**ST. XAVIER'S TECHNICAL INSTITUTE, MAHIM, MUMBAI 400 016**

Diploma in Electronics and Telecommunication Engineering

## TEACHING AND EXAMINATION SCHEME

SEMESTER FIVE

Academic Year 2013-2014

| Sr. No. | Subject Title | Subject Code | Teaching Scheme | | | | Examination Scheme | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | TH | TU | PR | CREDITS | PAPER HRS | THEORY | | PRACTICAL | | ORAL | | TERM WORK | | TOTAL |
| | | | | | | | | Max | Min | Max | Min | Max | Min | Max | Min | |
| 1 | Microprocessors and Peripherals (E1) | ET-11511 | 4 | xx | 2 | 6 | 3 | 100 | 40 | 50 | 20 | xx | xx | 25 | 10 | 175 |
| 2 | Signals and Systems | ET-11512 | 4 | xx | 2 | 6 | 3 | 100 | 40 | xx | xx | 50 | 20 | 25 | 10 | 175 |
| 3 | Advanced Communication Systems | ET-11513 | 4 | xx | 2 | 6 | 3 | 100 | 40 | xx | xx | 50 | 20 | 25 | 10 | 175 |
| 4 | Project Seminar | ET-11514 | xx | xx | 2 | 2 | xx | xx | xx | xx | xx | xx | xx | 50 | 20 | 50 |
| 5 | Industrial Electronics | ET-11515 | 4 | xx | 2 | 6 | 3 | 100 | 40 | 50 | 20 | xx | xx | 25 | 10 | 175 |
| 6 | Vocational Training | ET-11516 | xx | xx | 4 | 4 | xx | xx | xx | 50 | 20 | xx | xx | 50 | 20 | 100 |
| 7 | Circuit Simulation and PCB Design | ET-11517 | xx | xx | 2 | 2 | xx | xx | xx | 50 | 20 | xx | xx | 25 | 10 | 75 |
| 8 | PLC Systems and Applications (E1) | ET-11518 | 4 | xx | 2 | 6 | 3 | 100 | 40 | 50 | 20 | xx | xx | 25 | 10 | 175 |
| | | TOTAL | 16 | 0 | 16 | 32 | | 400 | | 200 | | 100 | | 225 | | 925 |

ET-11519 represents "Academic Skills" which is non-credit and non-exam in 5th Semester

Total Number of Credits, or Student Contact Hours = 32

Total Marks = 925

Abbreviations:

| | | |
|---|---|---|
| 1) | TH | Theory |
| 2) | TU | Tutorial |
| 3) | PR | Practical |
| 4) | | No Theory Exam |
| 5) | E1 | Elective One |

Note:

1) For progressive and continuous assessment two periodic tests of 20 marks each will be conducted for all the theory subjects. The average of these will be added to the final theory examination marks which will be of 80 marks.
2) All term work marks are Internal.
3) All practical exams/ oral are External and Internal.

Semester 5

***PROGRAMME TITLE :*** Diploma in Electronics & Telecomm. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11511 | MICROPROCESSORS AND PERIPHERALS (Elective 1) | | 4 | 2 | 6 | 80 | 20 | 50 | - | 25 | 175 |

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practical is Internal and External.

**RATIONALE:**

This subject comes under the Applied Technology group and provides an introduction to microprocessors. Programming in assembly language is covered in detail to develop a foundation for programming in machine level language. Study of Memory and I/O interface design, programming techniques, study of different microprocessors, their peripheral support components and devices, including CPU architecture, memory interfaces and management, coprocessor interfaces, bus concepts, serial I/O devices, and interrupt control devices are included in the course.

# SECTION 1

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 01 | **MICROPROCESSORS-GENERAL INTRODUCTION:**<br>1.1 Various types, their specifications<br>1.2 Simplified block diagram of microprocessor system.<br>1.3 Buses & their types- address, data & control buses. | 04 | 06 |

| | | | |
|---|---|---|---|
| 02 | **MICROPROCESSOR – 8085**<br>2.1 Introduction – Features of 8085 μp.<br>2.2 Pin diagram and functions.<br>2.3 Internal architecture – programming model (registers), functional block diagram | 08 | 10 |
| 03 | **BASIC PROGRAMMING WITH 8085:**<br>3.1 Instruction set of 8085.<br>3.2 Instruction fetch and execute cycles – timing diagrams for OF, MR, MW, IOR & IOW cycles.<br>3.3 Addressing modes.<br>3.4 Programming without the use of subroutines.<br>3.5 Concept of stack, stack pointers,<br>3.6 Interrupts, concept of subroutines,<br>3.7 Programming using subroutines.<br>3.8 I/O mapped I/O's & Memory mapped I/O's | 15 | 18 |
| 04 | **SEMICONDUCTOR MEMORIES:**<br>4.1 Definition of RAM, ROM, PROM, EPROM, EEPROM,<br>4.2 Pin functions of RAM6116 and EPROM 2764.<br>4.3 Interfacing of memory IC's with 8085 | 05 | 06 |

