(New Scheme 2010)

STUDY AND EVALUATION SCHEME
FOR
ELECTRONICS & COMMUNICATION ENGINEERING

SEMESTER - V

Code No.	Subject	Study Scheme Period/Week			Evaluation Scheme						Total Marks
		L	T	P	Internal Assessment		External Assessment Exam				
					Theory	Practical	Written Paper		Practical		
					Max Marks	Max. Marks	Max. Marks	Hrs.	Max. Marks	Hrs.	
1	Object Oriented Programming using C++	4	-	3	50	50	100	3	50	3	250
2	Industrial Electronics and Instrumentation	4	-	3	50	50	100	3	50	3	250
3	Communication Systems	4	-	3	50	50	100	3	50	3	250
4	Microwave Engineering	4	-	3	50	50	100	3	50	3	250
5	Troubleshooting and Maintenance of Electronic Equipments	4	-	3	50	50	100	3	50	3	250
6	Industrial Training Report Presentation	-	-	1	-	50	-	-	100	3	150
**	Student Centered activities	-	-	4	-	-	-	-	-	-	-
	TOTAL	20	-	20	250	300	500		350		1400

** Student centered activities will include: extension lectures, field visits, Soft Skills, seminars, debates, hobby clubs, library studies, awareness regarding ecology and environment, conservation of energy (Petroleum products, electricity etc), social service camps and other co-curricular activities including games. Advanced planning for each semester has got to be made

NOTE: - Students to undergo Industrial Training of 4 weeks duration in reputed organisation during summer vacation holidays at the end of semester and evaluation will be done in next semester in the subject Industrial Training Project Presentation.

OBJECT ORIENTED PROGRAMMING USING C++

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RATIONALE

Object orientation is a new approach to understand the complexities of the real world. This course offers the model programming language C++ that shall helped the students to implement the various concepts of object orientation practically.

DETAILED CONTENTS

1. Introduction **(2 Hr)**

(i) Problems with procedure oriented Programming technique.
(ii) Concepts of OOPs.
(iii) Characteristics of OOPs
(iv) Advantages and application of OOPs

2. C++ Programming Basics **(4Hr)**

(i) Basic Data types
(ii) Type Compatibility
(iii) Operators in C++
(iv) Scope resolution operator
(v) Control Structure

3. Function C++ **(4 Hr)**

(i) Function Prototyping
(ii) Call by reference
(iii) Inline function
(iv) Function overloading
(v) Library Function

4. Class and Objects **(6 Hr)**

(i) Comparison of Class and C-Structure
(ii) Creating objects
(iii) Arrays within Class
(iv) Arrays of objects
(v) Objects as Function Arguments

5. Constructor and Destructor **(4 Hr)**

(i) Constructor and its characteristics
(ii) Parameterized Constructor
(iii) Multiple Constructor in a class
(iv) Copy Constructor
(v) Overloaded Constructor
(vi) Destructor and its characteristics

6. Operator Overloading **(4 Hr)**

(i) Overloading of unary operator
(ii) Overloading of binary operator
(iii) Manipulation of Strings using operator
(iv) Type conversion – basic type of class & class to basic type

7. Inheritance **(2 Hr)**

(i) Type of Inheritance
(ii) Need of protected members
(iii) Application of inheritance

8. Virtual & friend function **(4 Hr)**

(i) Pointers to objects
(ii) This pointers
(iii) Pointer to derived classes
(iv) Virtual functions
(v) Pure virtual functions
(vi) Concept of late & early binding

9. Managing Console I/O operation **(2 Hr)**

(i) Unformatted I/O operation
(ii) Formatted I/O operation: fill, precision, width
(iii) I/O streams

10. File Operation **(2 Hr)**

(i) Opening & closing a file.
(ii) Programming with files

LIST OF PRACTICALS

1. Write a program to read elements of given two matrices of order n*n and perform matrix multiplication. Use a separate function for multiplication.
2. Write a program to read a set of lines from the keyboard, store it in a two dimensional array and determine the number of characters in the Lines. (Use cin.get() function to read lines.
3. Write a program to read two strings and concatenate them and display it.
4. Write a program to perform addition, subtraction, multiplication and division on complex numbers. Create a class complex and the above operations must be made as public functions of the class.
5. Write a program to find the distance between two points using the pointer to class object.
6. Write a program to generate a series of Fibonacci numbers using a copy constructor.
7. Write a program to calculate the sum of private data of a class with private data of another class through the common friend function.
8. Write a program to display the Objects address using this pointer. Also access member data with this pointer and display them.
9. Using function overloading find the square of integer data, floating point data and double precision data.
10. Write a program to create a class of objects say obj 1 and obj2 and assign the contents of obj 1 to obj 2 using operator overloading.
11. Develop a program to read the following information from the Keyboard in which the Class consist of employee name, code and designation and the desired class containing the data members like Years of Experience and age.

