# Solapur University, Solapur
## Structure of T.E.(Electronics & Telecommunication Engg.) Part I & II
## w.e.f. Academic Year 2009-10.

### T.E.(Electronics & Telecommunication Engg.) Part -I

| Sr. No. | Subject | Teaching Scheme | | | | Examination Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | Th. | TW | POE | OE | Total |
| 01 | Electro Magnetic Engg. & Radiating System | 3 | 1 | 2 | 6 | 100 | 25 | ---- | -- | 125 |
| 02 | Digital Communication | 3 | 1 | 2 | 6 | 100 | 25 | 50 | --- | 175 |
| 03 | Software Engineering & Project Management System | 3 | -- | -- | 3 | 100 | -- | -- | -- | 100 |
| 04 | Digital Signal Processing | 4 | -- | 2 | 6 | 100 | 25 | 25 | --- | 150 |
| 05 | Microprocessor & Peripherals | 4 | ---- | 2 | 6 | 100 | 25 | 50 | --- | 175 |
| 06 | Electronic Software Lab-II | 1 | --- | 2 | 3 | --- | 25 | -- | -- | 25 |
| | **Total** | **18** | **2** | **10** | **30** | **500** | **125** | **125** | **---** | **750** |

- Vacational 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.

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### T.E.(Electronics & Telecommunication Engg.) Part -II

| Sr. No. | Subject | Teaching Scheme | | | | Examination Scheme | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | L | T | P | Total | Th. | TW | POE | OE | Total |
| 01 | Radar & Microwave Engineering | 3 | --- | 2 | 5 | 100 | 25 | -- | 25 | 150 |
| 02 | Microcontrollers & Application | 4 | -- | 2 | 6 | 100 | 25 | 50 | --- | 175 |
| 03 | Industrial Electronics | 4 | -- | 2 | 6 | 100 | 25 | --- | --- | 125 |
| 04 | Optical Communication | 3 | ---- | 2 | 5 | 100 | 25 | -- | --- | 125 |
| 05 | Electronics System Design | 4 | -- | 2 | 6 | 100 | 25 | --- | 25 | 150 |
| 06 | Hardware Mini Project | -- | -- | 2 | 2 | --- | 25 | --- | --- | 25 |
| | **Total** | **18** | **--** | **12** | **30** | **500** | **150** | **50** | **50** | **750** |

- Vacational 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 practicals/tutorials be of 15 students. On forming the batches, if the strength of remaining students exceeds 7, then a new batch be formed.

# T.E. (Electronics & Telecommunication Engineering)-I
# 1. Electromagnetic Engineering & Radiating System

**Theory : 3 Hrs /Week** **Paper : 100 Marks**
**Tutorial : 1 Hr /week** **TW : 25 Marks**
**Practical : 2 Hrs/week**

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## SECTION-I

**1. Mathematical Fundamentals (4)**

Vector analysis, Coordinate systems & transformations, line, surface & volume integrals, diverengence & strokes theorem.

**2. Electrostatic field (8)**

Columbs law, electric field, electric flux density, gauss law with application electro potential & equipotential surfaces, relation between E & V electric dipole boundary conditions for electrostatic field, capacitance & capacitors, electrostatic energy & energy density, Poisson & Laplace equation

**3. Magneto static field. (8)**

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

## SECTION-II

**4. Electromagnetic waves (6)**

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

**5. Principles of radiation & Antennas (4)**

Fundamentals of radiation, basic antenna parameters, Antenna parameters, Antenna field Zones, Short Dipole Antenna, Power radiated by Short Dipole Antenna & it's radiation resistance. Basic types of antennas. Monopole Antenna, Loops Dipoles & slots, Parabolic dish.

