# MAHATMA GANDHI UNIVERSITY

**PRIYADARSHINI HILLS, KOTTAYAM – 686 560**

# SYLLABUS

# FOR

## 1. B. Sc. ELECTRONICS PROGRAMME (MODEL III)

## 2. B.Sc. ELECTRONICS & COMPUTER MAINTENANCE (MODEL III)

## 3. COMPLIMENTARY ELECTRONICS FOR B.Sc. PHYSICS (MODEL I)

## COURSE – CREDIT – SEMESTER SYSTEM

## 2017 ADMISSION ONWARDS

*Prepared by*

# Expert Committee

# And

# Faculty of Technology and Applied Sciences

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I express profound gratitude to the honourable Vice-Chancellor, Pro Vice-Chancellor, Registrar, Members of the Syndicate and Academic Council for their sincere co-operation and guidance during the restructuring process.

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**Dean, Faculty of Technology and Applied Sciences,**

**Mahatma Gandhi University, Kottayam.**

# 1. INTRODUCTION

Mahatma Gandhi University introduced choice based credit and semester and Grading System in colleges affiliated to the University from the Academic year 2009-10, under Direct Grading System. Subsequently, the Kerala State Higher Education Council constituted a committee of experts headed by Prof. B. Hridayakumari, to study and make recommendations for the improvement of the working of the Choice Based Credit and Semester System in Colleges affiliated to the Universities in the State. The State Government accepted the recommendations of the Committee and the Syndicate and the Academic Council of the Mahatma Gandhi University has resolved to reform the existing CBCSS regulations. Accordingly REGULATIONS FOR UNDER GRADUATE PROGRAMMES UNDER CHOICE BASED COURSE-CREDIT-SEMESTER SYSTEM AND GRADING, 2013 was introduced in the University from the Academic year 2013-14 onwards, under Indirect Grading System. The Board of Studies, Electronics (UG and PG) have proposed a syllabus during the year 2015-16 to implement the syllabus during the academic year 2016-17. But as per the UGC, University directions and the feedback from the stakeholders, the syllabus needs some modifications and additions to meet the requirements legally and technically. This syllabus is the modified one of the draft proposed by the Board of Studies of Electronics.

# 2. AIMS & OBJECTIVES

A curriculum, course content and assessment of scholastic achievement play complementary roles in shaping education. The committee is of the view that assessment should support and encourage the broad instructional goals such as basic knowledge of the discipline of Electronics including phenomenology, theories and techniques, concepts and general principles. This should also support the ability to ask physical questions and to obtain solutions to physical questions by use of qualitative and quantitative reasoning and by experimental investigation. The important student attributes including appreciation of the physical world and the discipline of Electronics, curiosity, creativity and reasoned scepticism and understanding links of Electronics to other disciplines and to societal issues should gave encouragement. With this in mind, we aim to provide a firm foundation in every aspect of Electronics and to explain a broad spectrum of modern trends in Electronics and to develop experimental, computational and mathematics skills of students.

The programme also aims to develop the following abilities:

- Read, understand and interpret physical information – verbal, mathematical and graphical.
- Impart skills required to gather information from resources and use them.
- To give need based education in physics of the highest quality at the undergraduate level.
- Offer courses to the choice of the students.

- Perform experiments and interpret the results of observation, including making an assessment of experimental uncertainties.
- Provide an intellectually stimulating environment to develop skills and enthusiasms of students to the best of their potential.
- Use Information Communication Technology to gather knowledge at will.
- Attract outstanding students from all backgrounds.

B.Sc. Programme in Electronics and Computer Maintenance is a two core courses programme under course credit and semester system. The programme aims to provide a strong foundation for developing skills in electronic circuit designing, software development, assembling, troubleshooting and maintenance of computers.

The programme is designed with the objective to equip students to pursue careers in Electronics, IT and Computer Hardware related fields or to go in for higher studies in the related disciplines. This is a vocational programme that prepares students to start an enterprise of their own.

The main objectives of the B.Sc. Electronics/B.Sc. E&CM Programme are

- To provide in depth knowledge of scientific and technological aspects of Electronics
- To familiarize with current and recent technological developments
- To enrich knowledge through programmes such as project lab and seminars
- To train students in skills related to electronics industry and market.
- To create foundation for research and development in Electronics
- To develop analytical abilities towards real world problems.
- To help students build-up a progressive and successful career in Electronics
- To produce electronic professionals who can be directly employed or start his/her own work as Electronic circuit Designer, Electronics consultant, testing professional, Service engineer and even an entrepreneur in electronic industry.
- To train students to a level where they can readily compete for seats for advanced degree courses like MSc (Electronics) and other related disciplines.

## 3. DURATION OF THE PROGRAMME

The duration of U.G. programmes shall be ***6 semesters***.

There shall be two Semesters in an academic year, the 'ODD' semester commences in June and on completion, the 'EVEN' Semester commences after a semester-break of three days with two months' vacation during April and May. (The commencement of first semester may be delayed owing to the finalization of the admission processes).

A student may be permitted to complete the Programme, on valid reasons, within a period of 12 continuous semesters from the date of commencement of the first semester of the programme.

# B.Sc. ELECTRONICS (MODEL III)

# PROGRAMME

# 4. EVALUATION OF VARIOUS COMPONENTS IN THE CURRICULUM AND MARKS DISTRIBUTION FOR INTERNAL AND EXTERNAL EVALUATION

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all papers (theory and practical) total marks of external examination is 80 and total marks of internal evaluation is 20.

Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

### 4.1 For all theory papers

**a) Marks of External Examination : 80**
**b) Marks of Internal Evaluation 20**

All the three components of the internal assessment are mandatory.

| Components of Internal Evaluation of theory | Marks |
|---|---|
| Attendance | **5** |
| Assignments (One or Two) | **5** |
| Test paper(s) (2 test papers minimum -2X 5=10) | **10** |
| **Total** | **20** |

### 4.2 For all Practical papers

**a) Marks of External Examination 80**
**b) Marks of internal evaluation 20**

**Internal Practical Evaluation:**
All the four components of the internal assessment are mandatory.

| Components of Internal Evaluation of Practical | Marks |
|---|---|
| Attendance | 5 |
| Test paper/Viva | 5 |
| Record* | 5 |
| Lab involvement | 5 |
| **Total** | **20** |

*Marks awarded for Record should be related to number of experiments recorded and duly signed by the concerned teacher in charge. For appearing external practical examination, certified record should be produced.

**External Practical Examination:**

For all the practical papers, there will be an external evaluation. The external examiner will be appointed by the University. There will be an internal examiner who will be appointed by the Head of the Department of the College. The examination will be of 3 Hours and the various components for evaluation of external examination depend on the course and is given in detail in the syllabus.

**4.3 For Project Work**

**a) Marks for External Examination 80**

**b) Marks for Internal Evaluation 20**

During the external evaluation of the project, a course Viva-Voce examination has also to be conducted. The components for external evaluation of project and course Viva-Voce examination are given as:

| **Components of External Evaluation of Project and Course Viva-Voce** | **Marks** |
|---|---|
| Project Evaluation (External) | 50 |
| Course Viva-Voce (External) | 30 |
| **Total** | **80** |

All the four components of the internal assessment for internal evaluation of project are mandatory.

| **Components of Internal Evaluation of Project** | **Marks** |
|---|---|
| Punctuality | **5** |
| Experimentation/Data collection | **5** |
| Knowledge | **5** |
| Report | **5** |
| **Total** | **20** |

| **Scheme for External Project Evaluation** | |
|---|---|
| **Component** | **Marks** |
| Presentation of the work and Relevance of the project | 15 |
| Participation in the project | 15 |
| Demonstration of the Project | 10 |
| Quality and content of the Project Report | 10 |
| Course Viva-Voce | 30 |
| **Total** | **80** |

For Course Viva-Voce examination, out of 30 marks, examiner has to evaluate the involvement of the student in the programme and the depth of knowledge in various subjects. The marks may be given based on answering the quiz, solving simple problems etc.

### 4.4 For Presentation Skill Practice

**Marks for Internal Evaluation: 100**

| **Components of Internal Evaluation of Presentation Skill** | **Marks** |
|---|---|
| Style of Presentation | 20 |
| Technical Content | 20 |
| Adequacy of references | 15 |
| Depth of knowledge | 15 |
| Impact over the listeners | 15 |
| Presentation Report | 15 |
| **TOTAL** | **100** |

### 4.5 ASSIGNMENTS

Assignments are to be done for all the Semesters. At least one assignment should be done in each semester for all the theory courses.

### 4.7 INTERNAL ASSESSMENT -TEST PAPERS

At least two internal test-papers are to be attended in each semester for each theory course. The evaluations of all components are to be published and acknowledged by the candidates. All documents of internal assessments are to be kept in the college for two years and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the paper.

### 4.8 ATTENDANCE EVALUATION

**For all courses – Theory and Practical**

| **% of attendance** | **Marks** |
|---|---|
| 90 and above | 5 |
| 85 – 89 | 4 |
| 80-84 | 3 |
| 76-79 | 2 |
| 75 | 1 |

# 5. CONSOLIDATED SCHEME FOR ALL SEMESTERS

## B.Sc. Electronics (Model – III)

| Semester | Course Code | Title of the Course | Course Category | Teaching Hours | Total Hours/Sem | Credits | Total Credits |
|---|---|---|---|---|---|---|---|
| 1 | | English – I | Common-I | 5 | 90 | 4 | 20 |
| | EL1CRT01 | Basic Electronics | Core | 4 | 72 | 4 | |
| | EL1CRT02 | Methodology of Science | Core | 4 | 72 | 4 | |
| | EL1CRP01 | Basic Electronics Lab – Practical | Core | 4 | 72 | 2 | |
| | | Physics-Solid State Physics | Complementary | 4 | 72 | 3 | |
| | | Mathematics – I | Complementary | 4 | 72 | 3 | |
| 2 | | English – II | Common-II | 5 | 90 | 4 | 21 |
| | EL2CRT03 | Electronic Circuits | Core | 4 | 72 | 4 | |
| | EL2CRT04 | Network Theory | Core | 4 | 72 | 4 | |
| | EL2CRT05 | Digital Electronics | Core | 4 | 72 | 4 | |
| | EL2CRP02 | Digital Electronics Laboratory – Practical | Core | 4 | 72 | 2 | |
| | | Mathematics – II | Complementary | 4 | 72 | 3 | |
| 3 | EL3CRT06 | Analog Communication | Core | 4 | 72 | 4 | 21 |
| | EL3CRT07 | Analog ICs and Applications | Core | 4 | 72 | 4 | |
| | EL3CRT08 | Electromagnetic Theory | Core | 4 | 72 | 4 | |
| | EL3CRT09 | 8085 Microprocessor | Core | 4 | 72 | 4 | |
| | EL3CRP03 | Analog Electronics Circuits Lab – Practical | Core | 5 | 90 | 2 | |
| | | Statistics | Complementary | 4 | 72 | 3 | |

| Semester | Course Code | Title of the Course | Course Category | Teaching Hours | Total Hours/Sem | Credits | Total Credits |
|---|---|---|---|---|---|---|---|
| 4 | EL4CRT10 | Programming in C | Core | 4 | 72 | 4 | 19 |
| | EL4CRT11 | Microwave Electronics | Core | 4 | 72 | 4 | |
| | EL4CRT12 | Digital Communication | Core | 4 | 72 | 4 | |
| | EL4CRT13 | Instrumentation Electronics | Core | 4 | 72 | 3 | |
| | EL4CRP04 | Programming in C Lab– Practical | Core | 5 | 90 | 2 | |
| | EL4CRT05 | Microprocessor Lab – Practical | Core | 4 | 72 | 2 | |
| 5 | EL5CRT14 | Microcontrollers and Applications | Core | 4 | 72 | 4 | 19 |
| | EL5CRT15 | Environmental Awareness and Human Rights | Core | 4 | 72 | 4 | |
| | EL5CRT16 | Computer Hardware | Core | 4 | 72 | 4 | |
| | EL5CRP06 | Microcontroller Lab – Practical | Core | 5 | 90 | 2 | |
| | EL5CRP07 | Communication Lab – Practical | Core | 4 | 72 | 2 | |
| | EL5CBT01 | Open Course | Core | 4 | 72 | 3 | |
| 6 | EL6CRT17 | Optoelectronics | Core | 4 | 72 | 4 | 20 |
| | EL6CRT18 | Computer Networks | Core | 5 | 90 | 4 | |
| | EL6CRT19 | Digital Signal Processing | Core | 5 | 90 | 4 | |
| | EL6CBT01 | Choice Based Course | Core | 4 | 72 | 4 | |
| | EL6SMP01 | Presentation Skill Practice | Core | 2 | 36 | 1 | |
| | EL6PRP01 | Project Lab | Core | 5 | 90 | 3 | |

| OPEN COURSES |
|---|
| Computer Assembling |
| Mechatronics |
| Electronic Communication |

| CHOICE BASED COURSES |
|---|
| Digital Image Processing |
| Power Electronics |
| Mobile Communication |

# 6. DETAILED SYLLABUS

## UNDERGRADUATE PROGRAMME IN B.Sc. ELECTRONICS (MODEL III)

## SEMESTER I

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| | English – I | 5 | | 4 | 20 | 80 |
| EL1CRT01 | Basic Electronics | 4 | | 4 | 20 | 80 |
| EL1CRT02 | Methodology of Science | 4 | | 4 | 20 | 80 |
| EL1CRP01 | Basic Electronics Lab – Practical | | 4 | 2 | 20 | 80 |
| | Physics | 4 | | 3 | 20 | 80 |
| | Mathematics – I | 4 | | 3 | 20 | 80 |
| | **Total** | **21** | **4** | **20** | **120** | **480** |

**Common Course - 1**

**ENGLISH - I**

***(Common with English for BA/B.Sc. Programmes)***

**Complementary Course**

**Solid State Physics**

**(Offered by the BOS in Physics)**

**Complementary Course**

**MATHEMATICS I**

**(Offered by the BOS in Mathematics)**

# EL1CRT01 BASIC ELECTRONICS

## SEMESTER I

**Aims and objectives:**

This course aims to get a pre-requisite knowledge on basic electrical technology and to familiarise with basic electronic devices.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I**

**Electricity & Magnetism: (16 Hours)**

Electric charge, Coulomb's Law, Electric Field, Capacitor, Energy stored in a capacitor, Magnetic Field, Magneto Motive Force, Magnetic Field Strength, Reluctance, Electro Magnetic Induction, Self-Induction, Mutual induction, Energy stored in magnetic field.

Ohm's Law, Kirchhoff's Law, Node and Mesh analysis, Series and parallel circuits

**Module II**

Alternating Current: **(14 Hours)**

AC Circuits, Series and Parallel Resonance (Derivations not required), Power factor, Bandwidth and Q factor, Transformer - principle (Equivalent circuit, SC-OC-test not required)

Text book: Electrical Technology Vol. I - B L Theraja

**Module III**

**Diodes: (16 Hours)**

Diodes - Symbol, Forward and Reverse biasing, V-I Characteristics, Shockley's equation, Breakdown mechanisms, Comparison of Si, Ge and GaAs diodes, Diode Equivalent circuits, Transition and Diffusion Capacitance, Mentioning the applications. Zener diode –Symbol, Operation, V-I characteristics, Equivalent circuits, Mentioning the applications. Light Emitting Diode – Symbol, Operation, Characteristics, Mentioning the applications.

**Text Book:** Electronic Devices – Thomas L. Floyd, Pearson

**Module IV**

**BJT and FET: (14 Hours)**

Bipolar Junction Transistor – Symbol, Structure, Operation, Three Configurations, Input and Output Characteristics, Alpha and Beta, Mentioning the applications.

Field Effect Transistors – Types, Junction Field effect Transistors – Symbolic representation, Constructional features, Operation, Drain and Transfer Characteristics, Shockley's equation, FET parameters. Comparison between BJT and FET, Mentioning the applications.

**Text Books:**

1. Electronic Devices and Circuits- Robert Boylestad, Pearson
2. Electronic Devices – Thomas L. Floyd, Pearson
3. Electronic Principles - Malvino

**Module V**

**Thyristors : (12 hours)**

Unijunction Transistor - Symbolic representation, Constructional features, Equivalent circuit, Intrinsic Stand-off ratio, Principle of operation, Characteristics, Mentioning the applications.

Silicon Controlled Rectifier – Symbolic representation, Principle and Modes of operation, Characteristics, Triggering methods, Two transistor analogy, Mentioning the applications.

**Text Book**: Electronic Devices – Thomas L. Floyd, Pearson

**Reference Books:**

1. Basic Electronics and linear Circuits: B. L. Theraja
2. Thyristor and their applications: M. Ramamoorthi

## EL1CRT02 METHODOLOGY OF SCIENCE

## SEMESTER I

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

### Course Outline

**Module I (10 Hours)**

Introduction- The History of Science, Philosophy of Science, Origins of Scientific Enquiry, European origins of Science, Contributions of Early India

**Module II (14 Hours)**

Science in the Middle Ages- in Europe, The fall of Aristotelean Universe, Bruno, Copernicus and Galileo, Medical Sciences, Advancement in India, Modern Scientific Outlook, Descartes

**Module III (16 Hours)**

Newton and after: A century of Genius, The Newtonian Synthesis, The Great Contemporaries of Newton, Mathematics, The century after Newton, Industrial revolution and its impact on Science, The Mechanistic Universe and Scientific Determinism.

**Module IV (16 Hours)**

Basic Concepts in the Philosophy of Science- Some Fundamental Questions- Scientific Reasoning, Scientific Explanation, The Components of Science, Realism and Anti Realism, Reductionism and Unity of Science, Some issues in the Philosophy of Science- Scientific Change and Scientific Revolutions, Paradigms and Research Programmes, Research Traditions model, Technologism, Science and Values, Science and Religion, Science and Society

**Module V (16 Hours)**

Electronics-Early Days, Early Electrical Communication- Telegraph, Telephone-Wireless Communication, Modulation- Father of Radio, The Dawn of Electronics- Evolution of Vacuum Tubes, The Electronics Era- Television, Fibre Optics

The Big Break- Semiconductors, Electronics in Medicine, Navigation, The Computer Generations.

**Text Book:** 1. An Introduction to the History and Philosophy of Science, R V G Menon, Pearson India (Module I-IV)

2. The Third Element: A Brief History of Electronics, Alfred Corbin, Author House Publications (Module V)

## EL1CRP01 BASIC ELECTRONICS LABORATORY

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER I

**Aims and objectives:**

1. To get a basic knowledge on Electronic components and their characteristics
2. To get a basic knowledge on Logic gates and truth tables.

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

**List of Experiments:**

l. Study of Passive and Active components - Colour coding, Terminal identification, Testing
2. Study of CRO and Function generators
3. Study of Multimeters - Analog and Digital
4. Soldering Practice, PCB design, Circuit design and Fabrication (Not to be asked for Practical Examination)
5. Verification of Ohm's law
6. Rectifier Diode Characteristics - Si and Ge (Knee voltage, Static & Dynamic resistances)
7. Zener Diode - Forward and Reverse Characteristics (Knee voltage, Static resistance & Dynamic resistance, Reverse break down voltage)
8. LED Characteristics (Knee voltage, Static & Dynamic resistances)
9. CB Input Characteristics
10. CB Output Characteristics
11. CE Input Characteristics
12. CE Output Characteristics
13. CC Input Characteristics
14. CC Output Characteristics
15. FET Drain & Transfer Characteristics (Determination of $r_d$, $g_m$ and $\mu$)
16. UJT Characteristics
17. SCR Characteristics

14 Experiments should be compulsorily carried out. For appearing external examination, certified laboratory record should be produced.

**Scheme of Evaluation of External Practical Examination**

| Parameter | Marks |
|---|---|
| Circuit diagram & Proper labelling | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | **80** |

# SEMESTER II

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| | English – II | 5 | | 4 | 20 | 80 |
| EL2CRT03 | Electronic Circuits | 4 | | 4 | 20 | 80 |
| EL2CRT04 | Network Theory | 4 | | 4 | 20 | 80 |
| EL2CRT05 | Digital Electronics | 4 | | 4 | 20 | 80 |
| | Digital Electronics Lab – Practical | | 4 | 2 | 20 | 80 |
| | Mathematics – II | 4 | | 3 | 20 | 80 |
| | **Total** | **21** | **4** | **21** | **120** | **480** |

## Common Course
## English II
## (Offered by the BOS in English)

## Complementary Course
## MATHEMATICS II
## (Offered by the BOS in Mathematics)

# EL2CRT03 - ELECTRONIC CIRCUITS

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER II

**Aims and Objectives**

To equip the students with circuit level application concepts of electronic devices.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (15 hours)**

**Regulated Power Supply**

Basic Concept of Regulated Power Supply - Block Diagram, Different Types of Rectifiers- HWR, FWR and Bridge Rectifier, Derivation of Ripple Factor-General Filter Considerations- Types of Filters -RC, LC, CLC, Zener Diode Voltage Regulator, Line and Load Regulation.

**Text Book**: Electronic Devices and Circuits- Allen Mottershed

**Module II (15 hours)**

**Amplifiers**

BJT Amplifier- Different Biasing Circuits - Bias Stabilization, Thermal Run away, Hybrid Parameter Analysis-input Impedance, Output Impedance, Voltage gain, Current Gain(Derivations not required) -RC Coupled Amplifier - Frequency Response - Concept of Gain-Bandwidth Product -Emitter Follower

FET Amplifiers – Operation - Comparison of BJT and FET amplifiers

**Text Book**: Electronic Devices and Circuits, Robert Boylestad

**Module III**

**Feedback Amplifier (18 hours)**

Concept of Positive and Negative Feedback in Amplifiers - Characteristics of Negative Feedback Amplifiers -Types of Feedback- Feedback Amplifiers - Current Series and Voltages Series BJT Amplifier Circuits

**Text Books**: 1. Electronic Devices and Circuits- Robert Boylestad
2. Electronic Devices and Circuits- Allen Mottershed

**Module IV**

**Oscillators (12 hours)**

Principle of Sinusoidal Oscillators - Barkhausen Criteria, Sinusoidal Oscillators - RC, LC & Crystal Oscillators -Typical Circuits - Frequency of Oscillation (Derivation Not required)

**Text Book**: 1. Electronic Devices and Circuits- Robert Boylestad
2. Electronic Devices and Circuits- Allen Mottershed

**Large Signal Amplifiers**

Power Amplification - Class A, Class B, Class C Operations – Distortion - Crossover and Harmonic Distortions - Push-Pull Amplifier Circuit, Complementary Symmetry Push-Pull Circuit.

**Text Books:** 1. Basic Electronics, N. N. Barghava
2. Electronic Devices and Circuits, Boylested

**Module V** **(12 hours)**

**Wave Shaping Circuits** – Clipping – Clamping, RC Differentiator and Integrator using passive components, Multivibrators - Typical Circuits - Astable- Monostable and Bistable Circuits. Wave Forms, expression for Period (Derivation Not Required).

**Text Books:** 1. Electronic Devices and Circuits, Boylested
2. Functional Electronics, Ramanan

# EL2CRT04 NETWORK THEORY
# SEMESTER II

**Aim of the course:**

This course equips the students to excel in the field of circuit theory, network theorems, circuit analysis, and filter theory

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I** **(16 hours)**

KirchoffsLaws- Node, Super node, Mesh, super mesh Analysis, Superposition Theorem - Thevenin's Theorem- Norton's Theorem - Reciprocity Theorem - Millman's Theorem- Miller Theorem- Maximum Power Transfer Theorem (Only DC circuit analysis is required - Simple problems only)

Text book pp 105-113, 115-l 16, 120- l30

**Module II** **(14 hours)**

Laplace Transforms: step, impulse and ramp functions.
Transients - Steady state and transient response - DC response of RL and RC circuits,

Text book pp 473-480, 235-245

**Module III** **(14 hours)**

Two port network parameters - Short circuit admittance(Y) - open circuit impedance (Z) hybrid (h) - Transmission (ABCD) parameters, Relationship between parameters

Text book pp. 597-654

**Module IV** **(l6 hours)**

Filters Classification (LPF, HPF, BPF and BRF) - basic Concepts characteristics, T and π networks- characteristic Impedance - propagation constant, Attenuators T and π types. (Detailed analysis/design not required)
Text book-pp. 663-671, 699-702

**Module V** **(12 hours)**

Network Functions -Transfer function - poles and zeros, Pole - zero plot Time domain response from transfer function, Stability -Routh-Hurwitz criterion.

