

## B.E BRANCH: ELECTRICAL AND ELECTRONICS ENGINEERING

| S.NO                       | CODE     | COURSE                                     | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|--|------------|---|---|---------|---------------|-----|-------|
|                            |          |  | L          | T | P |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 1 THEORY</b> |          |  |            |   |   |         |               |     |       |
| 1                          | 11USL101 | Communication skills - I                   | 3          | 0 | 1 | 3       | 20            | 80  | 100   |
| 2                          | 11USM101 | Engineering Mathematics -I                 | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 3                          | 11USC103 | Chemistry for Electrical Sciences          | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 4                          | 11USP103 | Physics for Electrical Sciences            | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 5                          | 11UAK161 | Basics of Civil and Mechanical Engineering | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 6                          | 11UFK103 | Fundamentals of Electric Circuits          | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 7                          | 11UFK102 | History of Electrical Engineering          | 1          | 0 | 0 | 1       | 100           | -   | 100   |
| <b>PRACTICAL</b>           |          |  |            |   |   |         |               |     |       |
| 1                          | 11USH111 | Physical Sciences Lab - I                  | 0          | 0 | 3 | 1       | 20            | 80  | 100   |
| 2                          | 11UCK104 | Computing Practices lab                    | 2          | 0 | 2 | 3       | 20            | 80  | 100   |
| 3                          | 11UAK104 | Engineering Graphics lab                   | 1          | 0 | 3 | 3       | 20            | 80  | 100   |
|                            |          | TOTAL                                      | 22         | 1 | 9 | 27      | 280           | 720 | 1000  |

| S.NO                       | CODE     | COURSE                                | HOURS/WEEK |   |    | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|---------------------------------------|------------|---|----|---------|---------------|-----|-------|
|                            |          |                                       | L          | T | P  |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 2 THEORY</b> |          |                                       |            |   |    |         |               |     |       |
| 1                          | 11USL201 | Communication skills – II             | 3          | 0 | 1  | 3       | 20            | 80  | 100   |
| 2                          | 11USM201 | Engineering Mathematics - II          | 3          | 1 | 0  | 4       | 20            | 80  | 100   |
| 3                          | 11USC201 | Environmental Science and Engineering | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 4                          | 11USP202 | Science of Engineering Materials      | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 5                          | 11UCK201 | C Programming                         | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 6                          | 11UAK201 | Engineering Mechanics                 | 3          | 1 | 0  | 4       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |                                       |            |   |    |         |               |     |       |
| 1                          | 11USH211 | Physical Sciences Lab - II            | 0          | 0 | 3  | 1       | 20            | 80  | 100   |
| 2                          | 11UCK203 | C programming lab                     | 0          | 0 | 3  | 2       | 20            | 80  | 100   |
| 3                          | 11UAK205 | Engineering practices lab             | 0          | 0 | 3  | 2       | 20            | 80  | 100   |
|                            |          | TOTAL                                 | 18         | 2 | 10 | 25      | 180           | 720 | 900   |

| S.NO                       | CODE     | COURSE                               | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|--------------------------------------|------------|---|---|---------|---------------|-----|-------|
|                            |          |                                      | L          | T | P |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 3 THEORY</b> |          |                                      |            |   |   |         |               |     |       |
| 1                          | 11USM301 | Engineering Mathematics - III        | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 2                          | 11UCK311 | Data structures and Algorithm        | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 3                          | 11UAK361 | Thermal and Fluid Mechanics          | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 4                          | 11UFK301 | Circuit Theory and Network Synthesis | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 5                          | 11UFK302 | Electro Magnetic Theory              | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 6                          | 11UFK303 | DC Machines and Transformers         | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |                                      |            |   |   |         |               |     |       |
| 1                          | 11UCK312 | Data structures and Algorithm Lab    | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
| 2                          | 11UFK391 | Circuits and Networks Lab            | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
| 3                          | 11UFK392 | DC Machines and Transformers Lab     | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
|                            |          | <b>TOTAL</b>                         | 18         | 3 | 9 | 27      | 180           | 720 | 900   |

| S.NO                       | CODE     | COURSE                                  | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|---|------------|---|---|---------|---------------|-----|-------|
|                            |          |   | L          | T | P |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 4 THEORY</b> |          |   |            |   |   |         |               |     |       |
| 1                          | 11USM405 | Engineering Mathematics - IV            | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 2                          | 11UBK451 | Principles of Communication Engineering | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 3                          | 11UCK411 | Object Oriented Programming             | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 4                          | 11UFK401 | Electronic Devices and Circuits         | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 5                          | 11UFK402 | Synchronous and Induction Machines      | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 6                          | 11UFK403 | Power Generation Systems                | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |   |            |   |   |         |               |     |       |
| 1                          | 11UCK412 | Object Oriented Programming Lab         | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
| 2                          | 11UFK491 | Synchronous and Induction Machines Lab  | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
| 3                          | 11UFK492 | Electronic Devices and Circuits Lab     | 0          | 0 | 3 | 2       | 20            | 80  | 100   |
|                            |          | <b>TOTAL</b>                            | 18         | 3 | 9 | 27      | 180           | 720 | 900   |