**6. Antenna array (10)**

Pattern multiplication, Linear array of n isotropic point sources of equal amplitude & spacing, Broad side array, Ordinary end-fire –array, end-fire –array,
arrays with parasitic elements, micro strip array, Yagi Uda array

**Text Books-**

1. Electromagnetic-John D. Kraus- Third Edition [Mc Graw Hill.]
2. Electromagnetic Engineering- William Hyte- [Mc Graw Hill.]
3. Antenna for all applications- John D. Kraus, Marhefka, Khan- Third Edition [Mc Graw Hill.]
4. Applied Electromagnetics- F. Ulaby- 2001 Media Edition- [PHI]
5. Electromagnetics Fields & Radiation Systems-Jordan & Balmain- Second Edition [PHI]
6. Applied Electromagnetic theory Analyses, Problems & Applications-Nair & Deepa [PHI]

**Reference Books-**

1. Field & Wave Electromagnetic – David K Cheng- [Pearson Education]
2. Elements of Electromagnetic- Mattew Sadiku- Third Edition [Oxford University Press]
3. Electromagnetic Schaum's outline series- J.A.Edminister- Second Edition [TATA Mc Graw Hill.]
4. Introduction to EM fields- Paul, Whites, Nasar- Second Edition [TATA Mc Graw Hill.]
5. Antennas and Wave Propagation – G.S.N. Raju-[ Pearson Education]
6. Electromagnetic field theory & transmission lines – 1st Edition - G.S.N. Raju [ Pearson Education]

**Term Work:-**

*Term work should consist of minimum 8 experiments & 6 Tutorials based on above syllabus.

**List of experiments.**

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

## T.E.(Electronics &Telecommunication Engineering) Part-I
## 2. Digital Communication

**Lecture: 3Hrs/week** **Paper : 100 Marks**
**Practical: 2 Hrs/week** **TW : 25 Marks.**
**Tutorial: 1 Hrs/week** **POE : 50 Marks**

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### SECTION – I

**1. Information Theory and Channel capacity.- (8)**

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.

**2. Pulse Modulation: (8)**

Introduction to Sampling theorem, PAM, PTM,

**Digital transmission of analog signal:**
Basic block diagram of digital communication, PCM, Quantization – Uniform & Non uniform , Differential , PCM, ADPCM, Bandwidth requirement, Noise in PCM , TDM-PCM Telephone system , PCM Vs. Analog modulation, Power bandwidth exchange, DPCM system, Delta Modulation – Noise in DM , Q level DPCM system, ADM, CVSD.

**3. Baseband Data Transmission : (5)**

Baseband pulse shaping , Duo binary & M-ary signaling , Shaping of transmitted spectrum , Effect of precoding , Pulse shaping by Digital Methods , Equalization , Eye Diagrams , Synchronization , Scrambler, ISI.

### SECTION – II

**4. Digital continuous wave Modulations Techniques: (7)**

Binary ASK , PSK , FSK schemes , Probability of error , Coherent PSK & FSK, Differential coherent PSK, Non coherent FSK, Comparison of digital modulation schemes–Bandwidth & power requirements, Equipment complexity , M-ary signaling schemes – M–ary coherent PSK , M-ary differential PSK , M-ary wideband FSK, Synchronization methods, QAM.

**5. Optimum receiver for digital Modulation (7)**

Probability of error, Matched filter receiver, Correlation receiver, Synchronization, Symbol Synchronization, Frame synchronization, Carrier recovery circuits.

**6. Multichannel and Multicarrier systems (7)**

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. Digital & Analog Communication systems – K. Sam Shanmugan-Wiley
2. Digital Communication System Design – M.S. Roden.-PHI
3. Digital Communication -John G. Proakis- Pearson Education


**Reference Books**:-


1. Principles of Communication System - Taub & Schling-TMH
2. Digital Communication - Simon Haykin- Wiley.
3. Communication System Analog & Digital - Singh & Sapre.-TMH.
4. Digital communication - Bernard Sklar & Pabitrakumar Ray.- Pearson Education.
5. Contemporary Communication system using MATLAB by John G. Proakis, M Asonid Salehi, Genhard Bauch.
6. Analog and Digital Communication – Martin-Shroff Publishers.
7. Digital Communication: Design for Real World ( With CD) – 1st Edition – Bateman [ Pearson Education].


**Term Work:-**

**List of Experiments (Minimum 10 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) DM,ADM,CVSD
7) ASK,FSK,
8) BPSK,DPSK,QPSK
9) Hamming Codes, Even and Odd Parity
10) Eye Diagram
11) Measurement of bit error rate
12) Companding
13) MATLAB Based Experiment.