Text book-pp. 569-579

**Text book:**

Circuits and Networks Analysis and Synthesis, Second Edition -A Sudhakar & Shyammohan S Palli

## EL2CRT05 DIGITAL ELECTRONICS
## SEMESTER II

**Aim of the course:**

To equip the students with the concepts of Boolean algebra, digital logic gates, combinational and sequential digital circuits

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

**Module I (12 hours)**

Review of number system, binary, octal, hexa-decimal addition and subtraction using 1's complement and 2's complement and coding-BCD- excess3, Gray, Hamming - logic gates - different types - logic operations - symbols - truth table and applications

**Module II (12 hours)**

Boolean operation - Boolean expression - laws and rules – Demorgan's theorem - Simplification using K-map (upto 4 variables) -- SOP and POS expressions.

**Module III (12 hours)**

Logic families - TTL, ECL gates - comparison - Types of TTL gates - Transfer characteristics - properties.

**Module IV (12 hours)**

Adders - comparators - subtractors - decoders - encoders - code converters-Gray to Binary and Binary to Gray, BCD to Binary and Binary to BCD, excess3 to Binary, Binary to excess-3, Binary to seven segment LED, BCD to Seven segment LED- multiplexers - demultiplexers - parity generators/ checkers.

**Module V (8 hours)**

Latches and its types – flip-flops – types- SR, D, JK, T - edge triggered - master slave characteristics, execution table of JK flip-flop. Shift registers - serial/parallel - data transfers, timing diagrams, ring counter, Johnson counter and applicatons.

**Module VI (16 hours)**

Counters – design of asynchronous/synchronous up/down counter- timing diagram, design of asynchronous/synchronous up/down decade counter- timing diagram, sequences generators - applications. .

**Text Book:**

1. Digital fundamentals - Thomas Floyd

**References:**

2. Digital Principles - Malvino
3. Digital Integrated circuits - Taub and Schilling
3. Digital Circuits and Design, Salivahanan. S. Vikas Publishing Hosue.
4. Roth CH, Fundamentals of logic design, Jaico.
5. Digital Design - Basic concepts and Principles - Mohammed A Karim and Xinghao Chen - CRC Press.

## EL2CRP02 DIGITAL ELECTRONICS LAB

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER II

**Aim of the course:**

To equip the student with expert in handling digital ICs, logic gates, and digital circuit designing

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

### List of Experiments

1. Familiarization of Logic Gates 7400, 7402, 7408, 7410, 7411, 7432, 7496
2. Realization of all Basic gates using NAND and NOR
3. Half Adder
4. Half Adder using NAND gates only
5. Full Adder
6. Full Adder using NAND gates only
7. Full Adder using two half adders
8. Two bit comparator (greater than, less than, equal)
9. Realization of multiplexer using gates
10. Realization of demultiplexer using gates
11. Realization of decoder using gates
12. Gray code to binary converter and binary to gray code converter
13. Binary to excess-3 code converter and excsee-3 to binary code converter
14. Parity Generators and parity Checkers
15. Familiarization of flip-flops 7473, 7476
16. Shift register- SIPO, SISO, PISO, PIPO
17. Ring counter
18. Johnson Counter
19. Asynchronous UP/DOWN counters
20. Synchronous UP/DOWN counters
21. Asynchronous UP/DOWN decade counter
22. Synchronous UP/DOWN decade counter
23. Sequence Generator

20 experiments should be compulsorily carried out. For appearing external examination, certified laboratory record should be produced.

**Scheme of Evaluation for External Practical Examination**

| **Parameter** | **Marks** |
|---|---|
| Circuit diagram & Proper labelling | 15 |
| Theory, Design, Truth Table, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | **80** |

# SEMESTER III

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| EL3CRT06 | Analog Communication | 4 | | 4 | 20 | 80 |
| EL3CRT07 | Analog ICs and Applications | 4 | | 4 | 20 | 80 |
| EL3CRT08 | 8085 Microprocessor | 4 | | 4 | 20 | 80 |
| EL3CRT09 | Electromagnetic Theory | 4 | | 4 | 20 | 80 |
| EL3CRP03 | Integrated Circuits Lab – Practical | | 5 | 2 | 20 | 80 |
| | Statistics | 4 | | 3 | 20 | 80 |
| | **Total** | **20** | **5** | **21** | **120** | **480** |

## Complementary Course
## Statistics
## (Offered by the BOS in Statistics)

## EL3CRT06 ANALOG COMMUNICATION

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER III

**Aim of the course:**

To get a thorough knowledge of modulation and analog communication techniques

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I** **(14 hours)**

Communication Systems - Modulation – Need for modulation - External noise, Internal noise, Shot noise, Transit Time noise, Signal-to-Noise Ratio, Noise Figure. Amplitude Modulation- Frequency spectrum of AM wave – Representation of AM wave, Power relation in AM wave, Generation of AM, Basic requirements.

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 2-6, 15-21,25, 35-46

**Module II** **(14 Hours)**

SSB Techniques – Evolution and description of SSB, Suppression of Carrier, Balanced Modulator, Suppression of unwanted Side band- Filter system, Phase shift method, Third method, Extensions of SSB-Pilot carrier systems, ISB and VSB.

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 57-75

**Module III** **(14 Hours)**

Frequency Modulation – Theory of Frequency and Phase modulation, Description of system, Mathematical representation of FM, Phase Modulation-Inter system comparison, Noise in FM (qualitative treatment only), Pre-emphasis, De-emphasis, Adjacent channel and Co-channel interference, Comparison of Wide band and Narrow band FM.

**Text book:** Electronic Communication Systems - Kennedy and Davis, pp 79-84, 89-98

**Module IV** **(14 Hours)**

FM Generation and Detection: Generation of FM – Direct method: Basic reactance modulator, Varactor diode modulator - Stabilized reactance modulator- Armstrong Frequency modulation system (Indirect method), FM demodulators - Slope detection, Balanced Slope detector, Phase discriminator

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 100-112, 162-171

**Module V** **(16 Hours)**

Radio receivers: Receivers Types, TRF Superheterodyne receiver, Sensitivity, Selectivity, Image frequency and its rejection, Double spotting, Superheterodyne tracking, local oscillator, Factors influencing the choice of Intermediate frequency, Diode Detector, AGC, AFC, Diversity reception, Super heterodyne FM receivers.

**Text book**:

Electronic Communication Systems - Kennedy and Davis , pp 118-128, 131-135, 136-138, 144-145, 149, 158-159, 162-165,169-171.

**Reference Book:**

Electronic Communication – Roody and Coolen- PHI

# EL3CRT07 ANALOG ICs & APPLICATIONS

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER III

**Aim of the course:**
To get a thorough knowledge of analog ICs

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module 1: Introduction (14 Hours)**

Integrated Circuits, Types of ICs, Development of ICs – SSI, MSI, LSI, VLSI packages, IC package types, Pin identification and temperature ranges , Device identification, Power supplies for ICs. Differential amplifier circuit configurations -DC and AC analysis

**Module II: Operational Amplifiers (15 Hours)**

Block diagram representation of a typical op-amp – schematic symbol - A general purpose IC Op amp – IC 741 and its features, Op-Amp parameters - input offset voltage and current, input bias current, differential input resistance, output resistance, output voltage swing, common mode rejection ratio (CMMR), slew rate and gain-bandwidth product, ideal and practical op-amps – Equivalent circuit of an op-amp, Open-loop op-amp configurations, Frequency response of an op-amp.

**Text Book :** Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad – Chapters 1, 2, 3

**Module III: Op Amp Circuits (15 Hours)**

Closed-loop non-inverting and inverting amplifiers – measurement of closed-loop voltage gain, differential input voltage, input resistance, output resistance, bandwidth and total output offset voltage, Voltage follower, Differential amplifier with one op-amp, two op-amps and three op-amps – measurement of voltage gain, Instrumentation amplifier, Summing, Scaling and averaging amplifiers – output voltage, Current to voltage and Voltage to current converters, Integrator, Differentiator, Comparators – Basic comparator, Zero-crossing detector, Schmitt trigger.

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad– Chapters 4, 7, 9

**Module IV: Oscillators (14 Hours)**

Oscillators – Principles – Types – Frequency stability, Sine wave oscillators - Phase shift oscillator and Wien bridge oscillator, Design of sine wave oscillators, Square wave generator, Triangular wave generator, Sawtooth wave generator, Voltage controlled oscillator - IC 566 .

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad–Chapter 8

**Module V: Timers, Phase locked loops and Voltage Regulators (14 Hours)**

Introduction to 555 timer - Functional diagram, Monostable and Astable operations and applications, PLL – Operating principles, Monolithic PLLs, 565 PLL, PLL as frequency multiplier. Voltage Regulators, Types - Fixed voltage regulators, Adjustable voltage regulators, Switching regulators, Special regulators, Three terminal regulator ICs like 78xx , 79xx series and LM317.

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad-Chapter10

**Reference Books**:

1. Integrated Electronics by Jacob Millman& C CHalkias (Tata McGraw Hill).
2. Electronic Devices and Circuits by Allan Mottershed PHI
3. Integrated Circuits by Botkar

# EL3CRT08- ELECTROMAGNETIC THEORY

## SEMESTER III

**Aim of the course:**

To equip the student to understand the theory of electromagnetic waves and their propagation

**Prerequisite:** Knowledge on Electrostatics and steady magnetic fields
**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

## Course Outline

**Module I: Coordinate systems and Vector Calculus (18 Hours)**

Coordinate Systems-Cartesian, Cylindrical and Spherical Coordinate System-Line, surface and volume integrals, Del Operator-Gradient, Divergence and Curl - Physical Interpretation of Gradient, Divergence and Curl, Laplacian Operator-Radian and Steradian, Stoke's Theorem and Divergence Theorem. (*Detailed analysis not required)*

**Module II: Electrostatics and Electric Fields in Material Space (18 Hours)**

Coulomb's law and field intensity, Electric Flux Density, Electric Potential, Relationship between E and V, Energy Density in Electrostatic Fields, Convection and Conduction Currents, Conductors, Dielectrics-Polarization, Linear, isotropic and homogeneous dielectrics, Boundary conditions.

**Module III: Magnetostatic Fields (10 Hours)**

Biot-Savart's law, Ampere's Circuit law, Force due to magnetic fields, Magnetic dipole, Classification of magnetic materials, Magnetic boundary conditions, Magnetic energy.

**Module IV: Maxwell's Equation and Electromagnetic Wave Propagation**

**(16 Hours)**

Equation of Continuity and Maxwell's Equation for time varying fields: in Differential Form, Integral Form. Waves in general- Plane waves in Free Space, Conductors and Dielectrics. Power and the Poynting Vector. (*Detailed analysis not required)*

**Module V: Radiation and Antennas (10 Hours)**

Antennas: definition, functions and properties, Antenna parameters, Radiation mechanism, Radiation fields of an alternating current element, Radiated power and Radiation resistance.

**Text Book: Matthew N.O. Sadiku, Principles of Electromagnetics**

**Reference Books:**


1. Electromagnetic Waves and Radiating systems – Jordan & Balmian – PHI.
2. Engineering Electromagnetics – Hayt
3. G.S.N. Raju, Electromagnetic Field Theory and Transmission Lines, Pearson.
4. Field and wave Electromagnetics, David K Cheng, second edition, Pearson

# EL3CRT08 8085 MICROPROCESSOR

## SEMESTER III

**Aim of the course:** This course aims to give a strong background in the field of Microprocessor 8085 and to expertise in assembly level programming

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (10 Hours)**

**Introduction**

Microcomputer: Difference between microprocessor and microcontroller (*Source: Text 2, Chapter 2)*

Microprocessor initiated operations and bus organization, internal data operations, externally initiated operations.*(Source: Text 1, Chapter 2)*

**Module II (16 Hours)**

**8085 architecture**: 8085 pin out and signals, functional block diagram of 8085 (ALU, timing and control unit, instruction register and decoder, register array, interrupt control, serial I/O control-only brief description required).

Microprocessor communication and bus timings, Demultiplexing the bus $AD_7$-$AD_0$, generating control signals, 8085 machine cycles and bus timings (*Source: Text 1, Chapter 3)*

**Module III (16 Hours)**

**8085 Instructions**

Classification of instructions, addressing modes, Data transfer group of instructions

(*Source: Text 2, Chapter 6)*
Arithmetic group of instructions (*Source: Text 2, Chapter 7)*
Logical group of instructions (*Source: Text 2, Chapter 8)*
Branch group of instructions (*Source: Text 2, Chapter 10)*

Stack and stack pointer, NOP and stack group of instructions (*Source: Text 2, Chapter 9)*

**Module IV** **(14 Hours)**

**Addressing of I/O ports :**Need for I/O ports, IN & OUT instructions, memory mapped I/O, I/O mapped I/O. (*Source: Text 2, Chapter 12)*

**Programming techniques:** Looping, counting, indexing, concept of subroutine. (*Source: Text 1, Chapter 7)*

**Counters and Time delay:** Time delay using one register, time delay using register pair, time delay using loop within a loop technique, counter design using time delay. (*Source: Text 1, Chapter 8)*

**8085 interrupts:** Description of interrupt process, vectored and non-vectored interrupts,

**Module V** **(16 Hours)**

**Programmable peripheral interface:** Block diagram of 8255, control logic, Control word, different modes of operation – I/O mode and BSR mode, Control word format for I/O & BSR mode (*Source: Text 1, Chapter 15)*

**Interfacing A/D converter**

Basic concept of successive approximation A/D converter, Interfacing 8-bit A/D converter using the interrupt. (*Source: Text 1, Chapter 13)*

**Text Books:**

1. Microprocessor architecture, programming, and application with 8085 –Ramesh. S Gaonkar
2. The 8085 Microprocessor- Architecture, programming and Interfacing–K. Udayakumar, B.S. Uma Shankar – Pearson publication 2012.

# EL3CRP03 ANALOG ELECTRONICS LABORATORY

**Hours/Week : 5**
**Contact Hours : 90**
**Credits : 2**

## SECTION-I CIRCUITS LAB

1. Half wave rectifier
2. Full Wave rectifier
3. Bridge Rectifier
4. Capacitor Filter
5. Inductor Filter
6. Zener Voltage Regulator
7. Clipping circuits
8. Clamping circuits
9. Single Stage RC coupled BJT Amplifier
10. RC Phase shift Oscillator
11. Astable Multivibrator using BJT
12. Sweep Circuit Using BJT
13. UJT Relaxation Oscillator

## SECTION –II ANALOG IC LAB

1. Measurement of 741 Op-amp parameters - Offset Voltage, CMRR and Slew Rate
2. Inverting and Non Inverting Amplifier
3. Summing and Difference Amplifier
4. Integrating and Differentiating Amplifier

5 First order Low Pass Filter

6. First order High Pass Filter
7. First order Wide Band Pass Filter
8. Narrow Band Reject Filter
9. Wien Bridge Oscillator
10. Square Wave and Triangular Wave Generators
11. 555 IC – Astable Multivibrator
12. Comparators – Inverting and Non Inverting
13. Schmitt Trigger

All the experiments should be carried out compulsorily. For appearing external examination, certified laboratory record should be produced.

| Scheme of Evaluation for External Practical Examination | |
|---|---|
| **Parameter** | **Marks** |
| Circuit diagram & Design | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | 80 |

# SEMESTER IV

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| EL4CRT10 | Programming in C | 4 | | 4 | 20 | 80 |
| EL4CRT11 | Microwave Electronics | 4 | | 4 | 20 | 80 |
| EL4CRT12 | Digital Communication | 4 | | 4 | 20 | 80 |
| EL4CRT13 | Instrumentation Electronics | 4 | | 3 | 20 | 80 |
| EL4CRP04 | Programming in C Lab – Practical | | 5 | 2 | 20 | 80 |
| EL4CRT05 | Microprocessor Lab Practical | | 4 | 2 | 20 | 80 |
| | **Total** | **16** | **9** | **19** | **120** | **480** |

# EL4CRT10 - PROGRAMMING IN C
# SEMESTER IV

**Aim of the course:**
This course introduces the student with high level computer programming concepts and enables the student to acquire sufficient skills for programming in C language.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

## Course outline

**MODULE I (16 hours)**

**Programming Concept**s: Characteristics of Programming, Programming aids- Algorithms, Flow Charts, Programming Techniques – Top down, Bottom up, Modular, Structured and OOP. Programming Logic- Simple, Branching, Looping & Recursion,
**C language basics**: C character set, Identifiers and keywords, Data types, Enumeration type, constants, variables, declarations, qualifiers – long, short and unsigned declarations, expressions, symbolic constants, input/output functions, compound statements, arithmetic operators, unary operators, relational and logical operators, assignment operators, increment and decrement operators, Precedence and order of evaluation, conditional operators, bit operators, type casting

**MODULE II (16 hours)**

**Control flow:** If statement, if….else statement, nested if ..else statement, switch statements, looping – for loop , while loop, do … while statements, nested loop structure, break, continue and go to statements.

**MODULE III (18 hours)**

**Arrays & Strings:** Single dimensional arrays, multidimensional arrays, initializing array using static declaration, Searching and sorting of Arrays, Array of Characters, Character arrays and strings, String handling Functions.
**User Defined Functions**: Function declaration, definition & scope, recursion, Arrays and functions, call by value

**MODULE 4 (18 hours)**

**Structures:** Definition of Structures, declaration, structure passing to functions, array of structures, arrays with in structures, Unions.
**Pointers:** Pointer Definition, pointer arithmetic, array & pointer relationship, call by reference, pointer to array.

**MODULE 5** **(6 hours)**

**Storage class and memory management in C:**
Storage Classes- automatic, external (global), static & registers, typedef statements, Dynamic memory allocation, pre-processors statements, command-line arguments.

**Text book**: Programming in C, Balaguruswamy, 5$^{th}$Edition
**Reference Book:** Programming in C, Schaum's Series

# EL4CRT11 - MICROWAVE ELECTRONICS

## SEMESTER IV

**Aim of the course:**

To equip the student with the theory of wave guides, transmission lines, microwave components, microwave tubes and devices

**Prerequisite:**

Knowledge on Maxwell's equation, Electromagnetic waves and EM wave propagation

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I** **(8 Hours)**

Introduction to microwaves, History, Microwave bands, Advantages of microwaves, Applications of microwaves.

*Chapter 1 - Microwave and Radar Engineering, Dr. M. Kulkarni, 5$^{th}$ Edition, Umesh Publications, Delhi*

**Module II**

**Transmission lines** **(18 Hours)**

Two Wire Transmission lines - Equivalent circuit, Characteristics impedance, reflection Coefficient, Standing waves and VSWR, Losses in transmission lines, Impedance matching, Stub matching. Multiconductor Transmission lines (derivations not required) - coaxial lines- Striplines- Microstrip line – Advantages and disadvantages

*Chapter 3 & 4 - Microwave and Radar Engineering, Dr. M .Kulkarni, 5$^{th}$Edition, Umesh Publications, Delhi*

**Module III** **(16 Hours)**

**Waveguides**

Wave guides – Types - Rectangular waveguides - TE and TM modes of propagation, Cut-off wavelength, Guide wavelength, Group velocity and Phase velocity, Wave Impedance. Dominant mode and degenerate modes (Derivations not required), Power transmission and power losses in rectangular waveguides.

*Chapter 4 - Microwave and Radar Engineering, Dr. M. Kulkarni, 5th Edition, Umesh Publications, Delhi*

**Module IV** **(14 Hours)**

**Microwave components**

Waveguide couplings, Bends and Corners, Taper and Twists, T junctions, Magic Tees, Hybrid rings, Impedance matching and Tuning, Cavity resonators, Directional Couplers, Isolators, Circulators.

*Chapter 12 - Electronic communication Systems- Fifth Edition, Kennedy, Davis & Prasanna, McGraw Hill*

**Module V** **(16 Hours)**

**Microwave Tubes and Devices**

Limitations of vacuum tubes, Transit time effects, Multicavity Klystron – construction and operation, Reflex Klystron – construction and operation, Magnetrons – operation and practical considerations, Traveling Wave Tube - operation, Varactor diodes, Parametric Amplifiers – Fundamentals and Amplification mechanism, Gunn diode, IMPATT diodes, PIN diodes.

*Chapter 13 - Electronic communication Systems- Fifth Edition, Kennedy, Davis & Prasanna, McGraw Hill*

**Text Books:**

1. Microwave and Radar Engineering, Dr. M. Kulkarni, 5th Edition, Umesh Publications, Delhi
2. Electronic communication systems- Fifth Edition, Kennedy, Davis & Prasanna, McGraw Hill

**Reference Books:**

1 Microwave engineering, Annapurna Das and Sisir K Das, 2nd Edition, McGraw Hill
2 Microwave Components and Devices, Samuel Y. Liao

## EL4CRT12 DIGITAL COMMUNICATION

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER V

**Aim of the course:** To equip the student to understand basics of Digital communication **Prerequisite:** Knowledge on Digital electronics

**Hours/Week : 4**
**Contact Hours : 72 hours**
**Credits : 4**

### Course Outline

**Module I** **(12 Hours)**

Information Theory – Concept of information, Communication Channel, Entropy- Shannon's theorem-channel capacity- Bandwidth Considerations –Noise trade off – Analog Vs Digital Communication- Coding scheme- ON-OFF, RZ, NRZ, Bipolar- Manchester signaling and differential coding.

**Module II** **(16 Hours)**

Pulse Digital Modulation:–PCM—Basic blocks- Sampling Theorem – Quantization – Quantization noise, Encoding –Generation and Receiver-Companding- Noise considerations in PCM Systems- -DPCM - Delta modulation –Linear prediction – Adaptive Delta Modulation – multiplexer –TDM

**Module III** **(16Hours)**

Pass band Digital Transmission: Digital bandpass modulation techniques- coherent binary schemes- ASK, FSK, PSK , M array QAM, QPSK , Differential phase shift keying – Pass band Transmission model- Generation, Detection.

**Module IV**

**(14 Hours)**

Spread Spectrum Modulation-Pseudonoise Sequences, a notion on spread spectrum, direct sequence spread spectrum-coherent binary Phase Shift Keying- Frequency hop spread spectrum applications

**Module V**

Mobile Computing Architecture- Internet-the Ubiquitous network, Architecture for Mobile computing, Design Consideration for Mobile Computing, Mobile computing through internet, Mobile computing through telephony

**Text Books:**

1. Digital Communications – Simon Haykins, John Wiley & Sons
2. Communication Systems, Simon Haykins, John Wiley & Sons, Inc., 4th Edition, 2001
3. Principles of Communication, Taub and Schilling
4. Mobile Computing- Technology, Applications and Service Creation: Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Mc Graw Hill Education.

**Reference Books:**

1. Digital Communications Fundamentals and Applications: Bernard Sklar, Person Education, 2nd edition
2. Modern Digital and Analog communication system: B. P. Lathi, Oxford University Press, 3rd edition.

## EL4CRT13 INSTRUMENTATION ELECTRONICS

*(Common to BSc Electronics and BSc Electronics & Computer Maintenance)*

## SEMESTER IV

**Aim of the course:**

This course aims to impart an in-depth knowledge in the field of transducers, Signal Conditioners and electronic instruments.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**Course Outline**

**Module I-Transducers (18 Hours)**

Generalized Measurement systems - Static and dynamic characteristics – Time Domain Analysis Classification of transducers - Resistive, inductive and capacitive transducers - strain gauge and gauge factor, Temperature transducers –RTD, Thermistor, Thermo couples, LVDT, Capacitive transducers-Different Configurations, Piezo-Electric transducers
(Ref 1 Ch 1, 2, 4, 25)

**Module II – Signal Conditioning and Data conversion (14 Hours)**

Bridge measurements – Wheatstone Bridge, Maxwell,(Ref 2 Ch11) Instrumentation Amplifier Chopper amplifiers,(Ref 2. Ch.14)Principle of operation of DAC- Weighted resistor network- Binary Ladder – resolution- linearity offset-principle of operation of ADC- counter method, successive approximation, single slope and dual slope integration, Simultaneous converter.(Ref 3.Ch 12)

**Module III- Electronic Measurements and Display Instruments (14 Hours)**

Digital Multimeter – Block representation- Simple frequency Counter, Cathode ray Oscilloscopes - block schematic - - Storage oscilloscope, Strip chart recorder and X-Y recorders. Flow Metering Electromagnetic flow meter, pH Meter. (Ref 2)

**Module IV - Analyzers and Controllers (14 Hours)**

Signal generators, Simple frequency counter, Wave analyzer, Harmonic distortion analyzer, Spectrum analyzer. Lock in Amplifier, Control Systems open and closed Loop. ON OFF Control, Proportional Control, Programmable Logic Controller, Distributed Control Systems (Ref 2)

**Module V - Data handling (12 Hours)**

Documentation of experiments, Nature and Types of data - typical examples, Data acquisition, Treatment of data, Data interpretation, Significance of Statistical tools in data interpretation, Errors and inaccuracies. Data presentation: graphs, tables, histograms and pi diagrams, Patterns and trends, Publications and Patents (Details not required) Plagiarism. (Ref 4)

**Text Books:**


1. A course in Electrical and Electronics Measurements and Instrumentation, A K Sawhney Dhanpath Rai & Co
2. Electronic Instrumentation – H S Kalsi– TMH
3. Digital Principles and Applications- Donald P Leach TMH
4. The Scientific Endeavour Methodology and Perspectives of Sciences- K. Vijayakumaran Nair, Biju Dharmapalan, Academica Publishers.