| S.NO                       | CODE     | COURSE                                     | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|--|------------|---|---|---------|---------------|-----|-------|
|                            |          |  | L          | T | P |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 5 THEORY</b> |          |  |            |   |   |         |               |     |       |
| 1                          | 11USM501 | Numerical Methods                          | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 2                          | 11UFK501 | Measurements and Instrumentation           | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 3                          | 11UFK502 | Transmission and Distribution              | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 4                          | 11UFK503 | Linear Integrated Circuits                 | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 5                          | 11UFK504 | Digital Electronics                        | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 6                          | 11UFK505 | Control Systems                            | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |  |            |   |   |         |               |     |       |
| 1                          | 11UFK591 | Control and Instrumentation Lab            | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
| 2                          | 11UFK592 | Linear and Digital Integrated Circuits Lab | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
| 3                          | 11USL501 | Communication Skills Lab                   | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
|                            |          | TOTAL                                      | 18         | 2 | 9 | 26      | 300           | 600 | 900   |

| S.NO                       | CODE     | COURSE                                 | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|--|------------|---|---|---------|---------------|-----|-------|
|                            |          |  | L          | T | P |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 6 THEORY</b> |          |  |            |   |   |         |               |     |       |
| 1                          | 11UBK651 | Digital Signal Processing              | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 2                          | 11UFK601 | Professional Ethics                    | 2          | 0 | 0 | 2       | 20            | 80  | 100   |
| 3                          | 11UFK602 | Power Electronics                      | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 4                          | 11UFK603 | Power System Analysis                  | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| 5                          | 11UFK604 | Microprocessors & Microcontrollers     | 3          | 0 | 0 | 3       | 20            | 80  | 100   |
| 6                          | 11UFK605 | Electrical Machine Design              | 3          | 1 | 0 | 4       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |  |            |   |   |         |               |     |       |
| 1                          | 11UBK659 | Digital Signal Processing Lab          | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
| 2                          | 11UFK691 | Power Electronics Lab                  | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
| 3                          | 11UFK692 | Microprocessors & Microcontrollers Lab | 0          | 0 | 3 | 2       | 60            | 40  | 100   |
|                            |          | TOTAL                                  | 17         | 3 | 9 | 26      | 300           | 600 | 900   |

| S.NO                       | CODE     | COURSE                          | HOURS/WEEK |   |    | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|---------------------------------|------------|---|----|---------|---------------|-----|-------|
|                            |          |                                 | L          | T | P  |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 7 THEORY</b> |          |                                 |            |   |    |         |               |     |       |
| 1                          | 11UFK701 | Protection and Switchgear       | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 2                          | 11UFK702 | Electric Drives and Control     | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 3                          | 11UFK703 | Embedded Systems                | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 4                          | 11UFK704 | VLSI Systems                    | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 5                          |          | Elective - I                    | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| 6                          |          | Elective - II                   | 3          | 0 | 0  | 3       | 20            | 80  | 100   |
| <b>PRACTICAL</b>           |          |                                 |            |   |    |         |               |     |       |
| 1                          | 11UFK791 | Power System Simulation Lab     | 0          | 0 | 3  | 2       | 60            | 40  | 100   |
| 2                          | 11UFK792 | Electric Drives and Control Lab | 0          | 0 | 3  | 2       | 60            | 40  | 100   |
| 3                          | 11UFK799 | Project : Phase I               | 0          | 0 | 6  | 4       | 60            | 40  | 100   |
|                            |          | TOTAL                           | 18         | 0 | 12 | 26      | 300           | 600 | 900   |

| S.NO                       | CODE     | COURSE   | HOURS/WEEK |   |    | CREDITS | MAXIMUM MARKS |     |       |
|----------------------------|----------|--|------------|---|----|---------|---------------|-----|-------|
|                            |          |  | L          | T | P  |         | CA            | FE  | TOTAL |
| <b>SEMESTER - 8 THEORY</b> |          |  |            |   |    |         |               |     |       |
| 1                          | 11UFK801 | Electrical Energy Utilization and Conservation | 3          | 0 | 0  | 3       | 60            | 40  | 100   |
| 2                          |          | Elective - III                                 | 3          | 0 | 0  | 3       | 60            | 40  | 100   |
| 3                          |          | Elective - IV                                  | 3          | 0 | 0  | 3       | 60            | 40  | 100   |
| <b>PRACTICAL</b>           |          |  |            |   |    |         |               |     |       |
| 1                          | 11UFK899 | Project : Phase II                             | 0          | 0 | 18 | 12      | 60            | 40  | 100   |
|                            |          | TOTAL  | 9          | 0 | 18 | 21      | 240           | 160 | 400   |

