BRANCH NAME – ELECTRONICS ENGINEERING　　　　　　　　　　　　　**SEMESTER – VI**

Subject Code	Subject	L	T	P	TOT	Internal Theory Max Marks	Internal Practical Max Marks	External Theory Max Marks	External Theory Hrs.	External Practical Max Marks	External Practical Hrs.	Total Marks	Credit Point
		Period/Weeks											
096003	Optical Fibre Communication	4	-	4	8	25	20	75	2.5	50	3.0	170	7
096002	Mobile Communication	4	-	3	7	25	20	75	2.5	50	3.0	170	7
096001	Microcontrollers and Embedded System	4	-	3	7	25	20	75	2.5	50	3.0	170	7
096004	PLC & Its Application	4	-	4	8	25	20	75	2.5	50	3.0	170	6
096005	Major Project - II	-	-	10	10	-	45	-	-	150	3.0	195	5
096052	Industrial Exposure (assessment at Inst. Level) +	-	-	-	-	-	25	-	-	-	-	25	1
016054	General Proficiency	-	-	4	4	-	25	-	-	-	-	25	1
016055	Employability Skills	4	-	-	4	25	-	50	2.5	-	-	75	1
	Total	**20**	**-**	**28**	**48**	**125**	**175**	**350**	**-**	**350**	**-**	**1000**	**35**

\#　General Proficiency will comprise of various co-curricular activities like games, hobby clubs, seminars, declamation contests, extension lectures, NCC, NSS and cultural activities and discipline etc.

+　Industrial visit compulsory at minimum 2 Industries or Department.

Note: 1- Each period will be 50 minutes. 2- Each session will be of 16 weeks. 3- Effective teaching will be at least 12.5 weeks.

SIXTH SEMESTER
ELECTRONICS ENGINEERING

OPTICAL FIBRE COMMUNICATION

Subject Code : 096003

L	T	P
4	-	4

RATIONALE

Progressing from communication over copper wire to today's fibre optic communication, we have increased our ability to transmit more information, more quickly and over longer distances. This has expanded our boundaries and is finding a good slot in communication system. Optical fibers has replaced existing transmission media due to its advantages. As a result the technicians are supposed to have knowledge of optical communication. This subject will provide basic concepts and requisite knowledge and skill required.

DETAILED CONTENTS

Unit:- I   **(10 Periods)**
INTRODUCTION

- Basic block diagram of Optical fiber communication.
- Its advantages & applications.
- Principle of light penetration, Total Internal Reflection, critical angle, Numerical aperture.

Unit:- II   **(12 Periods)**
OPTICAL FIBRES & CABLES

- Constructional details of various optical fibers, multimode and single mode fibers, step index and graded index fibers, acceptance angle.

Unit:- III   **(12 Periods)**
LOSSES IN OPTICAL FIBRE CABLES

- Absorption Losses: Scattering Losses, Radiation losses, Connector losses, Bending losses.
- Dispersion: Types and its effect on data rate.

Unit:- IV   **(15 Periods)**
OPTICAL SOURCES & DETECTOR

- Principle of operation of LED
- Brief introduction of Laser diode (Semiconductor laser).
- Characteristics of photo detectors used in optical communication; PIN diode and Avalanche photo diode (APD).

Unit:- V   **(15 Periods)**

Optical Fibre System

- Optical transmitter circuit, optical receiver circuit, optical power budgeting, multiplexing: WDM (Wavelength Division Multiplexing), Modulation in fibre optics

LIST OF PRACTICALS

1. Introduction to various components and tools used in optical fiber communication.
2. Establish the fiber optic analog link & observe its characteristics.
3. Establish the fiber optic digital link & observe its characteristics..
4. Measurement of bending losses in optical fibers.
5. To measure and calculate numerical aperture of optical fiber.
6. To observe characteristics of optical source.
7. To observe characteristics of optical detector.