**Reference Books:**


1. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice Hall of India, 2nd edn., 2003.
2. Joseph J. Carr, Elements of Electronic Instruments and Measurements.

# EL4CRP04 - PROGRAMMING IN C LAB
# SEMESTER IV

**Aim of the course:**

To introduce computer programming using C language. Also trains students to develop program and to acquire sufficient programming skills.

**Hours/Week : 5**
**Lab Hours : 90**
**Credits : 2**

**List of Programs**

1. Find greatest of two numbers
2. Check odd or even
3. Sum of numbers less than N
4. Generation of Fibonacci series
5. Checking of a prime
6. Prime number series generation
7. Temperature conversion
8. Reversing a given number
9. Checking whether a number is Armstrong or not
10. Addition of all the digits of a given number
11. Roots of quadratic equation
12. Calculator program using switch statement
13. Finding the largest and smallest among a list of numbers
14. Linear searching
15. Sorting a set of numbers in ascending order
16. Sorting in descending order
17. Matrix addition and subtraction
18. Matrix multiplication
19. Check for Identity Matrix
20. Transpose of a matrix
21. Process student's record using a structure to division of pass.
22. Program using Structure variable for storing employee details and to find the employee with highest pay.
23. Finding factorial using recursive function
24. Find the binary equivalent of a given decimal and vice versa
25. Find the number of vowels of a given string
26. Checking of palindrome (for string)

27. Program to copy a string from a source variable to a destination (using no built in library function)
28. Concatenate two string (using no built in library function)
29. Calculation of nCr
30. Greatest of three numbers using pointers.
31. Count of occurrence of a specific number in an array using pointers
32. Swapping (call by value & call by reference)
33. Menu Program using pointers to calculate the area and circumference of a circle

**Note:** 28 programs are to be carried out compulsorily. For appearing external examination, certified laboratory record should be produced.

**Scheme of Evaluation for External Practical Examination**

| **Parameter** | **Marks** |
|---|---|
| Logic (Flowchart/Algorithm | 15 |
| Coding | 25 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

# EL4CRT05 - MICROPROCESSOR LAB

## SEMESTER IV

**Aim of the course:**

To equip the student with a practical knowledge of 8085 programming, its interfacing and applications.

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

**List of Programs**

1. Data transfer using direct and indirect addressing
2. Block data transfer
3. Addition and subtraction of two unsigned numbers.
4. 16 bit addition.
5. Multiplication of two numbers.
6. Multiplication by shift rotate and add method.
7. Division of two numbers.
8. Checking specific bits in a number.
9. Finding the number of negative numbers in a dataset.
10. Finding largest number in a dataset.
11. Finding smallest number in a dataset
12. Sorting in ascending order.
13. Sorting in descending order.
14. BCD addition and subtraction.
15. BCD to HEX conversion
16. Finding the square of a given number.
17. Checking parity of a given number.
18. Waveform generation.
19. Lighting LED with a 1 second delay.
20. Counter to count from 0-99 with a delay.

All the experiments should be compulsorily carried out. For appearing external practical examination, certified record should be produced.

**Scheme of Evaluation for External Practical Examination**

| **Parameter** | **Marks** |
|---|---|
| Logic (Flowchart/Algorithm | 15 |
| Coding | 25 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

# SEMESTER V

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| EL5CRT14 | Microcontrollers and Applications | 4 | | 4 | 20 | 80 |
| EL5CRT15 | Environmental Awareness and E-Waste Management | 4 | | 4 | 20 | 80 |
| EL5CRT16 | Computer Hardware | 4 | | 4 | 20 | 80 |
| EL5CRP06 | Microcontroller Lab – Practical | | 5 | 2 | 20 | 80 |
| EL5CRP07 | Communication Lab – Practical | | 4 | 2 | 20 | 80 |
| EL5OPT01 | Open Course | 4 | | 3 | 20 | 80 |
| | **Total** | **16** | **9** | **19** | **120** | **480** |

## OPEN COURSES

| Semester | Course Title |
|---|---|
| **V** | Computer Assembling |
| **V** | Mechatronics |
| **V** | Electronic Communication |

# EL5CRT14 - MICROCONTROLLERS AND APPLICATIONS

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER V

**Aim of the course:**

To equip the student with the architecture and programming of microcontrollers

**Prerequisite**: Knowledge on Digital Electronics and Microprocessors

**Hours/week: 4**
**Contact Hours: 72**
**Credits: 4**

**Course Outline**

**Module I: Architectural overview of 8051 Microcontroller (14 Hours)**

Functional block diagram of 8051 , Registers in 8051:- accumulator , B register , register bank , program counter, data pointer, PSW register, input/ output register , stack pointer, special function Registers.

Memory organization of 8051:- memory representation, External code memory, External Ram Data memory, internal memory organization program memory.

**Module II: Addressing modes and Instruction set (14 Hours)**

Addressing modes: - direct, indirect, immediate, register, register specific, indexed.
Classification of Instruction: - Arithmetic, logic, data transfer, Boolean, branching instruction.

**Module III: Microcontroller programming**

**(18Hours)**

Assembly language programs: - data transfer operations, 8 bit arithmetic:-addition, subtraction, multiplication, division, swapping.

Introduction to embedded C:-Structure, unions , operators, function , Function parameters , data type, Accessing single bit, Accessing I/o port and SFR, Time delay, bitwise operators, Simple programs .

**Module IV: Peripherals (14Hours)**

An over view of Timer: - Timer/ Counter Mode, TMOD Register, TCON register.

Serial communication: - serial buffer registers, serial control registers. Setting serial port baud rates, writing to serial port , reading the serial port.

Interrupts: - Types of interrupts, interrupt enable register , interrupt priority , interrupt priority register , interfacing LED using interrupt service routine. Design a serial transceiver in embedded C.

**Module V: Interfacing** **(12 Hours)**

Key Board interfacing, Seven Segment interfacing, LCD Display interfacing, A/D and D/A interfacing, Stepper motor interfacing

**Text Books:**


1. Kenneth J Ayala, The 8051 Microcontrollers Architecture, Programming and Applications" IIndEdition, CENGAGE Learning.

2. Mohammed Ali Mazidi, The 8051 Microcontroller and Embedded Systems (using assembly and C) IInd Edition, PEARSON

# EL5CRT15 ENVIRONMENTAL AWARENESS, E-WASTE MANAGEMENT AND HUMAN RIGHTS

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER V

**Aims & Objectives of the course**

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building, and develop positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment and helps to protect the nature and natural resources.
- To help the students in acquiring the basic knowledge about environment and the social norms that provide unity with environmental characteristics and create positive attitude about the environment.
- To impart awareness on, Human rights and E-waste management

**Hours/Week** **4**
**Contact hours** **72**
**Credits** **4**

**Course Outline**

**Module I**

**Unit 1 : Multidisciplinary nature of environmental studies** (**2 Hours)**

Definition, scope and importance Need for public awareness.

**Unit 2 : Natural Resources** **(10 Hours)**

Renewable and non-renewable resources : Natural resources and associated problems.

a) **Forest resources**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced and slides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable life styles.

**Unit 3: Ecosystems** **(6 Hours)**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

**Module II**

**Unit 1: Biodiversity and its conservation** (**8 Hours**)

- Introduction
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

**Unit 2: Environmental Pollution** **(8 Hours)**

Definition

Causes, effects and control measures of: -

a. Air pollution
b. Water pollution
c. Soil pollution
d. Marine pollution
e. Noise pollution
f. Thermal pollution

g. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.

**Unit 3: Social Issues and the Environment (10 Hours)**

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air ( Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

**Module III (10 Hours)**

**E- Waste**

Global E-waste growth- Global and local E-waste definition, Global e-waste/WEEE growth and migration, WEEE/e-waste growth in India, The Hazardous waste rules 2003, The Municipal Solid Wastes Rules 2000

**Text Book:** E-waste: Implications, Regulations and Management in India and Current Global Best Practices, Edited by Rakesh Johri, The Energy and Resources Institute, New Delhi (Chapter 1)

**Module IV (10 Hours)**

**E-Waste Recycling**

Optimal Planning for computer waste, Re-cycling of e-scrap in a global environment-opportunities and challenges, Technologies for recovery of resources from electronic waste.

**Text Book:** E-waste: Implications, Regulations and Management in India and Current Global Best Practices, Edited by Rakesh Johri, The Energy and Resources Institute, New Delhi (Chapter 10,12)

**Module – V** **(8 Hours)**

**Unit 1- Human Rights**– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

**Unit-2 Human Rights and United Nations** – contributions, main human rights related organs - UNESCO,UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

**Human Rights in India** – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

**Unit-3 Environment and Human Rights** - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

**Conservation of natural resources and human rights**: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasturi Rangan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

**Internal: Field study**

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc
  (Field work Equal to 5 lecture hours)

## REFERENCES


1. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
2. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
3. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
4. Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.(Ref)
5. Down to Earth, Centre for Science and Environment (Ref)

6. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
7. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
8. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
9. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
10. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
11. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
12. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
13. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
14. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)
15. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
16. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
17. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)
18. (M) Magazine (R) Reference (TB) Textbook

**Human Rights**

1. Amartya Sen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)
3. Law Relating to Human Rights, Asia Law House,2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt.Ltd, New Delhi,
5. S.K.Khanna, Children And The Human Rights, Common Wealth Publishers,1998. 2011.
6. Sudhir Kapoor, Human Rights in 21st Century,Mangal Deep Publications, Jaipur,2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

# EL5CRT16 - COMPUTER HARDWARE
# SEMESTER V

**Aim of the course:**

To get an in-depth knowledge of computer hardware and hence to create a confidence in using and assembling PC

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (16 Hours)**

System Components: Keyboards-switches, working, interface, connectors, Pointing and positioning devices – Types, construction & working, Wireless input devices, Printers: Dot matrix, Inkjet, Laser , Digital camera, Scanner-types, Monitor-Display specifications, Types. SMPS: types- voltages, UPS, Microprocessor Types-Generation, Processor Specifications, Cache Memory, Processor features, Overclocking,

**Module II (16 Hours)**

Motherboard-Form Factor- Components, Chipsets-Evolution, Architecture, North Bridge/South Bridge Architecture, Hub Architecture, Super I/O chips, System Bus-Types, functions and features, FSB, Memory Bus, I/O Buses, Mother board settings.

**Module III (16 Hours)**

BIOS- Hardware and Software, Motherboard BIOS, ROM Hardware, Shadowing, POST, POST,Post sequence and Flow chart, ROM upgrading/flashing, BIOS Set up, Plug and Play BIOS ,CMOS Batteries , UEFI Memory-Basics, ROM, DRAM, SRAM, RAM Memory Types – SDRAM, DDR-SDRAM, RDRAM- Memory Modules: SIMM, DIMM & RIMM Memory.

**Module IV (14Hours)**

IDE interface- ATA IDE, Serial ATA- SCSI Interface- Hard Disk Drive- Construction and operation, features – Partitioning and Formatting, Optical Storage Devices: CD, DVD, BD, HD DVD, RAID.

**Module V (10 Hours)**

Ports – Serial, COM ports, USB, IEEE-1394(a,b,c), Game/MIDI port, Parallel – LPT1, IEEE-488 (GPIB), IrdA port.AGP.AMR,CNR,OTG,

1. **Text Books:** Upgrading and Repairing PCs, Scot Mueller

2. All About Printers/Keyboards/Mouse, ManaharLotia, BPB Publishers
3. All About Motherboards – Manahar Lotia, BPB Publishers

**Reference Books:**

1. The Indispensable PC Hardware Book, 3rd Edition, Addison Wesley

2. Troubleshooting, Maintenance and Repairing PCs, Stephen Bigelow

# EL5CRP06 - MICROCONTROLLER LAB

## SEMESTER V

**Hours/Week : 5**
**Lab Hours : 90**
**Credits : 2**

### List of Programs

**Part 1:- Assembly language**

1. Addition of 8 bit number
2. Subtraction of 8 bit number
3. Multiplication of 8 bit number
4. Division of 8 bit number
5. Addition of 16 bit number
6. Subtraction of 16 bit data
7. Program for continuously scanning the Port.
8. Generate square wave at port using timer / counter -1 in 8 bit timer mode.
9. Program to get data from Port x and send to Port y.
10. Program using interrupts to start or stop a device
11. ON/OFF control of D.C. Motor using any one bit of port.
12. Program to display a message in LCD

**Part 2:- Embedded C**

1. Multiplication of 16 bit data
2. Find the smallest number from an array
3. Find the largest number from an array
4. Arrange 'n' numbers in ascending order
5. Arrange 'n' numbers in descending order
6. Program to convert hexadecimal data to decimal.
7. Program to generate square wave using port bit.
8. Perform ON/OFF control of an LED using timers.
9. Interfacing stepper motor and perform clock wise and anti-clock wise rotation.
10. Interface DAC to generate staircase wave form
11. ADC interface to measure the temperature.
12. Program to display interrupt status on any one bit of port

Execute any 10 programs from Part 1 and 10 programs from Part 2. A total of 20 programs are to be compulsorily carried out. For appearing external lab examination, certified record should be produced.

## Scheme of Evaluation of External Practical Examination

| **Parameter** | **Marks** |
|---|---|
| Logic (Flowchart/Algorithm | 15 |
| Coding | 25 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

# EL5CRP07 - COMMUNICATION LAB
# SEMESTER V

**Hours/Week** **4**
**Lab Hours** **72**
**Credits** **2**

**List of Experiments**

**Design and Setup of:**

1. Collpitts Oscillator
2. Hartley Oscillator
3. Second order High Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
4. Second order Low Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
5. Second order Band Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
6. Universal Active Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
7. AM Generation using op-amp.
8. AM Generation using emitter modulation.
9. Phase Locked Loop, Determination of lock range and capture range
10. FM Modulation and demodulation using CD4046A
11. PLL characteristics using 565 IC, Design free running frequency
12. Pulse Modulation- PAM-modulation and demodulation (using CD4016).
13. Pulse Modulation -PWM, PPM using op-amp.
14. IF Amplifier
15. Balanced Mixer
16. Opto coupler
17. ASK, PSK, FSK

**Note:** 12 experiments should be compulsorily carried out. For appearing external lab examination, certified record should be produced.

| Scheme of Evaluation for External Practical Examination | |
|---|---|
| **Parameter** | **Marks** |
| Circuit diagram & Design | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | 80 |

# EL5OPT01-OPEN COURSES

## COMPUTER ASSEMBLING

**Aim of the course:**

To get an in-depth knowledge of computer hardware and hence to create a confidence in using and assembling PC

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**Course Outline**

**Unit I**

**Module I**

**(8 Hours)**

Computers: History, PC Components- Hardware and Software, PC Architecture, switches, I/O connectors, input and output devices, pointing and positioning devices, Printers-dot matrix, inkjet, laser, Scanner-types, monitor-types, display specifications, SMPS-types-voltages, UPS, CMOS battery.

**Module II (12 Hours)**

Microprocessor types-generation, Processor Specifications, Processor Sockets and Slots (detailed study not required), Co-Processor, math coprocessor, popular Intel and AMD processors.

**Module III (16 Hours)**

Motherboard- Form Factor- AT, ATX, NLX, WTX, BTX, motherboard Components, Chipsets-North Bridge/South Bridge Architecture, Hub Architecture, Intel i810E Chipset features and architecture, Super I/O chips,Expansion Slots, System Bus-Types, functions and features, FSB, Memory Bus, I/O Bus.

**Unit II**

**Module IV (10 Hours)**

BIOS- Hardware and Software,Errors, Error Indicating Methods Motherboard BIOS, ROM Hardware, Shadowing, POST,Post sequence and Flow chart, ROM upgrading and flashing, Plug and Play BIOS.

**Module V (13 Hours)**

Memory-Basics, ROM, DRAM, Cache Memory: SRAM, RAM Memory Types- FPM, EDO, Burst EDO, SDRAM, DDR-SDRAM, RDRAM, memory modules-SIMM, DIMM & RIMM Memory, memory banks, IDE interface- ATA IDE, Serial ATA- SCSI Interface- Hard Disk Drive- Construction and operation- Formatting & Partitioning, optical storage devices - CD, DVD, blue ray disc.

**Module VI** **(13 Hours)**

OS Concepts- DOS & Windows OS – Features, LINUX OS- Features,

**Text Books**: 1. Upgrading and Repairing PCs – Scot Mueller- Pearson Edn.
2. IBM PC and Clones- Govindarajalu, TMH

**Reference books**: 1.Computer installation and servicing – D. Balasubramanian, McGraw Hill
2. All about motherboard- Manohar Lotia , Bpb publications.

(For getting full advantage of this course a demonstration of the PC peripherals and their installation may be carried out)

## EL5OPT01-OPEN COURSES

## MECHATRONICS

## SEMESTER V

**Aim of the Course:** To study the field of Mechatronics and its applications

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**Module I (12 Hours)**

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach.

**Module II: (16 Hours)**

Review of fundamentals of electronics. Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers, Microprocessors controllers and PLCs.

**Module III: (16 Hours)**

Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, transfer systems.

**Module IV: (16 Hours)**

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps, Design of hydraulic circuits. Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. Description

**Module V: (12 Hours)**

Description of PID controllers, CNC machines and part programming, Industrial robotics.

**Text Books:**

1. HMT ltd. Mechatronics, Tata Mcgraw-Hill, New Delhi, 1988.

2. G.W. Kurtz, J.K. Schueller, P.W. Claar . II, Machine design for mobile and industrial applications, SAE, 1994.
3. T.O. Boucher, Computer automation in manufacturing - an Introduction, Chappman and Hall, 1996.
4. R. Iserman, Mechatronic Systems: Fundamentals, Springer, 1st Edition, 2005
5. Musa Jouaneh, Fundamentals of Mechatronics, 1st Edition, Cengage Learning, 2012.

# EL5OPT01-OPEN COURSES

# ELECTRONIC COMMUNICATION

## SEMESTER V

### UNIT I

Aim of the course:

To enable the student to become an expert in various communication techniques, modulation, concept of digital modulation and data communication

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

### UNIT I

**Module I (18 Hours)**

What is communication, Uses of communication, the structure and types of communication systems, communication systems and data communication

Text book: Chapter 1- Data Communications, William L Scweber, Mc Graw Hill, 1998

The communication channel, electromagnetic wave, frequency and wavelength, the electromagnetic spectrum, bandwidth, bandwidth and channel capacity, bandwidth and distance

Text book: Chapter 2- Data Communications, William L Scweber, Mc Graw Hill, 1998

**Module II (16 Hours)**

Modulation and demodulation, types of modulation, amplitude modulation, frequency modulation, phase modulation

Text book: Chapter3-3.1,3.3,3.4,3.5,3.6- Data Communications, William L Scweber, Mc Graw Hill, 1998

### Unit II

**Module III (12 Hours)**

Multiplexing, space division multiplexing frequency division multiplexing, time division multiplexing

Text book: Chapter 4-4.3, 4.4, 4.5,4.6- Data Communications, William L Scweber, Mc Graw Hill, 1998

**Module IV** **(13 Hours)**

Description of digital systems, advantages of digital systems, role of the medium, wire and cable air and vacuum, fiber optics

Text book: Chapter 5- 5.1, 5.2, 6-6.1, 6.2, 6.3, 6.4 Data Communications, William L Scweber, Mc Graw Hill, 1998

**Module V** **(13 Hours)**

Role of modems, modem functions, operation of a modem, originate and answer connecting the modem to the line, other specialised modems- fiber optic modems, direct connection modems, digital modems

**Text book**: Chapter 10- 10.5, 10.7 Data Communications, William L Scweber, Mc Graw Hill, 1998

**Reference Books**: 1. Electronic communication systems – Kennedy, Davis – Tata Mc Graw Hill

2. Electronic Communications, Roddy & Coolen, Pearson Education 4th Ed.

# SEMESTER VI

| Course Code | Course Title | No. of Hours/week | | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | Theory | Practical | | Int. | Ext. |
| EL6CRT17 | Optoelectronics | 4 | | 4 | 20 | 80 |
| EL6CRT18 | Computer Networks | 5 | | 4 | 20 | 80 |
| EL6CRT19 | Digital Signal Processing | 5 | | 4 | 20 | 80 |
| EL6CBT01 | Choice Based Course | 4 | | 4 | 20 | 80 |
| EL6SMP01 | Presentation Skill Practice | | 2 | 1 | 100 | - |
| EL6PRP01 | Project Lab | | 5 | 3 | 20 | 80 |
| | **Total** | **18** | **7** | **20** | **200** | **400** |

## Choice Based Courses

| Semester | Title of the Course |
|---|---|
| VI | Digital Image Processing |
| VI | Power Electronics |
| VI | Mobile Communication |

# EL6CRT17 - OPTOELECTRONICS

## SEMESTER VI

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Module I** **(20 hours)**

**Light source**
Light amplification- Population inversion- Active medium Pumping – Metastable state-principal pumping schemes -Optical resonant cavity -Types of Lasers –Ruby laser, He-Ne Laser, Nd:YAG Laser Applications

**Module II**

**(15 Hours)**

**Semi-conductor Laser and LEDs**
Principle of diode laser – hetero structure laser diode-laser diode characteristics - laser diode rate equations. Light emitting diodes – principles - device structures - LED characteristics. –DHLED.

**Module III** **(15 Hours)**

**Photo detectors**
Principle of p-n junction photodiode - photodiode materials – quantum efficiency and responsivity – PIN photodiode– avalanche photodiode –phototransistor. Solar energy spectrum -Photovoltaic device principles – I-V characteristics - Solar cell materials, device and efficiencies.

**Module IV** **(15 Hours)**

**Fiber Optics**
Propagation of light in a fiber -acceptance angle numerical aperture –number of modes in a fiber -single and multimode step index fibre –graded index fiber- attenuation- inter modal and intra modal dispersion-waveguide dispersion-application of fiber-optical fiber communication – advantages

**Module V** **(12 Hours)**
**Semiconductor Science and optical modulators**

Direct and indirect band gap semiconductors, p-n junction principles - open circuit-recombination life time. Electro-optic Effects– Pockels effect - Kerr effect, Magneto-optic effect.

**Text Book**: Optical Fiber Communications: Principles and Practice, 3e: Third edition, John M Senior, Pearson Education.

**Reference Books:** 1.Optical Fiber Communication Gerd Keiser, Mc Graw Hill Education, Fifth Edition.

2. Semiconductor Optoelectronics devices – Pallab Bhattacharya, PHI
3. An Introduction to optoelectronics – Wilson & Hawkes, PHI
4. Semiconductor Optoelectronics – Jasprit Singh, TMH

# EL6CRT18 - COMPUTER NETWORKS

## SEMESTER VI

**Aim of the course:** This course aims to give an in-depth knowledge in the field of computer networks and the protocols involved in data communication

**Hours/Week 5**
**Contact Hours : 90 hours**
**Credits 4**

### Course Outline

**Module I (16 Hours)**

Data Communications – characteristics, components, data representation, data flow, Introduction to computer networks –Definition-Basic Concepts - Uses of network-Network structure, OSI model, TCP/IP Protocol Suite.

**Module II (16 Hours)**

Physical Layer and Media, Switching, Circuited switched Networks, Datagram networks, Virtual-circuit networks, Error detection and Correction – Transmission media, Different types of transmission medium-Multiplexing. ISDN

**Module III (20 Hours)**

Data Link Control – Framing, Flow and Error control, Protocols for noiseless channels – Simplest, Stop & Wait, Protocols for noisy channel – Stop & Wait ARQ , Go-Back-N ARQ, Piggybacking, Multiple Access: Random access protocols – ALOHA, CSMA, CSMA/CD, CSMA/CA, IEEE standards 802.3, 802.4 and 802.5., Controlled access protocols – Reservation - Polling – Token passing, Channelization protocols – FDMA, TDMA and CDMA, Wired LANs: Standard Ethernet, Wireless LANs: Bluetooth, Connecting LANs-Connecting devices.