## SECTION 2

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 05 | **8255 P.P.I. CHIP:**<br>5.1 Internal block diagram pin functions.<br>5.2 Various modes of operations.<br>5.3 Interfacing of Matrix Keyboard & Multiplexed Display | 07 | 09 |
| 06 | **8279 KEYBOARD AND DISPLAY INTERFACE CHIP:**<br>6.1 List of features<br>6.2 Internal block diagram pin functions<br>6.3 Keyboard and display Interfacing circuit diagram. | 07 | 09 |

| | | | |
|---|---|---|---|
| 07 | **8155 P.P.I. CHIP:**<br>7.1 Internal block diagram, pin functions,<br>7.2 Various modes of operations.<br>7.3 8155 Timer & its programming | 07 | 09 |
| 08 | **ADC0808 and DAC0800**<br>8.1 Study of successive approximation type ADC 0808 and it's Interfacing with 8085 microprocessor.<br>8.2 DAC 0808 and it's Interfacing with 8085 microprocessor. | 04 | 04 |
| 09 | **16-bit Microprocessor 8086**<br>Silent features of 8086 Microprocessor, architecture of 8086 (Block diagram), register organization, concepts of pipelining, memory segmentation and memory address generation. | 07 | 09 |

**EXPERIMENT LIST :**

1. a. Draw a flowchart & write a program to find largest number from a given data block.
   b. Draw a flowchart & write a program to find smallest number from a given data block.
2. Draw a flowchart & write a program to count odd and even numbers in a given data block.
3. Draw a flowchart & write a program to add two, two byte numbers.
4. Draw a flowchart & write a program to multiply two bytes.
5. a. Draw a flowchart & write a program for arranging the data in ascending order.
   b. Draw a flowchart & write a program for arranging the data in descending order.
6. Draw a flowchart & write a program to divide two bytes.
7. Draw a flowchart & write a program to do data block memory transfer.
8. Draw a flowchart & write a program to compliment the given data block.
9. Draw a flowchart & write a program to fill given data block with a constant byte.
10. Draw a flowchart & write a program to generates square waves using 8255 in BSR mode.
11. Draw a flowchart & write a program to generate square waves on all ports of 8255 in mode 0.
12. Draw a flowchart & write a program to generate square waves on all ports of 8255 in mode 0 only when an interrupt occurs.
13. Draw a flowchart & write a program to read input status of port A of 8255 and reflect the status on port B.

**IMPLEMENTATION STRATEGY**

1. Teaching plan
2. Minimum 10 practicals/assignments

**REFERENCES :**

| Sr. No | Name of Book | Author | Publication |
|---|---|---|---|
| 1 | Microprocessor & interfacing (programming & hardware) | Douglas V-Hall | Tata McGraw Hill |
| 2 | Advanced microprocessor & peripheral | A.K. Ray & K.M. Bhurchandi | Tata McGraw Hill |
| 3 | Microprocessor Architecture programming & application with the 8085 | Ramesh A. Gaonkar | Penfam International |
| 4 | Microprocessors & Interfacing Programming & Hardware | Douglas V. Hal | McGraw Hill International Edition |

***PROGRAMME TITLE :*** Diploma in Electronics & Telecom. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11512 | SIGNALS AND SYSTEMS | | 4 | 2 | 6 | 80 | 20 | - | 50 | 25 | 175 |

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of oral is Internal and External.
4) The assessment of Term-Work is Internal

**RATIONALE:**
This subject which comes under the Applied Technology category is designed to provide a platform for engineers and designers who would like to work in the most challenging and emerging field of signal processing. As high speed computational machines are now available for processing, the concepts and techniques allied with signal processing field assume a broader and a versatile approach. Thus the study of signals and systems has opened up a whole new era of solutions to resolve many intricate signal processing problems.

