

Swami Ramanand Teerth Marathwada University, Nanded

**Syllabus**

B. Sc. Third Year

**ELECTRONICS**

Semester System [Long Answer Pattern]

(To Be Implemented From Academic Year 2013-2014)

Theory /Practical	Semester /Annual	Semester No.	Paper No.	Title of Paper	MARKS						Min. Lectures / Week
					Long Ans.	Internal	Experiment	Oral	Record book	Total	
Theory	Semester	V	XII	Communication Electronics-I	40	10	---	---	---	50	03
			XIII (A) or XIII (B)	Power Electronics-I or Introduction to Microcontroller 8051	40	10	---	---	---	50	03
		VI	XIV	Communication Electronics-II	40	10	---	---	---	50	03
			XV (A) or XV (B)	Power Electronics-II or 8051 Microcontroller And Embedded Systems	40	10	---	---	---	50	03
Practical	Annual	---	XVI	<b>LAB-IV</b>	---	---	35	10	05	50	03
			XVII	<b>LAB-V</b>	---	---	35	10	05	50	03
<b>TOTAL</b>					<b>160</b>	<b>40</b>	<b>70</b>	<b>20</b>	<b>10</b>	<b>300</b>	<b>---</b>
Total Marks for Theory = <b>50+50+50+50=200</b>					Total Marks for Practical = 50+50 = <b>100</b>						
Total Marks for TY = 200+100 = <b>300</b>					Total Lectures / Week /Division for Theory = <b>06</b>						
Total Lectures/ Week / Batch for Practical = <b>06</b>					Minimum Lectures / Week for TY = <b>12</b>						
<b>LAB-IV:</b> Practical Based On Papers XII And XIV				<b>LAB-V:</b> Practical Based On Papers [XIII(A) And XV(A)] or [XIII(B) And XV(B)]							

Paper-XII  
**Communication Electronics-I**

(50 Marks, 45 Periods)

**Unit I: Introduction to Communication Systems**

(05 Periods)

Introduction, Block Diagram of Communication System, Need for Modulation, Types of Modulation, Band Width  
(Numerical Problems)

**Unit II: Amplitude Modulation**

(20 Periods)

Amplitude Modulation Theory, Mathematical Representation of AM Wave, Modulation Index, Frequency Spectrum of AM Wave, Band Width of AM, Power Relations in AM Wave, AM Circuits: Basic Circuit for BJT Collector Modulation, Amplitude Demodulator Circuit  
(Numerical Problems)

**Unit III: Frequency Modulation**

(10 Periods)

Theory of Frequency Modulation, Mathematical Representation of FM Wave, Band Width, Generation of FM, Direct Method for FM Generation, Transistor Reactance Modulator, Varactor Reactance Modulator  
(Numerical Problems)

**Unit IV: Pulse Modulation**

(10 Periods)

Introduction, Types: Pulse-Amplitude Modulation (PAM), Pulse Width Modulation (PWM), Pulse Position Modulation (PPM), Pulse Code Modulation (PCM)  
(Numerical Problems)

**References:**

1. Electronic Communications  
-Dennis Roddy and John Coolen (4/e, PHI Publication)
2. Electronic Communication Systems  
-George Kennedy, (3/e, Mc Graw Hill International Edition)
3. Communication Engineering  
-J.S. Katre (Technova Educational Publications, Pune)

**Paper : XIII (A)**  
**Power Electronics-I**

**(50 Marks, 45 Periods)**

**Unit-I : Thyristor : Principles and Characteristics** **(15 Periods)**

Introduction, Thyristor family, principle of operations of SCR, static Anode-Cathode characteristics of SCR, The two-transistor model of SCR (Two transistor analogy), Thyristor construction, gate characteristics of SCR, Turn-ON methods of a Thyristor, Construction, working and V-I characteristics of DIAC and TRIAC.  
(Numerical Problems)

**Unit-II : Gate Triggering Circuits** **(10 Periods)**

Introduction, Firing of thyristors, gate current amplitude and rise time, gate pulse duration, pulse waveforms, spurious triggering; pulse transformer, pulse transformer in triggering circuits; gate trigger circuits, resistance firing circuit, resistance - capacitance firing circuit, resistor capacitor - full wave trigger circuit.