**Module IV (18 Hours)**

Network Layer: Logical Addressing, IPv4 addresses IP FrameFormat,IPv6 Address, Routing – Static and Dynamic Routing, OSPF, Flooding , Distance Vector Routing and Link state routing. Routing Protocols-IRP, ERP

**Module V** **(20 Hours)**

Brief introduction to the transport layer, session layer, presentation layer and application layer-Basic concepts of internet, WWW, E-mail, Websites -:
Transport Layer: Process-to-Process Delivery, UDP, TCP, Congestion and Congestion control – Open loop and Closed loop, Quality of Service, Techniques to improve QoS. Application Layer: Domain Name System, Domain Name Space, Distribution, Remote Logging, Electronic mail, File Transfer Protocol, HTTP, Encryption/Decryption.

**Books for study and reference**


1. Andrew S. Tanenbaum: Computer Networks, PHI
2. William Stallings: Data and Computer Communication, PHI
3. Behrouz and Forouzan: Introduction to Data Communications and Networking, Mc Graw Hill

## EL6CRT19 DIGITAL SIGNAL PROCESSING

## SEMESTER VI

**Objectives:** To study the fundamentals of DFT, Digital filter design and DSP hardware

**Hours/Week : 5**
**Contact hours : 90**
**Credits : 4**

### Course Outline

**Module I (20 Hours)**

Discrete time signals- Sampling, Classification of DT signals, Mathematical operations on Discrete Time signals- DT Systems- Response of DT LTI systems, Linear Convolution Classification. – Difference equation, Impulse response and convolution sum.

**Module II (18 Hours)**

Review of Z-Transforms, FIR and IIR systems, Structures for realization of LTI systems, Structures for IIR systems- Direct form-I, Direct form-II, cascade and Parallel. Structures for realization of FIR systems – Direct form, Cascade form

**Module III (18 Hours)**

Definition of DFT, Inverse DFT, Properties of DFT, Circular convolution, Relation between DFT and Z- Transform, Fast Fourier Transforms (FFT), DIT Radix-2 FFT, DIF Radix-2 FFT.

**Module IV (18 Hours)**

Frequency response of Analog and Digital filters, Impulse invariant transformation, Bilinear Transformation, Design of digital Low pass Butterworth filter.

**Module V (16 Hours)**

Digital Signal Processors – special features, architectures, VLIW architecture, TMS320C5x family of digital signal processors- architecture- functional units Applications of Digital Signal Processing

**Text Books:**

1. Digital Signal Processing, Nagoor Kani, Second Edition, McGraw-Hill Education

**Reference Books:**


1. Alan V. Oppenheim. Ronald W. Schaufcr and John R. Buck. Discrete Time Signal Processing, PHI

2. John G. Proakis and Dimitris G. Manolakis, Digital Signal Processing principle, Algorithms and application 3rd edition Prentice Hall of India Pvt. Ltd 3. Ashok Ambardar-Analog and Digital Signal Processing

## EL6CBT01-CHOICE BASED COURSES

## DIGITAL IMAGE PROCESSING

## SEMESTER VI

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Module I**

**Introduction to digital image processing and fundamentals (10 Hours)**

The Origins of Digital Image Processing, Examples of Fields that Use Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System.

Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Some Basic Relationships Between Pixels, Linear and Nonlinear Operations.

**Module II**

**Image Enhancement in the Spatial Domain (16 Hours)**

Background, Some Basic Gray Level Transformations, Histogram Processing. Enhancement Using Arithmetic/Logic Operations, Basics of Spatial Filtering, Smoothing Spatial Filters, Sharpening Spatial Filters, Combining Spatial Enhancement Methods.

**Module III (16 Hours)**

**Image Enhancement in the Frequency Domain**

Background. Introduction to the Fourier Transform and the Frequency Domain. Smoothing Frequency-Domain Filters. Sharpening Frequency Domain Filters. Homomorphic Filtering. Implementation.

**Module IV (12Hours)**

**Image Restoration**

A Model of the Image Degradation/Restoration Process. Noise Models. Restoration in the Presence of Noise Only-Spatial Filtering. Estimating the Degradation Function. Inverse Filtering. Minimum Mean Square Error (Wiener) Filtering. Constrained Least Squares Filtering. Geometric Mean Filter.

**Module V (16 Hours)**

**Colour Image Processing and Image Compression**
Colour Fundamentals. Colour Models. Pseudocolor Image Processing. Basics of Full-Colour Image Processing.

**Image Compression**
Fundamentals. Image Compression Models. Error-Free Compression. Lossy Compression. Image Compression Standards-JPEG, JPEG 2000

**Text Book:**
Digital Image Processing (3rd Edition), Rafael C Gonzalez and Richard E Woods, Pearson Education

**Reference books:**

1. Fundamentals of Digital Image Processing- Anil K Jain, Pearson Education.
2. Digital Image Processing- S Jayaraman, S Essakirajan, T Veera Kumar- TMH

## EL6CBT01-CHOICE BASED COURSES

## POWER ELECTRONICS

## SEMESTER VI

**Aim of the Course:** To have fundamental knowledge in power devices, circuits and its applications.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (16 Hours)**

**Power Devices**

Introduction, SCR, DIAC and TRIAC – Construction and operation – SCR triggering methods and circuits – series and parallel connections of SCRs – TRIAC triggering circuits. Protection of Thyristors, PUT, GTO, LASCR, Power diode, Power BJT, IGBT, MOSFET– Construction and operation, switching characteristics and applications

(Chapters 2 and 4, Text 1)

**Module II (16 Hours)**

**Controlled rectifiers and Commutation of SCR**

Controlled rectifiers - Principles of phase controlled converters - Half controlled-Semicontrolled - Principles of cycloconverters, Single phase series converter. Introduction to commutation, Class A, B, C, D, E & F (Circuit and explanation only) (Chapters 5 and 6, Text 1)

**Module III (14 Hours)**

**Inverters and AC Voltage Controllers**

Single phase bridge inverter –Half bridge- Full Bridge Inverters (Circuit and Explanation only) Voltage and frequency control of single phase inverters. (Chapter 8, Text 1) AC voltage controller – Principles of ON/OFF control –principle of phase control. (Chapter 11, Text 2)

**Module IV** **(14 Hours)**

**DC Choppers**

Introduction to choppers - principles and control techniques–classification (Chapter 7, Text 1) Switching regulator – Classification- buck regulator, boost regulator (Circuit and Explanation only)(Chapter 5, Text 2)

**Module V** **(12 Hours)**

**Applications of Power Electronics**

Battery charging – illumination control using TRIAC, industrial heating – Electrical welding

**Text Books:**

1. Dr. P. S. Bimbhra, "Power Electronics" Khanna Publishers $4^{th}$ Edition

2. M.H. Rashid," Power Electronics Circuit Devices and Application", Pearson $3^{rd}$ Edition

## EL6CBT01-CHOICE BASED COURSES

## MOBILE COMMUNICATION

## SEMESTER VI

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course outline**

**Unit 1 - Introduction (12 Hours)**

The Cellular Concept – Frequency Usage –Interface and System capacity - Trunking and Grade of service – Improving coverage and capacity in Cellular systems – Advanced mobile phone service - Global System for mobile communication - EIA/T IA IS 136 Digital cellular system – EIA / T IA IS – 95 Digital Cellular system - Cordless telephony and low tier TCS – Third generation wireless system.

**Unit II – Mobility Management**

**(12 Hours)**

Handoff – Roaming management – Handoff detection – Channel Assignment Technique – Radio link transfer IS -41 Network signalling – Inter system handoff and Authentication – PACs Network Signalling – Cellular digital packet data.

**Unit III – GSM (12 Hours)**

GSM network signalling – GSM mobility management – GSM short message service – international roaming for GSM – GSM operation – Administration and maintenance – mobile number – mobile number portability – VoIP service for mobile network

**Unit IV – Wireless Application Protocol (12 Hours)**

WA model – WAP Gateway – WAP Protocol – WAP UAProf and caching – wireless bearer for WAP – WAP developer tool kits – Mobile station application execution environment

**Unit V – Special Topics (12 Hours)**

Third Generation Mobile Service – Wireless local loop – Wireless enterprise networks – Bluetooth technology

**Text book:**

1. YI Bing Lin and Imrich Chlantae, Wireless and Mobile Network Architecture John Wiley, 2006

**Reference Books:**

1. Kauch Pahlavan and Prahant Krishnamoorthy, Principles of Wireless Networks, Learning 2007

2. T.S Rappaport, 'Wireless and Mobile Communication' Pearless Education, 2008

## EL6SMP01 - PRESENTATION SKILL PRACTICE

**Hours/Week : 2**
**Contact Hours : 36**
**Credits : 1**

To excel the presentation skills every student shall present a topic during this semester using ICT based techniques. Students are supposed to take laboratory sessions on DTP, Presentation software to excel in making reports and presentation aids. The topic should match the recent trends in the electronics and allied areas. The reference shall include standard journals, conference proceedings, reputed magazines and textbooks, technical reports and URLs. The references shall be incorporated in the report as per standards. Each student shall do the presentation for about 20 minutes of duration on the selected topic. The report and presentation shall be evaluated by a team of internal experts comprising of 2 teachers based on style of presentation, technical content, adequacy of references, depth of knowledge, impact over the listeners and overall quality of the presentation report.

| **Presentation Skill Practice** | |
|---|---|
| **Component** | **Marks** |
| Style of Presentation | 20 |
| Technical Content | 20 |
| Adequacy of references | 15 |
| Depth of knowledge | 15 |
| Impact over the listeners | 15 |
| Presentation Report | 15 |
| **TOTAL** | **100** |

# EL6PRP01 - PROJECT LAB

## SEMESTER VI

**Hours/Week : 5**
**Contact Hours : 90**
**Credits : 4**

Each batch of students shall develop a project in the project lab under the guidance of faculty members. A batch is defined as strength of 4 to 5 students. The core area of project work includes control, measurement and testing applications based on electronic hardware or/and software which will enable the student to get a thorough knowledge in the frontiers in the Electronics and allied areas.

The implementation phase shall proceed as follows:

For hardware projects, practical verification of the design, PCB design, fabrication, design analysis and testing shall be done. For software projects, a proper front end (GUI), if applicable, shall be designed. A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.

Integration of hardware and software, if applicable, shall be carried out. A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report. The work shall be reviewed and evaluated periodically. The final evaluation of the project shall be done by a team comprising 1 internal examiner and 1 external examiner both appointed by University. The evaluation phase consists of the following.

- Presentation of the work
- Oral examination
- Demonstration of the project against design specifications
- Quality and content of the project report

| **Scheme for External Project Evaluation** | |
|---|---|
| **Component** | **Marks** |
| Presentation of the work and Relevance of the project | 15 |
| Participation in the project | 15 |
| Demonstration of the Project | 10 |
| Quality and content of the Project Report | 10 |
| Course Viva-Voce | 30 |
| **Total** | **80** |

# B. Sc. ELECTRONICS
# AND
# COMPUTER MAINTENANCE PROGRAMME
# (B.Sc. E&CM)
# (MODEL III)

## COURSE – CREDIT – SEMESTER SYSTEM

## 2017 ADMISSION ONWARDS

# 7. B.Sc. ELETRONICS AND COMPUTER MAINTENANCE PROGRAMME: OVERVIEW

The U.G. programme in Electronics & Computer Maintenance include (a) Common Courses, (b) Core Courses, (c) Open Course, (d) Choice Based Course, (e) Complementary Course (f) Project Lab and (g) On The Job Training. No course shall carry more than 4 credits. The student shall select any one Generic Elective Course out of three in the Fifth Semester and any one Choice Based Elective course out of three in the Sixth Semester offered by the Department depending on the availability of teachers and infrastructure facilities in the institution. The number of Courses for the restructured programme should contain Two Common Courses, Twenty two Core Courses (18 Theory and 8 Practical), One Generic Elective course, One Choice Based Course, Four Complementary Courses from the relevant subjects for complementing the core of study, One Project Lab and one 'On The Job Training'.

# 8. B.Sc. E&CM EVALUATION METHODOLOGY.

**8.1** The evaluation of each course shall contain two parts:

(i) Internal or In-Semester Assessment (ISA)

(ii) External or End-Semester Assessment (ESA)

**8.2 EVALUATION OF EXTERNAL AND INTERNAL EXAMINATIONS**

The external theory examination of all semesters shall be conducted by the University at the end of each semester. Internal evaluation is to be done by continuous assessment. For all papers (theory and practical) total marks of external examination is 80 and total marks of internal evaluation is 20.

Marks distribution for external and internal assessments and the components for internal evaluation with their marks are shown below:

**For all theory papers**

a) **Marks of external Examination : 80**

b) **Marks of internal evaluation : 20**

All the three components of the internal assessment are mandatory.

| Components of Internal Evaluation of theory | Marks |
|---|---|
| Attendance | **5** |
| Assignment (one or two) | **5** |
| Test paper(s) (1 or 2) (1x10=10; 2x5=10) | **10** |
| **Total** | **20** |

**For all practical papers**

a) **Marks of external Examination : 80**
b) **Marks of internal evaluation : 20**

All the four components of the internal assessment are mandatory.

| **Components of Internal evaluation of Practical** | **Marks** |
|---|---|
| Attendance | 5 |
| Test paper | 5 |
| Record* | 5 |
| Lab involvement | 5 |
| **Total** | **20** |

*Marks awarded for Record should be related to number of experiments recorded and duly signed by the concerned teacher in charge.

The components for external evaluation of practical depend on the type of practical and are given along with the detailed syllabus.

**For projects**

a) **Marks of external Examination : 80**
b) **Marks of internal evaluation : 20**

During the external evaluation of the project, a course Viva-Voce examination has also to be conducted. The components for external evaluation of project and course Viva-Voce examination are given as:

| **Components of External Evaluation of Project and Course Viva-Voce** | **Marks** |
|---|---|
| Project Evaluation (External) | 50 |
| Course Viva-Voce (External) | 30 |
| **Total** | **80** |

All the four components of the internal assessment for internal evaluation of project are mandatory.

| **Components of Internal Evaluation of Project** | **Marks** |
|---|---|
| Punctuality | **5** |
| Experimentation/Data collection | **5** |
| Knowledge | **5** |
| Report | **5** |
| **Total** | **20** |

| Scheme for External Project Evaluation | |
|---|---|
| **Component** | **Marks** |
| Presentation of the work and Relevance of the project | 15 |
| Participation in the project | 15 |
| Demonstration of the Project | 10 |
| Quality and content of the Project Report | 10 |
| Course Viva-Voce | 30 |
| **Total** | **80** |

**For 'On The Job Training'**

**a) Marks of internal Evaluation : 100**

| Components of On The Job Training | Marks |
|---|---|
| Attendance | 10 |
| Test Paper | 20 |
| Report | 20 |
| Presentation | 20 |
| Viva | 15 |
| Lab involvement | 15 |
| **Total** | **100** |

**Attendance Evaluation**

**For all papers**

| % of attendance | Marks |
|---|---|
| 90 and above | 5 |
| 85 – 89 | 4 |
| 80-84 | 3 |
| 76-79 | 2 |
| 75 | 1 |

(Decimals are to be rounded to the next higher whole number)

**ASSIGNMENTS**

Assignments are to be done for all the Semesters. At least one assignment should be done in each semester for all the theory courses.

**INTERNAL ASSESSMENT TEST PAPERS**

At least one internal test-paper is to be attended in each semester for each paper. The evaluations of all components are to be published and are to be acknowledged by the

candidates. All documents of internal assessments are to be kept in the college for two years and shall be made available for verification by the University. The responsibility of evaluating the internal assessment is vested on the teacher(s), who teach the paper.

# 9. CONSOLIDATED SCHEME FOR ALL SEMESTERS
# BSc (Electronics & Computer Maintenance) – (Model -III)

| Semester | Course Code | Title of the Course | Course Category | No. of hours Per week | No. of Credits | Total hrs/semester | Total Credits |
|---|---|---|---|---|---|---|---|
| 1 | | English – I | Common | 5 | 4 | 90 | 21 |
| | EM1CRT01 | Basic Electronics | Core - I | 4 | 4 | 72 | |
| | EM1CRT02 | Methodology of Science | Core – I | 4 | 4 | 72 | |
| | EM1CRP01 | Basic Electronics Lab – Practical | Core – I | 4 | 2 | 72 | |
| | EM1CRT03 | C Programming | Core - II | 4 | 4 | 72 | |
| | | Mathematics – I | Complementary | 4 | 3 | 72 | |
| 2 | | English – II | Common | 5 | 4 | 90 | 19 |
| | EM2CRT04 | Electronic circuits | Core – I | 4 | 4 | 72 | |
| | EM2CRT05 | Digital Electronics | Core – I | 4 | 4 | 72 | |
| | EM2CRP02 | Digital Electronics Laboratory Practical | Core – I | 4 | 2 | 72 | |
| | EM2CRP03 | C Programming Lab | Core – II | 4 | 2 | 72 | |
| | | Mathematics – II | Complementary | 4 | 3 | 72 | |
| 3 | EM3CRT06 | Analog Communication | Core – I | 4 | 4 | 72 | 21 |
| | EM3CRT07 | Analog ICs and Applications | Core – I | 4 | 4 | 72 | |
| | EM3CRP04 | Analog Electronics Circuits Lab- Practical | Core – I | 4 | 2 | 72 | |
| | EM3CRT08 | Microprocessor Architecture, Programming and applications | Core – I | 4 | 4 | 72 | |
| | EM3CRT09 | Operating system Concepts | Core – II | 4 | 4 | 72 | |
| | | Mathematics- III | Complementary | 5 | 3 | 90 | |

| Semester | Course Code | Title of the Course | Course Category | No. of hours per week | No. of Credits | Total hrs / semester | Total Credits |
|---|---|---|---|---|---|---|---|
| 4 | EM4CRT10 | Digital Communication | Core – I | 4 | 4 | 72 | 20 |
| | EM4CRT11 | Instrumentation Electronics | Core - I | 4 | 4 | 72 | |
| | EM4CRT12 | Fundamentals of Computers | Core – II | 4 | 4 | 72 | |
| | EM4CRP05 | Intel 8085 Assembly language Programming Lab- Practical | Core – II | 5 | 2 | 72 | |
| | EM4OJP01 | On The Job Training | Core | 4 | 3 | 72 | |
| | | Mathematics – IV | Complementary | 4 | 3 | 90 | |
| 5 | EM5CRT13 | Microcontrollers and Applications | Core – I | 4 | 4 | 72 | 19 |
| | EM5CRT14 | Environmental awareness, E-Waste Management and human rights | Core – I | 4 | 4 | 72 | |
| | EM5CRP06 | Communication Lab – Practical | Core – I | 4 | 2 | 72 | |
| | EM5CRT15 | PC Maintenance and Troubleshooting | Core – II | 4 | 4 | 72 | |
| | EM5CRP07 | PC Hardware Lab | Core – II | 5 | 2 | 90 | |
| | EM5OPT01 | Open Course | Core – I | 4 | 3 | 72 | |
| 6 | EM6CRT16 | Computer Networks | Core – I | 5 | 4 | 90 | 20 |
| | EM6CRT17 | Intel 8086 Microprocessor and Programming | Core- II | 4 | 4 | 72 | |
| | EM6CRP08 | Intel 8086 Assembly language Programming Lab | Core- II | 4 | 2 | 72 | |
| | EM6CRT18 | Entrepreneurship Development and marketing | Core – II | 3 | 3 | 54 | |
| | EM6CBT01 | Choice Based Course | Core – I | 4 | 4 | 72 | |
| | EM6PRP01 | Project Lab | Core | 5 | 3 | 90 | |

**EM5OPT01 – Open Courses**

| Semester | Paper Title |
|---|---|
| V | Satellite Communication |
| V | Computer Assembling |
| V | Information Technology |

**EM6CBT01 - Choice Based Courses**

| Semester | Paper Title |
|---|---|
| VI | IC Technology |
| VI | Optoelectronics |
| VI | Mechatronics |
| VI | Advanced Communication Systems |

# 10. DETAILED SYLLABUS
# B.Sc. ELECTRONICS AND COMPUTER MAINTENANCE

## SEMESTER I

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| | Common Course - 1<br>**English - I** | **5** | **4** | **20** | **80** |
| EM1CRT01 | First Core Course – 1<br>**Basic Electronics** | **4** | **4** | **20** | **80** |
| EM1CRT02 | First Core Course – 2<br>**Methodology of Science** | **4** | **4** | **20** | **80** |
| EM1CRP01 | First Core Course Practical -1<br>**Basic Electronics lab** | **4** | **2** | **20** | **80** |
| EM1CRT03 | Second Core Course- 1<br>**C Programming** | **4** | **4** | **20** | **80** |
| | Complementary Course – 1<br>**Mathematics - I** | **4** | **3** | **20** | **80** |
| | **Total** | **25** | **21** | **120** | **480** |

**Common Course - 1**

**ENGLISH - I**

***(Common with English for BA/B.Sc. Programmes)***

**Complementary Course**

**MATHEMATICS 1**

***(Common with Mathematics for B.Sc. Programme in Physics, Chemistry)***

## First Core Course – 1
## EM1CRT01 BASIC ELECTRONICS

***(Common with B.Sc Electronics)***

## SEMESTER I

**Aims and objectives:**

This course aims to get a pre-requisite knowledge on basic electrical technology and to familiarise with basic electronic devices.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I**

**Electricity & Magnetism: (16 Hours)**

Electric charge, Coulomb's Law, Electric Field, Capacitor, Energy stored in a capacitor, Magnetic Field, Magneto Motive Force, Magnetic Field Strength, Reluctance, Electro Magnetic Induction, Self-Induction, Mutual induction, Energy stored in magnetic field.

Ohm's Law, Kirchhoff's Law, Node and Mesh analysis, Series and parallel circuits

**Module II**

Alternating Current: **(14 Hours)**

AC Circuits, Series and Parallel Resonance (Derivations not required), Power factor, Bandwidth and Q factor, Transformer - principle (Equivalent circuit, SC-OC-test not required)

Text book: Electrical Technology Vol. I - B L Theraja

**Module III**

**Diodes: (16 Hours)**

Diodes - Symbol, Forward and Reverse biasing, V-I Characteristics, Shockley's equation, Breakdown mechanisms, Comparison of Si, Ge and GaAs diodes, Diode Equivalent circuits, Transition and Diffusion Capacitance, Mentioning the applications. Zener diode

–Symbol, Operation, V-I characteristics, Equivalent circuits, Mentioning the applications. Light Emitting Diode – Symbol, Operation, Characteristics, Mentioning the applications.

**Text Book:** Electronic Devices – Thomas L. Floyd, Pearson

**Module IV**

**BJT and FET: (14 Hours)**

Bipolar Junction Transistor – Symbol, Structure, Operation, Three Configurations, Input and Output Characteristics, Alpha and Beta, Mentioning the applications.

Field Effect Transistors – Types, Junction Field effect Transistors – Symbolic representation, Constructional features, Operation, Drain and Transfer Characteristics, Shockley's equation, FET parameters. Comparison between BJT and FET, Mentioning the applications.

**Text Books:**

4. Electronic Devices and Circuits- Robert Boylestad, Pearson
5. Electronic Devices – Thomas L. Floyd, Pearson
6. Electronic Principles - Malvino

**Module V**

**Thyristors : (12 hours)**

Unijunction Transistor - Symbolic representation, Constructional features, Equivalent circuit, Intrinsic Stand-off ratio, Principle of operation, Characteristics, Mentioning the applications.

Silicon Controlled Rectifier – Symbolic representation, Principle and Modes of operation, Characteristics, Triggering methods, Two transistor analogy, Mentioning the applications.

**Text Book**: Electronic Devices – Thomas L. Floyd, Pearson

**Reference Books:**

3. Basic Electronics and linear Circuits: B. L. Theraja
4. Thyristor and their applications: M. Ramamoorthi

## First Core Course – 2

## EM1CRT02 METHODOLOGY OF SCIENCE

## SEMESTER I

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

### Course Outline

**Module I (10 Hours)**

Introduction- The History of Science, Philosophy of Science, Origins of Scientific Enquiry, European origins of Science, Contributions of Early India

**Module II (14 Hours)**

Science in the Middle Ages- in Europe, The fall of Aristotelean Universe, Bruno, Copernicus and Galileo, Medical Sciences, Advancement in India, Modern Scientific Outlook, Descartes

**Module III (16 Hours)**

Newton and after: A century of Genius, The Newtonian Synthesis, The Great Contemporaries of Newton, Mathematics, The century after Newton, Industrial revolution and its impact on Science, The Mechanistic Universe and Scientific Determinism.

