 2006.
3. Advanced Microprocessors and Peripherals: A. K. Ray and K. M. Bhurchandi, 3<sup>rd</sup> edition, Tata McGraw-Hill, 2009.
4. 0000 to 8085 – Introduction to Microprocessor for Engineers and Scientists: P. R. Sridhar and P. K. Ghosh, 2<sup>nd</sup> edition, Prentice Hall India Ltd, 2005.

#### **Term work:**

#### **List of Practicals** (Minimum Fourteen Practicals)

##### **A) Software/Simulator based (Minimum Eight experiments)**

1. Addition and subtraction of two 8-bit numbers with programs based on different addressing modes of 8085.
2. Addition and subtraction of two 16-bit numbers.(Using 2's complement method, also programs which access numbers from specified memory locations.)
3. Addition and subtraction of two 16-bit BCD numbers.(Using DAA instruction.)



4. Multiplication of two 8-bit numbers using the method of successive addition and Shift & add.
5. Division of two 8-bit numbers using the method of successive subtraction and shift & subtract.
6. Block transfer and block exchange of data bytes.
7. Finding the smallest and largest element in a block of data.
8. Arranging the elements of a block of data in ascending and descending order.
9. Converting 2 digit numbers to their equivalents.
  - a) BCD to HEX and b) HEX to BCD
10. Generating delays of different time intervals using delay subroutines and measurement of delay period on CRO using SOD pin of 8085A.
11. Generation of Fibonacci Series.
12. Finding Square of given number using look up table
13. Implementation of decimal up counter

**B) Hardware Based (Minimum Six experiments from the list given)**

1. Program controlled data transfer using 8255 PPI.
  - A) To INPUT data bytes from peripheral port and to store them in memory.
  - B) To OUTPUT data bytes from memory to peripheral port.
2. Study of interrupts by enabling them in main line program and then executing different subroutines when TRAP, RST 7.5, RST 6.5 & RST 5.5 are activated.
3. Interfacing 7 segment LED display using 8255A – in static and dynamic mode.
4. Interfacing ADC 0808/0809.
5. Interfacing DAC 0808.
6. Interfacing stepper motor with microprocessor using 8255A – in Half and Full excitation.
7. Interfacing of thumbwheel switches.
8. Interfacing of 8253 / 8254.
9. Interfacing of 8251.
10. Interfacing keyboard
11. Interfacing display



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-I**  
**6. ELECTRONIC SOFTWARE LAB – II**

**Teaching Scheme:**

**Tutorial: 1 Hr/Week**

**Practical : 2 Hr/Week**

**Examination Scheme:**

**Term-Work: 25 Marks**

**Course Objectives**

- 1) To develop the fundamental of Object Oriented Concepts
- 2) To learn data manipulation techniques using C++.
- 3) To solve simple and moderately complex problems using C++

**Course Outcome**

On completion of this course, students will be able to :

- 1) Analyze simple C++ Program.
- 2) Implement object oriented programming for data manipulation.
- 3) Solve problems related to object oriented concepts

**Unit 1: Beginning with C++:**

[1 Hrs.]

Benefits of OOP, Applications of OOP, Tokens, Keywords, Identifiers and Constants, Basic Data types, Scope Resolution Operator, Operator Precedence.

**Unit 2: Functions in C++:**

[2 Hrs.]

Function prototype, inline functions, function overloading, operator overloading

**Unit 3: Classes and objects:**

[3 Hrs.]

Class types, data members, member functions, pointers to class members, constructors, Destructors, friend functions, static member functions

**Unit 4: Inheritance:**

[3 Hrs.]

Derived classes, types of inheritance, virtual base classes.

**Unit 5: Polymorphism**

[2 Hrs.]

Introduction, Implementation Run-time Polymorphism, Virtual functions.

**Unit 6: Templates and exception handling.**

[1 Hrs.]

**Text Books:**

1. Programming with C++ by Ravichandran D, Tata McGraw Hill Publication, New Delhi, Second Edition
2. Object oriented programming in C++ by E. Balagurusamy, McGraw Hill Publication, New Delhi, Sixth Edition
3. Object-Oriented Programming with C++ by Rohit Khurana, Vikas Publication New Delhi.
4. Mastering C++ by K.R. Venugopal T. Ravishankar, Rajkumar Buyya ,McGraw Hill Publication, New Delhi, Second Edition.
5. Object-Oriented Programming in C++ by Rajesh Shukla , Wiley India Publication, India Edition.