## TE (Electronics & Telecommunication Engineering) – Part I
## 3. Software Engg. & Project Management System

**Lectures: 3 hrs/week** **Theory: 100 Marks**

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## SECTION- I

**1. Software Processes –** **[4]**
Software process models, process iteration, Process activities, the rational unified process.

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

**3. Software Life Cycle & Models -** **[8]**
Software life cycle concept, models -Water fall, V, prototyping, system models, context model, behavioral model, object models, structured models**.**

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

## SECTION-II

**5. Project Management -** **[6]**
Concept of general management, project planning, program management & project evaluation.

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

**7. Risk Management** – **[5]**
Risk & its categories, risk identification, assessment, planning & management, PERT, Monte Carlo & critical chain concept in Risk management (only application)

**8. Monitoring and Control** – **[5]**
Framework, data collection, visualizing methods, cost monitoring, dealing with slippage & change control

**Reference Books:**


1. Software Engineering
   - Summerville- Pearson Education (8th Edition)

2. Software Engineering – (Theory & Practice)
   – Pfleeger, Alleger, Atlee- Pearson (3rd Edition)

3. Software Project Management
   – Bob Hughes & Cottrell – TMH ($4^{th}$ Edition)

4. Software project management in practice
   - Pankaj Jalote - Pearson Education

## T.E. (Electronics & Telecommunication Engineering) Part-I
## 4. Digital Signal Processing

**Lectures: 4 hrs/week** **Paper: 100 marks**
**Practical: 2 hrs/week** **Term work: 25 marks**
**POE: 25 marks**

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### SECTION – I

**1.** DSP System concept, DT signals, co-relation of DT signals. **(2)**

**2.** Z – transform & properties overview, Digital transfer function, stability considerations & frequency response. **(3)**

**3. The Discrete Fourier transform and Fast Fourier Transform:**
DFT, Relation between DFT & Z Transform, Properties of DFT, Circular convolution, Fast convolution techniques (Overlap add & overlap save), Frequency analysis of signals using DFT .
FFT Algorithms (DIT FFT & DIF FFT) **(12)**

**4 . Realization of Digital Linear systems:**
Structures for realization of Discrete time systems
Structures for FIR Filters: Direct form, Cascade form & Lattice Structure.
Structures for IIR filters: Direct form, Signal flow graph & transposed structure, cascade form & parallel form. **(7)**

### SECTION II

**5. FIR Filter design:**
Characteristics of FIR Filters, Properties of FIR Filters, windowing method & frequency sampling method of filter design, finite word length effects in FIR filters, FIR Implementation techniques.
**(7)**

**6. IIR filter design:**
Impulse Invariant technique, Bilinear transformation, Frequency transformations, Analog filter approximation (Butterworth), Finite world length effects in IIR filters, Implementation of IIR filters. **(7)**

**7. Introduction to programmable Digital Signal Processors:**
Basic Architectural features, Multiply and accumulate (MAC) unit, Bus Architectures, VLIW Architecture, Special addressing modes, Fixed point and Floating point Digital signal processors overview of TMS320C54XX DSP Architecture **(6)**

**8.** Application of DSP in Audio processing, Telecommunication & Image processing.
**(4)**

**Term work:** TW should consist of minimum 8 experiments based on above syllabus.

**Reference Books:**


1. Digital Signal Processing – Principles, Algorithms and Applications by John G Proakies-Pearson Education.
2. Digital Signal Processing – A Practical Approach by Ifeachor E.C. & Jervis B. W. -Pearson Education.
3. Digital Signal Processing by S Salivahanan, A Vallavaraj & C Gnanapriya -TMH
4. Digital Signal Processing by Ramesh Babu -4th Edition Scientic Publication
5. Digital Signal Processing Implementations using DSP Microprocessors by Avtar Singh & S. Srinivasan-Thomson.
6. Digital Signal Processors- Architecture, Programming and Applications by B Venkataramani & M. Bhaskar-TMH.
7. Scientist and Engg. Guide on Digital Signal Processing
8. Discrete time signal Processing by A.V. Oppenheim & R.W. Schalfer.- John Wiley
9. Digital Signal Processing – A System Design approach by D.J. Defata- John Wiley
10. Digital Signal Processing Fundamentals Applications by Li Tan- Academic Press
11. Digital Signal Processing by M.H.Hyes.-( Schaums Outline ) TMH
12. Fundamental of DSP using Matlab by Schilling-Cengage learning

