

Gujarat University
M. Sc. (Electronic Science) Semester - II
(Effective from: 2016-2017)

Course	Name of the Course	Lect./ Hrs./ Week	Internal Marks	External Marks	Total Marks	Course Credits
ELE-407	Microwaves-I & Instrumentation-I	4	30	70	100	4
ELE-408	Microprocessor-II and Programming in C Language-I	4	30	70	100	4
ELE-409	Microcontroller-I and Power and Industrial Electronics-I	4	30	70	100	4
ELE-410	Optoelectronics and Digital Signal Processing-I	4	30	70	100	4
ELE-411 PR	Practicals	6	30	70	100	4
ELE-412 PT	Projects	6	30	70	100	4
TOTAL		28	180	420	600	24

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ELE-407: Microwaves-I & Instrumentation-I

To make students familiar with the characteristics and applications of microwave passive components and tubes.

Transmission lines form an important part of a communication system. Student of this course were made familiar with the conventional transmission line in semester -I. In continuation of this study another type of transmission lines known as strip lines have been introduced. This will familiarize the students about the types, structures and properties of the planar transmission lines which forms the basis of the present day complex microwave systems.

Bioelectrical Potentials are very useful to understand medical instruments.

Spectrophotometers and special purpose oscilloscopes are also included.

UNIT I :

Microwave components : Microwave cavities (Rectangular cavity resonators, circular cavity resonator and semicircular cavity resonator, Q-factor of a cavity resonator), Microwave hybrid circuits (Waveguide Tees, magic Tees, hybrid rings, waveguide corner bends and twists). Directional couplers (Two hole directional couplers, S-matrix of directional coupler, hybrid couplers), Circulators and Isolators (microwave circulators and microwave isolators).

STRIP LINES : Microstrip lines (Characteristics impedance of microstrip line, Effective dielectric constant, Transformation of rectangular conductor into equivalent circular conductor, characteristic impedance equation, Losses in microstrip lines, Quality factor Q of microstrip lines). Parallel strip lines (Distributed parameters, characteristic impedance, Attenuation losses), coplanar strip lines, shielded strip lines.

UNIT II:

Microwave Tubes: Conventional Vacuum triodes, tetrodes & pentodes (Lead inductance and interelectrode-capacitance effect, transit angle effect, Gain band, Width limitations).

Klystrons (Reentrant cavities, velocity modulation process, bunching process, output power and beam loading, state of the art), Multicavity Klystron amplifiers, beam current density, output current and output power of two cavity Klystron). Reflex Klystrons (Velocity modulation, power output and efficiency, electronic admittance). Helix Travelling-Wave Tubes TWTs (Slow wave structures, amplification process, convection current, axial electric field, wave modes, Gain considerations). Magnetron Oscillators (Cylindrical magnetron, equation of electron motion, cyclotron angular frequency, power output and efficiency).

MMIC: Monolithic microwave integrated circuits (Materials, substrate materials, conductor materials, Dielectric materials, Resistive materials), MMIC Fabrication techniques, Fabrication examples, Thin Film Formation (Planar resistor Film, Planar inductor Film, Planar capacitor Film), Hybrid integrated circuit fabrication.

Unit III: Bioelectric potentials : The Electrocardiogram. Electrodes : Electrode theory, Biopotential Electrodes : Microelectrodes, Body surface electrode, Needle electrodes, Electrocardiography : History, Electrodes and leads : Electrodes, Leads, ECG Recorder principles. Measurement of blood pressure using - sphygmomanometer, programmed Electro-sphygmomanometer, Electronic sphygmomanometer.

UNIT IV:

Spectrophotometers : Radiation sources, Monochromator, Sample counters, detectors, Indicators, UV, Visible and IR spectrophotometers (Single beam and double beam).

Special purpose oscilloscopes : Multi beam oscilloscope, Multi trace oscilloscope, sampling oscilloscope, Impulse waveform oscilloscopes, scanning oscilloscope, Digital storage oscilloscope, power scope, spectrum analyzer, electron microscope, synchroscope.