**Reference Books:**

1. Programming in C & C++ by S. S. Kahandare (S. Chand).
2. Object oriented Analysis & Design – by Deacon – Pearson Education.
3. Object Oriented Programming with ANSI and Turbo C++ by - Kamthane – Pearson Education.
4. Object oriented programming with C++ by Bhave – Pearson Education.
5. Program Solving with C++ -6/e by Savitch –Pearson Education.

**Term work:****List of Practicals**

(Term Work consists of minimum Ten practicals based on above syllabus)

- 01) Simple program using the concept of class.
- 02) Program using the concept of private, public, protected data members and functions.
- 03) Program using the concept of operator overloading.
- 04) Program on inline function.
- 05) Program on pointers to class members.
- 06) Program on constructors.
- 07) Program on destructors.
- 08) Program on static member function.
- 09) Program using the concept of friend function.
- 10) Program on single level, multilevel and multiple inheritance.
- 11) Program using the concept of virtual base class.
- 12) Program using the concept of virtual function.
- 13) Program on templates and exception handling.
- 14) Program on function overloading.



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**1. RADAR & MICROWAVE ENGINEERING**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Course Objectives**

- 1) To evaluate different parameters of transmission line and estimate transmission line equations.
- 2) To analyze the different active and passive microwave components.
- 3) To describe the principle of Radar and types of Radars.

**Course Outcome**

On completion of this course, students will be able to :

- 1) Calculate parameters and properties of transmission lines.
- 2) Analyze different parameters of microwave components.
- 3) Implement the fundamentals in Defense and in Industrial Applications.

**SECTION I**

**Unit 1: Microwave Transmission line**

**[5 Hrs.]**

Transmission line equation, Transmission line parameters, Group Velocity & Phase Velocity, Smith Chart, Microwave frequency band, Characteristic & applications of microwaves, Microwave hazards.

**Unit 2: Rectangular waveguide**

**[6 Hrs.]**

Solutions of Wave equations in Rectangular co-ordinates, TE mode & TM mode Rectangular Waveguide, Power Transmission & Power loss in Rectangular Waveguide.

**Unit 3: Microwave Components**

**[7 Hrs.]**

Introduction to S parameters, E-Plane Tee, H-Plane Tee, Magic Tee, Hybrid Junction, Directional Coupler, Ferrite devices-Circulator and Isolator

**Unit 4: Microwave Solid State Devices And Measurement**

**[6 Hrs.]**

Varactor diode, PIN diode, Tunnel diode, Gunn Diode, IMPATT, TRAPATT, BARITT diode

## SECTION II

### Unit 5: Microwave Measurements

[5 Hrs.]

Measurement of Power, frequency, attenuation, phase shift, VSWR, Impedance, dielectric constant, Insertion loss.

### Unit 6: Microwave Tubes

[8 Hrs.]

Limitations of conventional Tubes, Klystron-working of Klystron, velocity modulation process and its derivation, efficiency, Reflex Klystron- working, velocity modulation process, Repeller voltage vs. Accelerating voltage derivation, efficiency, Magnetron – working, Hull's cutoff voltage equation, mode jumping, frequency pushing and pulling, TWT- similarities and differences with klystron ,working of TWT.

### Unit 7: Radar Fundamentals

[5 Hrs.]

Introduction, Radar Principles, Target Information extraction, Radar Range Equation, Types of Radars and their Functions, Radar compared to other EM sensors, radar displays.

### Unit 8: MTI and Pulse Doppler Radar

[6 Hrs.]

Introduction, Doppler frequency shift, Sweep to Sweep Subtraction and Delay Line Canceler, MTI block diagram, Staggered Pulse Repetition frequencies, Moving Target Detector (MTD), MTI from Moving Platform (AMTI), Pulse Doppler Radar.