## T.E. (Electronics &Telecommunication Engineering) Part – I

## 5. Microprocessor and Peripherals

**Lectures. : 4 hrs./week.** **Theory : 100 marks.**
**Practical. : 2 hrs./week.** **TW : 25 marks.**
**POE : 50 marks**.

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## SECTION - I

**1. Semiconductor Memories :**

Memory Classification-RAM, ROM, PROM, EPROM, EEPROM, memory organization, memory expansion, EPROM programming methods. **(5)**

**2. Fundamentals of Microprocessors:-**

INTEL 8085A- Features, Functional Pin Configuration, Architecture, Demultiplexing of address & data bus, Generating different control signals, Study of Buffers-74244 & 74245. Instruction Set-Addressing Modes, Classification, timing diagrams, Programming with Assembly language, single stepping, single cycle execution, Transition states diagram-HOLD, WAIT, RESET & HALT.

. **(10)**

**3. Interrupts:**

Basic concepts, Classification-Hardware & Software Interrupts , Interrupt Structure of 8085,Instructions related to interrupts, Programming using Interrupts **(4)**

**4. Basics of I/O Interfacing**

Concepts of I/O Ports, Data transfer techniques, Memory mapped I/O & I/O Mapped I/O Schemes. **(4)**

## SECTION - II

**5. Memory Interfacing**

Interfacing different memory chips(RAM/ROM) with 8085 **(3)**

**6.Interfacing Chips & applications**

Features, Pin configuration ,Block diagram, Control word formats ,different operating modes

Programming of the following chips –

PPI-8255,Timer/counter-8253/54, USART -8251

Interfacing keyboard, 7 segment display, stepper motor, relay and thumbwheel switch using 8255.

Application- Frequency measurement using 8253/54. **(15)**

**7. Data converters**

DAC techniques-Weighted register DAC, R-2R Ladder DAC,

ADC techniques-Counter type, Successive approximation, Single slope, Dual Slope, Flash ADC

Interfacing ADC(0808/0809),DAC-(0808) using 8255 **(5)**

**Term work:**
**List of the Experiments:**

A) **Software/Simulator based (Minimum Ten experiments)**

01) Programs based on different addressing modes, arithmetic and logical instructions.

02) Multiplication of two 8-bit numbers using the method of successive addition and Shift & add.

03) Division of two 8-bit numbers using the method of successive subtraction and shift & subtract.

04) Block transfer and block exchange of data bytes.

05) Finding the smallest and largest element in a block of data.

06) Arranging the elements of a block of data in ascending and descending order.

07) Converting 2 digit numbers to their equivalents.
a) BCD to HEX and b) HEX to BCD

08) Generating delays of different time intervals using delay subroutines and measurement of delay period on CRO using SOD pin of 8085A.

09) Generation of Fibonacci Series

10) A) Digit separation of a 16 bit number (i.e. the given number is ABCD H, then separate it as 0D H, 0C H, OB H, OA H and store in consecutive memory location.)
B) Addition of these separated digits and storing sum at next consecutive memory Location. (0A+0B+0C+OD = 2E H)
C) Reversing the upper byte and lower byte of given numbers. (i.e. if given number is ABCD H then revered should be BA H upper byte and DC H in lower byte).

11) A) 16 bit sum of string of data.
B) Reversing a string of data.

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

01) 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.

02) 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.

03) Interfacing 7 segment LED display using 8255A – in static and dynamic mode.

04) Interfacing ADC 0808/0809.

05) Interfacing DAC 0808.

06) Interfacing stepper motor with microprocessor using 8255A – in Half and Full excitation.

07) Interfacing of thumbwheel switches.

08) Interfacing of 8253 / 8254.