Reference Books:

1. **Samuel Y.Liao**, Microwave Devices and circuits, Prentice Hall of India.
2. **R.E.Coolins**, Foundation of Microwave Engineering, McGraw Hill Book Company.
3. **D.C.Sarkar**, Microwave Propagation and Techniques, S.Chand and Company Ltd.
4. **M.Kulkarni** Microwave and Radar Engineering, Umesh Publications.
5. **Dennis Roddy and John Coolen**, Electronic Communications, Prentice Hall of India, (Fourth edition),.
6. **Robert E.Collins**, Antennas and radiowave propagation, MGH.
7. **George Kennedy**, Electronics and Communication systems, MGH Inter. Edition.
8. **Edward C. Jordan and Keith G. Balman**, Electromagnetic waves and Radiating systems, PHI
9. **H.A.Atwater**, Introduction to Microwave Theory, McGraw Hill Book Company.
10. **H.A.Watson**(ed.), Microwave semiconductor Devices and their circuit Application, McGraw Hill Book Company.
11. **Om P.Gandhi**, Microwave Engineering and Applications, Maxwell Macmillan International Edition.
12. **K.Padmanabhan & S.Ananthi**, Learn to use microprocessor, EFY.
13. **R.S.Khandapur**, Handbook of Analytical Instruments, TMH
14. **R.S.Khandapur**, Hand Book of biomedical Instrumentation, TMH
15. **A.K.Sawhney**, Electrical and electronic measurements and Instrumentation, Dhanpatrai and Sons.
16. **Leslie Cromwell, Fred Weibell**, Biomedical Instrumentation and measurements, PHI.
17. **Benedict and Weiner**, Industrial Electronics
18. **G.K.Mittal**, Industrial Electronics , Khanna Pub..
19. **H.S.Kalsi**, Electronic Instrumentation, TMH
20. **Joseph J. Carr**, Elements of Electronic Instrumentation and measurement Restor Book PH.

GUJARAT UNIVERSITY

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ELE-408: Microprocessor–II & Programming in C-Language-I

To describe basic concepts of constants, variables, data types, operators.
To explain fundamentals on various control structures
To describe arrays and various techniques of array handling.
To write programs using various logics based on above concepts.

UNIT I

Serial I/O and Data communication: Basic concepts in serial I/O, Transmission format, Introduction, Types of Communication Systems, Transmissions Standards, Serial Transmission Format, Data Communication over long distances, Block Diagram of Typical Modem device, Modulation Techniques
Interrupt System & Controller:
Features of 8259, Pin configuration of 8259, Functional block diagram of 8259, initialization command words of 8259
8253/8254 Programmable Internal Timer: Introduction Features of Programmable. Interval Timer, Pin Configuration, Functional Block Diagram, Control word register Format, Modes of Operation, Write Operation, Read Operation, Interfacing, Problems.

UNIT II: Microprocessor Application:

Measurement of electric quantities
Frequency Measurement, Interface of frequency measurement, Program flow chart for frequency measurement, Frequency measurement using SID line
Measurement of physical quantities
Temperature Measurement & Control, Water Level Indicator, Measurement of Display of speed of motor, Interfacing of Stepper Motor, Microprocessor based Traffic Control.
INTEL 8086 Microprocessor:
Introduction, INTEL 8086, Pin diagram and Pin Description, Operating Modes, Block Diagram, Pin Description of Minimum Mode/Maximum Mode, Operation of 8086, Register of Intel 8086, Interrupts, Addressing Modes of Intel 8086.

UNIT III: Overview of C: Importance of C, programming style and execution.

Constants, Variables and Data Types: Character set, C tokens, keywords and identifiers, constants, variables, data types, declaration, assignment, symbolic constants.

Operators, Expressions: Arithmetic, relational, logical, assignment, increment and decrement, conditional, bitwise and special operators, evaluation of expressions, type conversions, operator precedence and associativity, mathematical functions.

I/O operations : Reading and writing a character, formatted I/O.