## SECTION 1

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 01 | **Introduction**<br>1.1 Classification of Signals – Continuous and Discrete, Periodic and Non periodic, Even and Odd, Energy and Power, Deterministic and Random type<br>1.2 Standard Signals – Unit impulse, unit step, unit ramp, exponential, sinusoidal type<br>Classification<br>1.3 Basic operation of signals – Amplitude scaling, Time shifting, Time scaling etc.<br>1.4 Classification of Systems – Static and Dynamic, Time Variant and Time Invariant, Linear and Nonlinear, Causal and Anti-causal, Stable and Unstable | 12 | 15 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 02 | **Time Domain Representation for LTI Systems**<br>2.1 Convolution for C.T. Systems – Representation of C.T. Signal in terms of Impulses<br>2.2 Convolution Sum – Convolution for D.T. Systems<br>2.3 Linear Convolution<br>2.4 Methods of Convolution:<br>Graphical method<br>Using mathematical equation of convolution<br>Tabulation method<br>2.5 Properties of Linear Convolution<br>2.6 Series and Parallel connection of systems<br>2.7 Differential Equation representation for LTI Systems- Zero input response and Zero state Response<br>2.8 Impulse Response of LTI Systems<br>2.9 Finite Impulse Response (FIR) and infinite Impulse Response (IIR) Systems<br>2.10 Correlation – Auto Correlation and Cross Correlation | 20 | 25 |
| | **SECTION 2** | | |
| 03 | **Fourier Representation of Continuous Time and Discrete Time Signals**<br>3.1 Fourier Series<br>3.2 Properties of Fourier Series<br>3.3 Fourier Transform<br>3.4 Properties of Fourier Transform (proof of properties not expected)<br>3.5 Discrete Time Fourier Series ( DTFS )<br>3.6 Discrete Time Fourier Transform ( DTFT )<br>3.7 Fourier Transform of Standard Signals<br>3.8 Properties of Fourier Transform for Discrete Time Signals(proof of properties not expected) | 12 | 15 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 04 | **Z-Transform**<br>4.1 Introduction ,Definition of Z-Transform<br>4.2 Region of Convergence (ROC)<br>4.3 Z-Transform of elementary signals<br>4.4 Properties of Z-transform (proof of properties not expected)<br>4.5 Inverse Z-Transform (IZT)-<br>Power Series Expansion<br>Partial Fraction Expansion<br>Residue method<br>4.6 LTI System Analysis using Z-Transform-<br>Pole – Zero Plot<br>System Transfer Function<br>4.7 Conditions of Causality and Stability in terms of Z-Transform | 20 | 25 |

**IMPLEMENTATION STRATEGY**

1. Teaching plan
2. Minimum 10 practicals using Matlab

**REFERENCES**

| S. No. | Author | Title | Edition | Publisher & Address |
|---|---|---|---|---|
| 1 | Simon Haykin and Barry Van Veen | Signals and Systems | 2nd | John Wiley |
| 2 | Benoit Boulet | Fundamentals of Signals and Systems | 1st | Dreamtech |
| 3 | Smarajit Ghosh | Signals and Systems | 1s | Pearson Education |
| 4 | R.A.Barapate J.S.Katre | Signals and Systems | 1st | Techmax |

| ***PROGRAMME TITLE :*** Diploma in Electronics & Telecom Engineering<br>***SEMESTER :*** Five | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
| | | | | | | Theory | | PR | OR | TW | Total |
| | | | L | P | Total | TH | TS | | | | |
| ET 11513 | Advanced Communication Systems | | 4 | 2 | 6 | 80 | 20 | - | 50 | 25 | 175 |

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Oral is Internal and External.
4) The assessment of Term-Work is Internal.

**RATIONALE:**

This subject belongs to the Applied Technology group. As improvement and development in the technology have occurred with tremendous rapidity, in parallel with its increasingly wide scale deployment, Telecommunication and Networking based on Satellite, Microwave and Optical Fiber technology have become major information transmission systems. This has made provisions to improve the transmission standards and fidelity, coupled with an increase in the data rate such that more information is sent and at the same time increasing the transmission distance between relay stations. As a result of accelerating rate of growth of communication technology in research and industry, students who are preparing themselves, and electronics engineers who are working in these areas are faced with the need to understand the theoretical as well as practical design and analysis of communication systems.