#### Text Books:

1. Microwave & Radar Engineering by M.Kulkarni - Umesh Publication Third Edition
2. Microwave devices & Circuits by Samuel Y. Liao - Pearson Education
3. Introduction to Radar Systems by Merrill Skolnik – TMH Third Edition
4. Radar Principles, Technology, Applications by Byron Edde – Pearson Education

#### Reference Books:

1. Foundations for Microwave Engineering by Robert Collin - Wiley Publication.
2. Microwave Engineering (Passive Circuit) by Peter A. Rizzi - Pearson Education.
3. Microwave Engineering by G.S. Raghuvanshi - Cengage

#### Term work:

#### List of Practicals (Minimum Eight Practicals)

1. Measuring characteristics of Transmission line.
2. Measuring attenuation of Transmission line.
3. Measuring input impedance of Transmission line.
4. Measurement of Microwave wavelength and frequency.
5. Verification of working of different Microwave Components.
6. Plotting Gunn diode characteristics.
7. Plotting characteristics of Reflex Klystron and show negative resistance region.
8. Measurement of reflection coefficient and VSWR for different loads.
9. Measurement of attenuation provided by different attenuators.
10. Measuring different parameters of directional couplers.

11. Measuring different parameters of nonreciprocal devices (circulator, isolator).
12. Find Frequency of Pendulum using Radar.
13. Measure speed of the fan using Radar.
14. Measure frequency of oscillations of tuning fork using Radar.
15. Measure Transformer Hum and Frequency using Radar.

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**2. MICROCONTROLLERS AND APPLICATIONS**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Practicals/Oral Exam:** 50 Marks

**Course Objective :**

- 1) To provide an introduction to microcontroller families and details of MCS51.
- 2) To describe Core features and Peripheral features of PIC16f877a
- 3) To explain and practice assembly language programming techniques
- 4) To demonstrate and perform hardware interfacing and design

**Course Outcome :**

On completion of this course, students will be able to :

- 1) Describe the fundamental features and operation of contemporary microcontroller
- 2) Identify memory organization of a microcontroller and Illustrate microcontroller memory and peripherals expansion capability
- 3) Analyze the program for time and code complexity
- 4) Develop assembly language source code for applications that use I/O ports, timer and single/multiple interrupts

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**SECTION I**

**Unit 1: Introduction Microcontroller**

**[4 Hrs.]**

Introduction, Microprocessor and Microcontrollers, CISC & RISC Microcontroller ,harvard and von neumann architecture, Development system for Microcontroller.

**Unit 2:The 8051 Architecture and Instructions**

**[10 Hrs.]**

8051 Microcontroller Hardware, Addressing modes, Instruction set ,Input / Output Pins, ports and Circuits, External Memory, Counters and Timers, Serial Data Input/ output, interrupts.

**Unit 3:Assembly language programming**

**[2 Hrs.]**

The mechanics of Programming, The assembly Language programming process, Programming Tools and techniques. Program for interfacing Switches, LED, Relay, Buzzer.

**Unit 4: Interfacing of following with microcontroller**

**[8Hrs.]**

LCD display, Matrix keyboard, ADC 0809, DAC 0808. RTC DS1307, EEPROM (24C256), serial ADC/DAC PCF 8591

## SECTION II

**Unit 5: PIC Microcontrollers:** [2 Hrs.]  
PIC Microcontrollers overview and features

**Unit 6: PIC 16F877A Microcontroller Core Features:** [8 Hrs.]  
Introduction, Architecture, Functional pin description, various registers, Program memory and data memory organization, Input / output ports, Interrupts, various kinds of RESET

**Unit 7: Peripheral Features:** [6 Hrs.]  
Timers, Capture/compare / PWM (CCP) Modules in PIC 16F877, ADC, The Watchdog Timer.

**Unit 8: Serial Communication:** [8 Hrs.]  
Master synchronous serial port (MSSP) module: SPI, I<sup>2</sup>C, The Universal Synchronous Asynchronous Receiver Transmitter (USART) module.