Decision making and branching/looping: if statements, nesting of if- else statements, else if ladder, switch statement, conditional operator, goto statement, while, do and for statements, jumps in loops.

UNIT IV:Arrays : One dimensional arrays, declaration and initialization of arrays, two dimensional and multi-dimensional arrays.

Character strings : Declaring and initializing string variables, reading and writing strings, arithmetic operations on characters, concatenation, comparing, copying and finding length of strings, string handling functions, table of strings.

Reference books:

1. **R.S.Gaonkar**, Microprocessor architecture, programming and application, Wiley Eastern Limited.
 2. **B.Ram**, Microprocessors and Microcomputers, Dhanpatrai and Sons.
 3. **Borole and Vibhute**, Microprocessor Architecture, Programming, Interfacing and applications, Technowa Publications, PUNE.
 4. **Balagurusamy E.**, Programming in ANSI C (IIIrd Ed.), TMH Pub.
 5. **P. Day and M.Ghosh**, Programming in C, Oxford Univ. Press, 2007
 6. **Gottfried B.S.**, Programming with C
 7. **Kochan S.G.**, Programming in C, CBS Pub.
 8. **Kenetker Y.**, Let us C, BPB Pub.
 9. **Kernighan B.W. and Ritchie D.K.**, C Programming language, PH Pub.
 10. **Stan Kelly - Bootle**, Mastering Turbo C, BPB Pub.
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ELE-409: Microcontroller-I and Power & Industrial Electronics-I

To understand the difference between the microprocessor and microcontroller and the architecture of 8051 with instructions which are used in the programming.

Applications in heating, melting, relays and displays and high voltage power supplies in industries are detailed.

Unit 1: Microprocessor and microcontrollers : Introduction, microprocessor and microcontroller, 4-Bit/8 Bit/16 Bits/32 Bit/ microcontrollers.

The 8051 Architecture : Introduction, 8051 Microcontroller Hardware, Input/output pins, ports and circuits, External memory, counters and timers, serial data input/output, interrupts.

Moving data : Introduction, Addressing modes, External data moves, code memory, Read only data moves, push and pop opcodes data exchange, example programs.

Unit 2: Logical operations: Introduction, Byte-level logical operation, Bit-level logical operations, Rotate and swap operations, Example programs.

Arithmetic operations: Introduction, Flags, Incrementing and Decrementing, Addition, subtraction, multiplication and division, decimal arithmetic, example program

JUMP & CALL SUBROUTINES: Introduction, the jump and call program Range, Jumsp. Calls and subroutines, interrupts and returns, more details on interrupts example problems.

Unit 3: Polyphase rectifier, three phase half wave delta-wave rectifier, six phase star half wave rectifier, three phase delta-wye bridge rectifier, voltage and current relationship in polyphase rectifier, general m-phase rectifier circuit, transformer utility factor, rectifier performance.

Resistance welding, digital weld control timer, types of resistance welding, energy storage welding systems, spot welder timer with time sequence.

Unit : 4 Principle of induction/dielectric heating, Theory of induction/dielectric heating, Merits of induction heating, dielectric properties of materials, thermal losses in dielectric heating, Applications of induction/dielectric heating.

Resistance sensitive relay, voltage sensitive relay, photosensitive relay, fast photo relay solid-state relays. LCD displays.

Reference Books:

Kenneth J.Ayala, The 8051 Microcontroller, Architecture, Programming and application, Penram International.

1. **K.Padmanabhan & S.Ananthi**, Learn to use microprocessor, EFY
 2. **M.D.Singh & K.B.Khanchandani**, Power electronics, TMH.
 3. **M.H.Rashid**, Power electronics, PHI.
 4. **P.S.Bimbhra**, Power electronics, KP
 5. **H.C.Rai**, Power electronics, devices and system,
 6. **P.C.Sen**, Power electronics,
 7. **G.K.Mittal**, Industrial electronics, KP
 8. **Chute & Chute**, Electronics in industry,
 9. **H.C.Rai**, Industrial and power electronics, Umesh P
 10. **Benedict and Weiner**, Industrial electronic circuits and applications, PHI
 11. **K.R.Botkar**, Integrated circuits, KP
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ELE-410: Optoelectronics and Digital Signal Processing-I

These devices provide the optical sources and detectors that allow broadband telecommunications and data transmission over optical fibers.