RECOMMENDED BOOKS

1. Optical fiber Communication by John M Senior, Prentice Hall of India, New Delhi
2. Optical fiber Communication by J. Gower , Prentice Hall of India, New Delhi
3. Optical fiber Communication by Gerd Keiser, McGraw Hill International Editions
4. Optical Communications – Components and Systems by JH Franz and VK Jain, Narosa Publishing House, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	10	14
II	12	18
III	12	18
IV	15	25
V	15	25
TOTAL	**64**	**100**

MOBILE COMMUNICATION

L	T	P
4	-	3

Subject Code : 096002

RATIONALE

The wireless/mobile communication technology though complex but is spreading at a very fast rate. People use more mobile phones in comparison to land line phones. It is expected that with in very short period almost everybody will be using mobile communication. Technology is also changing very fast. Therefore, the students should know the functioning of wireless/mobile system/equipment to keep themselves abreast of this latest application of communication.

DETAILED CONTENTS

Unit:- I   **(08 Periods)**

WIRELESS COMMUNICATION

- Basics of wireless communication
- Advantages of wireless communication
- Example of wireless communication:
- Cellular Telephone System

Unit:- II   **(20 Periods)**

CELLULAR FUNDAMENTALS

- Cell area
- Frequency Reuse
- Co-channel Interference
- Adjacent channel Interference
- Power Control for Interference reduction
- Improving coverage and capacity in cellular system
- Cell Splitting. b) Sectoring c) Repeater for Range Extension.

Unit:- IV   **(20 Periods)**

Multiple Access Techniques for Wireless Communication

- Introduction to Multiple Access.

- Frequency Division Multiple Access (FDMA)
- Time Division Multiple Access (TDMA)
- Code Division Multiple Access (CDMA)
- Introduction to Wireless local loop (WLL) technologies.
   (a) Satellite- Based System
   (b) Cellular-- Based System
   (c) Micro Cellular-- Based System
   (d) Fixed Wireless Access Systems

Unit:- IV   **(16 Periods)**

DEVELOPMENT OF CELLULAR COMMUNICATION SYSTEM

- GSM Architecture & it's features.
- Salient features of GPS
- Introduction to Bluetooth, Wi-Fi & Radio Frequency identification (RFID)
- Features of LTE system

LIST OF PRACTICALS

1. To Study the features, specification and working of cellular Telephone system.
2. To observe waveforms at various stages of basic GSM trainer/demonstrator.
3. Fault finding on a basic GSM trainer/demonstrator.
4. Visit of BTS in order to get familiarize with the process.
5. Visit of nearby Mobile Switching Centre with a live demonstration of 'Frequency Reuse/Channel Allocation methods. (Mandatory)

RECOMMENDED BOOKS

1. Wireless Communications, Principles and Practice, by Thedore S. Rappaport.
2. Wireless Communications by Singal, Tata McGraw Hill Education Pvt Ltd, New Delhi
3. Wireless Communications by Misra, Tata McGraw Hill Education Pvt Ltd, New Delhi
4. Introduction to Wireless and Mobile Systems, by Dharma Prakash Agarwal, Qing-An zeng.
5. Wireless Communications and Networking, by William Stallings.

6. Satellite communication by D C Agarwal Khanna Pub. New Delhi.

7. Electronic Communication by George Kennedy, PHI New Delhi.

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	08	11
II	20	23
III	20	23
IV	20	23
V	16	20
TOTAL	**64**	**100**