## SECTION 1

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 01 | **Need for SATCOM system**:<br>1.1 Basic block diagram of SATCOM System.<br>1.2 Uplink and downlink frequencies.<br>1.3 Transponder types with reference to frequency bands.<br>1.4 Advantages and Applications of SATCOM Systems. | 05 | 08 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 02 | **Satellite Orbits:**<br>2.1 Geostationary orbit: features, advantages and disadvantages of such orbit.<br>2.2 Orbital adjustments: station keeping, Satellite spacing (orbital spacing).<br>2.3 Attitude Control | 05 | 06 |
| 03 | **Antennas in space:**<br>3.1 Earth coverage and narrow directional type.<br>3.2 Spot beams, Beam shaping, Foot prints, Elevation angle. | 05 | 04 |
| 04 | **Frequency allocations for satellite broadcast:**<br>4.1 Guiding principles, SATCOM frequency bands 6/4 Ghz, (C Band) 14/12 Ghz (Ku Band) 30/20 Ghz ( Ka Band).<br>4.2 Comparison of different frequency bands, advantages and disadvantages. | 05 | 08 |
| 05 | **Block diagram of Earth station**<br>5.1 Modulation technique<br>5.2 Typical C Band up converter, block diagram study.<br>5.3Typical down converter - LNB, block diagram study | 07 | 10 |
| 06 | **Satellite transponder:**<br>6.1 6/4 GHz (C - band) transponder, block diagram study<br>6.2 Electrical power subsystem. | 05 | 04 |
| | **SECTION 2** | | |
| 07 | **Fiber Optic Communication**<br>7.1 Light Wave Spectrum<br>7.2 Advantage & disadvantages of Fiber optic communication.<br>7.3 Block Diagram of Fiber Optic Communication. | 10 | 12 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 08 | **Fiber Optic Communication & Ray Theory**<br>8.1 Construction of Fiber Optic Cable.<br>8.2 Fiber Characteristics & Classification.<br>8.3 Source & It's Limitations, Construction & working Principle of LED, LASER.<br>8.4 Detector, Limitation, Construction & working principle, Avalanche Photo Diode.<br>8.5 Spicing Techniques.<br>8.6 Definition & Concept of Reflection, dispersion, diffraction.<br>8.7 Definition of Snell's Law, Numerical Aperture\ Acceptance angle, acceptance cone, Critical Angle | 15 | 20 |
| 09 | **Losses in Fiber Optic**<br>9.1 Attenuation, dispersion-intermodal, intramodal, bend loss, micro macro scattering losses- Linear. Non Linear. Absorption<br>9.2 OTDR-architecture, functioning & requirements<br>9.3 Link & power budget calculations | 07 | 08 |

**IMPLEMENTATION STRATEGY**

1. Teaching plan
2. Minimum 10 Assignments or Practicals.

**LIST OF PRACTICALS:**

1. Calculate the N.A for given FOC.
2. Calculate the bend Loss in given FOC.
3. Verify the characteristics of LASER.
4. Verify the characteristics of LED.
5. Verify the characteristics of Photo Diode.
6. Attenuation measurement in given FOC.
7. Dispersion measurement in given FOC.
8. Visit Industry to see
   - i) Satellite Earth Station
   - ii) Use of Splicing Technique (Demonstration)

## REFERENCES


| S. No. | Author | Title | Publisher & Address |
|---|---|---|---|
| 1 | Gary Miller | Modern Electronic communication | Prentice Hall of India |
| 2 | Dennis Roddy | Satellite Communication | Tata McGraw-Hill International |
| 3 | Keiser | Optical Fiber Communication | Tata McGraw-Hill International |
| 4 | Kennedy Davis | Electronic Communication System | Tata McGraw-Hill |
| 5 | A. Selverajan | Optical Fiber Communication | Tata McGraw-Hill |

| ***PROGRAMME TITLE :*** Diploma in Electronics & Telecom. Engineering<br>***SEMESTER :*** Five | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
| | | | | | | Theory | | PR | OR | TW | Total |
| | | | L | P | Total | TH | TS | | | | |
| ET 11514 | PROJECT SEMINAR **(No Theory exam)** | | - | 2 | 2 | - | - | - | - | 50 | 50 |
| 1) The assessment of project seminar term work is Internal. | | | | | | | | | | | |

**RATIONALE:**

Project Seminar comes under Applied Technology group. Project work is undertaken and begins in the fifth semester and continues towards completion in the sixth semester. The Project work undertaken by students in the final year will encompass following activities: Searching for appropriate material; solving problems; analyzing data; maintaining a weekly report book; preparing a report; presenting the project work.
Some of the objectives that the student would achieve by doing project work may be listed as follows:
The student will be able to: plan the project; show decision making skills by taking appropriate decisions at every stage of the project; show problem solving skills by solving problems that may arise at every stage of the project; show confidence to work on one's own and also in a group; Work effectively as a member of a team; use creativity in solving problems and decision making.