Digital Signal Processing is an area of science and engineering which has developed rapidly. Such development is a result of the significant advances in digital computer technology and IC fabrication. This has very wide applications in medicine, remote sensing and communications.

UNIT-I: OPTOELECTRONICS SOURCES:

LED: Introduction, Radiative transitions, Emission spectra, Methods of excitations, LED-Structures; -Planar LED, Domed shaped LED, Heterojunction LED, Surface Emitting LED, Edge Emitting LED,; Definition of efficiencies;

LASER: Laser physics, stimulated emission and population inversion, Laser operating characteristics, Semiconductor Laser: Semiconductor laser structure,

UNIT-II: DETECTORS:

Introduction, Photoconductor, Photodiodes- General consideration, quantum efficiency, response speed, device noise, p-i-n & p-n photodiodes, Heterojunction photodiode, Metal Semiconductor photodiode, Avalanche photodiode, avalanche gain, avalanche multiplication noise, Phototransistor.

UNIT-III: Discrete Time signal and systems:

Discrete time signals, Discrete time systems, Analysis of discrete time linear time invariant systems. Solving difference equations using Z – Transformation, Responses of systems Voice processing, Application of radar, Application to image processing, Adaptive canceling of mother's ECG in foetal ECG, Adaptive telephone echo cancellation.

UNIT-IV: Discrete Fourier Transform:

Introduction , computation of DFT, inverse discrete Fourier transformation, periodicity and symmetry properties of DFT, Comparison between DTFT and DFT, Circular convolution property of DFT, Solving convolution problems using various methods, Additional properties of DFT, Block convolution Application of digital signal processing: Introduction, Application of DSP classification, Applications in broader sense.

Reference books:

1. **B. Somanathan Nair**, Digital signal processing theory, analysis and digital filter design, (for article 6.1 to 6.9, 16.1, 16.2 and 16.3, 2.4 and 2.5, 15.8 and 15.10)
 2. **John G. Proakis and D.G. Manolakis**, Digital signal processing principles, Algorithms and applications PHI((2.1),(2.2) and (2.3))
 3. **S. Salivahanan, A Vallavraj and C. Gnanapriya**, Digital Signal processing, TMH (For article 14.2, 14.3 and 14.4)
 4. **S.M. SZE and Kwok K.Ng**, Physics of semiconductor devices 3rd ed. Wiley
 5. **R.P.Khare** , Fiber optics and optoelectronics Oxford university press
 6. **N. Kesavamurthy and S. Naryana Iyer**, Digital signal processing, Jaico publishing house.
 7. **Alan V.Oppenheim and Ronald W.Schafer**, Digital signal processing Prentice –Hall of India.
 8. **S.K Mitra** , Digital signal processing, TMH
 9. **A.K. Ganguly**, Opto electronic Devices and Circuits, (NAROSA)
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ELE– 411: PRACTICALS

LIST OF PRACTICALS:

- 1 Microwave (Guide Wavelength)
- 2 Optoelectronic Devices Characteristics – I
- 3 Optoelectronic Devices Characteristics – II
- 4 Peripheral IC 8155
- 5 Peripheral IC 8255
- 6 Traffic signal control using microprocessor
- 7 Microcontroller logic experiment-1
- 8 Microcontroller logic experiment-2
- 9 Analog Sampling
- 10 Mode characteristics of Klystron
- 11 Programming in C – I
- 12 Programming in C – II
- 13 Pulse Amplitude Modulator & Demodulator
- 14 Pulse Position Modulator & Demodulator
- 15 FSK Modulation & Demodulation

15% of new experiments can be introduced AND / OR replaced as per the need, with the permission of the Head. Total of at least 10 Practicals to be done.

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ELE– 412: PROJECT