MICROCONTROLLER & EMBEDDED SYSTEM
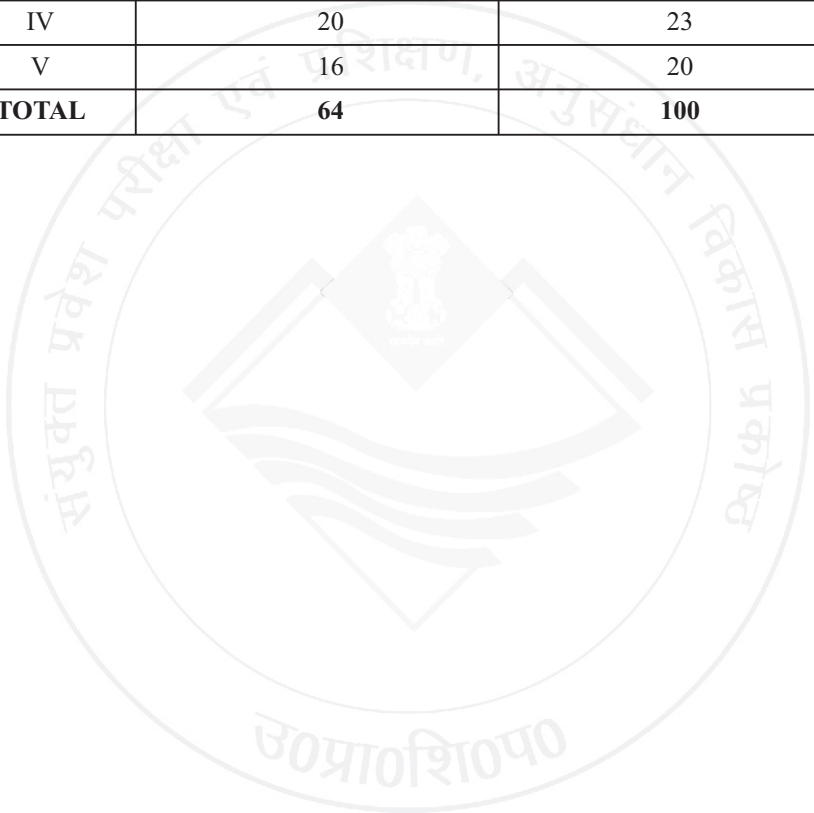
Subject Code : 096001

L	T	P
4	-	3

RATIONALE

This subject aims to expose students to the embedded systems besides giving them adequate knowledge of microcontrolles.

The study of microcontrollers in terms of architecture, software and interfacing techniques leads to the understanding of working of microcontrollers and applications of microcontroller in electronic industries. Microcontroller is the heart of the programmable devices. Embedded systems and Microcontrollers have also assumed a great significance in the electronic and consumer goods industry and are a very vital field. students of electronics and related engineering branches often use microcontroller to introduce programmable control in their projects, automation and fault finding in industry. The subect aims expose students to the embedded systems besides giving them adequate knowledge of micro controllers.

DETAILED CONTENTS

Unit:- I   (15 Periods)
MICROCONTROLLER SERIES (MCS) - 51
- Introduction & features of microcontroller,
- Pin details
- I/O Port structure
- Memory Organization
- External Memory

Unit:- II   (15 Periods)
INSTRUCTION SET
- Different instruction groups
- Addressing Modes
- Instruction types

Unit:- III   (15 Periods)
Special Function Registers (SFRS)
- Timer operation
- Serial Port operation
- Interrupts

Unit :- IV **(8 Periods)**

ASSEMBLER DIRECTVES & INTERFACING

- Different types of Assembler directives
- Interfacing of Switches and 7- segment display.

Unit:- V **(11 Periods)**

EMBEDDED SYSTEM

- Introduction, Embedded design concept.
- AVR:ATMEGA 16
- Pin description & features.
- Memory structure
- Architecture
- Interfacing examples of AVR board: LED, 7- segment, LDR, Stepper motor, IR module, Temperature sensor

LIST OF PRACTICALS

1. Familiarization of Micro Controllers (8051) kit
2. Write ALP for two 8 bit Addition.
3. Write ALP for two 8 bit Subtraction.
4. Write ALP for finding the greatest number out of 10 nos.
5. Write ALP for finding the smallest number out of 10 nos.
6. Write ALP for Ascending and Descending order sorting of 10 numbers.
7. Interfacing of switch with 8051.
8. Study of interfacing LED, 7- segment, LDR, Stepper motor, IR module, Temperature sensor on microcontroller board.