**Module IV (16 Hours)**

Basic Concepts in the Philosophy of Science- Some Fundamental Questions- Scientific Reasoning, Scientific Explanation, The Components of Science, Realism and Anti Realism, Reductionism and Unity of Science, Some issues in the Philosophy of Science- Scientific Change and Scientific Revolutions, Paradigms and Research Programmes, Research Traditions model, Technologism, Science and Values, Science and Religion, Science and Society

**Module V (16 Hours)**

Electronics-Early Days, Early Electrical Communication- Telegraph, Telephone-Wireless Communication, Modulation- Father of Radio, The Dawn of Electronics- Evolution of Vacuum Tubes, The Electronics Era- Television, Fibre Optics

The Big Break- Semiconductors, Electronics in Medicine, Navigation, The Computer Generations.

**Text Book:** 1. An Introduction to the History and Philosophy of Science, R V G Menon, Pearson India (Module I-IV)

2. The Third Element: A Brief History of Electronics, Alfred Corbin, Author House Publications (Module V)

# Second Core Course - 1
# EM1CRT03 - C PROGRAMMING
# SEMESTER I

**Objectives:**

- To develop computer programming skill in students by familiarizing the basic concepts, methods and applications of programming, types of programming languages and types of software
- To introduce basic features of programming language C and their applications

**Hours/week** **4**
**Contact hours** **72**
**Total Credits:** **4**

**Module I: Introduction** **(18 hrs)**

Concept of Programming Language – high level, low level, assembly language- Concept of System Software – Operating system, Compilers, Interpreters, Assemblers- Concept of Software- Concept of Algorithms and Flowcharts
Keywords, Identifiers, Constants, Punctuators or special symbols, Operators – arithmetic, logical, bitwise, increment, decrement, assignment, Precedence and order of evaluation, arithmetic expressions, conditional expressions

**Module II: Data types and Programming Techniques** **(18 hrs)**

Basic data types – int, float, double and char, Qualifiers-long, short and unsigned declarations
Input and output – character I/O – formatted I/O – printf and scanf functions – data type conversions-type casting- escape characters
Control flow – if statement, if-else and else-if constructs – nested if statements, switch statements – looping - for loop, nested for loops – while and do-while statements, break and continue statements

**Module III: Arrays , Strings and Functions** **(18 hrs)**

Arrays-initializing array elements - multi-dimensional arrays, sorting using arrays. Character arrays and Strings- comparison , string handling functions. Functions-arguments and local variables-declaration-return values-global variables - auto, static, register variables- recursive functions .Structures and unions- typedef statement

**Module IV: Pointers and File Management** **(18 hrs)**

Pointers - Declaration, Initialization, pointer expressions.

Pointers and structures, pointers and functions, pointers and arrays, operations and pointers
File I/O – fopen, fclose and feof functions – stdin, stdout and stderr, random access to files – fseek, ftell and rewind functions
Preprocessor directives – define, include, if and undef statements – command line arguments –exit function – goto statement – null statement – dynamic memory allocation – sizeof operator

**Text Book:**

1. Programming with C, Byron S. Gottfried (Schaum Series)

**Reference Books:**

1. Computer Programming in C, Kernigan and Ritchie
2. Programming in ANSI C, E. Balagurusamy
3. Let us C, Yashwant Kanetkar

# EM1CRP01 BASIC ELECTRONICS LABORATORY

***(Common with BSc Electronics)***

## SEMESTER I

**Aims and objectives:**

3. To get a basic knowledge on Electronic components and their characteristics
4. To get a basic knowledge on Logic gates and truth tables.

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

**List of Experiments:**

l. Study of Passive and Active components - Colour coding, Terminal identification, Testing
2. Study of CRO and Function generators
3. Study of Multimeters - Analog and Digital
4. Soldering Practice, PCB design, Circuit design and Fabrication (Not to be asked for Practical Examination)
5. Verification of Ohm's law
6. Rectifier Diode Characteristics - Si and Ge (Knee voltage, Static & Dynamic resistances)
7. Zener Diode - Forward and Reverse Characteristics (Knee voltage, Static resistance & Dynamic resistance, Reverse break down voltage)
8. LED Characteristics (Knee voltage, Static & Dynamic resistances)
9. CB Input Characteristics
10. CB Output Characteristics
11. CE Input Characteristics
12. CE Output Characteristics
13. CC Input Characteristics
14. CC Output Characteristics
15. FET Drain & Transfer Characteristics (Determination of $r_d$, $g_m$ and $\mu$)
16. UJT Characteristics
17. SCR Characteristics

14 Experiments should be compulsorily carried out. For appearing external examination, certified laboratory record should be produced.

**Scheme of Evaluation of External Practical Examination**

| Parameter | Marks |
|---|---|
| Circuit diagram & Proper labelling | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | **80** |

# SEMESTER II

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| | Common Course - 1<br>**English – II** | **5** | **4** | **20** | **80** |
| EM2CRT04 | First Core Course – **3**<br>**Electronic Circuits** | **4** | **4** | **20** | **80** |
| EM2CRT05 | First Core Course – **4**<br>**Digital Electronics** | **4** | **4** | **20** | **80** |
| EM2CRP02 | First Core Course Practical -2<br>**Digital Electronics lab** | **4** | **2** | **20** | **80** |
| EM2CRP03 | Second Core Course Practical - 1<br>**C Programming Lab** | **4** | **2** | **20** | **80** |
| | Complementary Course – 1<br>**Mathematics - I** | **4** | **3** | **20** | **80** |
| | **Total** | **25** | **19** | **120** | **480** |

## Common Course – 2
## ENGLISH - II
***(Common with English for BA/B.Sc. Programmes)***

## Complementary Course – 2
## MATHEMATICS II
***(Common with Mathematics for B.Sc. Programme in Physics, Chemistry)***

## First Core Course – 3

## EM2CRT04 - ELECTRONIC CIRCUITS

*(Common with BSc Electronics )*

## SEMESTER II

**Aims and Objectives**

To equip the students with circuit level application concepts of electronic devices.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I** **(15 hours)**

**Regulated Power Supply**
Basic Concept of Regulated Power Supply - Block Diagram, Different Types of Rectifiers- HWR, FWR and Bridge Rectifier, Derivation of Ripple Factor-General Filter Considerations- Types of Filters -RC, LC, CLC, Zener Diode Voltage Regulator, Line and Load Regulation.
**Text Book**: Electronic Devices and Circuits- Allen Mottershed

**Module II** **(15 hours)**
**Amplifiers**
BJT Amplifier- Different Biasing Circuits - Bias Stabilization, Thermal Run away, Hybrid Parameter Analysis-input Impedance, Output Impedance, Voltage gain, Current Gain(Derivations not required) -RC Coupled Amplifier - Frequency Response - Concept of Gain-Bandwidth Product -Emitter Follower
FET Amplifiers – Operation - Comparison of BJT and FET amplifiers
**Text Book**: Electronic Devices and Circuits, Robert Boylestad

**Module III**
**Feedback Amplifier** **(18 hours)**

Concept of Positive and Negative Feedback in Amplifiers - Characteristics of Negative Feedback Amplifiers -Types of Feedback- Feedback Amplifiers - Current Series and Voltages Series BJT Amplifier Circuits
**Text Books**: 1. Electronic Devices and Circuits- Robert Boylestad
2. Electronic Devices and Circuits- Allen Mottershed

**Module IV**

**Oscillators** **(12 hours)**

Principle of Sinusoidal Oscillators - Barkhausen Criteria, Sinusoidal Oscillators - RC, LC & Crystal Oscillators -Typical Circuits - Frequency of Oscillation (Derivation Not required)

**Text Book**: 1. Electronic Devices and Circuits- Robert Boylestad
2. Electronic Devices and Circuits- Allen Mottershed

**Large Signal Amplifiers**

Power Amplification - Class A, Class B, Class C Operations – Distortion - Crossover and Harmonic Distortions - Push-Pull Amplifier Circuit, Complementary Symmetry Push-Pull Circuit.

**Text Books:** 1. Basic Electronics, N. N. Barghava
2. Electronic Devices and Circuits, Boylested

**Module V** **(12 hours)**

**Wave Shaping Circuits** – Clipping – Clamping, RC Differentiator and Integrator using passive components, Multivibrators - Typical Circuits - Astable- Monostable and Bistable Circuits. Wave Forms, expression for Period (Derivation Not Required).

**Text Books:** 1. Electronic Devices and Circuits, Boylested
2. Functional Electronics, Ramanan

## First Core Course – 4

## EM2CRT05 DIGITAL ELECTRONICS

*(Common with BSc Electronics )*

## SEMESTER II

**Aim of the course:**

To equip the students with the concepts of Boolean algebra, digital logic gates, combinational and sequential digital circuits

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 4**

**UNIT I**

**Module I (12 hours)**

Review of number system, binary, octal, hexa-decimal addition and subtraction using 1's complement and 2's complement and coding-BCD- excess3, Gray, Hamming - logic gates - different types - logic operations - symbols - truth table and applications

**Module II (12 hours)**

Boolean operation - Boolean expression - laws and rules – Demorgan's theorem - Simplification using K-map (upto 4 variables) -- SOP and POS expressions.

**Module III (12 hours)**

Logic families - TTL, ECL gates - comparison - Types of TTL gates - Transfer characteristics - properties.

UNIT II

**Module IV (12 hours)**

Adders - comparators - subtractors - decoders - encoders - code converters-Gray to Binary and Binary to Gray, BCD to Binary and Binary to BCD, excess3 to Binary, Binary to excess-3, Binary to seven segment LED, BCD to Seven segment LED- multiplexers - demultiplexers - parity generators/ checkers.

**Module V (8 hours)**

Latches and its types – flip-flops – types- SR, D, JK, T - edge triggered - master slave characteristics, execution table of JK flip-flop. Shift registers - serial/parallel - data transfers, timing diagrams, ring counter, Johnson counter and applicatons.

**Module VI (16 hours)**

Counters – design of asynchronous/synchronous up/down counter- timing diagram, design of asynchronous/synchronous up/down decade counter- timing diagram, sequences generators - applications. .

**Text Book:**

1. Digital fundamentals - Thomas Floyd

**References:**

2. Digital Principles - Malvino
3. Digital Integrated circuits - Taub and Schilling
3. Digital Circuits and Design, Salivahanan. S. Vikas Publishing Hosue.
4. Roth CH, Fundamentals of logic design, Jaico.
5. Digital Design - Basic concepts and Principles - Mohammed A Karim and Xinghao Chen - CRC Press.

# EL2CRP02 DIGITAL ELECTRONICS LAB

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER II

**Aim of the course:**

To equip the student with expert in handling digital ICs, logic gates, and digital circuit designing

**Hours/Week : 4**
**Lab Hours : 72**
**Credits : 2**

### List of Experiments

1. Familiarization of Logic Gates 7400, 7402, 7408, 7410, 7411, 7432, 7496
2. Realization of all Basic gates using NAND and NOR
3. Half Adder
4. Half Adder using NAND gates only
5. Full Adder
6. Full Adder using NAND gates only
7. Full Adder using two half adders
8. Two bit comparator (greater than, less than, equal)
9. Realization of multiplexer using gates
10. Realization of demultiplexer using gates
11. Realization of decoder using gates
12. Gray code to binary converter and binary to gray code converter
13. Binary to excess-3 code converter and excsee-3 to binary code converter
14. Parity Generators and parity Checkers
15. Familiarization of flip-flops 7473, 7476
16. Shift register- SIPO, SISO, PISO, PIPO
17. Ring counter
18. Johnson Counter
19. Asynchronous UP/DOWN counters
20. Synchronous UP/DOWN counters
21. Asynchronous UP/DOWN decade counter
22. Synchronous UP/DOWN decade counter
23. Sequence Generator

20 experiments should be compulsorily carried out. For appearing external examination, certified laboratory record should be produced.

**Scheme of Evaluation for External Practical Examination**

| **Parameter** | **Marks** |
|---|---|
| Circuit diagram & Proper labelling | 20 |
| Theory, Design, Truth Table, Procedure & Tabular columns | 10 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | **80** |

## Second Core Course Practical - 1
## EM2CRP03 - C PROGRAMMING LAB

**Objective:** To develop programming skill in C language

**Hours/Week** **4**

**Practical Hours** **: 72 hrs**

**Credits** **2**

**List of Programs**

*Programs showing the application of*

1. Formatted input/ output using printf and scanf functions
2. C expressions using various operators
3. Symbolic constants and const modifier
4. Type-casting
5. Control structures – simple if, if-else, else-if, nested if, switch
6. Looping statements – for loop, while loop, do-while loop
7. Jump statements – break and continue
8. Arrays
9. Functions
10. Structures and unions
11. Pointers
12. Dynamic memory allocation
13. Files
14. Command line arguments
15. Preprocessor Directives

All the experiments are compulsorily to be carried out. For appearing external examination, certified laboratory record should be produced.

| **Scheme of Evaluation of External Practical Examination** | |
|---|---|
| **Parameter** | **Marks** |
| Logic (Flowchart/Algorithm | 20 |
| Coding | 20 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

## SEMESTER III

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| EM3CRT06 | First Core Course – **5**<br>**Analog Communication** | **4** | **4** | **20** | **80** |
| EM3CRT07 | First Core Course – **6**<br>**Analog IC's and Applications** | **4** | **4** | **20** | **80** |
| EM3CRP04 | First Core Course Practical -3<br>**Analog Electronics Circuits lab** | **5** | **2** | **20** | **80** |
| EM3CRT08 | Second Core Course -2<br>**Microprocessor, Architecture, Programming and Applications** | **4** | **4** | **20** | **80** |
| EM3CRT09 | Second Core Course- 3<br>**Operating System Concepts** | **4** | **4** | **20** | **80** |
| | Complementary Course – 1<br>**Mathematics - I** | **4** | **3** | **20** | **80** |
| | **Total** | **25** | **21** | **120** | **480** |

## Complementary Course - 3
## MATHEMATICS - III
## SEMESTER III

**(*Common with Mathematics for B.Sc. Programme in Physics, Chemistry*)**

## First Core Course – 5
## EM3CRT06 ANALOG COMMUNICATION

***(Common with BSc Electronics )***

## SEMESTER III

**Aim of the course:**

To get a thorough knowledge of modulation and analog communication techniques

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I** **(14 hours)**

Communication Systems - Modulation – Need for modulation - External noise, Internal noise, Shot noise, Transit Time noise, Signal-to-Noise Ratio, Noise Figure. Amplitude Modulation- Frequency spectrum of AM wave – Representation of AM wave, Power relation in AM wave, Generation of AM, Basic requirements.

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 2-6, 15-21,25, 35-46

**Module II**

**(14 Hours)**

SSB Techniques – Evolution and description of SSB, Suppression of Carrier, Balanced Modulator, Suppression of unwanted Side band- Filter system, Phase shift method, Third method, Extensions of SSB-Pilot carrier systems, ISB and VSB.

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 57-75

**Module III** **(14 Hours)**

Frequency Modulation – Theory of Frequency and Phase modulation, Description of system, Mathematical representation of FM, Phase Modulation-Inter system comparison, Noise in FM (qualitative treatment only), Pre-emphasis, De-emphasis, Adjacent channel and Co-channel interference, Comparison of Wide band and Narrow band FM.

**Text book:** Electronic Communication Systems - Kennedy and Davis, pp 79-84, 89-98

**Module IV** **(14 Hours)**

FM Generation and Detection: Generation of FM – Direct method: Basic reactance modulator, Varactor diode modulator - Stabilized reactance modulator- Armstrong Frequency modulation system (Indirect method), FM demodulators - Slope detection, Balanced Slope detector, Phase discriminator

**Text book**: Electronic Communication Systems - Kennedy and Davis, pp 100-112, 162-171

**Module V** **(16 Hours)**

Radio receivers: Receivers Types, TRF Superheterodyne receiver, Sensitivity, Selectivity, Image frequency and its rejection, Double spotting, Superheterodyne tracking, local oscillator, Factors influencing the choice of Intermediate frequency, Diode Detector, AGC, AFC, Diversity reception, Super heterodyne FM receivers.

**Text book**:

Electronic Communication Systems - Kennedy and Davis , pp 118-128, 131-135, 136-138, 144-145, 149, 158-159, 162-165,169-171.

**Reference Book:**

Electronic Communication – Roody and Coolen- PHI

## First Core Course – 6
## EM3CRT07 ANALOG ICs & APPLICATIONS
***(Common with BSc Electronics )***

## SEMESTER III

**Aim of the course:**
To get a thorough knowledge of analog ICs

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module 1: Introduction (14 Hours)**

Integrated Circuits, Types of ICs, Development of ICs – SSI, MSI, LSI, VLSI packages, IC package types, Pin identification and temperature ranges , Device identification, Power supplies for ICs. Differential amplifier circuit configurations -DC and AC analysis

**Module II: Operational Amplifiers (15 Hours)**

Block diagram representation of a typical op-amp – schematic symbol - A general purpose IC Op amp – IC 741 and its features, Op-Amp parameters - input offset voltage and current, input bias current, differential input resistance, output resistance, output voltage swing, common mode rejection ratio (CMMR), slew rate and gain-bandwidth product, ideal and practical op-amps – Equivalent circuit of an op-amp, Open-loop op-amp configurations, Frequency response of an op-amp.

**Text Book :** Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad – Chapters 1, 2, 3

**Module III: Op Amp Circuits (15 Hours)**

Closed-loop non-inverting and inverting amplifiers – measurement of closed-loop voltage gain, differential input voltage, input resistance, output resistance, bandwidth and total output offset voltage, Voltage follower, Differential amplifier with one op-amp, two op-amps and three op-amps – measurement of voltage gain, Instrumentation amplifier, Summing, Scaling and averaging amplifiers – output voltage, Current to voltage and Voltage to current converters, Integrator, Differentiator, Comparators – Basic comparator, Zero-crossing detector, Schmitt trigger.

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad–Chapters 4, 7, 9

**Module IV: Oscillators** **(14 Hours)**

Oscillators – Principles – Types – Frequency stability, Sine wave oscillators - Phase shift oscillator and Wien bridge oscillator, Design of sine wave oscillators, Square wave generator, Triangular wave generator, Sawtooth wave generator, Voltage controlled oscillator - IC 566 .

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad–Chapter 8

**Module V: Timers, Phase locked loops and Voltage Regulators** **(14 Hours)**

Introduction to 555 timer - Functional diagram, Monostable and Astable operations and applications, PLL – Operating principles, Monolithic PLLs, 565 PLL, PLL as frequency multiplier. Voltage Regulators, Types - Fixed voltage regulators, Adjustable voltage regulators, Switching regulators, Special regulators, Three terminal regulator ICs like 78xx , 79xx series and LM317.

**Text Book**: Op Amps and Linear Integrated Circuits by Ramakant A Gayakwad-Chapter10

**Reference Books**:

1. Integrated Electronics by Jacob Millman& C CHalkias (Tata McGraw Hill).
4. Electronic Devices and Circuits by Allan Mottershed PHI

5. Integrated Circuits by Botkar

## Second Core Course - 2

## EM4CRT08 - MICROPROCESSOR ARCHITECTURE, PROGRAMMING AND APPLICATIONS

## SEMESTER III

**Aim of the course:**

This course aims to give a strong background about microprocessor Intel 8085 and to develop skill in assembly level programming

**Hours/Week** **4**
**Contact hours** **72**
**Credits** **4**

**Course outline**

**Module I** **(18 hrs)**

Microprocessor Architecture and its operations, Memory, Input/ Output devices, Example of a microcomputer system, Logic devices for interfacing

Intel 8085 Microprocessor - Architecture and memory interfacing, SDK-85 memory system

Interfacing I/O Devices- basic interfacing concepts, interfacing output displays, interfacing input devices, memory-mapped I/O and peripheral I/O.

**Module II** **(18 hrs)**

The 8085 programming model, Instruction classification, Instruction, Data format and storage, Overview of Intel 8085 Instruction set

Intel 8085 Instructions- data transfer/copy operations, arithmetic operations, logic operations, branch operations, Writing assembly language programs, Debugging a program

Programming Techniques – Looping, Counting and Indexing, Additional data transfer and 16-bit arithmetic instructions, arithmetic operations related to memory, logic operations - rotate, compare, Dynamic debugging.

**Module III** **(18 hrs)**

Counters and Time Delays – illustrative programs – hexadecimal counter, modulo-ten counter, illustrative program for generating pulse waveforms, debugging counter and time delay programs

Stack and Subroutines, conditional call and return instructions, advanced subroutine concepts.

**Module IV** **(18 hrs)**

The Intel 8085 Interrupts- vectored interrupts, restart as software instructions, additional I/O concepts and processes

Basic concepts in serial I/O, software-controlled asynchronous serial I/O, the Intel 8085 –Serial I/O lines – SOD and SID, hardware-controlled serial I/O using programmable chips

**Text Book:**

Microprocessor Architecture, Programming and Applications, Ramesh S. Gaonkar (Penram International)

**Reference Books:**

1. Fundamentals of Microprocessors and Microcomputers, B. Ram (Dhanpatrai Publications)
2. Introduction to Microprocessors, A.P. Mathur (TMH)

## Second Core Course - 3
## EM3CRT09 - OPERATING SYSTEM CONCEPTS
## SEMESTER III

**Aim of the course:**

To provide an in- depth knowledge of operating system, its functioning and its need in a computer system.

**Hours/Week** **4**
**Contact hours** **72**
**Credits** **4**

**Course outline**

**Module 1 Overview** **(16 hrs)**

Definition- Functions- OS as Resource Manager, Types – Structure- Concept of Batch processing, multi-programming, multi-user Systems and Real-time system, Multiprocessor Systems.

Operating system structures- system components-Operating –system services- system calls-system programs –system structure-virtual machines.

**Module 2 Process Management** **(20 hrs)**

Process concept-Process scheduling- Operations on Processes.

CPU Scheduling - Basic concepts - Scheduling criteria - Scheduling Algorithms.

**Deadlocks** – The deadlock problem, deadlock characterization, Resource allocation graph, deadlock prevention, deadlock avoidance, deadlock detection, Recovery from deadlock

**Module 3 Storage Management** **(18hrs)**

Memory Management **–** Background, Swapping, Contiguous memory allocation , Paging, Segmentation, Segmentation with paging.

**Virtual Memory:** Demand Paging, Performance of Demand Paging, Page Replacement, Page Replacement Algorithms – FIFO, Optimal replacement, Least Recently used, LRU Approximation

**Module 4 File System Interface** **(18hrs)**

File Concept – Access Methods – Directory Structure- Protection

File System Implementation – File system structure – Directory Implementation – Allocation Methods – Free space management- Recovery.