### Text Books:

1. The 8051 Microcontroller Architecture, programming and Applications by Kenneth Ayala Penram International ( Third Edition)
2. The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi Pearson Education Asia LPE ( Second Edition)
3. Designs with PIC Microcontrollers by John B. Peatman Pearson Education Asia LPE
4. PIC Microcontroller & Embedded Systems – Mazidi – Pearson Education

### Reference Books:

1. 8051 Microcontrollers programming and practice by Mike Predcko.
2. Data sheets of MCS51 family microcontrollers, PIC 16F877A Flash microcontrollers, RTC DS1307, EEPROM(24C256), serial ADC/DAC PCF 8591
3. 8051 Microcontroller by I Stott, Mackenzie, Rathel & Phan – Fourth Edition - Pearson
4. Designing & Customizing of PIC Microcontrollers by Mike Predcko.

### Term work:

#### List of Practicals (Minimum Ten Practicals)

1. Arithmetic and Logic operations
2. Interfacing of Switches, LEDs and Buzzer.
3. Interfacing of Matrix Keyboard
4. Interfacing of LCD Display.
5. Interfacing of DAC 0808 and generation of various waveforms.
6. Interfacing of ADC 0809
7. Use of Timer for generation of time delays
8. Use of Timer as counter.
9. Interfacing of Serial RTC
10. Interfacing of Stepper motor.
11. Speed control of DC Motor.



12. Use of ADC of PIC Microcontrollers.
13. Use of Interrupts for any Application.
14. Serial communication.

**Note:-** Students should be introduced to embedded C programming and Minimum two practical's should be taken using embedded C programming .

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**3. ELECTRONICS APPLICATIONS & SYSTEM DESIGN**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Oral Exam:** #50 Marks

**CourseObjectives**

- 1) To describe the concept of power devices.
- 2) To design and analyze timer, frequency counters and digital voltmeter.
- 3) To design applications of Phase Locked Loop (PLL) and industrial process control.
- 4) To provide introduction of the concept of PLC and its applications.

**CourseOutcome**

On completion of this course, students will be able to :

- 1) Use the power devices in industrial applications.
- 2) Design and implement timers, frequency counters and digital voltmeters.
- 3) Design and implement PLL applications.
- 4) Identify and implement the design aspects for solving industrial problems.

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**SECTION I**

**Unit 1: Introduction to Power Semiconductor Devices:**

**[8 Hrs.]**

SCR - construction, working, VI characteristics, turn on and turn off methods (Class A, B, C, D).  
TRIAC - construction, working, VI Characteristics. DIAC - construction, working, VI Characteristics.

**Unit 2: Power Electronics Applications:**

**[8 Hrs.]**

Single phase half wave controlled rectifier, center tapped full wave rectifier, fully controlled bridge rectifier, AC power control using DIAC & TRIAC, Fan regulator, lamp dimmer, induction and dielectric heating.

**Unit 3: Modulator, Demodulator & PLL:**

**[8 Hrs.]**

Balanced modulator principle, IC 1596, applications of IC 1596 -AM modulator & Mixer.  
PLL-Working Principle, design consideration, FM detector, FSK demodulator, PSK demodulator, Frequency synthesizer using LM565 & CD 4046.

## SECTION II

### Unit 4: Timer, Counters Digital Voltmeter:

[8 Hrs.]

Timer design using XR 2240, Design of counter using IC 74C926 for the time & event counting, Design of 3 ½ digit Multi-range DVM using discrete components.

### Unit 5: Design of Industrial Control:

[8 Hrs.]

Signal conditioning for sensors PT 100, LM 35, Thermocouples (J & K type), current loop Interface (4mA to 20mA), zero & span circuit, offset V to I & I to V convertor, V to V convertor.

### Unit 6: Controllers:

[8 Hrs.]

Design of analog ON/OFF controller and proportional controller for controlling process, PLC architecture and applications, bottle filling plant & elevator control.

**Note: # Oral Examination of Electronics Applications & System Design is combined with Mini Project (Hardware)**

### Text Books:

1. Power Electronics, circuits, devices & applications by M. H. Rashid, Pearson Education, 3<sup>rd</sup> edition.
2. Power Electronics by P. C. Sen, TATA Mc. Graw Hill, 2<sup>nd</sup> Edition.
3. Power Electronics by M. D. Singh & K. B. Khanchandani, TATA Mc. Graw Hill, 2<sup>nd</sup> Edition.
4. Introduction to System Design Using Integrated Circuits by B. S. Sonde, NewAge International Publishers, 2<sup>nd</sup> Edition.