09) Interfacing of 8251

**Reference Books:-**

01. Microprocessors Architecture, Programming and Applications, with the 8085A - Ramesh S Gaonkar.-Wiley Eastern Ltd. New Delhi.

02. Microprocessors and Programmed Logic - Kenneth L Short – 2nd Edition, Pearson Education.

03. INTEL- Microprocessor Peripheral hand book, application notes, Manual.

04. Fundamentals of Microprocessor & Microcomputer- B Ram – Dhanpat Rai Publication.

05. Microprocessor & Peripherals – S. P. Choudhary, Sunita Choudhary - Scitech Publication.

06. Microprocessor Architecture, Programming and System Featuring 8085 – Willam A Rout – Cenage Learning Publication.

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

## 6. Electronic Software Lab – II

**Lectures:1 Hr/Week** **Term Work: 25 Marks**

**Practical**: **2 Hrs/Week**

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**1. Introduction to C++ programming:** **(2)**
Basic concept of object oriented programming, applications of OOPs and C++, dynamic initialization of variables.

**2. Functions in C++:** **(2)**
Function prototype, inline functions, function overloading, operator overloading

**3. Classes and objects:** **(4)**
Class types, data members, member functions, pointers to class members, constructors, destructors, friend functions, static member functions

**4. Inheritance:** **(3)**
Derived classes, types of inheritance, virtual base classes, virtual functions.

**5. Data structures Using C++:** **(2)**
Implementing Stack, Queues, Linklist using class.

**6. Templates and exception handling.** **(1)**

**Text and Reference 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, Tata McGraw Hill Publication, New Delhi.

3. Turbo C+ + Techniques and application by Scoot, Robert Ladd, BPB Publication New Delhi.

4. Mastering C++ by K.R. Venugopal T. Ravishankar, Rajkumar, Tata McGraw Hill Publication, New Delhi.

5. Data Structures using C and C++ by Yedidyah Langsam, Moshej Augenstein, Aaron M. Tenenbaum, Published by PHI, Second Edition.

6. Programming in C++ by P.B. Mahapatra (S. Chand).

7. Programming in C & C++ by S. S. Kahandare (S. Chand).

8. Object oriented Analysis & Design – Deacon – Pearson Education.

9. Object Oriented Programming with ANSI and Turbo C++ - Kamthane – Pearson Education.

10. Object oriented programming with C++ - Bhave – Pearson Education.

11. Program Solving with C++ -6/e – Savitch –Pearson Education.

**Term work:**

**List of the Experiments:**
**Minimum 12 experiments from the list given below**.

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 and function overloading.

05) Program on pointers to class members.

06) Program on constructors and destructors.

07) Program on static member function.

08) Program using the concept of friend function.

09) Program on single level, multilevel and multiple inheritance.

10) Program using the concept of virtual base class.

11) Program using the concept of virtual function.

12) Program on templates and exception handling.

13) Program on stack using class.

14) Program on Queues using class.

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

## 1. Radar And Microwave Engineering

**Theory: 3 Hrs/week** **Paper: 100 Marks**
**Practical: 2 Hrs/week** **TW: 25 Marks**
**OE: 25 Marks**

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## SECTION –I

**1. Microwave Transmission line:** **(5)**

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

**2. Microwave waveguide** **(8)**

**a. Rectangular waveguide**

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

**b. Circular waveguide**

- Solutions of Wave equations in Circular coordinate.
- TE ,TM and TEM modes Circular Waveguide
- Power Transmission & Power loss in Circular Waveguide

**3. Microwave Components** **(5)**

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

## SECTION -II

**4. Microwave Tubes:** **(6)**

Limitations of conventional Tubes, Klystron, Reflex Klystron, TWT, Magnetron

**5. Microwave Solid State Devices And Measurement:** **(6)**

Microwave Transistor, PIN diode, Gunn Diode, IMPATT, TRAPATT diode, Introduction to MMIC, Measurement of Power, frequency and Impedance.

**6. Radar:** **(7)**

Introduction to Radar, radar range equation, Radar target and clutter,
Radar cross section definition and fundamentals, Types of radars and radar functions: MTI radar, Pulse Doppler radar, Navigational and remote sensing radar.