**Text Book:**

1. Operating System Concepts (Sixth Edition) – James. L. Peterson, Abraham Silberschatz (Addition Wesley Publishing Co.)

**Reference Books:**

1. Modern Operating System, Andrew S. Tanenbaum
2. Operating System , Galvin and Silberzchatz

## First Core Course Practical - 3

## EM3CRP04 ANALOG ELECTRONICS CIRCUIT LABORATORY

### SECTION-I CIRCUITS LAB

**Hours/Week** **5**
**Contact hours** **90**
**Credits** **2**

1. Half wave rectifier
2. Full Wave rectifier
3. Bridge Rectifier
4. Capacitor Filter
5. Inductor Filter
6. Zener Voltage Regulator
7. Clipping circuits
8. Clamping circuits
9. Single Stage RC coupled BJT Amplifier
10. RC Phase shift Oscillator
11. Astable Multivibrator using BJT
12. Sweep Circuit Using BJT
13. UJT Relaxation Oscillator

### SECTION –II ANALOG IC LAB

1. Measurement of 741 Op-amp parameters - Offset Voltage, CMRR and Slew Rate
2. Inverting and Non Inverting Amplifier
3. Summing and Difference Amplifier
4. Integrating and Differentiating Amplifier
5. First order Low Pass Filter
6. First order High Pass Filter
7. First order Wide Band Pass Filter
8. Narrow Band Reject Filter
9. Wien Bridge Oscillator
10. Square Wave and Triangular Wave Generators
11. 555 IC – Astable Multivibrator
12. Comparators – Inverting and Non Inverting
13. Schmitt Trigger

All the experiments should be carried out compulsorily. For appearing external examination, certified laboratory record should be produced.

| Scheme of Evaluation for External Practical Examination | |
|---|---|
| **Parameter** | **Marks** |
| Circuit diagram & Design | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | 80 |

# SEMESTER IV

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| EM4CRT10 | First Core Course – **7** **Digital Communication** | **4** | **4** | **20** | **80** |
| EM4CRT11 | First Core Course – **8** **Instrumentation Electronics** | **4** | **4** | **20** | **80** |
| EM4CRP05 | Second Core Course Practical -2 **Intel 8085 Assembly language Lab** | **5** | **2** | **20** | **80** |
| EM4OJP01 | On the Job Training | **4** | **3** | **20** | **80** |
| EM4CRT12 | Second Core Course- 3 **Fundamentals of Computers** | **4** | **4** | **20** | **80** |
| | Complementary Course – 4 **Mathematics - IV** | **4** | **3** | **20** | **80** |
| | **Total** | **25** | **20** | **120** | **480** |

## Complementary Course - 4
## MATHEMATICS - IV
## SEMESTER IV
**(*Common with Mathematics for B.Sc. Programme in Physics, Chemistry*)**

## First Core Course – 7
## EM4CRT10 DIGITAL COMMUNICATION
***(Common to BSc Electronics )***

## SEMESTER V

**Aim of the course:** To equip the student to understand basics of Digital communication **Prerequisite:** Knowledge on Digital electronics

**Hours/Week : 4**
**Contact Hours : 72 hours**
**Credits : 4**

### Course Outline

**Module I** **(12 Hours)**

Information Theory – Concept of information, Communication Channel, Entropy- Shannon's theorem-channel capacity- Bandwidth Considerations –Noise trade off – Analog Vs Digital Communication- Coding scheme- ON-OFF, RZ, NRZ, Bipolar- Manchester signaling and differential coding.

**Module II** **(16 Hours)**

Pulse Digital Modulation:–PCM—Basic blocks- Sampling Theorem – Quantization – Quantization noise, Encoding –Generation and Receiver-Companding- Noise considerations in PCM Systems- -DPCM - Delta modulation –Linear prediction – Adaptive Delta Modulation – multiplexer –TDM

**Module III** **(16Hours)**

Pass band Digital Transmission: Digital bandpass modulation techniques- coherent binary schemes- ASK, FSK, PSK , M array QAM, QPSK , Differential phase shift keying – Pass band Transmission model- Generation, Detection.

**Module IV**

**(14 Hours)**

Spread Spectrum Modulation-Pseudonoise Sequences, a notion on spread spectrum, direct sequence spread spectrum-coherent binary Phase Shift Keying- Frequency hop spread spectrum applications

**Module V**

Mobile Computing Architecture- Internet-the Ubiquitous network, Architecture for Mobile computing, Design Consideration for Mobile Computing, Mobile computing through internet, Mobile computing through telephony

**Text Books:**

5. Digital Communications – Simon Haykins, John Wiley & Sons
6. Communication Systems, Simon Haykins, John Wiley & Sons, Inc., 4th Edition, 2001
7. Principles of Communication, Taub and Schilling
8. Mobile Computing- Technology, Applications and Service Creation: Asoke K Talukder, Hasan Ahmed, Roopa R Yavagal, Mc Graw Hill Education.

**Reference Books:**

3. Digital Communications Fundamentals and Applications: Bernard Sklar, Person Education, 2nd edition
4. Modern Digital and Analog communication system: B. P. Lathi, Oxford University Press, 3rd edition.

## First Core Course – 8

## EM4CRT11 INSTRUMENTATION ELECTRONICS

*(Common with BSc Electronics )*

## SEMESTER IV

**Aim of the course:**

This course aims to impart an in-depth knowledge in the field of transducers, Signal Conditioners and electronic instruments.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I-Transducers (18 Hours)**

Generalized Measurement systems - Static and dynamic characteristics – Time Domain Analysis Classification of transducers - Resistive, inductive and capacitive transducers - strain gauge and gauge factor, Temperature transducers –RTD, Thermistor, Thermo couples, LVDT, Capacitive transducers-Different Configurations, Piezo-Electric transducers
(Ref 1 Ch 1, 2, 4, 25)

**Module II – Signal Conditioning and Data conversion (14 Hours)**

Bridge measurements – Wheatstone Bridge, Maxwell,(Ref 2 Ch11) Instrumentation Amplifier Chopper amplifiers,(Ref 2. Ch.14)Principle of operation of DAC- Weighted resistor network- Binary Ladder – resolution- linearity offset-principle of operation of ADC- counter method, successive approximation, single slope and dual slope integration, Simultaneous converter.(Ref 3.Ch 12)

**Module III- Electronic Measurements and Display Instruments (14 Hours)**

Digital Multimeter – Block representation- Simple frequency Counter, Cathode ray Oscilloscopes - block schematic - - Storage oscilloscope, Strip chart recorder and X-Y recorders. Flow Metering Electromagnetic flow meter, pH Meter. (Ref 2)

**Module IV - Analyzers and Controllers (14 Hours)**

Signal generators, Simple frequency counter, Wave analyzer, Harmonic distortion analyzer, Spectrum analyzer. Lock in Amplifier, Control Systems open and closed Loop. ON OFF Control, Proportional Control, Programmable Logic Controller, Distributed Control Systems (Ref 2)

**Module V - Data handling (12 Hours)**

Documentation of experiments, Nature and Types of data - typical examples, Data acquisition, Treatment of data, Data interpretation, Significance of Statistical tools in data interpretation, Errors and inaccuracies. Data presentation: graphs, tables,

histograms and pi diagrams, Patterns and trends, Publications and Patents (Details not required) Plagiarism. (Ref 4)

**Text Books:**


5. A course in Electrical and Electronics Measurements and Instrumentation, A K Sawhney Dhanpath Rai & Co
6. Electronic Instrumentation – H S Kalsi– TMH
7. Digital Principles and Applications- Donald P Leach TMH
8. The Scientific Endeavour Methodology and Perspectives of Sciences- K. Vijayakumaran Nair, Biju Dharmapalan, Academica Publishers.


**Reference Books:**


3. Alan. S. Morris, Principles of Measurements and Instrumentation, Prentice Hall of India, 2nd edn., 2003.
4. Joseph J. Carr, Elements of Electronic Instruments and Measurements.

## Second Core Course - 4
## EM4CRT12 - FUNDAMENTALS OF COMPUTERS
## SEMESTER IV

**Aim of the course:**
This course aims to impart detailed knowledge on the functional hardware units of the computer

**Hours/Week 4**
**Contact hours : 72 hours**
**Credits 4**

### Course Outline

**Module I Introduction to Computer & Processing Unit (18 hrs)**

Functional units of a computer – input unit, memory unit, arithmetic and logic unit, output unit, control unit – Basic operational concepts, Bus structures.
Fundamental concepts- register transfers, performing an arithmetic or logic operation, fetching a word from memory, storing a word in memory, Execution of a complete instruction, Branch instructions.

**Module II Input /Output Organization (18 hrs)**

Accessing I/O devices, Interrupts – Interrupt hardware, Enabling and disabling of Interrupts – Handling multiple devices, Buses – synchronous and asynchronous, Interface circuits-parallel port, serial port

**Module III Storage Devices (18 hrs)**

Hard Disk – HDD components – disk platter, Read/Write Head, head arm/head slider, spindle motor, logic board, air filter, head actuator mechanism
Disk Geometry –Sides or heads, track, cylinder, sectors
Disk Recording – Data Recording Method, Writing on and Reading from a magnetic disk
Data Encoding Methods – FM, MFM and RLL encoding scheme, Interleave, Skew
Hard disk Interfacing – IDE, SCSI controllers
Hard Disk Formatting – Low level and high level formatting
Other Secondary storage devices- Floppy Disks, CD-ROM, CD-R, CD-RW, DVD

**Module IV Memory Organization (18 hrs)**

Memory systems – Basic concepts, Internal organization of memory chips, cache memory – mapping functions – direct mapping, associative mapping, set-associative mapping, Virtual memory –organization, address translation
Memory: RAM – SRAM, DRAM., EDO DRAM, SDRAM, RDRAM
ROM – Mask ROM, EPROM, EEPROM, EAROM, Flash RAM, CMOS

Physical Memory Organization – DIP, SIMM, DIMM, SIPP, memory speed, memory capacity of the motherboard

**Text Book:**

Computer Organization, V. Hamacher (McGraw Hill)
The Complete Reference PC Hardware– Zacker, Rourke (TMH)
Computer System Architecture, M. Morris Mano (Pearson Education)
Module III: Modern all About Hard Disk Drive – Lotia/Nair (BPB)

## Second Core Course Practical - 2
## EM4CRP05 - INTEL 8085 ASSEMBLY LANGUAGE PROGRAMMING LAB
## SEMESTER IV

**Aim of the course:**
To equip the student with a practical knowledge of Intel 8085 microprocessor programming, its interfacing and applications

**Hours/Week** **5**
**Contact hours** **90**
**Credits** **2**

**List of Experiments**

1. Study of architecture of Intel 8085 microprocessor
2. Data Transfer Experiments
3. Addition of two 8-bit and 16-bit numbers
4. Addition of N 8-bit numbers
5. Subtraction of two 8-bit and 16-bit numbers
6. Multiplication of two 8-bit and 16-bit numbers
7. Division of two 8-bit numbers
8. Odd or Even Number
9. Positive or Negative Number
10. Divisible or not
11. Addition of two 8-bit and 16-bit BCD numbers
12. Subtraction of two BCD numbers
13. Searching of a number
14. Sorting in ascending and descending order
15. Largest and smallest number in a group
16. Multi-byte addition
17. Square root of a number
18. Factorial of a number
19. Hex Counter
20. Decimal up/down counter
21. Modulo-ten counter
22. Square wave Generator
23. Traffic light Controller
24. Stepper motor Controller
25. DAC and ADC Interfacing

All the experiments should be carried out compulsorily. For appearing external examination, certified laboratory record should be produced.

| Scheme of Evaluation of External Practical Examination | |
|---|---|
| **Parameter** | **Marks** |
| Logic (Flowchart/Algorithm | 20 |
| Coding | 20 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

# EM4OJP01- On the Job Training

## SEMESTER IV

Students can be formed into groups containing 4 to 5 members and are given opportunity to work in Electronics or Electrical industry. They will be given training for jobs in different environments. A presentation of the work should be carried out and a report needs to be submitted.

**For 'On The Job Training'**

**a) Marks of internal Evaluation : 100**

| **Components of On The Job Training** | **Marks** |
|---|---|
| Attendance | 10 |
| Test Paper | 20 |
| Report | 20 |
| Presentation | 20 |
| Viva | 15 |
| Lab involvement | 15 |
| **Total** | **100** |

# SEMESTER V

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| EM5CRT10 | First Core Course – **9** **Microcontrollers and Applications** | **4** | **4** | **20** | **80** |
| EM5CRT11 | First Core Course – **10** **Environmental Awareness and Human Rights** | **4** | **4** | **20** | **80** |
| EM5CRP06 | First Core Course Practical - 4 **Communication Lab - Practical** | **4** | **2** | **20** | **80** |
| EM5CRT12 | Second Core Course – 5 **PC Maintenance and Troubleshooting** | **4** | **4** | **20** | **80** |
| EM5CRP07 | Second Core Course Practical -3 **PC Hardware Lab** | **5** | **2** | **20** | **80** |
| | Open Course | **4** | **3** | **20** | **80** |
| | **Total** | **25** | **19** | **120** | **480** |

**EM5OPT01 – Open Course**

| Semester | Paper Title |
|---|---|
| V | Satellite Communication |
| V | Computer Assembling |
| V | Information Technology |

## First Core Course- 9
## EM5CRT13 - MICROCONTROLLERS AND APPLICATIONS

*(Common with BSc Electronics)*

## SEMESTER V

**Aim of the course:**

To equip the student with the architecture and programming of microcontrollers

**Prerequisite**: Knowledge on Digital Electronics and Microprocessors

**Hours/week: 4**
**Contact Hours: 72**
**Credits: 4**

**Course Outline**

**Module I: Architectural overview of 8051 Microcontroller (14 Hours)**

Functional block diagram of 8051 , Registers in 8051:- accumulator , B register , register bank , program counter, data pointer, PSW register, input/ output register , stack pointer, special function Registers.

Memory organization of 8051:- memory representation, External code memory, External Ram Data memory, internal memory organization program memory.

**Module II: Addressing modes and Instruction set (14 Hours)**

Addressing modes: - direct, indirect, immediate, register, register specific, indexed. Classification of Instruction: - Arithmetic, logic, data transfer, Boolean, branching instruction.

**Module III: Microcontroller programming (18Hours)**

Assembly language programs: - data transfer operations, 8 bit arithmetic:-addition, subtraction, multiplication, division, swapping.

Introduction to embedded C:-Structure, unions , operators, function , Function parameters , data type, Accessing single bit, Accessing I/o port and SFR, Time delay, bitwise operators, Simple programs .

**Module IV: Peripherals (14Hours)**

An over view of Timer: - Timer/ Counter Mode, TMOD Register, TCON register.

Serial communication: - serial buffer registers, serial control registers. Setting serial port baud rates, writing to serial port , reading the serial port.

Interrupts: - Types of interrupts, interrupt enable register , interrupt priority , interrupt priority register , interfacing LED using interrupt service routine. Design a serial transceiver in embedded C.

**Module V: Interfacing (12 Hours)**

Key Board interfacing, Seven Segment interfacing, LCD Display interfacing, A/D and D/A interfacing, Stepper motor interfacing

**Text Books:**

1. Kenneth J Ayala, The 8051 Microcontrollers Architecture, Programming and Applications" IIndEdition, CENGAGE Learning.

2. Mohammed Ali Mazidi, The 8051 Microcontroller and Embedded Systems (using assembly and C) IInd Edition, PEARSON

# EM5CRT14 ENVIRONMENTAL AWARENESS, E-WASTE MANAGEMENT AND HUMAN RIGHTS

***(Common to BSc Electronics and BSc Electronics & Computer Maintenance)***

## SEMESTER V

**Aims & Objectives of the course**

- Environmental Education encourages students to research, investigate how and why things happen, and make their own decisions about complex environmental issues by developing and enhancing critical and creative thinking skills. It helps to foster a new generation of informed consumers, workers, as well as policy or decision makers.
- Environmental Education helps students to understand how their decisions and actions affect the environment, builds knowledge and skills necessary to address complex environmental issues, as well as ways we can take action to keep our environment healthy and sustainable for the future. It encourages character building, and develop positive attitudes and values.
- To develop the sense of awareness among the students about the environment and its various problems and to help the students in realizing the inter-relationship between man and environment and helps to protect the nature and natural resources.
- To help the students in acquiring the basic knowledge about environment and the social norms that provide unity with environmental characteristics and create positive attitude about the environment.
- To impart awareness on, Human rights and E-waste management

**Hours/Week** **4**
**Contact hours** **72**
**Credits** **4**

**Course Outline**

**Module I**

**Unit 1 : Multidisciplinary nature of environmental studies** (**2 Hours)**

Definition, scope and importance Need for public awareness.

**Unit 2 : Natural Resources** **(10 Hours)**

Renewable and non-renewable resources : Natural resources and associated problems.

a) **Forest resources**: Use and over-exploitation, deforestation, case studies. Timber extraction, mining, dams and their effects on forest and tribal people.

b) **Water resources** : Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems.

c) **Mineral resources** : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) **Food resources** : World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies.

e) **Energy resources**: Growing energy needs, renewable and non-renewable energy sources, use of alternate energy sources, Case studies.

f) **Land resources**: Land as a resource, land degradation, man induced and slides, soil erosion and desertification

- Role of individual in conservation of natural resources.
- Equitable use of resources for sustainable life styles.

**Unit 3: Ecosystems** **(6 Hours)**

- Concept of an ecosystem
- Structure and function of an ecosystem
- Producers, consumers and decomposers
- Energy flow in the ecosystem
- Ecological succession
- Food chains, food webs and ecological pyramids.
- Introduction, types, characteristic features, structure and function of the given ecosystem:- Forest ecosystem

**Module II**

**Unit 1: Biodiversity and its conservation** (**8 Hours**)

- Introduction
- Biogeographical classification of India
- Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values.
- India as a mega-diversity nation
- Hot-spots of biodiversity
- Threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts
- Endangered and endemic species of India

**Unit 2: Environmental Pollution** **(8 Hours)**

Definition

Causes, effects and control measures of: -

h. Air pollution
i. Water pollution
j. Soil pollution
k. Marine pollution
l. Noise pollution
m. Thermal pollution

n. Nuclear hazards

- Solid waste Management: Causes, effects and control measures of urban and industrial wastes.
- Role of an individual in prevention of pollution
- Pollution case studies
- Disaster management: floods, earthquake, cyclone and landslides.

**Unit 3: Social Issues and the Environment (10 Hours)**

- Urban problems related to energy
- Water conservation, rain water harvesting, watershed management
- Resettlement and rehabilitation of people: its problems and concerns, Case studies
- Environmental ethics: Issues and possible solutions
- Climate change, global warming, acid rain, ozone layer depletion , nuclear accidents and holocaust, Case studies
- Consumerism and waste products
- Environment Protection Act
- Air ( Prevention and Control of Pollution) Act
- Water (Prevention and control of Pollution) Act
- Wildlife Protection Act
- Forest Conservation Act
- Issues involved in enforcement of environmental legislation
- Public awareness

**Module III (10 Hours)**

**E- Waste**

Global E-waste growth- Global and local E-waste definition, Global e-waste/WEEE growth and migration, WEEE/e-waste growth in India, The Hazardous waste rules 2003, The Municipal Solid Wastes Rules 2000

**Text Book:** E-waste: Implications, Regulations and Management in India and Current Global Best Practices, Edited by Rakesh Johri, The Energy and Resources Institute, New Delhi (Chapter 1)

**Module IV (10 Hours)**

**E-Waste Recycling**

Optimal Planning for computer waste, Re-cycling of e-scrap in a global environment-opportunities and challenges, Technologies for recovery of resources from electronic waste.

**Text Book:** E-waste: Implications, Regulations and Management in India and Current Global Best Practices, Edited by Rakesh Johri, The Energy and Resources Institute, New Delhi (Chapter 10,12)

**Module – V** **(8 Hours)**

**Unit 1- Human Rights**– An Introduction to Human Rights, Meaning, concept and development, Three Generations of Human Rights (Civil and Political Rights; Economic, Social and Cultural Rights).

**Unit-2 Human Rights and United Nations** – contributions, main human rights related organs - UNESCO,UNICEF, WHO, ILO, Declarations for women and children, Universal Declaration of Human Rights.

**Human Rights in India** – Fundamental rights and Indian Constitution, Rights for children and women, Scheduled Castes, Scheduled Tribes, Other Backward Castes and Minorities

**Unit-3 Environment and Human Rights** - Right to Clean Environment and Public Safety: Issues of Industrial Pollution, Prevention, Rehabilitation and Safety Aspect of New Technologies such as Chemical and Nuclear Technologies, Issues of Waste Disposal, Protection of Environment

**Conservation of natural resources and human rights**: Reports, Case studies and policy formulation. Conservation issues of western ghats- mention Gadgil committee report, Kasturi Rangan report. Over exploitation of ground water resources, marine fisheries, sand mining etc.

**Internal: Field study**

- Visit to a local area to document environmental grassland/ hill /mountain
- Visit a local polluted site – Urban/Rural/Industrial/Agricultural Study of common plants, insects, birds etc
- Study of simple ecosystem-pond, river, hill slopes, etc
  (Field work Equal to 5 lecture hours)

## REFERENCES


19. Bharucha Erach, Text Book of Environmental Studies for undergraduate Courses. University Press, IInd Edition 2013 (TB)
20. Clark.R.S., Marine Pollution, Clanderson Press Oxford (Ref)
21. Cunningham, W.P.Cooper, T.H.Gorhani, E & Hepworth, M.T.2001 Environmental Encyclopedia, Jaico Publ. House. Mumbai. 1196p .(Ref)
22. Dc A.K.Enviornmental Chemistry, Wiley Eastern Ltd.(Ref)
23. Down to Earth, Centre for Science and Environment (Ref)

24. Heywood, V.H & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge University Press 1140pb (Ref)
25. Jadhav.H & Bhosale.V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p (Ref)
26. Mekinney, M.L & Schock.R.M. 1996 Environmental Science Systems & Solutions. Web enhanced edition 639p (Ref)
27. Miller T.G. Jr., Environmental Science, Wadsworth Publishing Co. (TB)
28. Odum.E.P 1971. Fundamentals of Ecology. W.B. Saunders Co. USA 574p (Ref)
29. Rao.M.N & Datta.A.K. 1987 Waste Water treatment Oxford & IBII Publication Co.Pvt.Ltd.345p (Ref)
30. Rajagopalan. R, Environmental Studies from crisis and cure, Oxford University Press, Published: 2016 (TB)
31. Sharma B.K., 2001. Environmental Chemistry. Geol Publ. House, Meerut (Ref)
32. Townsend C., Harper J, and Michael Begon, Essentials of Ecology, Blackwell Science (Ref)
33. Trivedi R.K., Handbook of Environmental Laws, Rules Guidelines, Compliances and Stadards, Vol I and II, Enviro Media (Ref)
34. Trivedi R. K. and P.K. Goel, Introduction to air pollution, Techno-Science Publication (Ref)
35. Wanger K.D., 1998 Environmental Management. W.B. Saunders Co. Philadelphia, USA 499p (Ref)
36. (M) Magazine (R) Reference (TB) Textbook

**Human Rights**

1. Amartya Sen, The Idea Justice, New Delhi: Penguin Books, 2009.
2. Chatrath, K. J.S., (ed.), Education for Human Rights and Democracy (Shimla: Indian Institute of Advanced Studies, 1998)
3. Law Relating to Human Rights, Asia Law House,2001.
4. Shireesh Pal Singh, Human Rights Education in 21st Century, Discovery Publishing House Pvt.Ltd, New Delhi,
5. S.K.Khanna, Children And The Human Rights, Common Wealth Publishers,1998. 2011.
6. Sudhir Kapoor, Human Rights in 21st Century,Mangal Deep Publications, Jaipur,2001.
7. United Nations Development Programme, Human Development Report 2004: Cultural Liberty in Today's Diverse World, New Delhi: Oxford University Press, 2004.

# EL5CRT16 - COMPUTER HARDWARE
# SEMESTER V

**Aim of the course:**

To get an in-depth knowledge of computer hardware and hence to create a confidence in using and assembling PC

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (16 Hours)**

System Components: Keyboards-switches, working, interface, connectors, Pointing and positioning devices – Types, construction & working, Wireless input devices, Printers: Dot matrix, Inkjet, Laser , Digital camera, Scanner-types, Monitor-Display specifications, Types. SMPS: types- voltages, UPS, Microprocessor Types-Generation, Processor Specifications, Cache Memory, Processor features, Overclocking,

**Module II (16 Hours)**

Motherboard-Form Factor- Components, Chipsets-Evolution, Architecture, North Bridge/South Bridge Architecture, Hub Architecture, Super I/O chips, System Bus-Types, functions and features, FSB, Memory Bus, I/O Buses, Mother board settings.

**Module III (16 Hours)**

BIOS- Hardware and Software, Motherboard BIOS, ROM Hardware, Shadowing, POST, POST,Post sequence and Flow chart, ROM upgrading/flashing, BIOS Set up, Plug and Play BIOS ,CMOS Batteries , UEFI Memory-Basics, ROM, DRAM, SRAM, RAM Memory Types – SDRAM, DDR-SDRAM, RDRAM- Memory Modules: SIMM, DIMM & RIMM Memory.

**Module IV (14Hours)**

IDE interface- ATA IDE, Serial ATA- SCSI Interface- Hard Disk Drive- Construction and operation, features – Partitioning and Formatting, Optical Storage Devices: CD, DVD, BD, HD DVD, RAID.