**Unit-III : Unijunction Transistors And Triggering Circuit.** **(08 Periods)**

Unijunction transistor, basic operation, UJT relaxation oscillator, the UJT as an SCR trigger.

**Unit-IV : Series And Parallel Operations Of Thyristor** **(12 Periods)**

Introduction, series operations of thyristors, need for equalising network; unequal distribution of voltage, difference in reverse recovery time; equalising network design, static equalising network, dynamic equalising network, triggering of series connected thyristors, simultaneous triggering, sequential triggering, optical triggering.  
Parallel operation of thyristors, methods for ensuring proper current sharing, triggering of thyristors in parallel, string efficiency, derating.  
(Numerical Problems)

**References :**

- 1] Power Electronics  
-M.D.Singh and K.B.Khanchandani (T.M.H. Publishing Company.)
- 2] Industrial Electronics and Control  
-S.K.Bhattacharya and S.Chatterjee (T.M.H. Publishing Company.)
- 3] Thyristors : Theory and Applications  
-R.K.Sugandhi and K.K.Sugandhi (2/e, Wiley Eastern Ltd.)

**Paper-XIII(B)**  
**Introduction to Microcontroller (8051)**

**(50 marks, 45 periods)**

**Unit I:**

**Introduction to Microcontroller:**

**(06 periods)**

Block diagram of microcomputer, block diagram of microcontroller, comparison between microprocessor and microcontroller, embedded systems, microcontroller survey (8-bit, 16-bit, 32-bit)

**Unit II:**

**Architecture of 8051 Microcontroller:**

**(15 periods)**

Features, pin out diagram, internal block diagram, CPU registers, flags, PSW, SFRs, PC, Data -Pointer, SP, Internal RAM/ROM, External memory, I/O ports.

**Unit III:**

**Instruction set of 8051:**

**(15 periods)**

Addressing modes, Data transfer, arithmetic, logical operations, JUMP, Loop and CALL instructions, single bit operations, stack and interrupt instructions

**Unit IV:**

**8051 Programming:**

**(09 periods)**

Assembly language programming, instruction syntax, assembler, compiler, simple programs on data transfer, arithmetic and logical operations.

**References**

1. The 8051 Microcontroller architecture, Programming & Applications- Kenneth J. Ayala (Penram international)/Cengage Learning India Pvt. Ltd, (Patparganj), New Delhi.
2. Th 8051 Microcontroller and Embedded Systems-M. A. Mazadi, J. C. Mazadi (Pearson Education, Asia)
3. 8051 Microcontroller: Hardware, Software and Applications- V. Udayshankara, M. S. Mulikarjun Swami-McGraw Hill.
4. Microprocessor, microcontroller & applications- U. S. Shah (Tech-Max Pune).
5. Microcontroller (Theory and Applications) - Ajay V. Deshmukh- McGraw Hill.
6. Microcontroller & Applications-A. P. Godse, Technical Publications, Pune.

Paper-XIV  
**Communication Electronics-II**

**(50 Marks, 45 Periods)**

**Unit I: Radio Receivers**

(08 Periods)

Introduction, Basic Block diagram of Communication Receiver, Tuned Radio Frequency (TRF) Receiver, Super Heterodyne Receiver, Characteristics of Radio Receivers, Sensitivity, Selectivity, Fidelity, Image Frequency and Its Rejection, Double Spotting  
(Numerical Problems)

**Unit II: Microwaves And Radar Systems**

(15 Periods)

Microwaves:-Introduction, Reflex Klystron Operation, Mathematical Analysis, Modes, Gunn Effect, Gunn diode

Radar Systems:-Basic Principles, Block Diagram of Basic Pulsed Radar System, Radar Range Equation, Moving Target Indication, CW Doppler Radar  
(Numerical Problems)

**Unit III: Introduction To Mobile Communication**

(10 Periods)

Historical Perspective, Cellular Systems, Third-Generation (3G) Systems, Fourth-Generation (4G) Systems,

**Unit IV: Introduction to Optical Fibres**

(12 Periods)

Fibre Optics, Structure of Optical Fibres, Classification of Optical Fibres, Propagation of Light, Refraction and Snell's law, Total Internal Reflection, Light Propagation through an Optical Fibre, Acceptance Angle and Numerical Aperture, Dispersion, Intermodal Dispersion, Fibre Characteristics, Fibre Losses, Calculation of Losses, Choice of Wavelength, Fibre Optic Communications, Applications of Fibre Optic Communication, Advantages of Optic Fibres, Disadvantages of Optic Fibres.