**Text Books:**

1) Radar Principles, Technology, Applications, by Byron Edde.
   – Pearson Education
2) Microwave & Radar Engineering by M.Kulkarni.
   – Third Edition ( Umesh Publication)
3) Microwave devices & Circuits by Samuel Y. Liao – 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.
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**Term Work:-**

**Experiment List:-**

1. Measuring characteristics of Transmission line
2. Measuring attenuation of Transmission line
3. Measuring input impedance of Transmission line
4. Measurement of Microwave frequency
5. Measurement of Microwave Components
6. Measurement of Gunn diode characteristics
7. Verification of characteristics of Reflex Klystron.
8. Measurement of VSWR

## T.E.(Electronics and Telecommunication Engineering) Part II
## 2. Microcontrollers and Applications

**Lectures: 4 hrs/week** **Paper: 100 marks**
**Practical: 2 hrs/week** **TW: 25 marks**
**POE: 50 marks**

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## SECTION -I

**MCS 51 Microcontroller family:**

1. Introduction to MCS 51 family, Architecture, Memory organization, Functional pin description, SFRs and various resources of MCS 51. (5)

2. Addressing modes, Instruction set and Assembly language programming. (5)

3. Hardware overview: study of Port structure, interrupt structure, Timers, Serial port (6)

4. Interfacing of following with MCS 51 microcontroller
   Switches, LED, Relay, Buzzer, LCD display, Matrix keyboard, ADC 0809, DAC 0808,RTC DS1307 (8)

## SECTION –II

**Microchip PIC microcontroller family**

5. PIC Microcontrollers: overview and features (2)

6. PIC 16F8XX Flash microcontrollers: Introduction, Architecture, Functional pin description, Various registers, Program memory and data memory organization, Input / output ports, Timers and Interrupts. (8)

7. Capture/ compare / PWM (CCP) Modules in PIC 16F877,
   Master synchronous serial port (MSSP) module: SPI, $I^2C$ . USART and ADC (6)

8. Interfacing of following with PIC microcontrollers
   Switches, LED, Relay, Buzzer, LCD display, Matrix keyboard, RTC DS1307 (8)

**Text Books:**


1 The 8051 Microcontroller Architecture, programming and Applications by Kenneth Ayala Penram International ( Third Edition)
2 Microcontrollers ( Theory and Applications) by Ajay V. Deshmukh Tata MGH
3 The 8051 Microcontroller and Embedded systems by Muhammad Ali Mazidi Pearson Education Asia LPE ( Second Edition)
4 8051 Microcontrollers programming and practice by Mike Predcko.
5 8051 Microcontroller by I Stott, Mackenzie, Rathel & Phan – Fourth Edition - Pearson
6 Designing & Customizing of PIC Microcontrollers by Mike Predcko.
7 Designs with PIC Microcontrollers by John B. Peatman Pearson Education Asia LPE
8 Datasheets of MCS 51 family microcontrollers
9 Datasheets of Microchip PIC family of Microcontrollers
10 Datasheets of RTC DS1307 from DALAS Semiconductor.
11 PIC Microcontroller & Embedded Systems – Mazidi – Pearson Education


## Term work:

Minimum 10 experiments of following with 5 Experiments on MCS 51 and

5 Experiments on Microchip PIC Microcontrollers. Use Assemblers for MCS 51 and

MPLAB software for PIC Microcontrollers.

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.

## T.E.( Electronics & Telecommunication Engineering)Part II
## 3. Industrial Electronics

**Lectures : 4hrs/week** **Paper: 100 marks**
**Practical : 2hrs/week** **TW : 25 marks**

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## SECTION -I

**1. Silicon controlled Rectifiers: (8)**

Construction, characteristics & ratings. Turn on and turn off mechanism.
Firing circuits: line synchronized UJT firing circuit, digital firing circuit. Line commutation and forced commutation techniques.
SCR protections: over current, over voltage, thermal protection and dv/dt protection.