**Module V (10 Hours)**

Ports – Serial, COM ports, USB, IEEE-1394(a,b,c), Game/MIDI port, Parallel – LPT1, IEEE-488 (GPIB), IrdA port.AGP.AMR,CNR,OTG,

4. **Text Books:** Upgrading and Repairing PCs, Scot Mueller

5. All About Printers/Keyboards/Mouse, ManaharLotia, BPB Publishers
6. All About Motherboards – Manahar Lotia, BPB Publishers

**Reference Books:**

3. The Indispensable PC Hardware Book, 3rd Edition, Addison Wesley

4. Troubleshooting, Maintenance and Repairing PCs, Stephen Bigelow

# EM5CRP06 - COMMUNICATION LAB
## SEMESTER V

**Hours/Week** **4**
**Lab Hours** **72**
**Credits** **2**

**List of Experiments**

**Design and Setup of:**

1. Collpitts Oscillator
2. Hartley Oscillator
3. Second order High Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
4. Second order Low Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
5. Second order Band Pass Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
6. Universal Active Filter – Plotting the frequency response, Determination of Cut-off frequency and bandwidth
7. AM Generation using op-amp.
8. AM Generation using emitter modulation.
9. Phase Locked Loop, Determination of lock range and capture range
10. FM Modulation and demodulation using CD4046A
11. PLL characteristics using 565 IC, Design free running frequency
12. Pulse Modulation- PAM-modulation and demodulation (using CD4016).
13. Pulse Modulation -PWM, PPM using op-amp.
14. IF Amplifier
15. Balanced Mixer
16. Opto coupler
17. ASK, PSK, FSK

**Note:** 12 experiments should be compulsorily carried out. For appearing external lab examination, certified record should be produced.

| **Scheme of Evaluation for External Practical Examination** | |
|---|---|
| **Parameter** | **Marks** |
| Circuit diagram & Design | 15 |
| Theory, Formula, Expected graph, Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | 80 |

## Second Core Course - 5
## EM5CRT15 - PC MAINTENANCE AND TROUBLESHOOTING
## SEMESTER V

**Aim of the course:**

To get an in-depth knowledge of computer hardware and hence to create a confidence in using and assembling computer.

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Module I (15 Hours)**

System Components: Keyboards-switches, working, interface, connectors, Pointing and positioning devices – Types, construction & working, Wireless input devices, Printers: Dot matrix, Inkjet, Laser, Digital camera, Scanner-types, Monitor-Display specifications, Types. SMPS: types- voltages, UPS, Microprocessor Types-Generation, Processor Specifications, Cache Memory, Processor features, Overclocking,

**Module II (15 Hours)**

Motherboard-Form Factor- Components, Chipsets-Evolution, Architecture, North Bridge/South Bridge Architecture, Hub Architecture, Super I/O chips, System Bus-Types, functions and features, FSB, Memory Bus, I/O Buses, Mother board settings.

**Module III (15 Hours)**

BIOS- Hardware and Software, Motherboard BIOS, ROM Hardware, Shadowing, POST, POST,Post sequence and Flow chart, ROM upgrading/flashing, BIOS Set up, Plug and Play BIOS ,CMOS Batteries , UEFI Memory-Basics, ROM, DRAM, SRAM, RAM Memory Types – SDRAM, DDR-SDRAM, RDRAM-

**Module IV (15 Hours)**

IDE interface- ATA IDE, Serial ATA- SCSI Interface- Hard Disk Drive- Construction and operation, features – Partitioning and Formatting, Optical Storage Devices: CD, DVD, BD, HD DVD, RAID.
Ports – Serial, COM ports, USB, IEEE-1394(a,b,c), Game/MIDI port, Parallel – LPT1, IEEE-488 (GPIB), IrdA port.AGP.AMR,CNR,OTG,

**Module V** **(12 Hours)**

Introduction to troubleshooting, Trouble shooting index, Start-up problems– Booting Problem, SMPS Problems- Surge, Spike, Brown Out, Black Out, Run problems– troubleshooting of motherboard and processor, memory, hard disk, display problems, keyboard problems, CD- Drive Problems – Lens Cleaning, Sound Problems, and other I/O problems, Operating System Problems.

**Text Books:** Upgrading and Repairing PCs, Scot Mueller

1. All About Printers/Keyboards/Mouse, ManaharLotia, BPB Publishers
2. All About Motherboards – Manahar Lotia, BPB Publishers

**Reference Books:**

1. The Indispensable PC Hardware Book, 3rd Edition, Addison Wesley
2. Troubleshooting, Maintenance and Repairing PCs, Stephen Bigelow
3. How a computer works, Ron White (QUE)
4. Hardware Bible, Winn L. Rosch (QUE)

## Second Core Course Practical - 3
## EM5CRP07 - PC HARDWARE LAB
## SEMESTER V

**Hours/week : 5**
**Total hours : 90**
**Credits : 2**

**I. Familiarization of Hardware Components**

**II. Assembling**

1. AT machine
2. ATX Machine

**III. Hard Disk Preparation**

3. FDISK
4. Disk Manager
5. Partition Magic

**IV. Installation of Operating Systems**

6. Windows 98
7. Windows 2000 Professional
8. Windows 2003 Server
9. Redhat Linux

**V. Installation of Drivers and Other Utilities**

10. Installation of motherboard drivers
11. Installation of anti-virus software
12. Installation of MS Office, Visual Basic
13. Installation and configuration of Norton Ghost

**VI. Installation of peripheral components**

14. Installation and configuration of Modems
15. Installation and configuration of Printers

**VII. Familiarization of Operating Systems**

16. Windows 2003 server
17. Red hat Linux

**VIII. Preparations for installing networks**

18. Crimping - Cross and Straight connections
19. Installation of Network Cards

**IX. Installation and Configuration of Networks**

20. Windows Networks
    a) Peer-to-Peer network
    b) Client/Server Network
20. Linux Networks
    a) Linux to Linux Network
    b) Linux to Windows Network

**X Printer sharing and Internet sharing**

| | Open Courses (OC ) |
|---|---|
| A | Satellite communication |
| B | Information Technology |
| C | Computer Assembling |

## EM5OCT01 – OPEN COURSE
## A. SATELLITE COMMUNICATION
## SEMESTER V

**AIM**

To enable the student to become familiar with satellites and satellite services.

**Objectives:**

- Overview of satellite systems in relation to other terrestrial systems.
- Study of satellite orbits and launching.
- Study of earth segment and space segment components
- Study of satellite access by various users.
- Study of DTH and compression standards.

**Hours/Week : 4**
**Contact Hours 72**
**Credits 3**

**Course outline**

**Module I Satellite Orbits (9 Hours)**

Kepler's Laws, Newton's law, orbital parameters, orbital perturbations, station keeping, geo stationary and non Geo-stationary orbits – Look Angle Determination- Limits of visibility –eclipse-Sub satellite point –Sun transit outage-Launching Procedures - launch vehicles and propulsion.

**Module II Space Segment And Satellite Link Design (15 Hours)**

Spacecraft Technology- Structure, Primary power, Attitude and Orbit control, Thermal control and Propulsion, communication Payload and supporting subsystems, Telemetry, Tracking and command. Satellite uplink and downlink Analysis and Design, link budget, E/N calculation- performance impairments-system noise, inter modulation and interference, Propagation Characteristics and Frequency considerations- System reliability and design lifetime.

**Module III Satellite Access (15 Hours)**

Modulation and Multiplexing: Voice, Data, Video, Analog – digital transmission system, Digital video Broadcast, multiple access: FDMA, TDMA, CDMA, Assignment Methods, Spread Spectrum communication, compression – encryption.

**Module IV Earth Segment (5 Hours)**

Earth Station Technology-- Terrestrial Interface, Transmitter and Receiver, Antenna Systems TVRO, MATV, CATV, Test Equipment Measurements on G/T, C/No, EIRP, Antenna Gain.

**Module V Satellite Applications (10 Hours)**

INTELSAT Series, INSAT, VSAT, Mobile satellite services: GSM, GPS, INMARSAT, LEO, MEO, Satellite Navigational System. Direct Broadcast satellites (DBS)- Direct to home Broadcast (DTH), Digital audio broadcast (DAB)- Worldspace services, Business TV(BTV), GRAMSAT, Specialized services – E –mail, Video conferencing, Internet

**Text Books:**

1. Dennis Roddy, 'Satellite Communication', McGraw Hill International, 4th Edition, 2006.
2. Wilbur L. Pritchard, Hendri G. Suyderhoud, Robert A. Nelson, 'Satellite Communication Systems Engineering', Prentice Hall/Pearson, 2007.

**Reference Books:**

1. N.Agarwal, 'Design of Geosynchronous Space Craft, Prentice Hall, 1986.
2. Bruce R. Elbert, 'The Satellite Communication Applications' Hand Book, Artech HouseBostan London, 1997.
3. Tri T. Ha, 'Digital Satellite Communication', II edition, 1990.
4. Emanuel Fthenakis, 'Manual of Satellite Communications', McGraw Hill Book Co., 1984.
5. Robert G. Winch, 'Telecommunication Trans Mission Systems', McGraw-Hill Book, Co., 1983.
6. Brian Ackroyd, 'World Satellite Communication and earth station Design', BSP, professional Books, 1990.
7. G.B.Bleazard, ' Introducing Satellite communications NCC Publication, 1985.
8. M.Richharia, 'Satellite Communication Systems-Design Principles", Macmillan 2003.

# EM5OCT01 - OPEN COURSE
# B. INFORMATION TECHNOLOGY
# SEMESTER V

**Hours/Week : 4**
**Contact Hours 72**
**Credits 3**

**Course outline**

**Module I Overview of Information Technology (13 hrs)**

Features of the modern personal computer and peripherals, computer networks and Internet, wireless technology, cellular wireless networks, introduction to mobile phone technology, introduction to ATM, purchase of technology, License, Guarantee, Warranty, overview of Operating Systems & major application software.

**Module II Knowledge Skills for Higher Education (14 hrs)** Data, information and knowledge, knowledge management- Internet access methods – Dial-up, DSL, Cable, ISDN, Wi-Fi – Internet as a knowledge repository, academic search techniques, creating cyber presence, case study of academic websites, open access initiatives, open access publishing models. Basic concepts of IPR, copyrights and patents, plagiarism, introduction to use of IT in teaching and learning, case study of educational software, academic services INFLIBNET, NICNET, BRNET

**Module III Social Informatics (14 hrs)**

IT and Society – issues and concerns – digital divide, IT and development, the free software movement, IT industry**:** new opportunities and new threats, software piracy, cyber ethics, cyber-crime, cyber threats, cyber security, privacy issues, cyber laws, cyber addictions, information overload, health issues – guide lines for proper usage of computers, internet and mobile phones. e-wastes and green computing, impact of IT on language and culture – localization issues – Unicode – IT and regional languages.

**Module IV IT Applications (13 hrs)**

e-Governance applications at national and state level, IT for national integration, overview of IT application in medicine, healthcare, business, commerce, industry, defense, law, crime detection, publishing, communication, resource management, weather forecasting, education, film and media, IT in service of disabled, futuristic IT – Artificial Intelligence, Virtual Reality, Bio-Computing.

**Text Books:**

1. *Alan Evans, Kendal Martin et.al.* **Technology in Action**, Pearson Prentice Hall (Third Ed.)

2. *V Rajaraman,* **Introduction to Information Technology**, Prentice Hall
3. *Alexis Leon & Mathews Leon,* **Computers Today**, Leon Vikas.
4. *Peter Norton,* **Introduction to Computers**, 6e (Indian Adapted Edition)

**Additional References**

1. Greg Perry, SAMS Teach Yourself Open Office.org, SAMS,
2. Alexis & Mathews Leon, **Fundamentals of InformationTechnology**, Leon Vikas
3. George Beckman, Eugene Rathswohl, **Computer Confluence**, Pearson Education
4. Barbara Wilson, **Information Technology: The Basics**, Thomson Learning
5. John Ray, 10 Minute Guide to Linux, PHI, ISBN 81-203-1549-9
6. Ramesh Bangia, **Learning Computer Fundamentals**, Khanna Book Publishers

**Web Resources:**

1. www.fgcu.edu/support/office2000
2. www.openoffice.org *Open Office Official web site*
3. www.microsoft.com/office *MS Office web site*
4. www.lgta.org *Office on-line lessons*
5. www.iearnthenet.com *Web Primer*
6. www.computer.org/history/timeline
7. www.computerhistory.org
8. http://computer.howstuffworks.com
9. www.keralaitmission.org
10. www.technopark.org
11. http://ezinearticles.com/?Understanding-The-Operation-Of-Mobile-Phone-Networks&id=68259
12. http://www.scribd.com/doc!259538/All-about-mobile-phones
13. http://uww.studentworkzone.com/question.php?ID=96
14. http://www.oftc.usyd.edu.au/edweb/revolution/history/

# EM5OCT01 - OPEN COURSE
# C. COMPUTER ASSEMBLING
# SEMESTER V

**Aim of the course:**

To get an in-depth knowledge of computer hardware and hence to create a confidence in using and assembling PC

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 4**

**Course Outline**

**Unit I**

**Module I**

**(8 Hours)**

Computers: History, PC Components- Hardware and Software, PC Architecture, switches, I/O connectors, input and output devices, pointing and positioning devices, Printers-dot matrix, inkjet, laser, Scanner-types, monitor-types, display specifications, SMPS-types-voltages, UPS, CMOS battery.

**Module II** **(12 Hours)**

Microprocessor types-generation, Processor Specifications, Processor Sockets and Slots (detailed study not required), Co-Processor, math coprocessor, popular Intel and AMD processors.

**Module III** **16 Hours**

Motherboard- Form Factor- AT, ATX, NLX, WTX, BTX, motherboard Components, Chipsets-North Bridge/South Bridge Architecture, Hub Architecture, Intel i810E Chipset features and architecture, Super I/O chips,Expansion Slots, System Bus-Types, functions and features, FSB, Memory Bus, I/O Bus.

**Unit II**

**Module IV** **10 Hours**

BIOS- Hardware and Software,Errors, Error Indicating Methods Motherboard BIOS, ROM Hardware, Shadowing, POST,Post sequence and Flow chart, ROM upgrading and flashing, Plug and Play BIOS.

**Module V** **13 Hours**

Memory-Basics, ROM, DRAM, Cache Memory: SRAM, RAM Memory Types- FPM, EDO, Burst EDO, SDRAM, DDR-SDRAM, RDRAM, memory modules-SIMM, DIMM & RIMM Memory, memory banks, IDE interface- ATA IDE, Serial ATA- SCSI Interface- Hard Disk

Drive- Construction and operation- Formatting & Partitioning, optical storage devices - CD, DVD, blue ray disc.

**Module VI** **13 Hours**

OS Concepts- DOS & Windows OS – Features, LINUX OS- Features,

**Text Books**: 1. Upgrading and Repairing PCs – Scot Mueller- Pearson Edn.
2. IBM PC and Clones- Govindarajalu, TMH

**Reference books**: 1.Computer installation and servicing – D. Balasubramanian, McGraw Hill
2. All about motherboard- Manohar Lotia , Bpb publications.

(For getting full advantage of this course a demonstration of the PC peripherals and their installation may be carried out)

# SEMESTER VI

| Course Code | Course Details | No: of hours / week | credits | Marks | |
|---|---|---|---|---|---|
| | | | | Int | Ext |
| EM6CRT16 | First Core Course – **11** **Computer Network** | **5** | **4** | **20** | **80** |
| EM6CRT17 | Second Core Course – **6** **Intel 8086 Microprocessor and Programming** | **4** | **4** | **20** | **80** |
| EM6CRP08 | Second Core Course Practical - 4 **Intel 8086 Assembly Language Lab** | **4** | **2** | **20** | **80** |
| EM6CRT18 | Second Core Course - 7 **Entrepreneurship Development and Marketing** | **3** | **3** | **20** | **80** |
| EM6CB01 | Choice Based Course | **4** | **4** | **20** | **80** |
| EM6PRP01 | Project Lab | **5** | **3** | **20** | **80** |
| | **Total** | **25** | **20** | **120** | **480** |

**EM6CBT01 - Choice Based Courses**

| Semester | Paper Title |
|---|---|
| VI | IC Technology |
| VI | Optoelectronics |
| VI | Mechatronics |
| VI | Advanced Communication Systems |

## First Core Course - 11
## EM6CRT16 - COMPUTER NETWORKS

***(Common with B.Sc Electronics )***

## SEMESTER VI

**Aim of the course:** This course aims to give an in-depth knowledge in the field of computer networks and the protocols involved in data communication

**Hours/Week 5**
**Contact Hours : 90 hours**
**Credits 4**

### Course Outline

**Module I** **(16 Hours)**

Data Communications – characteristics, components, data representation, data flow, Introduction to computer networks –Definition-Basic Concepts - Uses of network-Network structure, OSI model, TCP/IP Protocol Suite.

**Module II** **(16 Hours)**

Physical Layer and Media, Switching, Circuited switched Networks, Datagram networks, Virtual-circuit networks, Error detection and Correction – Transmission media, Different types of transmission medium-Multiplexing. ISDN

**Module III** **(20 Hours)**

Data Link Control – Framing, Flow and Error control, Protocols for noiseless channels – Simplest, Stop & Wait, Protocols for noisy channel – Stop & Wait ARQ , Go-Back-N ARQ, Piggybacking, Multiple Access: Random access protocols – ALOHA, CSMA, CSMA/CD, CSMA/CA, IEEE standards 802.3,802.4 and 802.5. , Controlled access protocols – Reservation - Polling – Token passing, Channelization protocols – FDMA, TDMA and CDMA, Wired LANs: Standard Ethernet, Wireless LANs: Bluetooth, Connecting LANs-Connecting devices.

**Module IV** **(18 Hours)**

Network Layer: Logical Addressing, IPv4 addresses IP FrameFormat,IPv6 Address, Routing – Static and Dynamic Routing, OSPF, Flooding , Distance Vector Routing and Link state routing. Routing Protocols-IRP, ERP

**Module V** **(20 Hours)**

Brief introduction to the transport layer, session layer, presentation layer and application layer-Basic concepts of internet, WWW, E-mail, Websites -:
Transport Layer: Process-to-Process Delivery, UDP, TCP, Congestion and Congestion control – Open loop and Closed loop, Quality of Service, Techniques to improve QoS.
Application Layer: Domain Name System, Domain Name Space, Distribution, Remote Logging, Electronic mail, File Transfer Protocol, HTTP, Encryption/Decryption.

**Books for study and reference**


1. Andrew S. Tanenbaum: Computer Networks, PHI
2. William Stallings: Data and Computer Communication, PHI
3. Behrouz and Forouzan: Introduction to Data Communications and Networking, Mc Graw Hill

## Second Core Course - 6
## EM6CRT17 - INTEL 8086 MICROPROCESSOR AND PROGRAMMING
## SEMESTER VI

**Hours/Week** **4**
**Contact Hours** **72**
**Credits** **4**

**Course outline**

**Module I - Introduction to Microprocessors (18 hrs)**

Microprocessors – Basic Concepts-Types of Microprocessors – Vector, Array, Scalar, Superscalar, RISC and CISC processors, DSP, Symbolic processors, Embedded processors – Microprocessor applications

Intel 8086 - Microprocessor Architecture, Pin Description, Addressing Modes,

Memory mapping of 8086/ 8088, Operation of 8086, Timing Diagram - Read & Write operation, Interrupts of 8086 – Hardware & Software, Buses and Cycle

Operating modes of 8086 – minimum mode and maximum mode, System Connections, System Bus Timing, Bus Buffering and Latching, Input/ Output ports of 8086 and Bus Controllers

**Module II - Assembly Language Programming (18 hrs)**

Using Debug with the help of Debug commands, Machine language Examples

Introduction to 8086/88 Assembly Language

Instruction set- MOV, ADD, SUB Instructions ,Stack Operations – Short/LongJumps/Branches– Flag Register Looping, Shift/Rotate Instructions ,String Handling (MOVS, LODS, STOS, CMPS, SCAS),Call Procedures

Assembling, Linking, Executing a Program

Assembler Pseudo-OPS- Data Definition Pseudo-OPS, Listing Pseudo-OPS

**Module III - I/O Programming (18 hrs)**

Macro Pseudo-OPS, Writing Macros

Reading from Keyboard, Writing to Screen

Interrupt 21H (DOS), 17H (BIOS)

Table Handling

Programming Examples

Debugging any software

**Module IV - Advanced Microprocessors (18 hrs)**

Basic concepts, microprocessor architecture, memory mapping, applications of processors – 80186/18, 80286, 80386, 80486 and Pentium processors

**Text Books:**

1. Microcomputer Systems-the 8086/8088 family Architecture, Programming and Design, Liu and Gibson (PHI)

2. The Intel Microprocessors – 8086/88, 80186/188, 80286, 80386, 80486, Pentium and Pentium Pro Processors
   Architecture, Programming and Interfacing, Barry B. Brey
3. Assembly Language Programming, Peter Abel. (PHI)

**Reference Books:**

1. Microprocessors and Interfacing Programming and Hardware, , Doughlas Hall, (TMH)
2. Advanced Microprocessors and peripherals, A.K. Ray, Bhurchandi
3. Microcomputer Systems-the 8086/8088 family Architecture, Programming and Design, Liu and Gibson (PHI)
4. Advanced Microprocessors and peripherals, A.K. Ray, Bhurchandi
5. Microprocessor x 86 Programming, K.R. Venugopal (BPB)
6. MS-DOS Handbook, King

## Second Core Course Practical - 4

## EM6CRP08 - INTEL 8086 ASSEMBLY LANGUAGE PROGRAMMING LAB

## SEMESTER VI

**Hours/ Week 5**
**Contact hours : 90**
**Credits : 2**

**List of Programmes**

1. Study of architecture of Intel 8086
2. Addition of two 8-bit numbers
3. Addition of two 16- bit numbers
4. Addition of two double words
5. Addition of *n* 8-bit numbers
6. Block data transfer
7. Divisible or not
8. Square root of a number
9. Count of positive and negative numbers in a group
10. Sum of odd and even numbers in a group
11. Generation of Fibonacci series
12. Searching of a number in a group
13. Sorting of an array of numbers
14. Largest and smallest number in a group
15. Factorial of a number

| **Scheme of Evaluation of External Practical Examination** | |
|---|---|
| **Parameter** | **Marks** |
| Logic (Flowchart/Algorithm | 20 |
| Coding | 20 |
| Viva | 15 |
| Execution & Result | 15 |
| Certified Record | 10 |
| **Total** | **80** |

## Second Core Course - 7
## EM6CRT18 - ENTREPRENEURSHIP DEVELOPMENT AND MARKETING
## SEMESTER VI

**Hours/Week : 3**
**Contact hours : 54**
**Credits : 3**

**Course outline**

**Module I**

Accounts, Book-Keeping, Books of accounts, Financial Statements and Funds Flow Statements; Cash flow statement; working capital management.

**Module II**

Factories Act, Provision regarding working hours, Health, Safety and Welfare, Provision Regarding working hours, over time, Leave with wages, Penalties. Sale of goods Act- Conditions and warranties, Sale, and agreement to sell, Types of goods, caveat emptor, Nemo Dat, Quod Non Habet, Rights of unpaid vendor Partnership Act- Kinds of partnership, Types of partners, Registration, Rights of partners, Liabilities of Partners, Dissolution of Partnership and Partnership firm. Income Tax Act- Heads of income, Assesse, Deduction from Income, Preparation of returns (Theory Only) Sales Tax Act- Registration of firms. Excise Rules-Goods, Penalties. Consumer Protection Act-Rights of consumers, Objectives, Provision Regarding Settlement of Disputes. Right to Information Act (General Information)

**Module III**

Need, Scope and Characteristics of Entrepreneurship, STED, Marketing Survey Techniques, Project Formulation, Report, Development, CPM, PERT, SSI, creativity, innovation, SWOT analysis, Packaging, Advertising, Costing and Pricing, Dilution Control, Social Responsibility of business, Business Ethics, Quality Control, Marketing Research, Financial Institutions.

**Module IV**

Plant Layout, Licensing, Business Environment.