**OBJECTIVE :**

The students will be able to do
1. Design, analyze, test & implement the various projects
2 Feasibility Studies and Approvals
3. The Project Organization, The Functional Organization,
   The Matrix organization, Designing an Organization, Building the Team, Leadership
4. Defining and Financing the Project. How Project Evolve- the Client Brief.,
   Financing the Project. Sources of Finance and Cash Flow.

| CONTENTS | | | |
|---|---|---|---|
| Sr. No. | Name of the Topic | Periods | Marks |
| 1 | Before finalizing the project they have to consider: -<br>i) availability of components, parts required for the project.<br>ii) total cost of the project.<br>iii) approval for the project by the guide based on technical level and feasibility. | 08 | 15 |
| Sr. No. | Name of the Topic | Periods | Marks |
| 2 | After finalizing the project they are supposed to do the following under the guidance of the guide:-<br>i) purchasing of components, parts required for the project.<br>ii) testing circuits part by part on a bread-board.<br>iii) designing of art-work of PCB<br>iv) making PCB by any suitable method.<br>v) mounting and soldering of components.<br><br>vi) testing the circuit fault finding if it is not working.<br>vii) voltage and waveform analysis, calculations, plotting of graphs (if required)<br>viii) mounting the circuit in a cabinet and mounting panel controls fuse meters etc. | 16 | 20 |
| 3 | All batches are supposed to prepare the Project report.<br>The Project report must contain:-<br>i) block diagram and working principle<br>ii) working of the circuit with detailed circuit diagram<br>iii) observations, graphs, calculations, results, applications<br>iv) data sheets of active devices used.<br>v) list of components and the total cost of the project | 08 | 15 |

**INSTRUCTIONS:**

1. The typed project report must be bound and submitted by each student before the end of the term.
2. One extra copy of the project report per batch must be submitted to the examiner.

## REFERENCES

| S. No. | Author | Title | Edition | Year of Publication | Publisher & Address |
|---|---|---|---|---|---|
| 1. | Bosschart | Printed Circuit Board - Design and Technology | | | |

**Subject teacher will provide the details of references**

***PROGRAMME TITLE :*** Diploma in Electronics & Telecom. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11515 | INDUSTRIAL ELECTRONICS | | 4 | 2 | 6 | 80 | 20 | 50 | - | 25 | 175 |

1) Theory paper duration 3 hrs.
2) Theory paper assessment is Internal and External.
3) The assessment of Practicals is Internal and External.
4) The assessment of Term-Work is Internal.

**RATIONALE:**

This subject which comes under the Applied Technology group enables the students to comprehend the theory, construction, concepts and working principles of various basic power electronic devices and circuits and their applications in industry. The knowledge acquired by student will help them to design, test, troubleshoot and repair power electronic circuits and systems that are widely used in heavy industries, switching and control systems, induction heating, resistance welding and so on.