    Employee Name
    Designation
    Department
    Experience

Age
Create a virtual base class for the item employee name and write code for the same.

12. Write a program to prepare the mark sheet of examination assuming the following items can be read
Name of student
Roll No.
Subject Code
Subject Name
Internal Marks
External Marks
Construct the data base with suitable member functions for initialing and destroying the data using constructors and destructors.

INDUSTRIAL ELECTRONICS & INSTRUMENTATION

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RATIONALE

Electronics adapted to industrial plant, in terms of timings, action switching and action or parameter control, is called 'Industrial Electronics'. Other common areas of application where electronics is increasing its interface with other branches of engineering include temperature control, welding control, speed regulation of motor and soldering. The student should study this subject with a view to understand the use of electronics to bring about faster and more accurate responses in industrial plants.

DETAILED CONTENTS

1. Thyristor ratings and gate rating. Turn on methods – Dc gate, AC Gate, and Pulse Gate Triggering and R-C trigger circuits. Turn off methods – Nature and Forced turn off methods. **(4 Hr)**

2. Internal power dissipation and need for Heat sinks in thyristors. Definition of following terms and their relationship with the power dissipation of the device (no derivation). **(4 Hr)**
   (i) Heat sink efficiency
   (ii) Heat Sink transfer co-efficient
   (iii) Heat dissipating area of a Heat Sink. Concept of thermal resistance of Heat Sinks. Various types of Heat sinks and techniques of mounting device on heat sinks

3. Principles of operation and working of the following switching circuits, using SCRs and Triacs **(4 Hr)**
   (i) Automatic Battery charger
   (ii) Voltage regulator
   (iii) Emergency light
   (iv) Alarm circuit
   (v) Time delay relay Circuit
   (vi) Circuits for over voltage and over current protection

4. Explanation of the working of a single phase and 3-phase controlled bridge rectifiers with the help of waveforms, using SCR's with resistive and inductive loads mathematical expression (No derivations). **(2 Hr)**

5. Principles of working of AC phase control circuit using triac and its applications. **(4 Hr)**
   (i) Illumination control
   (ii) Fan speed control
   (iii) Temperature Control
   (iv) Speed control of DC and small AC motors

6. Principles of operation of Basic inverter circuits. Basic series and parallel commutated inverters **(4 Hr)**

7. Principles of induction and dielectric heating and their typical applications **(2 Hr)**

8. Introduction to instrumentations: **(2 Hr)**

Basic Measurement System functions of its elements namely the transducer, signal conditioner, display or read-out and power supply.

9. Transducers: **(12 Hr)**

a) Distinguish between active and passive transducers with examples. Basic requirements of a transducer

b) Principle of operation of the following transducers and their applications in measuring the physical quantities listed against each one of them.

c) Transducer

Variable Resistance Type	**Physical Quantities**
- Potentiometeric	Displacement and force
- Strain gauge	Torque and displacement
- Thermister	Temperature
- Resistance Hydrometer	Humidity

Variable capacitance Type	
Pressure gauge	Displacement and pressure
- Dielectric gauge	Liquid Level and thickness

Variable Inductance Type	
- LVDT	Pressure, force, displacement and position

Other Types	
- Solid State Sensor	Temperature
- Thermocouple	Temperature
- Piezoelectric device	Force
- Photoelectric devices	Light
- Proximity probes	r.p.m
- Digital transducer	displacement

10. Security & Surveillance devices:- **(6 Hr)**

Block diagram, application & use of the following:

- Hand held metal detector and door frame
- Analog & IP CCTV including DV Recorder & NVR (Network Video Recorder) with video analysis
- Access Control System (Bio-metric)
- Attendance Recording System

12. Output Devices and Displays **(4 Hr)**

Basic principles of operation, constructional features and application of the following:

(i) Graphic Recorder

(ii) X-Y Recorder

PRACTICALS

1. Observation of waveshape and measurement of voltage relevant points of an SCR based single phase half wave controlled rectifier circuit using resistive (in phase gate triggering circuit)