(Numerical Problems)

**References:**

1. Electronic Communications  
-Dennis Roddy and John Coolen (4/e, PHI Publication)
2. Electronic Communication Systems  
-George Kennedy (3/e, Mc Graw Hill International Edition)
3. Microwave Engineering  
-Sanjeeva and Gupta
4. Microwave Devices And Circuits  
-Samuel Y. Liao (3/e, Prentice Hall)
5. Optical Fibers And Fiber Optic Communication Systems  
-S.K. Sarkar (S.Chand and Company Ltd., New Delhi)
6. Communication Engineering  
-J.S. Katre (Technova Educational Publications, Pune)
7. Basic Electronics (Solid State) [ Multicolour Illustrative Edition ]  
- B. L. Theraja (S. Chand & Company Ltd)
8. Mobile Satellite Communication Networks:  
-Ray E. Sheriff & Y. Fun Hu (Wiley India)
9. Wireless & Cellular Telecommunications:  
-William C. Y. Lee (3/e, McGraw Hill)

**Paper : XV (A)**  
**Power Electronics-II**

**(50 Marks, 45 Periods)**

**Unit-I : Phase Controlled Rectifiers**

**(20 Periods)**

Introduction, phase angle control, single - phase half-wave controlled rectifier (one-quadrant), with resistive load, with inductive load, effect of freewheeling diode, single-phase full-wave controlled rectifier (two quadrant converters), mid-point converter (M-2 connection), single-phase half-controlled Bridge rectifier, half-controlled bridge rectifier with resistive load, half-controlled Bridge rectifier with R-L load.

**Unit-II : Thyristor Control Circuits**

**(10 Periods)**

Phase control circuit for regulating temperature, remote temperature controller, light activated turn-off circuit using DIAC, TRIAC and LDR, 'Off at Dark' circuit, automatic water level indicator using SCR.

**Unit-III : Inverters**

**(5 Periods)**

Introduction, thyristor inverter classification, series inverters, basic series inverter modified series inverter. Basic parallel inverter.

**Unit-IV : Choppers**

**(10 Periods)**

Introduction, principle of chopper operation, control strategies, Time Ratio Control (TRC), Current Limit Control, step up choppers, step down chopper.

**References :**

- 1] Power Electronics  
-M.D.Singh and K.B.Khanchandani (T.M.H. Publishing Company)
- 2] Industrial Electronics and Control  
-S.K.Bhattacharya and S.Chatterjee (T.M.H. Publishing Company.)
- 3] Thyristors : Theory and Applications  
-R.K.Sugandhi and K.K.Sugandhi (2/e, Oiley Eastern Ltd.)

**Elective Paper-XV(B)**  
**8051 Microcontroller and Embedded Systems**  
**(50 marks, 45 periods)**

**Unit I:**

**8051 Programming: (08 periods)**

Assembly language programming examples: arithmetic, logical, single bit, branching, looping and code conversion programs.

**Unit II:**

**Timers and Counters in 8051: (08 periods)**

Timer modes, timer counter registers, programming the timers in various modes, counter programming.

**Unit III:**

**Interfacing and Applications: (14 periods)**

Interfacing of LEDs, LCD, switches, relays, stepper motor, interfacing DAC and ADC converters(0808).

**Unit IV:**

**Programmable Logic Controllers (PLC): (15 periods)**

PLC system, internal architecture of PLC (CPU, bus, memory, I/O unit), Ladder & Functional Block programming: Ladder diagrams, PLC ladder programming, logic functions, latching, Boolean algebra, functional blocks, and program examples.