## SECTION 1

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 01 | **Static Power Switching Devices**<br><br>1.1 Power Semiconductor Devices<br>1.1.1 Need for high power semiconductor devices<br>1.1.2 Power BJT – construction, I-V Characteristics, Specifications and ratings, Applications.<br><br>1.2 Thyristor Family Devices - construction, Detailed operation, I-V Characteristics, Specifications and ratings, Applications of :<br>1.2.1 SCR *(and two transistor equivalent circuit of SCR)*<br>1.2.2 UJT<br>1.2.3 PUT<br>1.2.4 TRIAC *(and two SCR anti-parallel connected equivalent)*<br>1.2.5 DIAC<br>1.2.6 Power MOSFET<br>1.2.7 IGBT<br>1.2.8 LASCR | 12 | 16 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 02 | **2.1 Gate Triggering Circuits of SCR**<br><br>2.1.1 Various Gate Triggering Methods – D.C, A.C & Pulse triggering<br>2.1.1 RC firing circuits<br>2.1.2 UJT Relaxation Oscillator<br>2.1.3PUT Relaxation Oscillator<br>2.1.4 Pulse Transformer for gate coupling & isolation, transistor interfacing.<br>2.1.5 TRIAC triggering using DIAC(AC phase control)<br>2.1.6 Two SCR back to back (anti-parallel) connection for A.C. power control<br><br>**2.2 Multiple connection of SCR**<br>2.2.1 Series & Parallel Connections | 10 | 12 |
| 03 | **Phase Controlled Convertors**<br><br>3.1 Concept of Controlled Conversion of a.c to d.c<br>3.2 Various types of control techniques<br>3.3 Rectifier Circuits Using SCR<br>3.3.1 Single Phase Half Wave, Full Wave & Bridge Controlled Rectifier – with Resistive Load.<br>3.3.2 Expressions (no derivations) for Output d.c voltage, d.c power, output a.c voltage, input a.c power<br>3.3.3 Simple Numerical Examples based on above expressions.<br>3.3.4 Controlled Rectifier operation with L+R loads<br>3.4 Introduction to three phase controlled rectifiers. | 10 | 12 |
| | **SECTION 2** | | |
| 04 | **Resistance Welding**<br><br>4.1 Working Principle of Resistance Welding process.<br>4.2 Importance in the Quality Control of Welding.<br>4.3 Electronic Circuits used in Resistance Welding – Line Contractor &<br>Sequential Timer.<br>4.4 IGNITRON – construction & working principle.<br>4.5 Energy Storage Welding Process.<br>4.6 Functional Block diagram of Welding Control. | 11 | 12 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 05 | **High Frequency Heating**<br><br>5.1 Need & Advantages<br>5.2 Induction Heating<br>5.2.1 Operating Principle<br>5.2.2 Applications – Industrial Heating , Heat Treatment<br>5.3 Dielectric Heating<br>5.3.1 Operating Principle<br>5.3.2 Applications- Industrial, Medical. | 08 | 10 |
| 06 | **Ultrasonics**<br><br>6.1 Special Features & properties of Ultrasonic energy waves.<br>6.2 Propagation, Attenuation & reflection(Echo) of Ultrasonic energy<br>waves.<br>6.3 Generation of Ultrasonic waves.<br>6.4 Applications<br>6.4.1 Low Frequency Applications - Ultrasonic Cleaning.<br>6.4.2 Medium Frequency Applications – Ultrasonic Drilling , Soldering ,<br>Welding<br>6.4.3 High Frequency Applications – NDT measurement, Ranging ,<br>Scanning | 11 | 12 |
| 07 | **Introduction to PLC Systems, working/ operating principles/ operation, block diagram and applications** | 02 | 06 |

**PRACTICE:**

**1) V-I Characteristics of U.J.T.**
**2) U.J.T. Relaxation Oscillator**
**3) Characteristics of S.C.R.**
**4) Characteristics of TRIAC**
**5) V-I Characteristics of P.U.T.**
**6) V-I Characteristics of DIAC**
**7) A.C. Power control using DIAC – TRIAC**
**8) Full Wave Rectifier Using SCR**
**9) V-I Characteristics of a Photocell**
**10) Working of an Optocoupler IC MCT2E / 4N25**
**11) Induction Heating of Conducting Materials**
**12) Dielectric Heating of Non-conducting Materials**

**IMPLEMENTATION STRATEGY**

1.Teaching plan
2.Minimum 10 practicals/assignments

**REFERENCES**

| S. No. | Author | Title | Edition | Year of Publication | Publisher & Address |
|---|---|---|---|---|---|
| 1. | J.S. Katre | Industrial Electronics | | 2009 | Tech Max |
| 3. | P.C. Sen | Power Electronics | 1st | 1987 | Tata Mcgraw Hill |
| 4. | Williams | Power Electronics & Applications | 1st | 1987 | Macmillan Education Ltd |

***PROGRAMME TITLE :*** Diploma in Electronics & Telecom. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11516 | VOCATIONAL TRAINING **(No Theory exam)** | All subjects | - | 2 + 2 * | 4 | - | - | 50 | | 50 | 100 |

1) The assessment of Report / Certification of **practical work done in industry** is Internal and External.
2) Assessment of Term Work / Presentation is Internal.

- **2 credits for actual vocational training in industry**

**RATIONALE:**

It is of utmost importance that the student gets exposure to the environment and working conditions in industry. This subject is classified under the Applied Technology category. It is of utmost importance that the student gets exposure to the environment and working conditions in industry. For this purpose, the Institute has introduced the mandatory vocational training programme of 4 to 6 weeks, for all the students, after the fourth semester examinations (during vacation period). The students are placed in various industries / companies in various departments where they are exposed to actual work environment, enabling them to learn various aspects of the functioning of the industry as well as interacting and communicating with people associated with the industry. The objective of this vocational training programme is to instill confidence among students and build their personality, as well as gain work experience in a real-time industry environment.
This Vocational Training programme has a total weightage of **four credits**, and the assessment is based on the performance of the student, other traits like punctuality and attendance, and also feedback from the industry as well as the report submitted by the student. This assessment of term work / presentation is internal.