2. Observation of waveshapes and measurement of voltages at relevant point of an SCR based single phase half wave controlled rectifier circuit using R-C phase shift gate triggering circuit
3. Observation of waveshapes and measurement of voltages at relevant points of an SCR based single phase half wave controlled rectifier circuit using UJT relaxation oscillator for gate griggering
4. Observation of waveshapes and measurement of voltage at relevant points of an SCR based single phase controlled bridge rectifier circuit
5. Observation of waveshapes and measurement of voltage at relevant points in a triac based AC phase control circuit used for lamp intensity and /or AC fan speed control.
6. Observe the waveforms and measure voltages at various points of a circuit for over voltage protection using SCR
7. Study of various transducers like Strain guage, thermistor, photodiode, phototransistor, etc.
8. Study of security & Surveillance devices.
9. Study an X-Y recorder and graphic recorder.

COMMUNICATION SYSTEMS

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RATIONALE

DETAILED CONTENTS

1. Audio systems (12 Hr)

(i) Microphones: Construction, working principles and applications of carbon, moving coil, velocity, crystal, condenser type, cordless microphone.

(ii) Loudspeakers: Direct radiating, horn loaded woofer, tweeter, mid range, multi speaker system, baffles and enclosures.

(iii) Sound Recording on magnetic tape, its principles, block diagram and tape transport mechanism, digital sound recording on tape and disc.

2. AM/FM transmitters (6 Hr)

(i) Classification of transmitters on the basis of power & frequency.

(ii) Concept of low level and high level modulation. Block diagram of low level and high level modulation. AM transmitters and working of each stage.

(iii) Block diagram and working principles of reactance transistor and Armstrong FM transmitter.

3. AM/FM Radio Receiver (10 Hr)

(i) Principles of working with block diagram of super heterodyne AM receiver function of each block and typical waveforms at input and output of each block.

(ii) Performance characteristics of a radio receiver sensitivity, selectivity, fidelity, S/N ratio, image-rejection ratio and their measurement procedure, ISI standards on radio receivers (brief idea).

(iii) Selection criteria for intermediate frequency(IF) , Concepts of simple and delayed AGC

(iv) Block diagram of an FM receiver, function of each block and waveforms at input and output of different blocks. Need for limiting and de-emphasis in FM reception.

(v) Block diagram of communication receivers, differences with respect to broadcast receivers.

4. Antennas: (8 Hr)

(i) Electromagnetic spectrum and its various ranges: VLF, LF, HF, UHF, Microwave.

(ii) Physical concept of radiation of electromagnetic energy from a dipole. Concept of Polarization of EM waves.

(iii) Definition and physical concepts of the terms used with antennas like point source, gain, directivity, aperture, effective area, radiation pattern, beam angle, beam width and radiation resistance.

(iv) Types of antennas – brief description, characteristics and typical applications of dipole, medium wave (mast) antennas, folded dipole, turns tile, loop antenna, yagi and ferrite rod antenna(used in transistor receivers).

(v) Brief description of board-side and end fire arrays, their radiation pattern and applications (without analysis); brief idea about Rhombic antenna and disc antenna.

5. Propagations: (8 Hr)

(i) Basic idea about different modes of radio wave propagation and typical areas of applications. Ground wave propagation & its characteristics, summer field equation for field strength.

(ii) Space wave communication _ line of sight propagation, standard atmosphere, concept of effective earth radius, range of space wave propagation in standard atmosphere.

(iii) Duct propagation: sky wave propagation-ionosphere & its layers, explanation of terms-virtual height, critical frequency, skip distance maximum usable frequency, multiple hop propagation.

6. Fiber Optic Communications (8 Hr)

(i) Advantages of fiber optic communication

(ii) Constructional features of optical fiber and fiber optic cables, concepts of numerical aperture (NA), modes of propagation in an optical fibers, fiber attenuation and dispersion.

(iii) Light sources-diode laser, LEDs and their characteristics

(iv) Light detectors and their characteristics

(v) Basic idea of fiber connection techniques

(vi) Block diagram of fiber –optic communication link

7. Satellite Communication (2 Hr)

(i) Basic idea, passive and active satellites, meaning of the terms, orbit, apogee, perigee.

(ii) Geostationary satellites and its need, block diagram and explanation of satellite communication link.