### Reference Books:

1. Integrated Circuits by K. R. Botkar, Khanna publishers, 10<sup>th</sup> Edition.
2. Programmable Logic Controllers by Job Den Otter, Prentice Hall International Editions.
3. Programmable Logic Controllers by John Web & Ronald Reis, PHI Publications, 5<sup>th</sup> edition.
4. Process Control Instrumentation Technology by Curtis. D. Joshon, Pearson Education, 8<sup>th</sup> edition.
5. National semiconductor manual.
6. Linear IC manual

### Term work:

#### List of Practicals (Minimum Eight Practicals)

1. VI Characteristics of SCR.
2. VI characteristics of TRIAC & DIAC.
3. Single phase half wave controlled rectifier.
4. Lamp dimmer using TRIAC & DIAC.
5. AM simulation using MATLAB SIMULINK.
6. PLL application using MATLAB SIMULINK.
7. Implementation of frequency division circuit using IC.
8. Application implementation using PLC.
9. Temperature controller using OPAMP.
10. V to V Convertor.
11. Simulation of Display design.
12. Design and simulate 3 ½ digit DVM.



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**

**4. OPTICAL COMMUNICATION**

**Teaching Scheme:**

**Theory:** 4 Hrs/Week

**Practical :** 2 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Oral Exam:** 25 Marks

**CourseObjectives:**

- 1) To understand different components & its losses in optical fiber communication.
- 2) To describe the structure & characteristics of optical sources & detectors.
- 3) To evaluate various parameters of optical fiber.

**CourseOutcome:**

On completion of this course, students will be able to :

- 1) Evaluate various losses in optical fiber communication.
- 2) Able to select appropriate source and detector for a communication system.
- 3) Evaluate various parameters of given optical fiber.

**SECTION I**

**Unit 1: Introduction**

**[7 Hrs.]**

The general optical communication system, Advantages and disadvantages, ray theory of transmission, Mode theory, Types of optical fibers ,Applications

**Unit 2: Transmission characteristics of optical fibers**

**[6 Hrs.]**

Attenuation, Material absorption, losses in fibers, Linear and Nonlinear scattering losses, fiber bend losses. Dispersion: Intermodal and Intramodal dispersion, Dispersion modified Single mode fibers.

**Unit 3: Optical fibers and Joints**

**[7 Hrs.]**

Preparation of optical fibers, Liquid phase and vapour phase deposition techniques. Cables: Fiber strength, durability and stability of fiber transmission characteristics, cable design. Fibers alignment and joint loss. Fiber splices, connectors, Fiber couplers

**Unit 4: Optical sources**

**[4 Hrs.]**

LASER basic concept, optical emission from semiconductors. Semiconductor Injection Laser, Injection laser structures and characteristics, Laser Modulation.

## SECTION II

### Unit 5: Optical sources

[5 Hrs.]

LED power and efficiency, LED structures, characteristics and Modulation technique.

### Unit 6: Optical detectors

[7 Hrs.]

Introduction, device, types, optical detection principles, absorption, quantum efficiency, responsivity. Semiconductor photo diodes with and without internal gain. Photoconductive detectors, PN, PIN, Avalanche Photo diodes, Phototransistors.

### Unit 7: Fiber optical communication systems

[6 Hrs.]

Introduction, Transmitter Design, Receiver Design, Link Design, Line Codes for optical Fiber links, Wavelength Division Multiplexing (WDM), Optical Time Division Multiplexing, Data buses, FDDI.

### Unit 8: Optical fiber Measurements

[6 Hrs.]

Attenuation, Dispersion. Refractive Index profile, cutoff wavelength, Numerical aperture, fiber diameter and field measurements.

#### Text Books:

1. Optical Fiber communications- Principles and practice By John. M. Senior – Pearson Education.
2. Optical Fiber communications By D.C. Agarwal - S. Chand and company

#### Reference Books:

1. Optical Fiber communications-Gerd Keiser, Third Edition - TMH
2. Optical communications- David Gover - PHI
3. Fiber Optics communication – Hozold Kolimbris - Pearson Education.
4. Fibre Optics Communication – 5<sup>th</sup> Edition – Palais-Pearson Education.