RECOMMENDED BOOKS

1. Mazidi and Mazidi: The 8051 Microcontroller and Embedded Systems, Pearson education.
2. Ayala Kenneth:- The 8051 microcontroller, Third Edition, Cengage Learning
3. A. V. Deshmukh: Microcontroller (Theory and Application), TMH.
4. Raj Kamal: Embedded Systems- Architecture, Programming and Design, TMH, New Delhi.

5. V. Udayashankara and M.S. Mallikarjunaswamy: 8051 Microcontroller, TMH, New Delhi.

6. The AVR microcontroller & embedded system using Assembly & C by M A Mazidi, Naimi: Pearson Education India

SUGGESTED DISTRIBUTION OF MARKS

Unit	Time Allotted (Periods)	Marks Allocation %
I	15	25
II	15	25
III	15	25
IV	08	10
V	11	15
TOTAL	**64**	**100**

PLC & ITS APPLICATION

Subject Code : 096004

L	T	P
4	-	4

RATIONAL

This subject deals with various instruments, thier construction and working which control the various parameters and operations in any industry.

This subject deals with the various instruments, their construction and working which control the various parameters and operations in any industry. A diploma holder in the field of electronics employed for maintenance of electronic equipment/gadgets is required to diagnose faults, rectify them and test the total system for good performance. thus there is a need of introducing diploma holders to the basics of Instrumentation. In industry, many manufacturing processes demand a sequence of operation, which are to be performed repetitively. Early automation systems were mechanical in design, timing and sequencing being effected by gears and cams. Slowly these design concepts were replaced by electrical drives which were controlled by relays and now by programmable logic controllers (PLCs). A PLC is a solid state device, designed to operate in noisy industrial environments and can perform all logic functions. PLCs are widely used in all industries for efficient control operations. A diploma holder in industry is called upon to design, modify and troubleshoot such control circuits. Looking to the industrial applications of PLCs in the modern industry, this subject finds its usefulness in the present curriculum.

DETAILED CONTENTS

Unit – I (15 Periods)

PLC (Programmable Logic Controller)

- Introduction
- Advantage s of PLC control Panel
- Architecture of PLC
- Functions of various blocks that make PLC
- Working Principle of PLC
- Memory Types
- Different types of Input / Output circuits
- Concept of inputs & outputs : Concept of Digital inputs & outputs, Concept of Analog inputs & outputs.
- Concept of PLC scan cycle
- Concept of sink & source input /output card

Unit – 2 **(20 Periods)**

Instructions for Programming in PLC

- Basic Instructions – NO & NC contacts
- User & bit functions
- Input / Output
- Compare Instructions
- Compute / Math Instructions
- Move & Logical Instructions

Unit-3 **(20 Periods)**

Programming with PLC

- Programming methods
- Programming devices
- Boolean gates – Symbols & truth tables
- Ladder Logic
- Concept of latching & unlatching
- Timers (on-delay timer, off-delay timer, retentive timer, resetting of timers).
- Counters (Counter instructions like up-counter, down counter, resetting of counters).
- Sequencers, output sequencers, input sequencers time driven and event driven sequencers masking .

Unit - 4 **(9 Periods)**

Applications of PLCs

- Car parking
- Doorbell operation
- Traffic light control
- Microwave Oven
- Washing machine

LIST OF PRACTICALS

1. Familiarization with the working of PLC
2. Familiarization with the functions of different modules of PLC'
3. Steps to enter, Load & Execute the program in PLC .
4. Practice of Basic Logic operations: AND, OR, NOT etc. on PLC Trainer'

5. Write, enter & execute programs using a computer having the following functions: Timer, Counter & sequencer.

6. Simple program based on basic instructions.

7. Simple program based on gates.

RECOMMENDED BOOKS

1. Programmable Logic controller by Job Dan otter, PHI

2. Introduction to PLC by Grey Dunning, Mccraw Hill Pub.

3. Module on PLC & their applications by Rajesh Kumar, NITI-TR Chandigarh

Suggested Distribution of Marks

Unit	Time Allotted (Periods)	Marks Allocation %
I	15	23
II	20	32
III	20	32
IV	09	13
TOTAL	64	100