**References:**

1. The 8051 Microcontroller architecture, Programming & Applications- Kenneth J. Ayala (Penram international)/Cengage Learning India Pvt. Ltd, (Patparganj), New Delhi.
2. The 8051 Microcontroller and Embedded Systems-M. A. Mazadi, J. C. Mazadi (Pearson Education, Asia)
3. 8051 Microcontroller: Hardware, Software and Applications-V. Udayshankara, M. S. Mulikarjun Swami, McGraw Hill.
4. Programmable Logic Controllers-W. Bolton - 4 th Edition, Elsevier India Pvt. Ltd. Gurgaon, Harayana.
5. Microcontroller (Theory and Applications) - Ajay V. Deshmukh- McGraw Hill.
6. Microprocessor, microcontroller & applications- U. S. Shah (Tech-Max Pune).
7. Microcontroller & Applications-A. P. Godse, Technical Publications, Pune

Paper-XVI  
**LAB -IV**  
(Practical Based On Papers XII And XIV)

(50 Marks)

**Note:**

1. Every student must perform at least TEN experiments
2. Use graphs wherever necessary

**List of Experiments:**

1. Study of Class–C Amplitude Modulation and Measurement of Efficiency, Percentage Modulation Index
2. Study of Linear Diode Detector and Measurement of Detection Efficiency
3. Study of Frequency Response of Two Stage IF Amplifier
4. Study of Frequency Response of Audio Amplifier.
5. Study of Class B Push–Pull Amplifier using Complimentary Symmetry and Determination of Efficiency
6. Study of RF Mixer using BF 194 Transistor
7. Study of FM Modulation using IC 566
8. Study of FM Demodulator.
9. Study of Pulse Amplitude Modulation
10. Study of Pulse Position Modulation
11. Study of Pulse Width Modulation
12. Study of Pulse Mode Modulation
13. Measurement of Numerical Aperture of Optical Fiber
14. Study the Bending Loss of an Optical Fiber
15. Study of the Characteristics of Laser LED
16. Study of Photo-Diode Detector Characteristics (Use Avalanche Photo Diode)
17. Study of Transmission and Reception Through Optical Fiber



**Paper XVII (A)**  
**LAB -V**  
(Practical Based On Papers XIII (A) And XV(A))

**(50 Marks)**

**Note:**

1. Every student must perform at least TEN experiments
2. Use graphs wherever necessary

**List of Experiments:**

1. Unijunction Transistor Characteristics
2. UJT relaxation oscillator
3. Firing characteristics of SCR.
2. Half wave gate controlled rectifier using one SCR
3. Firing of single SCR using UJT
4. Firing of two SCRs by a UJT.
5. Phase control circuit using SCR
6. Characteristics of Diac
7. Firing characteristics of a Triac
8. Illumination control using Diac and Triac
9. Light activated turnoff circuit using LDR and SCR
10. Light activated turn off circuit using Diac-Triac and LDR
11. Inverter using SCR and measurement of frequency, output power.
12. Study of simple Chopper circuit/step-up chopper circuit and measurement of ontime, off-time , output voltage

**Paper-XVII (B)**  
**LAB -V**  
(Practical Based On Papers XIII (B) and XV(B))

(50 Marks)

**Note:**

- Every student must perform at least TEN experiments

**List of Experiments:**

1. Programs to study addressing modes of IC 8051.
2. Addition of two 8 bit numbers & 16 bit numbers.
3. Subtraction of two 8 bit numbers & 16 bit numbers
4. Multiplication of two 8 bit numbers.
5. Division of two 8 bit numbers.
6. 1's and 2's complement of 8 bit number/16 bit numbers.
7. Two programs on logical operations.
8. Program to convert Binary number to equivalent Gray number.
9. Program to unpack the packed BCD number.
10. Program to move the block of memory to other area.
11. Program to flash LED connected to port P3.1 with the time delay of 1 sec. using timer-1 in mode-2.
12. Program to find Sum of series / to get average of given set of numbers.
13. Program to generate square wave of 3 KHz on port P1.3 using timer-1 in mode-1.
14. Program to interface relay switch and make it ON/OFF repeatedly with the delay of 1 sec.
15. Program to interface 7-segment display unit to IC 8051 to generate desired character.
16. Program to interface stepper motor to rotate clockwise/anticlockwise with given number of steps per revolutions.
17. Interfacing with DAC 0808.
18. Interfacing with ADC 0808.
19. Smallest of two numbers
20. Largest of two numbers