## LIST OF ELECTIVES

| S.NO                  | CODE     | COURSE   | HOURS/WEEK |   |   | CREDITS | MAXIMUM MARKS |    |       |
|-----------------------|----------|--|------------|---|---|---------|---------------|----|-------|
|                       |          |  | L          | T | P |         | CA            | FE | TOTAL |
| <b>ELECTIVE - I</b>   |          |  |            |   |   |         |               |    |       |
| 1                     | 11UFE701 | Power System Operation and Control                         | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 2                     | 11UFE702 | Special Electrical Machines                                | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 3                     | 11UFE703 | Advanced Control Theory                                    | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 4                     | 11UFE704 | Digital Image Processing                                   | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 5                     | 11UAK661 | Total Quality Management                                   | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| <b>ELECTIVE - II</b>  |          |  |            |   |   |         |               |    |       |
| 6                     | 11UFE705 | Biomedical Instrumentation                                 | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 7                     | 11UFE706 | High voltage Engineering                                   | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 8                     | 11UFE707 | Computer Aided Analysis and Design of Electrical Apparatus | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 9                     | 11UFE708 | Computer Networks  | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 10                    | 11UFE709 | PLC and Industrial Automation                              | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| <b>ELECTIVE - III</b> |          |  |            |   |   |         |               |    |       |
| 11                    | 11UFE801 | Intellectual Property Rights                               | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 12                    | 11UFE802 | Microprocessor based System design                         | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 13                    | 11UFE803 | Switched Mode Power Converters                             | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 14                    | 11UFE804 | Principles of Management                                   | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 15                    | 11UFE805 | RTOS   | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| <b>ELECTIVE - IV</b>  |          |  |            |   |   |         |               |    |       |
| 16                    | 11UFE806 | Advances in Soft Computing                                 | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 17                    | 11UFE807 | Digital System Design using VHDL                           | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 18                    | 11UFE808 | Virtual Instrumentation                                    | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 19                    | 11UFE809 | Computer Organization and Architecture                     | 3          | 0 | 0 | 3       | 20            | 80 | 100   |
| 20                    | 11UFE810 | Power Quality  | 3          | 0 | 3 | 3       | 20            | 80 | 100   |

11USL101

**COMMUNICATION SKILLS - I**

**L T P C**  
**3 0 1 3**

**Course Objectives**

- *To improve the language proficiency of the students in English with emphasis on LSRW skills.*
- *To equip the students to study academic subjects with greater facility with theoretical and practical components of the English syllabus.*
- *Enable students to develop their listening skills and to improve their pronunciation.*
- *To make students aware of the role of speaking in English and its contribution to their success.*
- *To develop the ability of students to guess the meanings of words from context and grasp the overall message of the text, draw inferences etc.*
- *To equip them with the components of different forms of writing beginning with the lower order ones.*
- *To empower students with the grammatical skills.*

**UNIT I - LISTENING SKILLS**

**9**

Listening for general content - Listening to fill up information - Intensive listening Listening for specific purpose

**UNIT II - SPEAKING SKILLS**

**9**

Introducing oneself in various situations - Describing objects, situation and people Asking questions - Narrating incidents - Just a minute sessions - Day to Day Conversations - Debates

**UNIT III - READING SKILLS**

**9**

Skimming the text - Understanding the gist of an argument - Inferring lexical and contextual meaning - Understanding discourse features - Recognizing coherence/ sequencing of sentences.

**UNIT IV - WRITING SKILLS**

**9**

Paragraph writing - Extended Definition – Transcoding -Formal and informal letter Note making - Editing a passage- itinerary- instructions.

**UNIT V - LANGUAGE FOCUS**

**9**

Articles – Parts of speech – Tenses – Voice - Gerunds and infinitives – concord- modal verbs- definitions-‘ wh’ questions- comparative adjectives- Conditionals - Nominal compounds – Word formation – Prefixes and Suffixes/ one form to another form - Synonyms and Antonyms

**Total hours: 45**

## **TEXT BOOKS**

- 1 Department of Humanities and Social Sciences, Anna University 'English for Engineers and Technologists', Combined Edition Volume I and II, Chennai: Orient Longman Private Limited, 2006.
- 2 Murphy, "Murphy's English Grammar", Cambridge University Press.