**Reference Books:**

1. Entrepreneurial Development and Management, Renu Arora & S.K. Sood
2. Marketing Management, Philip Kotler

## EM6CBT01 - CHOICE BASED COURSE

A. IC TECHNOLOGY
B. OPTOELECTRONICS
C. MECHATRONICS
D. ADVANCED COMMUNICATION SYSTEMS

## EM6CBT01 - CHOICE BASED COURSE
## IC TECHNOLOGY

**Hours/Week : 4**
**Contact Hours: 72**
**Credits 4**

**Course outline**

**Module I (18 hrs)**

Introduction – General Classification of Integrated Circuits – Advantages of ICs over discrete components – Features of hybrid IC

Thick film technology – conductors, dielectrics, resistors – thick film processing – thick film substrates – thick film design ideas – resistor and capacitor design – advantages and applications

Thin film technology – conductor material, resistor material, dielectric material – substrate material – thin film processing – thin film design guidelines - resistor and capacitor design – advantages and applications

**Module II (18 hrs)**

Monolithic IC process – refining and growth of Silicon crystal – production of EGS – Crystal structure and growing – crystal growth apparatus – effect of impurities

Silicon wafer preparation – trimming, slicing polishing and cleaning

Diffusion of dopant impurities – nature of impurity diffusion – Fick's law – diffusion profile –diffusion systems – diffusion furnace – diffusion of N and P type impurity

**Module III (18 hrs)**

Ion Implantation – ion implantation systems – properties

Thermal oxidation – utility – growth and properties of oxide layer

Photo Lithography – process steps – photo resist – Etching for lithographic process

CVD – epitaxial deposition – growth of silicon – CVD reactors – features of epitaxial layers

Metallization – process – patterning

**Module IV (18 hrs)**

Bipolar IC process – Lead bonding, Encapsulation

Monolithic bipolar transistor construction – npn bipolar transistor – parasitic effects

Monolithic diodes, monolithic Junction FET, MOSFET technology – structure-process, Silicon gate technology – structure, short channel MOS structures – SMOS, DMOS, VMOS

CMOS FET technology – Metal gate CMOS process, Silicon gate CMOS process, SOS CMOS process, Twin well CMOS process
Monolithic resistors, Monolithic capacitors, IC crossovers

**Text Book:**

1. Integrated Circuits, K. R. Botkar (Khanna Publishers)

**Reference Book:**

1. Device Electronics for Integrated Circuits, Richard Muller

# EM6CBT01 - CHOICE BASED COURSE
# OPTOELECTRONICS
# SEMESTER VI

**Aim of the course:**

This course aims to give an in-depth knowledge in the field of lasers, optical semiconductor devices, optical display devices and optical wave guides

**Hours/week 4**

**Contact hours : 72 hours**

**Credits 4**

**Course Outline**

**Module I**

Nature of light, wave nature of light, elliptical polarization, birefringence, optical activity, electro-optic effect, Kerr modulators, magneto-optic devices, Acousto-optic effect (Text book 2 pp 1-11, 76-87, & 94-104)

**Module II**

Lasers- emission and absorption of radiation, population inversion, attainment, optical feedback, threshold condition, Doped insulator lasers, gas lasers.(Text book 2 pp 155-157, 161-168, 181-187, 201-209). LED - LED structures, LED characteristics (text book 3 394-410 )

**Module III**

Photodetectors- Thermal detectors, junction photodiodes, APD, phototransistor, Solar cells- I-V characteristics and spectral response. Materials and design considerations of solar cells (text book 2 pp 254-261, text book 3 pp 430-453, 455-458, text book 1 pp 430-432, 435-438, 442-445)

**Module IV**

Display devices – PL, EL and CL displays, displays based on LED, Plasma panel and LCD (text book 2 pp 113-153 )

**Module V**

Optical fibre waveguides, step index and graded index fibres, attenuation, modes in step index fibre, modes in graded index fibre, pulse Distortion and information rate in optic fibres, construction of optic fibres, optic fibre cables(text book 4 pp 102-138)

**Text Books:**


1. Semiconductor Optoelectronics devices, Pallab Bhattacharya, PHI
2. An Introduction to optoelectronics, Wilson & Hawkes, PHI
3. Optic fiber Communications, J M Senior, PHI
4. Fiber Optic Communications, Fourth Edition- Joseph C Palais, Pearson Education, Asia

**Reference Books:**

1. Semiconductor Optoelectronics, Jasprit Singh, TMH
2. Optical Fiber Communicatios, Gerd Keiser, MHI
3. Optical Communication Systems, John Gowar, EEE

# EM6CBT01 - CHOICE BASED COURSE
# MECHATRONICS
# SEMESTER VI

**Hours/Week** **4**
**Total hours** **72**
**Credits** **4**

**Course outline**

**Module I: (12 Hours)**

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach.

**Module II: (14 Hours)**

Review of fundamentals of electronics. Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs.

**Module III: (16 Hours)**

Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, transfer systems.

**Module IV: (16 Hours)**

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits. Pneumatics: production, distribution and conditioning of compressed air, system components and graphic representations, design of systems. Description

**Module V: (14 Hours)**

Description of PID controllers. CNC machines and part programming . Industrial Robotics.

**Text Books:**

1. HMT ltd. *Mechatronics*, Tata Mcgraw-Hill, New Delhi, 1988.
2. G.W. Kurtz, J.K. Schueller, P.W. Claar . II, *Machine design for mobile and industrial applications*, SAE, 1994.

3. T.O. Boucher, *Computer automation in manufacturing - an Introduction*, Chappman and Hall, 1996.
4. R. Iserman, *Mechatronic Systems: Fundamentals*, Springer, 1st Edition, 2005
5. Musa Jouaneh, *Fundamentals of Mechatronics*, 1st Edition, Cengage Learning, 2012.

# EM6PRP01 - PROJECT LAB
# SEMESTER VI

**Hours/Week : 5**
**Contact Hours : 90**
**Credits : 4**

Each batch of students shall develop a project in the project lab under the guidance of faculty members. A batch is defined as strength of 4 to 5 students. The core area of project work includes control, measurement and testing applications based on electronic hardware or/and software which will enable the student to get a thorough knowledge in the frontiers in the Electronics and allied areas.

The implementation phase shall proceed as follows:

For hardware projects, practical verification of the design, PCB design, fabrication, design analysis and testing shall be done.For software projects, a proper front end (GUI), if applicable, shall be designed. A detailed algorithm level implementation, test data selection, validation, analysis of outputs and necessary trial run shall be done.

Integration of hardware and software, if applicable, shall be carried out. A detailed project report in the prescribed format shall be submitted at the end of the semester. All test results and relevant design and engineering documentation shall be included in the report. The work shall be reviewed and evaluated periodically. The final evaluation of the project shall be done by a team comprising 1 internal examiner and 1 external examiner both appointed by University. The evaluation phase consists of the following.

-Presentation of the work
-Oral examination
-Demonstration of the project against design specifications
-Quality and content of the project report

| **Scheme for External Project Evaluation** | |
|---|---|
| **Component** | **Marks** |
| Presentation of the work and Relevance of the project | 15 |
| Participation in the project | 15 |
| Demonstration of the Project | 15 |
| Quality and content of the Project Report | 10 |
| Course Viva | 25 |
| **Total** | **80** |

# COMPLEMENTARY ELECTRONICS

# FOR

# B.Sc. PHYSICS (MODEL I) PROGRAMME

# DETAILED SYLLABUS

# 11. DETAILED SYLLABUS OF COMPLIMENTARY ELECTRONICS

## FOR B.Sc. PHYSICS (MODEL I)

| Semester | Course Code | Course Title | Course Category | Credits | Marks | |
|---|---|---|---|---|---|---|
| | | | | | Int | Ext. |
| I | EL1CMT01 | Basic Electronics | Complementary | 3 | 20 | 80 |
| II | EL2CMT02 | Amplifiers, Oscillators and Power Electronics | Complementary | 3 | 20 | 80 |
| I & II (I year) | EL2CMP01 | Electronics Practical - I | Complementary | 3 | 20 | 80 |
| III | EL3CMT03 | Operational Amplifiers, Communication Electronics and Integrated Circuits | Complementary | 3 | 20 | 80 |
| IV | EL4CMT04 | Digital Electronics | Complementary | 3 | 20 | 80 |
| III & IV (II year) | EL4CMP02 | Electronics Practical - II | Complementary | 3 | 20 | 80 |

## SEMESTER I

## EL1CMT01 - BASIC ELECTRONICS

**Aim of the course:** This course aims to give an in-depth knowledge in the field of Basic Semiconductor devices and their applications

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**MODULE I**

**Network Theorems (6 Hours)**

Kirchhoff's Current Law- Kirchhoff's Voltage Law-Thevenins Theorem-Norton's Theorem-Super Position Theorem-Maximum Power Transfer Theorem.

**Semiconductor, PN Junction and PN Junction Diode (6 Hours)**

Semiconductor-Bonds In Semiconductor-Energy Band-Effect of Temperature on Semiconductors - Intrinsic Semiconductor - Extrinsic Semiconductor - N Type Semiconductor- P Type Semiconductor-Majority and Minority Carriers - Formation of PN Junction (Alloying)- Properties of PN Junction- Biasing of a PN Junction- VI Characteristics of PN Junction-Specifications of PN Junction Semiconductor Diode - Resistance of Crystal Diode - Diode Equivalent Circuit – Forward Current- Peak Inverse Voltage - Reverse Current- Diode Current Equation

**MODULE II**

**Rectifiers and Filters (6 Hours)**

Half Wave Rectifier - Efficiency of Half Wave Rectifier-PIV of A Diode In Half Wave Rectifier- Full Wave Rectifier-Centre Tapped FWR- Efficiency of FWR- Advantage And Disadvantages of Centre Tapped FWR- Bridge Rectifier- Advantages And Disadvantages of Bridge Rectifier- Efficiency of FWR- Ripple Factor- Ripple Factor Of HWR- Ripple Factor of FWR. Filters- Inductor Filter - Capacitor Filter- LC Filter – CLC Filter.

**Special Purpose Diodes (6 Hours)**

Zener Diode- Avalanche And Zener Breakdown- Reverse Characteristics of Zener Diode- Zener Diode Specifications- Zener Diode Equivalent Circuits- Zener Diode as a Voltage Stabilizer - Tunnel Diode- V I Characteristics Of Tunnel Diode- Tunnel Diode Parameters-Tunnel Diode Equivalent Circuit- Tunnel Diode Applications- Varactor Diode - Schottky Diode- Photodiode- LED.

**MODULE III**

**Transistors** **(6 Hours)**

Transistors- NPN Transistor- PNP Transistor- Transistor Symbols- Transistor Configurations- 1. Common Base Configuration-Current Amplification Factor- Expression for Collector Current-Input And Output Characteristics of Common Base Connection- 2. Common Emitter Connection- Base Current Amplification Factor- Expression for Collector Current- Relation Between β and α - Input And Output Characteristics of Common Emitter Configuration- 3. Common Collector Configuration- Current Amplification Factor- Expression for Collector Current- Relation Between γ and α-Comparison of Transistor Configurations.

Transistor as an Amplifier in CE Arrangement- Transistor Load Line Analysis- Operating Point- Transistor Biasing- Need for Stabilization- BJT Factors Contributing to Thermal Stability - Stability Factor- Base Resistor bias Method- Voltage Divider Bias Method.

**Wave Shaping Circuits** **(6 Hours)**

Clipping Circuits: Positive Clipper- Series Positive Clipper- Shunt Positive Clipper- Negative Clipper- Series Negative Clipper- Shunt Negative Clipper - Biased Clipper.

Clamper Circuits: Positive Clamper Circuit- Negative Clamper Circuit. Differentiating circuit, Applications of a Differentiating circuit - Generation of a narrow pulse from square wave. Integrating circuit - Applications of an integrating circuit - Generation of a triangular wave from a square wave. Voltage multipliers - Voltage doubler - Voltage Tripler.

**Text Books:**

*1. Principles of Electronics- V K Mehta and Rohit Mehta*

*2. Applied Electronics- R S Sedha*

## SEMESTER II

## EL2CMT02 - AMPLIFIERS, OSCILLATORS AND POWER ELECTRONICS

**Aim of the course:** This course aims to give an in-depth knowledge in Amplifiers, oscillators and power electronics

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**MODULE I**

**Single Stage CE Amplifier with Voltage Divider Biasing (12 Hours)**

Single Stage Transistor Amplifier- Transistor as an Amplifier- Components of Single Stage CE Amplifier with Voltage Divider Biasing- Various Currents in Single Stage CE Amplifier with Voltage Divider Biasing- Phase Reversal in Common Emitter Amplifier- DC Equivalent and AC Equivalent Circuits of Single Stage CE Amplifier with Voltage Divider Biasing. DC Load Line Analysis and AC Load Line Analysis of Single Stage CE Amplifier with Voltage Divider Biasing- Voltage Gain- AC Emitter Resistance- Voltage Gain of Unloaded CE Amplifier- Voltage Gain of Loaded CE Amplifier- Voltage Gain Of CE Amplifier Without $C_E$- Input Impedance of CE Amplifier- Voltage Gain Stability- Classification of Amplifiers- Amplifier Equivalent Circuit.

**MODULE II**

**Negative Feedback Amplifier (6 Hours)**

Feedback- Types of Feedback- Positive Feedback- Negative Feedback-Gain of Negative Voltage Feedback Amplifiers- Advantages of Negative Voltage Feedback Amplifiers. Input Impedance of Negative Voltage Feedback Amplifiers- Output impedance of Negative Voltage Feedback Amplifiers, Emitter Follower- DC Analysis of Emitter Follower- Voltage Gain of Emitter Follower - Input Impedance of Emitter Follower- Output Impedance of Emitter Follower -

Applications of Emitter Follower.

**Oscillators (6 Hours)**

Comparison of Oscillator And Amplifier- Classification of Oscillators- Applications of

Sinusoidal Oscillators- Oscillatory Circuit- Factors Determining Frequency of Oscillatory Circuit- Factors Determining The Frequency Stability of An Oscillator- The Barkhausen Criterion- Colpitts Oscillator-Hartley Oscillator- Phase Shift Oscillator- Piezo Electric Effect- Quartz Crystal- Transistor Crystal Oscillator.

**MODULE III**

**Field Effect Transistors** **(6 Hours)**

Comparison of BJT And FET- Types of FET- Junction Field Effect Transistor- N Channel JFET- P Channel JFET- JFET as an Amplifier- JFET Characteristics- Drain Characteristics- Transfer Characteristics- JFET Parameters- Advantages of JFET- JFET Biasing- Fixed Biasing- Self Biasing- Voltage Divider Biasing.

**Power Electronics** **(6 Hours)**

Silicon Controlled Rectifier- Working of SCR- Equivalent Circuit of SCR- SCR Characteristics- Triac - Triac Construction- Triac Operation- Triac Characteristics- Applications of Triac- DIAC- Operation of Diac- UJT- UJT Construction- UJT Operation- Equivalent Circuit of UJT- UJT Characteristics- Applications of UJT.

**Text Books:**

*1. Principles of Electronics- V K Mehta and Rohit Mehta*

*2. Applied Electronics- R S Sedha*

## SEMESTER III

## EL3CMT03 - OPERATIONAL AMPLIFIERS, COMMUNICATION ELECTRONICS AND INTEGRATED CIRCUITS

**Aim of the course:** This course introduces operational amplifiers and their applications, communication electronics and integrated circuits

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 3**

**MODULE I**

**The Operational Amplifier (18 hours)**

Basic Concepts of Operational Amplifier- Block Diagram of Opamp- Schematic Diagram- Ideal Operational Amplifier Features- Inverting Amplifier Using Opamp-Non Inverting Amplifier Using Opamp- Voltage Follower Using Opamp- Differential Amplifier with One Opamp- Differential Amplifier with Two Opamp- Opamp Parameters (basic ideas)- 1. Input Bias Current- 2. Input Offset Current-3. Input Offset Voltage- 4. Common Mode Rejection Ratio- 5. Supply Voltage Rejection Ratio-6. Output Voltage Swing- 7. Slew Rate-8. Gain Bandwidth Product.

**Applications of Op-amp**

Adder Circuit in Inverting Configuration- Adder Circuit in Non Inverting Configuration- Adder Circuit in Differential Configuration- Integrator- Differentiators- Square wave Generator using Opamp.

**MODULE II (18 hours)**

**Communication Electronics**

Modulation- Need for Modulation.

Principle of Amplitude Modulation- Frequency Spectrum of The AM Wave- AM Representation- Power Relations in the AM Wave- Modulation by Several Sine Waves-

Essentials of Demodulation- Limitations of AM- Transistor AM Modulator- Demodulation-Necessity of Demodulation- Essentials of Demodulation- AM Diode Detector- AM Radio Receivers- Straight Radio Receiver- Superheterodyne Receiver- Advantages of Superheterodyne Circuit

Frequency Modulation (qualitative study only)- Advantages of FM over AM-Comparison of FM And AM.

Pulse Modulation- Pulse Amplitude Modulation- Sampling Theorem- PAM Demodulation-Pulse Time Modulation-A. Pulse Width Modulation-PWM Generation using Monostable Multivibrator - B. Pulse Position Modulation- PPM Generation- PPM Demodulation- Pulse Code Modulation- Principles of PCM (basic ideas)

TV Fundamentals- Monochrome TV Transmission and Reception- Scanning- Horizontal Scanning- Vertical Scanning- Interlaced Scanning-TV Aspect Ratio- High Definition TV- Liquid Crystal Display- Plasma Display- Comparison of LCD And Plasma TV.

**MODULE III** **(18 hours)**

**Integrated Circuits**

Integrated Circuits- Advantages of ICs- Limitations of ICs- Scale of Integration- Classification of ICs By Structure- Monolithic ICs- Thick Film and Thin Film ICs- Hybrid ICs-Monolithic IC Technology-Planar Processes-1. Crystal Growth of The Wafer- 2.Epitaxial Growth- 3. Oxidation- 4. Photolithography and Chemical Etching- 5. Diffusion- 6. Ion Implantation- 7. Metallization. (Basic Ideas) Fabrication of a Bipolar Junction Transistor.

**TEXT BOOKS:**

*1. Opamps and Linear Integrated Circuits- Gayakwad*

*2. Electronic Communication Systems- George Kennedy & Bernard Davis*

*3. Principles of Electronics- V K Mehta and Rohit Mehta*

*4. Micro Electronics- Millman and Grabel*

## SEMESTER IV

## EL4CMT04 - DIGITAL ELECTRONICS

**Aim of the course:** This course aims to give an in-depth knowledge in digital electronics and applications

**Hours/Week** **4**
**Contact Hours** **72**
**Credits** **3**

**MODULE I**

**Number Systems** **(6 Hours)**

Introduction- Number Systems- Decimal Number System- Binary Number Systems- Octal Number Systems- Hexadecimal Number Systems- Binary Arithmetic-Binary Coded Decimal

**Boolean Algebra** **(6 Hours)**

Boolean Logic Operations- Properties of Boolean Algebra—Principle of Duality-

Demorgans Theorem- Simplification of Boolean Expression using Algebraic Method- Sum of Products and Product of Sums- Minterm- Canonical SOP- Maxterm- Canonical POS-Deriving SOP and POS From Truth Table- Karnaugh Map- Rules for K Map- Simplification of Boolean Expression Using K-Map.

**Logic Gates** **(6 Hours)**

Logic Gates- OR Gate- and Gate- NOT Gate- NAND Gate- NOR Gate- Universal Gates- XOR

Gate- XNOR Gate

**MODULE II**

**Combinational Circuits** **(6 Hours)**

Half Adder- Full Adder- Half Subtractor- Full Subtractor- Four Bit Adder. Decoder- Basic Binary Decoder- 3 to 8 Decoder- 4 to 16 Decoder- Applications of Decoder- Encoders-

Octal to Binary Encoder- Decimal to BCD Encoder- Priority Encoder.

**Sequential Circuits** **(6 Hours)**

Flip Flops- Types of Flip Flops- SR Filp Flop- NOR Based SR Flip Flop- NAND Based SR Flip Flop- Excitation Table of SR Flip Flop- Clocked SR Flip Flop-D Flip Flop- JK Flip Flop-T Flip Flop.

Triggering of Flip Flops- Asynchronous Inputs in Flip Flop- Master Slave JK Flip Flop-Race Around Condition- Applications of Flip Flops.

**Applications of Flip Flops** **(6 Hours)**

Counters- Asynchronous/Ripple Counter- Asynchronous Up Counter- Asynchronous Down Counter- Asynchronous Up Down Counter- Drawbacks Of Ripple Counters- Synchronous Counters- Synchronous Up Counter- Synchronous Down Counter- Synchronous Up Down Counter- Mod 3 Counter- Mod 6 Counter- Mod 10 (Bcd) Counter-Ring Counter Shift Registers- Types of Shift Registers- SISO –SIPO- PISO- PIPO

Converters- Digital to Analog Converters- Weighted Resistor Type DAC- R-2R Ladder Type DAC- Specifications of DAC- Analog to Digital Converters- Counter Type ADC

**MODULE III** **(18 hours)**

**Basics of Python Programming**

Python and its advantages- Python interpreter- IDLE- Basic Python syntax- comments, string operations, variable types, type casting, operators; simple IO- print, input, loadtxt; Program control flow- conditional statements, loops, Functions; packages and modules-math, numpy, scipy; Lists- append, pop, map, sort (basic ideas only).

**TEXT BOOKS**

1. Digital Circuits and Design- S Salivahanan and S Arivizhagan

2. Python in a Nutshell- Alex Martelli

3. Computational Physics with Python- Dr. Eric Ayars

# EL2CMP01 - ELECTRONICS PRACTICALS – I

**Aim of the course:** This course aims to give hands on training in basic electronic characteristics and their applications

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 2**

## FIRST YEAR (SEMESTER I AND II)

1. CRO Familiarization
2. PN Junction Diode Characteristics
3. Zener Diode Characteristics
4. LED Characteristics
5. Half Wave Rectifier with and without Filter
6. Centre Tapped Full Wave Rectifier with and without Filter
7. Bridge Full Wave Rectifier with And Without Filter
8. Clippers- Positive, Negative, Biased
9. Clampers- Positive, Negative
10. Voltage Multipliers
11. Zener Diode Regulator
12. RC Integrator
13. RC Differentiator
14. Common Base Characteristics
15. Common Emitter Characteristics
16. Single Stage CE Amplifier
17. JFET Characteristics
18. Emitter Follower
19. Transistor as a Switch
20. Hartley Oscillator
21. Colpitts Oscillator
22. RC Phase Shift Oscillator

**Reference**:

Electronics Lab Manual Vol I - Dr. K A Navas

20 experiments are to be carried out compulsorily. For appearing external examinations, certified record should be produced.

## EL4CMP02 - ELECTRONICS PRACTICALS – II

**Aim of the course:** This course aims to give practical expertise in op-amp ICs , analog and digital ICs and their applkcations

**Hours/Week : 4**
**Contact Hours : 72**
**Credits : 2**

## SECOND YEAR (SEMESTER III AND IV)

1. Zero Crossing Detector using Op-amp
2. Inverting Amplifier using Op-amp
3. Non Inverting Amplifier using Op-amp
4. Comparator using Op-amp
5. Buffer (Voltage Follower) using Op-amp
6. Adder Circuit using Op-amp
7. Difference Amplifier using Op-amp
9. Integrator using Op-amp
10. Differentiator using Op-amp
11. Square Wave Generator Using Op-amp
12. Verification of Truth Table using ICs
13. Verification of Truth Table using Universal Gates
14. Verification of Demorgan's Law
15. Half Adder using ICs
16. Full Adder using ICs
17. Verification of Truth Table of JK Flip Flop
18. Shift Register using IC
19. Ripple Counter using IC
20. Ring Counter using IC
21. Decade Counter using IC
22. Digital to Analog Converter
23. Analog to Digital Converter
24. Print a Set of Numbers in Fibonacci Series using Python
25. Python Program to Check Prime Numbers.

**Reference:**

Electronics Lab Manual Vol II - Dr. K A Navas

22 experiments are to be carried out compulsorily. For appearing external examinations, certified record should be produced.

**For all Practical papers**

**a) Marks of External Examination 80**

**b) Marks of internal evaluation 20**

**Internal Practical Evaluation:**

All the four components of the internal assessment are mandatory.

| Components of Internal Evaluation of Practical | Marks |
|---|---|
| Attendance | 5 |
| Test paper/Viva | 5 |
| Record* | 5 |
| Lab involvement | 5 |
| **Total** | **20** |

*Marks awarded for Record should be related to number of experiments recorded and duly signed by the concerned teacher in charge. For appearing external practical examination, certified record should be produced.

**External Practical Examination:**

For all the practical papers, there will be an external evaluation. The external examiner will be appointed by the University. There will be an internal examiner who will be appointed by the Head of the Department of the College. The external university examination will be of 3 hours and the various components for external evaluation of practical are:

**Scheme of Evaluation for External Practical Examination**

| Parameter | Marks |
|---|---|
| Circuit diagram & Proper labelling | 15 |
| Theory, Design, Truth Table(for digital circuits), Procedure & Tabular columns | 15 |
| Viva | 15 |
| Conduction & Observation | 15 |
| Result | 10 |
| Certified Record | 10 |
| **Total** | **80** |