***PROGRAMME TITLE :*** Diploma in Electronics & Telecom. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11517 | CIRCUIT SIMULATION AND PCB DESIGN | | - | 2 | 2 | - | - | 50 | | 25 | 75 |

1) The assessment of Term-Work is Internal.
2) Assessment of practicals is Internal and External.

**RATIONALE:**

This subject which comes under the Applied Technology group will enable the students to compare the performance of simulated circuits and physical circuits with components mounted on a printed circuit board. The laboratory experiences also provide an opportunity to students to design printed circuit boards after verification of the performance of the designed circuit through simulation using the "Eagle" circuit simulation and design software. This knowledge builds a strong foundation for further development of their project work in the final year.

## LIST OF EXPERIMENTS:

| Sr.No. | Name of the Experiments |
|---|---|
| 1. | Simulation of diode characteristics<br>1.1 P-n junction diode<br>1.2 Zener diode |
| 2. | Simulation of transistor circuits<br>2.1 Bipolar Junction Transistor amplifier<br>2.2 Field effect Transistor amplifier<br>2.3 Unipolar Junction Transistor relaxation oscillator |
| 3. | Simulation of IC-741op-amp circuits<br>3.1 Astable multivibrator<br>3.2 Monostable multivibrator<br>3.3 Active Filters-Low pass, High pass, Band pass<br>3.4 Integrator and Differentiator. |
| 4. | Simulation of IC 555 timer circuits<br>4.1 Astable multivibrator<br>4.2 Monostable multivibrator |
| 5. | Simulation of VCO/PLL circuit using IC 566/IC 565 |
| 6. | Simulation of arithmetic circuits using digital ICs<br>6.1 Half adder/Half subtractor<br>6.2 Full adder/Full subtractor |
| 7. | Simulation of Flip flops using digital ICs<br>7.1 RS FF<br>7.2 D FF<br>7.3 JK FF<br>7.4 T FF |
| 8. | Simulation of Counter circuits using digital ICs<br>8.1 Synchronous Counter<br>8.2 Asynchronous Counter |
| 9. | Simulation of Shift registers using digital ICs<br>9.1 PIPO<br>9.2 SISO |
| 10. | Simulation of code converters using digital ICs<br>10.1 BCD to Decimal<br>10.2 Decimal to BCD<br>10.3 Binary to Gray code |

At least one of the experiments from each serial number listed above must be performed. The software to be used for simulation is PSPICE and CIRCUIT MAKER.

## PCB DESIGN:

| | |
|---|---|
| 1. | Selection of any one circuit with minimum 3 to 4 different ICs. |
| 2. | Simulation of the circuit using PSPICE or CIRCUITMAKER and store the results. |
| 3. | Design of PCB layout. |
| 4. | Making of PCB. |
| 5. | Mounting the components physically according to the circuit and soldering them. |
| 6. | Obtain the results of the above assembled circuit and compare with the simulated results. |
| 7. | Soldering and De-soldering practice. |

**References:**

1. Printed Circuit Boards, Design and Technology, Walter Bosshart.
2. Printed Circuits Handbook, Edited by Clyde f. Coombs, Jr.
3. Printed Circuit Board Assembly, P.J.W. Noble.

***PROGRAMME TITLE :*** Diploma in Electronics & Telecomm. Engineering
***SEMESTER :*** Five

| Course Code | Course Title | Prerequisite | Credits | | | Examination Scheme | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | Theory | | | | | |
| | | | L | P | Total | TH | TS | PR | OR | TW | Total |
| ET 11518 | PLC SYSTEMS AND APPLICATIONS (Elective 1) | | 4 | 2 | 6 | 80 | 20 | - | 50 | 25 | 175 |

4) Theory paper duration 3 hrs.
5) Theory paper assessment is Internal and External.
6) The assessment of Oral Exam is Internal and External.

**RATIONALE:**

The subject is classified under Applied Technology group. An example of application of this subject would be the automobile industry, in applications such as pick and place, welding, spray painting etc. The objective of this subject is to teach the student different systems used in various industries universally through Programmable Logic Control (PLC) Systems. The subject introduces the common industrial control system elements including programmable logic controller, PC based control and process monitoring. This subject is a multi disciplinary subject.