## **REFERENCE BOOKS**

- 1 Bhaskaran and Horsburgh, "Strengthen Your English", , Oxford University Press.
- 2 Francis Soundararaj, "Speaking and Writing for Effective Business Communication", MacMillan, India Ltd., 2007.
- 3 Robert J. Dixon, 'Everyday Dialogues in English', Prentice-Hall of India Ltd., 2006.
- 4 John Seely, 'The Oxford Guide to Writing and Speaking', Oxford.

|                 |                                    |          |          |          |          |
|-----------------|------------------------------------|----------|----------|----------|----------|
| <b>11USM101</b> | <b>ENGINEERING MATHEMATICS – I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 | <b>(Common to all branches)</b>    | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objective**

*To provide strong foundation to the students to expose various emerging new areas of applied mathematics and appraise them with their relevance in Engineering and Technological field.*

**PREREQUISITE:**

- (i) Matrices – rank of matrix, Linear dependence and linear independence
- (ii) Differential Calculus – Differentiation of Implicit functions, parametric functions
- (iii) Ordinary Differential equations – Basic terminologies like definition, formation, meaning of solution, variable and separable method, linear differential equations.

**UNIT I– LINEAR ALGEBRA 9**

Euclidean n-space – Vector spaces – Subspaces – Linear combinations – Linear dependence and independences – Basis and dimensions – Applications to matrices: Rank of a matrix, Inner product spaces – Example of inner product spaces – Cauchy-Schwarz inequality– Orthonormal bases – Gram Schmidt process.

**UNIT II – MATRICES 9**

Characteristic equation – Eigen values and eigen vectors of a real matrix – Properties – Cayley-Hamilton theorem (excluding proof) – Orthogonal transformation of a symmetric matrix to diagonal form – Quadratic form – Reduction of quadratic form to canonical form by orthogonal transformation

**UNIT III – APPLICATIONS OF DIFFERENTIAL CALCULUS 9**

Curvature in Cartesian co-ordinates – Centre and radius of curvature – Circle of curvature – Evolutes – Envelopes.

**UNIT IV – FUNCTIONS OF SEVERAL VARIABLES 9**

Partial derivatives – Total derivatives – Differentiation of implicit functions – Jacobians – Taylor’s expansion – Maxima and Minima – Method of Lagrangian multipliers.

## **UNIT V – ORDINARY DIFFERENTIAL EQUATIONS**

**9**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients – Applications to Engineering problems.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 Erwin Kreyszig, “Advanced Engineering Mathematics”, 8th Edition, Wiley India, 2006.
- 2 Grewal. B.S, “Higher Engineering Mathematics”, 40<sup>th</sup> Edition, Khanna Publications, Delhi,

### **REFERENCE**

- 1 Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 2007.
- 2 Glyn James, “Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Wiley India, 2007.
- 3 Jain R.K and Iyengar S.R.K,” Advanced Engineering Mathematics”, 3<sup>rd</sup> Edition, Narosa Publishing House Pvt. Ltd., 2007.

|   |          |          |          |          |
|---|----------|----------|----------|----------|
| <b>11USC103 CHEMISTRY FOR ELECTRICAL SCIENCES</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objective**

*To provide strong foundation to the students to expose various emerging new areas of applied chemistry and appraise them with their relevance in Engineering and technological field.*

**UNIT I - CHEMISTRY IN EVERYDAY LIFE 9**

Applications of Chemistry in health and hygiene – Chemicals in medicines – analgesics, antiseptics, antacids, disinfectants –Chemicals in food preservatives – artificial sweetening agents –Water quality parameter and standards -types of hardness –estimation by EDTA method-characteristic of portable water –domestic water treatment –disinfection methods-Chlorination –UV treatment – Ozonation – desalination –reverse osmosis.

**UNIT II - POLYMERS 9**

Introduction – monomers and polymers – Nomenclature of polymers- Classification of polymers- Polymerization-Types- Mechanism of addition polymerization-Plastics-Classification- Compounding of plastics-Preparation, properties and uses of PVC, Teflon Nylon 6,6- Rubber –vulcanization of rubber- Synthetic rubber ( Butyl rubber and SBR)-Conducting polymers- Conducting mechanisms.

**UNIT III - NON CONVENTIONAL ENERGY SOURCES AND STORAGE DEVICES 9**

Introduction to Energy resources-Primary cell- Lechlanche cell- alkaline batteries -secondary batteries - Lead acid Nickel cadmium and lithium-sulphur batteries- Fuel cells- hydrogen oxygen fuel cell- Solar cells- principles and applications of solar cells- Nuclear energy- nuclear fission and fusion reactions- light water power plant-breeder reactor.

**UNIT – IV ELECTROCHEMISTRY AND CORROSION SCIENCE 9**

Electrochemical cells - single electrode potential –Measurement of emf - Reference electrode-standard hydrogen electrode-Calomel electrode - glass electrode and measurement of pH- Corrosion – chemical corrosion- electrochemical corrosion- galvanic corrosion – differential corrosion- Protective coatings –Electroplating of gold - Electroless plating, anodizing-Electrochemical machining of metals and alloys.