#### Term work:

#### List of Practicals (Minimum Eight Practicals)

1. Setting up fiber optic analog link & digital link.
2. Pulse width modulation system.
3. Propagation loss in optical fiber
4. Bending loss.
5. Measurement of optical power using optical power meter.
6. Measurement of Numerical Aperture.
7. To observe effect of EMI on copper medium and optical fiber medium.
8. Speed measurement of light using optical fiber.
9. To transmit and receive frequency modulated analog signal using fiber optic cable.
10. To transmit and receive computer signal using fiber optic cable.
11. To transmit and receive voice signal using fiber optic cable.
12. Frequency modulation system.



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**5. MOBILE COMMUNICATION**

**Teaching Scheme:**

**Theory:** 3 Hrs/Week

**Tutorial :** 1 Hr/Week

**Examination Scheme:**

**Theory:**100 Marks

**Term-Work:** 25 Marks

**Course Objectives**

- 1) To understand cellular concept in mobile communication.
- 2) To identify multiple access techniques used in mobile communication.
- 3) To introduce the GSM and CDMA architecture.

**Course Outcome**

On completion of this course, students will be able to :

- 1) Interpret how cellular systems work in mobile communication.
- 2) Identify how many mobile users simultaneously share the given radio spectrum.
- 3) Analyze how GSM works and also others services like SMS, GPRS, call waiting service etc works.

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**SECTION I**

**Unit 1: Introduction**

**[8 Hrs.]**

Introduction to wireless communication systems

The cellular concept: Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, trunking and grade of service, improving the capacity of cellular systems, cordless transmission technique, short distance baseband transmission, pulse transmission, carrier modulation transmission.

**Unit 2: Mobile Radio Propagation**

**[7 Hrs.]**

Large scale path loss reflection, ground reflection model (two ray model), diffraction, practical link budget design using path loss models. Small scale fading and multipath small scale multipath propagation, parameter of multipath channels, types of small scale fading, Rayleigh and Ricean distribution, diversity, RAKE Receiver.

**Unit 3: Multiple access Technique in Wireless Communications**

**[6 Hrs.]**

Frequency Division Multiple access, Time Division Multiple access, Spread Spectrum Multiple access, Space Division Multiple access

## SECTION II

### Unit 4: GSM

[8 Hrs.]

GSM Network architecture, signaling protocol architecture, identifiers, channels, Frame structure, speech coding, authentication and security, call procedure, handoff procedure, services and features. Mobile data networks, Data oriented CDPD network, GPRS and higher data rates, SMS in GSM. Radio resource and power management.

### Unit 5: CDMA digital cellular standard (IS-95)

[7 Hrs.]

Frequency and channel specifications of IS-95, forward and reverse CDMA channel, packet and frame formats, mobility and radio resource management.

### Unit 6: IMT – 2000

[6 Hrs.]

Forward and reverse channels in W-CDMA and CDMA-2000, Handoff and power control in 3G system.

#### Text Books:

1. Wireless Communications - Theodore S. Rappaport, Prentice Hall of India, PTR Publication.
2. Principles of Wireless Networks – Kaveh Pahlavan, Prashant Krishnamurthy, PHI.
3. Mobile Communication – G. K. Behera & Lopamudra Das, Scitech Publication.
4. Mobile Communications – Jochen Schiller, Pearson Education, Second Edition.

#### Reference Books:

1. Wireless Communication – Singhal, TMH.
2. Mobile and Personal Communication Systems and Services – Raj Pandya, Prentice Hall of India.
3. Wireless Communication – D. P. Agarwal, Thomson learning 2007, Second Edition.

#### Term work:

Term work shall include minimum Twelve tutorials based on above syllabus.



**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**6. MINI PROJECT (HARDWARE)**

**Teaching Scheme:**  
**Practical : 2 Hr/Week**

**Examination Scheme:**  
**Term-Work: 25 Marks**

### Course Objectives

- 1) To understand PCB designing processes and techniques.
- 2) To make students familiar with PCB artwork and fabrication.
- 3) To design, implement, analyze, and test Hardware/Software mini project.

### Course Outcome

On completion of this course, students will be able to :

- 1) Understand and design PCB technique.
- 2) Understand and design PCB artwork and fabrication techniques.
- 3) Design, implement, analyze, and test Hardware mini project.