MAJOR PROJECT - II

L	T	P
-	-	10

Subject Code : 096005

Each teacher is expected to supervise and guide 5-6 students. Some of the project activities are given below:

one third part of Major Project is all ready Completed in 5th Sem.

a) Projects related to designing small electronic equipment / instruments.

b) Projects related to increasing productivity in electronic manufacturing areas.

c) Projects related to quality assurance.

d) Projects connected with repair and maintenance of plant and equipment.

e) Projects related to design of PCBs.

f) Projects related to suggesting substitutes of electronics components being used.

g) Projects related to design of small oscillators and amplifier circuits.

h) Projects related to design, fabrication, testing and application of simple digital circuits and components.

i) Projects related to microprocessor/microcontroller based circuits/ instruments.

A. SOME OF THE PROJECTS BASED ON ABOVE AREAS ARE LISTED BELOW FOR THE BENEFIT OF STUDENTS

1. Microprocessor/Microcontroller based rolling display/bell and calendar

2. Microprocessor based stepper motor control.

3. Speed control of DC Machines by Microprocessor/Microcontrollers

4. Temperature monitoring using Microprocessor/Microcontroller based systems.

5. Microprocessor/Microcontroller based liquid level indicator and control

6. Fabrication and assembling of digital clock.

7. Fabrication of PCB circuits using ORCAD/ EAGLE Software.

8. Fabrication of ON line/OFF line UPS of different ratings and inverters

9. Design, fabrication and testing of different types of experimental boards

10. Repair of oscilloscope, function generator

11. Design and developing web sites of organizations

12. Installation of computer network (LANS).

13. Microprocessor/Microcontroller based solar tracking system

14. GSM based car or home security system

15. Bank token display using microcontroller

16. Printer sharing unit

17. Microprocessor/Microcontroller Based A/D converter

18. Microprocessor/Microcontroller Based D/A converter

19. Simulation of half wave and full wave rectifiers using Simulation Software

20. Simulation of class A, Class B, Class AB and Class C amplifiers

21. Simulation of different wave forms like sine, square, triangular waves etc.

22. GPS based vehicle tracking system

23. Calculate Bit Error Rate (BER) of various modulation techniques

24. Design ALU using CPLD/FPGA

25. Design Display System using CPLD/FPGA

26. Electronic Weighing Machines

B. FABRICATION AND TESTING (AT LEAST TWO OF THE FOLLOWING):

1   Voltage Stabilizer for Refrigerator, Air-Conditioner

2   Emergency Light using SCR

3   Power amplifier

4   Low cost intercom for home

5   Analog computer

6   Regulated power supply (+ 12V and + 6V) using 7812, 7912 and 7806, 7906

7   Automatic battery charger using SCR

8   Burglar Alarm

9   Automatic street light/dressing table light

10 Inverter circuit 500 watt.

11 Microprocessor/Microcontroller Based A/D converter

12 Microprocessor/Microcontroller Based D/A converter

13 Simulation of half wave and full wave rectifiers using Simulation Software

14 Simulation of class A, Class B, Class AB and Class C amplifiers

15 Inverter/Emergency light circuit using power transistors

16 SCR based automatic battery charger

17 SCR operated illumination controller

18 SCR operated automatic water level controller

19 SCR based speed controller for DC shunt motor

20 Three phase full wave rectifier using power diodes

21 Timer circuit using 555-IC

22 SCR controlled rectifier circuit

23 Speed control circuit of DC shunt motor using SCR

24 Inverting and non-inverting amplifiers using OP AMP (741)

25 Comparator circuits using OP AMP (741)

NOTE: The list is only the guideline for selecting a project; however a student is at liberty to select any other related project of his choice independently under guidance of his teacher