## UNIT V - ANALYTICAL TECHNIQUES

9

Laws of absorption- Principles- Instrumentation and applications- UV - Visible spectroscopy- IR spectroscopy- Colorimetry- Estimation of Iron by Colorimetry -Flame photometry- Estimation of Sodium by Flame Photometry- Atomic absorption spectroscopy- Estimation of Nickel by atomic absorption spectroscopy.

### TEXT BOOKS

- 1 Jain P.C & Monika Jain, “Engineering Chemistry”, Dhanpat Rai Publishing Co Ltd, New Delhi,2004
- 2 Dr. Dara S.S & Dr. Umare S.S., “Engineering Chemistry”, S .Chand & Company Ltd, New Delhi.

### REFERENCE

- 1 Steven S. Zumdahl and Susan A. Zumdahl “Chemistry” Houghton Mifflin Seventh Edition 2009.
- 2 Kaiser A.B, “Electronic properties of conjugated polymers – basics, models and applications”, Springer Verlag, 1997.
- 3 Dr. Ramachandran T, Dr Venkataraman H, Dr. Magudeswaran P N, “Chemistry for Engineers”, Vijay Nicole imprints Private Limited, Chennai.

**Course Objective**

*To provide strong foundation to the students to expose various emerging areas of Applied Physics and appraise them with their relevance in Engineering and technological field.*

**UNIT I: LASER TECHNOLOGY AND FIBER OPTICS****9**

Introduction, Principle – Spontaneous emission, Stimulated emission, Population Inversion, Pumping mechanisms - Types of Laser – He-Ne Laser, CO<sub>2</sub>, Semiconductor Laser. Applications – Lasers in Microelectronics, Drilling, Welding, Heat Treatment, Cutting and Holography. Principle, Modes of Propagation, Fabrication Techniques – Rod & Tube method, Crucible-Crucible Technique - Classification based on Materials, Refractive Index Profile and Modes. Splicing, Losses in Optical fiber. Light Sources for fiber Optics. Detectors, Fiber Optical Communication links.

**UNIT II: QUANTUM PHYSICS AND MICROSCOPY****9**

Development of quantum theory, Dual Nature of Matter and Radiation – de-Broglie wavelength, Uncertainty Principle, Schrodinger equation – Time dependent, Time independent. Particle in a box. Limitation of Optical Microscopy, Electron Microscopy, Transmission Electron Microscope, Scanning Transmission Electron Microscope and Application

**UNIT III: ELECTRICAL AND THERMAL PROPERTIES****9**

Electrical conductivity – Drude – Lorentz theory of metals (qualitative). Wiedmann-Franz law. Origin of band structure – band theory of solids, distinction between conductors, semiconductor and insulator based on band theory. Factors affecting resistivity of metals – Temperature, alloying, strain and magnetic field with respective applications. Thermal conduction – Thermal conductivity, Flow of heat through compound media.

**UNIT IV: SEMICONDUCTING MATERIALS AND DEVICES****9**

Elemental and compound semiconductors, Intrinsic and extrinsic semiconductors – Properties. Carrier concentration in intrinsic semiconductors. Carrier concentration in n-type and p-type semiconductors. Material preparation – Czochralski method and zone refining, doping methods (diffusion and ion implantation) Hall Effect in extrinsic semiconductors, Solar cells, IC fabrication

## **UNIT V: MAGNETIC MATERIALS AND DEVICES**

**9**

Dia, Para, Ferro, Antiferro and ferri magnetic materials – Properties, Heisenberg and domain theory of ferromagnetisms. Hysteresis, Ferrites – Structure, preparation and its applications – CD ROM, Magneto optical recording.

**TOTAL HOURS: 45**

### **TEXT BOOKS:**

- 1 M.N. Avadhanulu and PG Kshirsagar, ‘A Text book of Engineering Physics’, S.Chand and company, Ltd., New Delhi, 2005.
- 2 William D Callister, Jr “Material Science and Engineering” John wiley and Sons, New York, 2007.

### **REFERENCES BOOKS:**

- 1 Jayakumar, S “Materials Science”, RK Publishers, Coimbatore 2006.
- 2 Richard Wolfson, “Essential University Physics”, Pearson Education ,Volume I & II
- 3 Ageov N, Zuev A.I and Kokora A, “Laser and Electron Beam materials processing”, Mir Publications, Moscow, 1998.

|                 |   |          |          |          |          |
|-----------------|---|----------|----------|----------|----------|
| <b>11UAK161</b> | <b>BASICS OF CIVIL AND MECHANICAL ENGINEERING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |   | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objectives**

- *Learning and understanding of the basic concepts of civil and Mechanical Engineering with applications.*

**A – CIVIL ENGINEERING**

**UNIT I - SURVEYING AND CIVIL ENGINEERING MATERIALS 9**

Surveying: Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples. Civil Engineering Materials: Bricks – stones – sand – cement – concrete – steel sections.