**2. Power devices: (6)**

Construction, characteristics & ratings of MOSFET, IGBT,GTO, DIAC,TRIAC.
AC power control using TRIAC: fan regulator, lamp dimmer, PIC( Power Integrated Circuit)

**3. Controlled rectifiers: (10)**

Circuit diagram, operation & waveforms of following converters.
Single phase converters: half wave, full wave converter with R, RL load,
Half controlled & fully controlled bridge converters with R & RL load. Analysis of single-phase bridge converters: average and RMS output voltage, Fourier series expression for line current, input power factor.
Three-phase converters: circuit, operation, waveforms and derivation of average output voltage of half wave and full wave converter with R load.

## SECTION-II

**4. Inverters and cycloconverters: (8)**

Single phase inverters: series, parallel and bridge inverter.
Three- phase inverters: $120^0$ and $180^0$ mode with R load.
Voltage control techniques for inverters, Harmonic reduction techniques.
Cycloconverters: principle of step down and step up cycloconverter, single-phase bridge cycloconverter.

**5. DC choppers: (8)**

Principle of step down and step up chopper,
Classification of choppers, Chopper control techniques: fixed frequency and variable frequency Time ratio control, Current limit control.
Chopper circuits: Jones chopper, Morgan's chopper.

**6. Applications: (8)**

ON line and off line UPS with battery AH, back up time, battery charger rating calculations. Single phase separately excited DC motor drive. HVDC transmission. Principle and applications of induction and dielectric heating. Static circuit breakers.

**Text books**

1. Power electronics, circuits, devices & applications by M. H. Rashid. - 3rd Edition Pearson Education.
2. Power electronics & its applications by Alok Jain. -2nd Edition- Penram International Publication.
3. Thyristors & their applications by M. Ramamoorty- 2nd Edition –East West Press
4. SCR Manual – German Electric Co. USA
5. Power Electronics by P. C. Sen- Tata Mc Graw Hill
6. Power Electronics by M.D. Singh, K.B. Khanchandani- Tata Mc Graw Hill
7. Modern Power Electronics- B.K. Bose

**Reference Book:**

Power Electronics by Ned Mohan, Undeland – John Willey

**Term Work:-**

**List of Experiments**

Minimum **8** experiments out of following-

1. To obtain VI characteristics of SCR.
2. Line synchronized UJT firing circuit for SCR.
3. To obtain VI characteristics of TRIAC & DIAC.
4. To obtain VI characteristics of MOSFET.
5. Fan regulator using DIAC & TRIAC.
6. Single phase Half controlled rectifier with R & RL load
7. Single phase full controlled rectifier with R & RL load
8. Series inverter
9. Parallel inverter
10. Single Phase Cyclo-Converter
11. Jones chopper
12. Morgans chopper
13. Off line UPS

## T.E.( Electronics & Telecommunication Engineering)Part II
## 4. Optical Communication

**Lectures: 3Hrs/Week** **Theory :100 Marks**
**Practical: 2Hr/Week** **Term Work: 25 Marks**

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**SECTION- I**

1. **Introduction**: The general optical communication system, Advantages and disadvantages, ray theory of transmission, Mode theory, Types of optical fibers , Applications **(5)**

2. **Transmission characteristics of optical fibers**: Attenuation, Material absorption, losses in fibers, Linear and Nonlinear scattering losses, fiber bend losses, Mid-infrared and Far-Infrared transmission. Dispersion: Intermodal and Intramodal dispersion, Dispersion modified Single mode fibers **(6)**

3. **Optical fibers and cables**: Preparation of optical fibers, Liquid phase and vapour phase deposition techniques, Fluoride glass fibers. Cables: Fiber strength, durability and stability of fiber transmission characteristics, cable design. **(4)**

4. **Optical Fiber Joints and Couplers**, Fibers alignment and joint loss. Fiber splices, connectors, Fiber couplers **(2)**

5. **Optical sources**- LASER basic concept, optical emission from semiconductors. Semiconductor Injection Laser, Injection laser structures and characteristics , Laser fiber coupling, Non-semiconductor Lasers, Laser Modulation. **(4)**

**SECTION II**

6. **Optical Sources** – LED power and efficiency, LED structures, characteristics and Modulation techniques **(4)**