List of Practicals

1. To plot the frequency response of microphone.
2. To plot the frequency response of loudspeaker.
3. To study the tape transport mechanism.
4. To plot the sensitivity characteristics of a radio receiver.
5. To plot the selectivity characteristics of a radio receiver.
6. To plot the fidelity characteristics of a radio receiver.
7. Familiarization and identification if fiber optic components.
8. To assemble the fiber optic communication set up and compare the transmitted signal with the output of the receiver.
9. To plot the radiation pattern of a directional and omni directional antenna.
10. To measure the light attenuation of the optic fibres.

MICROWAVE ENGINEERING

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1. Introduction to microwaves and its applications, frequency bands as per IEEE, advantages of microwave **(2Hr)**

2. Electromagnetic theory (8 Hr)
   - i) Coulomb's law, Electric field intensity, Electric flux and Gauss's law, Ampere's law, Faraday's law, magnetic flux density, Maxwell's equations. Simple numerical problems on Electric and magnetic fields.
   - ii) Concept of plane waves, uniform plane waves, wave equations
   - iii) Boundary conditions, free space impedance, skin effect, pointing vector (no derivations)

3. Wave Guides (4 Hr)
   - i) Rectangular and circular waveguides and their applications.
   - ii) Cut-off frequency, cut-off wave length, guide wave length, guide impedance, phase velocity and group velocity and their relations.
   - iii) TE and TM modes in wave guides, impossibility of TEM made in waveguide, degenerate modes, simple numerical problems on rectangular and circular wave guides, dominant modes.
   - iv) Field patterns in rectangular wave guides for TE10, TE20 and TM11 modes
   - v) Methods of exciting wave guides

4. Cavity Resonators (2Hr)
   - (i) Physical ideas of rectangular and cylindrical and reentrant cavity resonators, applications, coupling methods, tuning and Q factor of cavity resonators
   - (ii) Calculations of resonant frequencies (simple numerical problems) of rectangular and circular cavity resonators (no derivation)

5. Microwave Components (4Hr)

   Constructional features, characteristics and applications of:-
   - i) E-plane, H-Plane, Magic Tee's, Hybrid ring
   - ii) Waveguide joints, bends, corners, transition and twists
   - iii) Waveguide irises, posts and tuning screws
   - iv) Coupling probes, coupling loops
   - v) Terminations, fixed and variable attenuators
   - vi) Isolator, circulator, two hole directional couplers
   - vii) Duplexer (Y-type and branch type), coaxial to waveguide adapter

6. S-Parameters (2Hr)
   - i) Concept of scattering (s) parameters
   - ii) S-parameters of E,H, and magic Tee's (no derivations)

7. Microwave Devices (10 Hr)
   - i) Basic concept of thermionic emission and vacuum tubes
   - ii) Effect of inter electrode capacitance, load inductance and transit time effect on high frequency performance of conventional vacuum tubes and steps to extend their high frequency operations.

iii) Construction,, characteristics principles, bunching process and typical applications of the following
   a) Two cavity klystron amplifier,
   b) Reffex klystron
   c) Multi cavity magnetron, phased focusing effect, electronic tuning, strapping, frequency pulling and pushing
   d) Travelling wave Tube (TWT)
   e) Gunn diode
   f) IMPATT diode

iv) Concept of parametric amplifiers

8. Microwave Antennas (3Hr)

i) Parabolic reflector / dish antenna, gain, beam width, feeding methods, typical applications

ii) Horn antenna, sectoral, pyramidal and circular, flase angle of horn antenna, typical applications.

iii) Basic idea of slot antenna

9. Microwave communication systems (3Hr)

i) Block diagram and working principles of microwave communication link

ii) Block diagram of tropospheric communication link and its working principles, advantages and disadvantages

iii) Digital microwave communication system block diagram and its working.

10. Radar Systems (6Hr)

i) Introduction to RADAR and its various applications

ii) Radar range equation and its applications

iii) Block diagram and operating principles of Pulse, CW, FMCW and MTI Radar systems and their applications

iv) Radar displays : A-scope, B-scope, E-scope, F-scope and Plan position Indicator (PPI)

11. Microwave oven (2Hr)

Block diagram and its working

LIST OF PRACTICALS

1. To study various microwave components and devices such as waveguides, E,H, Magic Tee's, directional coupler, isolator, circulator, variable attenuator, VSWR meter, frequency meter, and Microwave bench, Reflex klystron tube, slotted section, Detector mount
2. To study the characteristics of the reflex klystron tube and to determine electronic and mechanical tuning range
3. To measure the frequency and wavelength in a rectangular waveguide in TE10 mode
4. To measure VSWR and reflection coefficient of a given load
5. To measure directivity and coupling factor of a directional coupler
6. To verify the properties of magic tee
7. To measure radiation (polar) pattern and the gain of a waveguide Horn antenna
8. To study the I-V characteristics of Gunn diode
9. To study the Radar system trainer
10. To study the Microwave oven