**1. Maximum Group Size:** Minimum 2 and maximum 3 students can form a group for the mini project.

**2. Project Type:** The selected mini project must be based on development of a prototype electronic system/product mandatorily having a hardware component with supporting software.

### 3. Execution steps for Mini Projects:

- (i) Complete Paper work Design using datasheets specifying:
  - Selection criteria of the components to be used.
  - Specifications of system i/p and desired o/p.
  - Module based hardware design.
  - Test points at various stages in various modules
- (ii) The circuit should be simulated using any of the standard simulation software available (either complete circuit to be simulated, if possible or an appropriate part of the circuit can be simulated.)
- (iii) Algorithm and the flow chart of the software part must be defined.
- (iv) Result verification for hardware and testing the algorithms.
- (v) Comparison with the paper design to identify the discrepancies, if any. Justification of the same must be given.
- (vi) Verified circuit should be assembled and tested on breadboard or general purpose board.
- (vii) Simulation results and/or the snapshots indicating the current and voltage readings or detailing



- the test point results at various stages must be preserved and included in the project report.
- (viii) Art work / layout of the circuit using standard layout tools.
  - (ix) Assembling and testing of circuit on final PCB.
  - (x) Design and fabrication of suitable enclosure and outside fittings such as switches, Buttons, knobs, meters, indicators, displays etc.
  - (xi) Final testing of the circuit using the earlier defined test points.
  - (xii) Preparing Bill of components and materials.
  - (xiii) Drawing entire circuit diagram (Component level), outlining various blocks indicating test points, inputs and outputs at various stages on A3 graph sheet

#### **4. Guidelines for the Seminar:**

- Seminar is based on the Mini Project topic.
- The seminar shall consist of the Literature Survey, Market survey, Basic project work and Applications of Mini project.
- Seminar Assessment shall be based on Innovative Idea, Presentation skill, depth of understanding, Applications, Future Scope and Individual Contribution.
- Maximum three students can deliver a seminar on one topic.(Three students per group)
- Each group shall be given time of 20 mins for presentation and 5 mins for question answer session.
- A certified copy of seminar/ project report shall be required to be presented to external examiner at the time of final examination.

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**1. COMPUTER ORGANIZATION (Self Learning)**

**Examination Scheme:**  
**Theory:50 Marks**

**Course Objectives**

- 1) To introduce the concept computer architectures and organization.
- 2) To explain processor and programming basics .
- 3) To describe memory organization and input output control.

**Course Outcome**

On completion of this course, students will be able to :

- 1) Describe processor architectures .
- 2) Implement basic programs.
- 3) Analyze memory and I/O systems.

**SECTION I**

**Unit 1: Processor Basic:**

CPU organization fundamental, Data representation, Basic formats, Floating point numbers, Instruction sets: Instruction formats, Instruction type, Programming consideration, Introduction to RISC and CISC  
(06 Hrs)

**Unit 2: Memory Organization:**

Memory Systems, Multilevel memories, Address Translation, Memory allocation schemes FIFO, LRU, OPT, etc. Virtual Memory, Cache memory.

**SECTION II**

**Unit 3:Control Design:**

Introduction, hardwired control design examples, Micro programmed control, Multiplier control unit, CPU control unit design.

**Unit 4: System Organization:**

Processor programmed I/O architecture, DMA architecture, Interrupt I/O hardware.

**Text Books:**

1. J.P. Hayes “Computer Architecture and Organization” Third edition ,McGraw Hill publication

**Reference Books:**

1. Hamacher Zaki “Computer Organization” McGraw Hill publication

2. W. Stallings, "Computer Organization and Architecture - Designing for Performance", Prentice Hall of India, 2002
3. D. A. Patterson and J. L. Hennessy, "Computer Organization and Design - The Hardware/Software Interface", Morgan Kaufmann, 1998

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**2. OPERATING SYSTEM (Self Learning)**

**Examination Scheme:**  
**Theory:50 Marks**

### Course Objectives

- 1) To provide knowledge of operation and performance of modern operating systems
- 2) To give ability to model, abstract, and implement efficient software solutions.
- 3) To compare, contrast, and evaluate the key trade-offs between multiple approaches to operating system design.