**UNIT II - BUILDING COMPONENTS AND STRUCTURES 9**

Foundations: Types, Bearing capacity – Requirement of good foundations. Superstructure: Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering –Types of Bridges and Dams.

**B – MECHANICAL ENGINEERING**

**UNIT III - POWER PLANT ENGINEERING 9**

Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps and Centrifugal Pumps.

**UNIT IV - I.C ENGINES 9**

Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

**UNIT V - REFRIGERATION AND AIR CONDITIONING SYSTEM 9**

Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

**Total Hours = 45**

## **TEXT BOOKS**

- 1 Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, 1996.
- 2 Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. 1999.

## **REFERENCE**

- 1 Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, 2005.
- 2 Venugopal K and Prahua Raja V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, 2000.
- 3 Neil S. Grigg, “Civil Engineering Practice in the Twenty-First Century : Knowledge and Skills for Design and Management”, American Society of Civil Engineers, 2001.
- 4 Shantha Kumar S.R.J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, 2000.

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|   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>11UFK103 FUNDAMENTALS OF ELECTRIC CIRCUITS</b> | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objectives**

- *To understand the concept of circuit elements, circuit laws and network reduction.*
- *To understand the concept of active, reactive and apparent powers, power factor.*
- *To understand the concept of magnetic circuits, coupled circuits and network topology*

**UNIT I - BASIC CONCEPTS AND ELECTRICAL QUANTITIES 9**

Basic concepts - Electric charge – static electricity - Current in solids, liquids and gases – electric potential – polarity - Power, Energy – classification of circuit elements – active and passive – Resistors – types, tolerance, color coding, power rating, temperature dependence, specific resistance, conductance – capacitors & inductors – types and uses.

**UNIT II - DC CIRCUIT CONCEPTS 8**

Circuit essentials – Circuit symbols and diagrams - Electrical network – Node, branches, closed path and networks – Series, parallel – Open circuit and Short circuit - Voltage and Current Sources – Dependent and Independent sources - Resistors in series and parallel circuits - Ohm’s Law -Kirchoffs laws - Star and Delta transformations - Network reduction – Current and Voltage division rules – measuring electrical quantities.

**UNIT III - MAGNETIC CIRCUITS 12**

Flux – flux density – mmf – magnetic field intensity - reluctance – permeability – permeance - Analysis of simple and composite magnetic circuits - Ohms law of magnetic circuits – leakage flux - fringing effect - emf - self and mutual induced emf – generator action – transformer action - comparison between electric and magnetic circuit – hands rule – dot rule – coupled circuits – analysis

**UNIT IV - BASIC CONCEPTS OF AC CIRCUITS 9**

AC terminology - Waveforms - types - Sinusoidal voltage and current - advantages of AC - Inductance and Capacitance in series and parallel circuits - Impedance - RMS, Average Value – Form factor and Peak factor, Phasor – Phasor relationship for R, L and C – Instantaneous power – average power – apparent power and power factor – Complex power.

## **UNIT V - CIRCUIT COMPONENTS AND ELECTRICAL APPLIANCES**

**9**

Lamps – incandescent lamps, Fluorescent lamps, CFL, LED – Switches – types, symbols and uses – wires and cables – fuses – circuit breakers – relays – earthing – earth resistance – residential wiring  
Electrical appliances (working principle only) – iron box, fan, emergency lamps

**Total Hours: 45**

### **TEXT BOOKS**

- 1 Fowler, “Electricity Principles and Applications”, McGraw Hill International edition, third edition.
- 2 T.Thyagarajan, K.P.Sendur chelvi, T.R.Rangaswamy, “Engineering Basics Electrical, Electronics and computer engineering”, New Age International Publishers, 2007

### **REFERENCE**

- 1 Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”, TMH, Second Edition, (2006).
- 2 Giorgio Rizzoni, “Principles and Applications of Electrical Engineering” Tata McGraw Hill Publications, 2010
- 3 Ravish Singh, “Electrical Networks”, Tata Mc Graw Hill, New Delhi, 2008.

|   | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|---|----------|----------|----------|----------|
| <b>11UFK102 HISTORY OF ELECTRICAL ENGINEERING</b> | <b>1</b> | <b>0</b> | <b>0</b> | <b>1</b> |

**Course Objectives**

- Know historical development of science and technology.
- Create awareness of material knowledge.
- Know about scientists and their invention in the field of Electrical Engineering.
- Have historical knowledge of Electronics Engineering

**UNIT I - HISTORY OF SCIENCE 3**

Mathematics applications in Engineering-History of Material Science-Physical Sciences-Atomic physics to Quantum theory- History of Chemistry

**UNIT II - HISTORY OF ELECTRICAL ENGINEERING 3**

History of electricity- Electric light bulb-Thomas Edison - Electrical Wiring-Electrical appliances- History of Magnetism - Electro Magnetic Induction-Electrical Measurements