Reference Books

1. Microwave and Radar Engineering : By M. Kulkarni
2. Microwave Devices and circuits : By S.Y. LIAO
3. Electronic communication systems : by George Kennedy & Bernard Davis
4. Theory and problems of Electromagnetics : by Schaum's outline services

TROUBLESHOOTING & MAINATENACE OF ELECTRONIC EQUIPMENT

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RATIONALE

The course provides the students with necessary knowledge and competency to diagnose the faults for trouble shooting and for systematic repair and maintenance of electronic equipment and components.

DETAILED CONTENTS

1. Repair, servicing and Maintenance Concepts **(8 Hr)**

Introduction, Modern Electronic equipment, Mean time between failures (MTBF), Mean time to repair (MTR), Maintenance policy, potential problems, preventive maintenance, corrective maintenance.

(i) Study of basic procedure of service and maintenance
(ii) Circuit tracing techniques
(iii) Concepts of shielding, grounding and power supply considerations in instruments.

2. Fundamental Trouble Shooting Procedure **(8 Hr)**

Fault location, Fault finding aids

- Service manuals
- Test and measuring instruments
- Special tools

Trouble Shooting Techniques

- Functional Areas Approach
- Split half method
- Divergent, convergent and feedback path circuit analysis
- Measurement techniques

3. Passive components **(8 Hr)**

Test procedures for checking passive components, resistors, capacitors, inductors, chokes and transformers.

4. Semiconductor Devices (From Testing Procedure Point of view) **(8 Hr)**

Diodes, rectifier and zener diodes. Bipolar transistors. Field effect transistors JFET and MOSFET. Thyristors, unijunction transistors, Photo cells, Transistor equivalents, Data books on transistors.

5. Trouble-shooting Digital Systems **(4 Hr)**

Typical faults in digital circuits. Use of Logic clip, logic probe, logic pulser, IC tester

6. Typical Examples of Trouble Shooting **(8 Hr)**

Trouble shooting procedures for the following:

(i) Oscilloscope
(ii) Power supplies
(iii) Digital multi-meters
(iv) Signal generator
(v) PA system

(vi) Tape recorder and
(vii) Stereo amplifier

7. Log Book & History Sheet **(2 Hr)**
Introduction, preparation and significance of log book and History sheet.

LIST OF PRACTICALS

1. Selection, demonstration and correct use of tools and accessories, nose pliers, wire cutter, wire stripper, tweezers, soldering station, desoldering tools, neon tester, screw driver Accessories insulating tapes, solders, solder tips, fluxes, desoldering wick, solder cleaning fluids, sleeves, tags, identifiers.
2. Develop skill in assembly of components, wiring, soldering and desoldering methods.
3. Selection and use of commonly used passive components and accessory
4. Testing of active and passive components
5. Testing of linear integrated circuits
6. Use of digital tools for troubleshooting digital components
7. Trouble shooting at least two of the following equipments: Single beam oscilloscope, Regulated power supplies, digital multimeter, AM/FM signal generator, PA system, Tape recorder and Stereo amplifier.

INDUSTRIAL TRAINING REPORT PRESENTATION

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Industrial training report presentation means for solving live problems faced electronics industries by applying the knowledge and skills obtained through the diploma course in electronics. The institute offering the course will identify live problems pertaining to Electronics industries. The activity of problem identification should begin well in advance (say in the beginning of fourth semester). Students should be allotted a problem of interest to him/her. The students will execute the work under the guidance of teachers. Each teacher would not have more than six students for guiding and supervise.

The students shall go for industrial training for a period of 4 to 6 weeks in the summer vacation after the examination of IV semester. The students will submit a comprehensive training report (in a presentable manner, preferably typed and bound) for evaluation by the teacher guide, an expert from the industry and an external examiner.

The industry for training should be related to Electronics, Microprocessor, Electronic Instruments and institution like Scientific Laboratories, Radio Station, VSNL, Radio & TV Transmitters, Telephone Exchange or any other electronics related field.

Assessment criteria for industrial training will be as under:-

(i)	Attendance and Punctuality	-	15% weightage
(ii)	Initiative in problem solving	-	30% weightage
(iii)	Relationship with people	-	10% weightage
(iv)	Report-Writing	-	45% weightage