A suggestive criterion for assessing student performance by the external (person from industry) and internal (teacher) examiner is given in table below:

Sr. No.	Performance criteria	Max. marks	Rating Scale				
			Excellent	Very Good	Good	Satis-factory	Poor
1.	Selection of project assignment	10	10	8	6	4	2
2.	Planning and execution of considerations	10	10	8	6	4	2
3.	Quality of performance	20	20	16	12	8	4
4.	Providing solution of the problems or production of final product	20	20	16	12	8	4
5.	Sense of responsibility	10	10	8	6	4	2
6.	Self expression/communication skills	5	5	4	3	2	1
7.	Interpersonal skills/human relations	5	5	4	3	2	1
8.	Report writing skills	10	10	8	6	4	2
9.	Viva voce	10	10	8	6	4	2
	Total marks	**100**	**100**	**80**	**60**	**40**	**20**

The overall grading of the practical training shall be made as per following table. In order to qualify for the diploma, students must get "Overall Good grade" failing which the students may be given one more chance to improve and re-evaluate before being disqualified and declared "not eligible to receive diploma ". It is also important to note that the students must get more than six "goods" or above "good" grade in different performance criteria items in order to get "Overall Good" grade.

Range of maximum marks Overall grade

i)   More than 80 Excellent

ii) 79 <> 65 Very good

iii) 64 <> 50 Good

iv) 49 <> 40 Fair

v)   Less than 40 Poor Important

Notes

1. This criteria must be followed by the internal and external examiner and they should see the daily, weekly and monthly reports while awarding marks as per the above criteria.

2. The criteria for evaluation of the students have been worked out for 200 maximum marks. The internal and external examiners will evaluate students separately and give marks as per the study and evaluation scheme of examination.

3. The external examiner, preferably, a person from industry/organization, who has been associated with the project-oriented professional training of the students, should evaluate the students performance as per the above criteria.

4. It is also proposed that two students or two projects which are rated best be given merit certificate at the time of annual day of the institute. It would be better if specific nearby industries are approached for instituting such awards.

The teachers are free to evolve other criteria of assessment, depending upon the type of project work.

It is proposed that the institute may organize an annual exhibition of the project work done by the students and invite leading Industrial organisations in such an exhibition
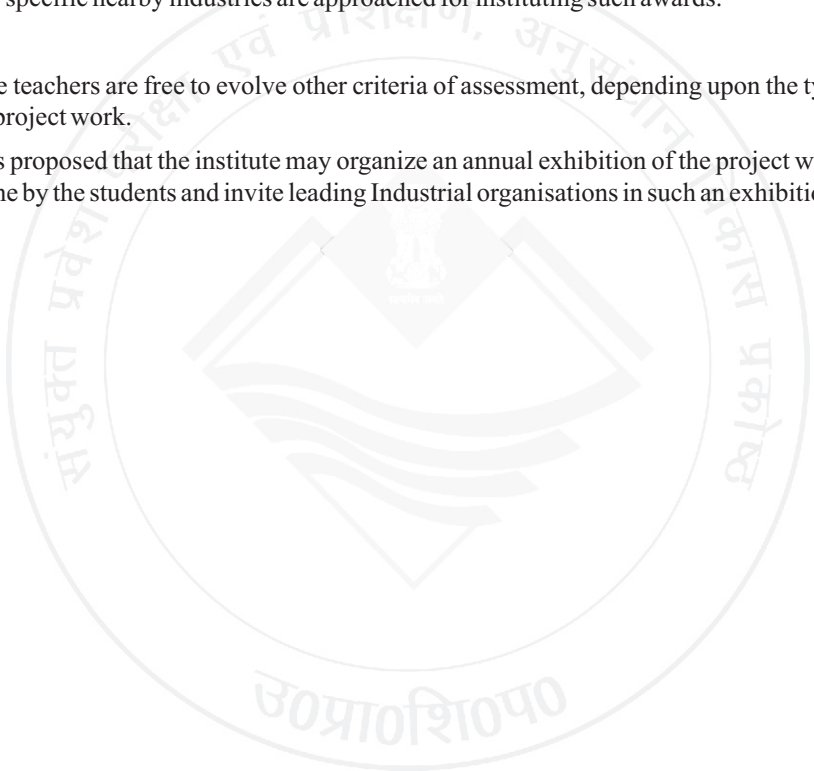
EMPLOYABILITY SKILLS