### Course Outcome

On completion of this course, students will be able to :

- 1) Explain the objective and functions of modern operating systems.
- 2) Describe how computing resources are used by application software in an operating system.
- 3) Analyze the common algorithms used for various tasks in operating systems.

## SECTION I

### Unit 1: Introduction :

Basics of operating system, Simple Batch System, Multi-programmed Batch System ,Time Sharing System, Personal Computer System, Parallel System, Real Time System, System Calls.

### Unit 2: Process and Scheduling :

Process Concept , Process Scheduling, Operation on process , Cooperating process , Threads , Inter-process Communication, Basic concept, Scheduling Criteria, Scheduling Algorithms.

## SECTION II

### Unit 3: Deadlocks :

System modes, Deadlock characterization, Methods for handling deadlocks Deadlock prevention, Deadlock avoidance, Deadlock detection Recovery from deadlock.

### Unit 4: Memory management :

Background, Logical Versus Physical Address space, Swapping Contiguous Allocation, Paging, Segmentation.

**Text Books:**

1. Operating System concepts – 8<sup>th</sup> Edition – Silberschatz Galvin (John Wiley).
2. Operating Systems – by K.A.Sumitradevi, N.P.Banashree – SPD Publ. (2<sup>nd</sup> Edition)

**Reference Books:**

1. Operating System concepts ,6th Edition , Silberschatz Galvin , John Wiley
2. Operating systems-Concept and design, Milan Milenkovic's, TMGH
3. Operating Systems- - Tanenbaum – PHI Publ. (3<sup>rd</sup> Edition)

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**Solapur University, Solapur**  
**T.E. (Electronics and Telecommunication Engineering)**  
**Semester-II**  
**3. ROBOTICS (Self Learning)**

**Examination Scheme:**  
**Theory:50 Marks**

### Course Objectives

- 1) To explain the concept of robotics.
- 2) To understand various sensors and controllers.
- 3) To make students familiar with the fundamentals of robotic vision and MEMS.

### Course Outcome

On completion of this course, students will be able to :

- 1) Solve problems in implementing efficient robots.
- 2) Use various sensors and controllers to design a robot.
- 3) Demonstrate and implement robotic vision based application.

## SECTION I

### Unit 1: Robot Fundamentals:

Definitions, present and future trends in robotics, Robot classifications, Robot configurations, Point to Point robots, Continuous Path robots, Work volume, Issues in design and controlling robots Repeatability, Control resolution, spatial resolution, Precision, Accuracy, Applications of robots. Drives used in robots Hydraulic, Pneumatic and Electric drives, Comparison of drive systems and their relative merits and demerits.

### Unit 2: Robot Sensors and Controllers:

Internal and external sensors, position potentiometric, optical sensors ,encoders absolute, incremental ,touch and slip sensors velocity and acceleration sensors, proximity sensors, force & torque sensors, DC motor Overload over current and stall detection methods, microprocessor based robot Controller.

## SECTION II

### Unit 3: Robot Vision:

Introduction, Image acquisition, Illumination Techniques, Image conversion, Cameras, sensors, Camera and system interface, Frame buffers and Grabbers, Image processing, low level & high level machine vision systems.

### Unit 4: Futuristic topics in Robotics:

Microrobotics and MEMS ( Microelecto mechanical systems ), fabrication technology for Micro robotics.

**Text Books:**

- 1) S.R.Deb, "Robotics Technology and Flexible Automation ", Tata Mc Graw Hill 1994.
- 2) M.P.Groover, M. Weiss R.N. Nagel, N.G. Odrey " Industrial Robotics (Technology , Programming and application s) , McGraw, Hill 1996
- 3) K.S.Fu, R.C.Gonzalez and C.S.G.Lee, "Robotics: Control , sensors , vision and inintlligence " , MCGraw Hill.1987.

**Reference Books:**

- 1) J.J.Craig , introduction to Robotics , Addisonwesely 1989.
- 2) Klafter , Richard D., et al " Robotics Engineering",PhI,1996.
- 3) Zuech,Nello,"Applying Machine Vision " ,john Wiley and sons, 1988.

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