**UNIT III - HISTORY OF ELECTRICAL POWER 3**

History of Power Generation- Electric Motors- Electric Generators-Transformers-History of Power Transmission

**UNIT IV - HISTORY OF ELECTRONIC ENGINEERING 3**

Radio Communication-Vacuum Tubes –Transistors-ICs–VLSI- Phonographs-Radiogrammes- Telephone- Television- Audio Systems - Hi-Fi Communication-Microprocessors and Computers

**Total Hours = 12**

**REFERENCE**

- 1 Bryan Bunch with Alexander Hellemans., "The History of Science and Technology" , Houghton Mifflin Company, New York, 2004.
- 2 <http://en.wikipedia.org/wiki/electricity>
- 3 [http://en.wikipedia.org/wiki/electrical\\_engineering](http://en.wikipedia.org/wiki/electrical_engineering)
- 4 [http://en.wikipedia.org/wiki/semiconductor\\_device](http://en.wikipedia.org/wiki/semiconductor_device)

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| <b>11USH111</b> | <b>PHYSICAL SCIENCE LABORATORY - I</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |  | <b>0</b> | <b>0</b> | <b>3</b> | <b>1</b> |

**Course Objective**

*To provide exposure to the students with hands-on experience on scientific equipments*

**PHYSICS LABORATORY I**

1. a) Particle size determination using diode laser.
- b) Determination of laser parameters – Wavelength and angle of divergence
- c) Determination of acceptance angle in an optical fiber.
2. Determination of Band gap of a Semi conducting material.
3. Characteristics of LDR
4. Determination of thermal conductivity of a bad conductor – Lee’s disc method.
5. Determination of Hysteresis Loss of a Ferro-magnetic material.
6. Determination of Young’s modulus of the material – Non uniform bending.

**DEMONSTRATION:**

1. Optical phenomena using Laser.

**CHEMISTRY LABORATORY-I**

1. Determination of pH of strong acid by pH metry
2. Conductometric titration of strong acid with strong base.
3. Estimation of HCl and CH<sub>3</sub>COOH by Conductometric titration.
4. Potentiometric titration of Ferrous ion using Potassium dichromate.
5. Determination of Electrode Potential of an electrode.
6. Estimation of Iron by Spectrophotometry.

**Total Hours: 30**

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| <b>11UCK104</b> | <b>COMPUTING PRACTICES LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                       | <b>2</b> | <b>0</b> | <b>2</b> | <b>3</b> |

**Course Objectives**

- To enable the students to create technical reports, spread sheets and presentations

**A) WORD PROCESSING**

1. Document creation, Text manipulation with Scientific notations.
2. Table creation, Table formatting and Conversion.
3. Mail merge and Letter preparation.
4. Drawing - flow Chart

**B) SPREAD SHEET**

5. Chart - Line, XY, Bar and Pie.
6. Formula - formula editor.
7. Spread sheet - inclusion of object, Picture and graphics, protecting the document and sheet.
8. Sorting and Import / Export features.

**C) PRESENTATION**

9. Creating a Demo Presentation (Getting Started)
10. Enhancing the slides (Changing the slide background, apply design templates to a presentation, Format the text in the slides, Modify the layout of a slide)
11. Inserting Objects into a slide (Inserting Graph, Organizational Chart, Word Art, Clip Art)
12. Using Autoshapes to create a drawing, Group and Ungroup Objects, Emboss Objects)
13. Enhancing (Apply Build Effects, Animation Effects, Transition Effects, Specify a Time period for transition and build effects, Rehearse slide timings)
14. Add Action Items and minutes of the meeting during the slide show
15. Modify the slide setup to match presentation requirements, Preview slides in grey Scale, Print Slides, notes pages, outline and handouts

**Total Hours: 30**

**REFERENCE**

- University of California <http://www.universityofcalifornia.edu>
- University of Michigan <http://www.umich.edu/>
- University of Texas <http://www.utexas.edu>
- IIT Bombay <http://www.cse.iitb.ac.in>
- IISc Bangalore [www.iisc.ernet.in](http://www.iisc.ernet.in)
- University of Cambridge <http://www.cam.ac.uk/>

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| <b>11UAK104</b> | <b>ENGINEERING GRAPHICS LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |  | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

***Course Objectives***

*To develop in students graphic skill for communication of concepts, ideas and design of engineering products.*

**CURVES USED IN ENGINEERING PRACTICES 9**

Conics – Construction of ellipse, parabola and hyperbola by eccentricity method - Construction of cycloid – Involutives – Drawing of tangents and normal to the above curves.

**FREE HAND SKETCHING 9**

General principles of orthographic projection – Need for importance of multiple views and their placement – First angle projection – Free hand sketching of multiple views from pictorial views of 3D objects.

**PROJECTION OF POINTS, LINES AND SOLIDS 9**

Projection of points and straight lines located in the first quadrant – Determination of true lengths and true inclinations of lines. Projection of polygonal surface and circular lamina inclined to any one reference plane. Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane by change of position method.