RATIONALE

Diploma holders are required to not only possess subject related knowledge but also soft skills to get good jobs and to rise steadily at their workplace. This subject is included to develop employability skills amongst the students.

DETAILED CONTENTS

Unit I: **(06 periods)**

- Technical Education & Industrial scenario.
- Competency required of an engineer.

Unit II: **(06 periods)**

- Professional Engineer desirable values and ethics and their development.
- Relation between engineering profession, society and environment

Unit III: **(12 periods)**

Effective Communication

- Reading & Active Listening Skills
- Speaking
- Writing
- Presentation Technique/Seminar
- Group discussion

Unit IV: **(12 periods)**

Managing project

- Leadership
- Motivation
- Time management
- Resource management
- Interpersonal relationship

Unit V: **(10 periods)**

Preparing for Employment

- Searching for job/job hunting

- Resume & CV Writing
- Interview technique in personal interview telephonic interview, panel
- Interview, group interview, video conferencing

Unit VI: (08 periods)

Self Management
- Self awareness
- Stress Management
- Conflict resolution

Unit VII: (06 periods)

- Creativity, Innovation and Intellectual property right
- Concept and need in present time for an engineer

Unit VIII: (04 periods)

Rules & Ethics
- Basic rules, laws and norms to be adhered by engineers during their working

LIST OF PRACTICAS

- Steps how to effectively write different types of Letters.
- Steps to make a Presentation in Power Point.
- Steps to make a Resume more effective.
- Steps to conduct Telephonic/On-line Interview (Through skype/Google Hangout).
- Study of Different Techniques of Stress Management.
- Study of Rules & Ethical practices to be followed at Workplace.

RECOMMENDED BOOKS

- Employability skills by Kapil Dev, Vishnu P. Singh Asian Pub. New Delhi
- Employability skills for Diploma students by Dr. S.K. Singh, Vayu Education, New Delhi

SUGGESTED DISTRIBUTION OF MARKS

Unit No.	Time Allotted (Periods)	Marks Allotted(%)
1	06	10
2	06	10
3	12	18
4	12	18
5	10	16
6	08	12
7	06	10
8	04	6
Total	**64**	**100**