**OBJECTIVES:**

The student will be able to:
1. Know the new advanced systems used in Industrial as well as at domestic levels.
2. Identify different systems in Industrial Automation.
3. Know the ladder language programming for PLC.
4. Know the programming for HMI panel.
5. Know the programming for SCADA.

| SECTION 1 | | | |
|---|---|---|---|
| Sr. No. | Name of the Topic | Periods | Marks |
| 1 | **Basics of automation**<br>1.1 Need of automation<br>1.2 Benefits of automation<br>1.3 Application areas – Process industries, Buildings, Robotics, Infrastructure, Aerospace, railways, Automobiles, Telecom, Electrical distribution, Medical | 08 | 10 |
| 2 | **PLC Basics**<br>2.1 Evolution and Role of PLC in Automation<br>2.2 Block Diagram & Principle of Working<br>2.3 PLC Classification based on Type and Size<br>2.4 PLC Characteristics – CPU, Racks, Power Supply, Memory, Input & Output Modules, Application Specific Modules, Speed of Execution, Communication, Redundancy. | 16 | 20 |
| 3 | **PLC Hardware**<br>3.1 Description and Function of various PLC Modules<br>3.2 PLC Hardware Configuration<br>3.2.1 Addressing of PLC I/O<br>3.2.2 Diagnostic Features | 08 | 10 |
| **SECTION 2** | | | |
| 4 | **PLC Programming**<br>4.1 Definition and Use of Bits and Words<br>4.1.1 Introduction to PLC Programming Languages – Ladder, Instruction List, Structured Text, Grafcet<br>4.1.2 PLC Programming Software, its installation and use with a PC<br>4.1.3 Instruction Set in Ladder – NO, NC, Set, Reset, Timers, Counters, Comparison, Arithmetic, Logical, Move, Drum Controller<br>4.1.4 Programming Examples in Ladder with simple applications | 16 | 20 |

| Sr. No. | Name of the Topic | Periods | Marks |
|---|---|---|---|
| 5 | **HMI: Local Operator Panels**<br>5.1 Need for HMI<br>5.2 Types and Characteristics of Local HMI operator panels<br>5.2.1 Introduction to Programming of HMI Panels<br>5.2.2 Interface between HMI Panels and PLC | 08 | 10 |
| 6 | **HMI: SCADA**<br>6.1 Definition of SCADA<br>6.1.1 Functional Block Diagram<br>6.1.2 Function of SCADA<br>6.1.3 Communication between PLC and SCADA<br>6.2 SCADA Applications | 08 | 10 |

**A) Practical Training:**
Skills to be developed:

Intellectual Skills:
i) Logical thinking.
ii) Software development.
iii) Programming using ladder language.

Motor Skill:
i) Observational Skills

**List of Practicals:**

1. Use of simulation package for different function
2. Verify function of logic gates by using PLC.
3. Write and verify ladder program for motor ON-OFF Control with two push button.
4. Write and verify the ladder program for analog input (temp.) Measurement.
5. Develop a graphical screen for SCADA based system.
6. Measure the frequency measurement by using high speed counter in PLC.

**B) Field Work:**
Case study of typical PLC systems like Siemens, Allen Bradley, Schneider, Messung, etc. and comparison of the specification and cost.

## IMPLEMENTATION STRATEGY

The term work marks are based on reports/ presentations made by training and practice sessions experienced during the external training programmes of the subject in different industries/ institutes/ case studies of different equipment.

The oral exam assessment is internal and external which carries 50 marks.

## REFERENCES :


| Sr. No | Name of Book | Author | Publication |
|---|---|---|---|
| 1 | Programmable Logic control- Principles and applications | NIIT | Prentice Hall India |
| 2 | Introduction to Programmable Logic Controllers | Grag Dunming | Thomson |
| 3 | Programmable logic controllers and Industrial automation | Madhuchand A Mitra & Samarjit Sen Gupta | Penram International |
| 4 | Process Control Instrumentation Technology | C D Johnson | Prentice Hall India |
| 5 | Programmable Logic Controller | Petruzella | McGraw Hill |

## ET-11519 Academic Skills

This subject which belongs to the Foundation category does not carry any credits and there is no examination for the same. It is included in the third semester as well as the fifth semester, which gives a double opportunity to sharpen their presentation skills on a topic selected by students from the subjects if the diploma course. These skills encompass reading, researching and gathering information, synthesis and analysis of content matter, writing reports, making presentations and delivering them effectively with confidence. The most recent necessary academic skill is being computer savvy. Computers are used for almost everything, including work and learning. In order to compete in the global marketplace, students need to be able to use computers, especially popular software and the Internet. Computer skills are essential for studying, research, and writing, as well as for communication. These same skills become an integral part and parcel of one's life in the work environment without one being even aware of it. Students are required to make a PowerPoint presentation on a topic of their choice and present the same to an audience comprising of staff and students.