7. **Optical detectors**: Introduction, device, types, optical detection principals, absorption, quantum efficiency, responsivity, long wavelength Cutoff. Semiconductor photo diodes with and without internal gain. Mid-infrared and photoconductive detectors, PN, PIN, Avalanche Photo diodes, Phototransistors. **(5)**

8. **Fiber optical communication systems**: Introduction, Transmitter Design, Receiver Design, Link Design, Line Codes for optical Fiber links, Wavelength Division Multiplexing (WDM) , Optical Time Division Multiplexing, Data buses, Local Area Network (LAN) Systems, FDDI, SONET and SDH Networks, ISDN , BISDN and High Speed Networks **(7)**

9. **Optical fiber Measurements**: Attenuation, Dispersion. Refractive Index profile, cutoff wavelength, Numerical aperture, fiber diameter and field measurements. **(5)**

**Text books:**

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

**References:**

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

**Term Work:-**

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 transmit and receive analog signal using fiber optic cable.
8 To transmit and receive digital signal using fiber optic cable.
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.

## T.E. (Electronics & Telecommunication Engineering) – Part II
## 5. Electronic System Design

**Lectures**: **4 Hrs/Week** **Theory: 100 Marks**
**Practical: 2 Hrs/Week** **Term Work**: **25 Marks**
**OE: 25 Marks**

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**SECTION-I**

**1. Product design :**

Product specification, requirement analysis, product design stages, power supply requirement, shielding and wiring techniques, PCB design for high frequency equipment **(3)**

**2. Timers & Counters:**

Timer design using XR 2240.
Design of frequency counter using IC 74C926 for the time & event counting **(6)**

**3. Digital Voltmeter:**

Design of 4-digit numeric display system, Design of 3 ½ digit DVM using discrete components **(6)**

**4. Modulator, Demodulator & PLL:**

Balanced modulator principle, Balanced modulator /demodulator-IC 1596 and its applications-AM modulator, Mixer.

**PLL-**Working Principle, design consideration, Applications- Frequency synthesizer, FM detector, FSK demodulator ,PSK demodulator using LM565 &CD 4046 **(9)**

**SECTION-II**

**5. Programmable Logic Controller:**

PLC architecture, comparison with relay logic, ladder diagram for bottle filling plant, elevator control, washing machine **(6)**

**6. Design of Industrial Control:**

Signal conditioning for sensors like PT 100, LM 35, Thermocouples & current loop Interface (4mA to 20mA), zero & span circuit, V to I & I to V converter (4mA to 20mA).Design of analog ON/OFF & proportional controller for controlling process, Design of PID controller. Design of temperature controller & frequency measurement using microcontroller

**(9)**

**7. Antenna Design:**

Spatial beam forming, multipathing, Application system –MIMO, Smart antenna, Microstrip antenna.

**(7)**

**8. ASM Design:**

SM chart, derivation of SM chart, realization of SM chart, Applications-Traffic light controller. **(3)**

**Term work should consist of minimum 1 design on each chapter.**

**Reference Books:**


1. National semiconductor manual
2. Linear IC manual
3. Introduction to system design using integrated circuits by B.S.Sonde
4. Integrated circuits by K.R.Botkar (Khanna publishers)
5. PLC design by Otter
6. PLC design by John Web
7. Process control instrumentation technology by C.D.Joshon –PHI
8. Fundamentals of Logic design by Charles H.Roth, Jr.-JAICO publication
9. Printed Circuit Boards Design & Technology by Walter C. Bosshart
   TMH Publication
10. Antennas for all application 3rd Edition by John D. Kharus
    TMH Publication

## T.E.(Electronics & Telecommunication Engineering) Part-II
## 6. Hardware Mini Project.

**Practical : 2 Hrs/week** **TW: 25 Marks.**

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- Hardware Mini project should consist of Circuit design, PCB fabrication, assembling & testing of small digital or analog **application circuit**.
- Mini Project work should be carried out by a group of maximum **three** students.
- Student should use standard software available for drawing circuit schematic, simulating the design and PCB (**single/double sided**) layout of circuit.
- Project report should consist of details of work carried out including **layouts, circuits, datasheets, list of components, cost** .