IMPLEMENTATION

ASSESSMENT

LEARNING OUTCOMES

IMPACT
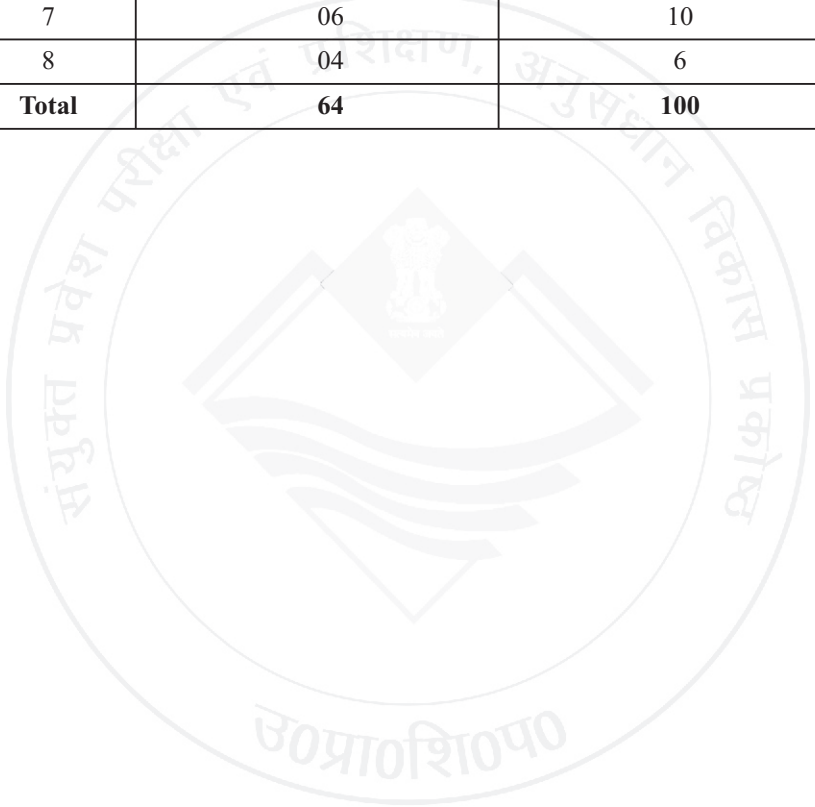
LEARNING OUT COMES AND MEANS OF ASSESSMENT

BRANCH NAME – ELECTRONICS ENGINEERING **SEMESTER – VI**

S.N0.	Title of Subject/Unit	Learning Outcomes	Means of Assessment
1	Optical Fibre Communication	The students will be able to: • demonstrate various types of optical fibres. • identify and test losses in optical fibres. • explain and demonstrate characteristics of optical source and optical detector. • understand optical fibre system.	• Assignments and quiz/class tests, mid-semester and end-semester written tests. • Ability to analyze different characteristics of optical fibre. • Seminars and Viva-Voce.
2	Mobile Communication	The students will be able to: • explain the concept of wireless communication and cellular fundamentals. • describe and analyze different Multiple Access Techniques for Wireless Communication • (FDMA, TDMA, CDMA and WLL) • describe different Mobile Communication Systems (GSM, GPS, etc.) • demonstrate call processing on a GSM trainer Kit. • Demonstration of LTE, Vo-LTE and mobile network.	• Assignments and quiz/class tests, mid-semester and end-semester written tests. • Ability of fault finding on GSM trainer. • Presentations and Viva-Voce.
3	Microcontroller and Embedded System	The student should be able to: • understand the working of microcontrollers. • understand the Instruction set and programming related to microcontrollers. • describe embedded system. • interface sensors with microcontroller.	• Assignments and quiz/class tests, mid-semester and end-semester written tests. • Programming on 8051 trainer kit and interfacing of sensors. • Presentations and Viva-Voce.

4	PLC & Its Applications	The student should be able to: • understand the different phenomena of PLC. • understand the Instruction set and programming, ladder and FBD on software. • upload ladder to PLC processor using programming terminal. • understand the concept of latching, unlatching, timer, counter and sequencer. • implement the applications of PLC.	• Assignments and quiz/class tests, mid-semester and end-semester written tests. • Formation of ladder diagram for different tasks. • Presentations and Viva-Voce.
5	Employable Skills	The student should be able to: • communicate effectively. • develop competent qualities required of an engineer. • lead a project. • work in a group. • plan and organise the task allotted within a given stipulated time. • enhance the ability of problem solving. • develop the qualities of self management, creativity and innovation.	• Assignments and quizzes. • Group discussions. • Seminars. • Organizing events. • Presentations and Viva-Voce.
6	Major Project-II	• The students will be able to: • Apply in totality the knowledge and skills gained through the course work in the solution of particular problem or by undertaking a project. • Develop understanding regarding the size and scale of operations and nature of fieldwork in which students are going to play their role after completing the courses of study. • Develop understanding of subject based knowledge given in the classroom in the context of its application at work places. • Develop firsthand experience and confidence amongst the students to enable them to use and apply polytechnic/institute based knowledge and skills to solve practical problems related to the world of work. • Assemble/fabricate and test an electronics gadget.	Based on: • Selection of project • Planning and execution • Quality of performance • Solution of problems • Communication skills • Interpersonal skill • Report writing skill • Viva-voce