**SECTIONING OF SOLIDS AND DEVELOPMENT OF SURFACES 9**

Sectioning of solids in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other – true shape of section. Development of lateral surfaces of prisms, pyramids, cylinders, cones and truncated solids.

**ISOMETRIC PROJECTION 9**

Principles of isometric projection – isometric scale – isometric projections of simple solids, truncated prisms, pyramids, cylinders and cones. Introduction to Perspective

**TOTAL HOURS: 45**

## **TEXT BOOKS**

- 1 N.D. Bhatt, “Engineering Drawing”, Charotar Publishing House, 46th Edition, 2003.
- 2 Modeling software packages like solid edge, unigraphics and Auto CAD

## **REFERENCE**

- 1 Dhananjay A.Jolhe, “Engineering Drawing with an introduction to AutoCAD” Tata McGraw Hill Publishing Company Limited, 2008.
- 2 Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
- 3 K. R. Gopalakrishnana, “Engineering Drawing” (Vol. I & II), Subhas Publications, 1998.

|                           |                                  |          |          |          |          |
|---------------------------|----------------------------------|----------|----------|----------|----------|
| <b>11USL201</b>           | <b>COMMUNICATION SKILLS - II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>Course Objectives:</b> |                                  | <b>3</b> | <b>0</b> | <b>1</b> | <b>3</b> |

- *To enable the students to understand the meaning and the importance of communication*
- *To equip students with necessary training in listening so that they can comprehend the speech of people of different backgrounds and regions*
- *To enhance the written communication in business context*
- *To make students confident to express themselves fluently and appropriately in social and professional contexts*
- *To develop an awareness in the students about writing as an exact and formal Skill.*

**UNIT I - BASIC COMMUNICATION THEORY 9**

Importance of communication -Stages of communication - Modes of communication - Barriers to Communication - Difference between Verbal and Non Verbal communication - Body Language - Psychological and cultural influence on communication

**UNIT II - LISTENING AND ANALYSIS 9**

Listening to technical and Non technical material - Intensive listening - Note taking - Cloze Listening - Listening and interpreting the missing texts - Listening to lectures and speeches - Listening to discussions and explanations - Telephonic listening

**UNIT III - BUSINESS CORRESPONDENCE 9**

Report writing - Recommendations - Memoranda – Notice - Minutes of meeting - Letters and Emails (pertaining to business situations) - Resume and Job applications- advertisements- checklists- technical essays.

**UNIT IV - ORAL COMMUNICATION 9**

Basics of Phonetics - Presentation Skills - Role-plays - Group Discussions - Short Extempore - Debates - Conversation Practices

**UNIT V - LANGUAGE FOCUS 9**

Introduction to technical writing - spelling - Error detection – cause and effect- structures expressing purposes- prepositions- sequencing of words- Punctuation - Idioms and phrases - American and British Words - One word Substitutes (Technical) - Foreign Phrases

**Total Hours: 45**

## **TEXT BOOKS**

- 1 Asraf M Rizvi, “Effective Technical Communication” Tata McGraw.2005  
Department of Humanities and Social Sciences, Anna University ‘English for Engineers and
- 2 Technologists’, Combined Edition Volume I and II, Chennai: Orient Longman Private Limited, 2006.

## **REFERENCE BOOKS**

- 1 Boove, Counter R et al “Business Communication Today”, Pearsons Education, 2002.
- 2 Jod O connor, “Better Pronunciation”, Cambridge Paperback, 2008.
- 3 Meenakshi Raman, “Technical Communication Principle and Practice”, OUP 2007.

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|-----------------|-------------------------------------|----------|----------|----------|----------|
| <b>11USM201</b> | <b>ENGINEERING MATHEMATICS – II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                     | <b>4</b> | <b>1</b> | <b>0</b> | <b>5</b> |

**Course Objectives**

*To provide strong foundation to the students to expose various emerging new areas of applied mathematics and appraise them with their relevance in Engineering and Technological field.*

**PREREQUISITE:**

- i) Three dimensional analytical geometry – Direction cosines and Direction ratios, equation of straight line and plane.
- ii) Integration – Evaluation of single integrals – Definite integrals and its properties.
- iii) Vector algebra – position vector – Dot and Cross product – Properties.
- iv) Definition – examples – Modulus and amplitude form – Demovire’s theorem – properties of complex variable.

**UNIT I – THREE DIMENSIONAL ANALYTICAL GEOMETRY 9**

Equation of a sphere – Plane section of a sphere – Tangent Plane – Equation of a cone –Right circular cone – Equation of a cylinder – Right circular cylinder.

**UNIT II – INTEGRAL CALCULUS 9**

Double integration – Cartesian and polar coordinates – Change of order of Integration – Triple integration in Cartesian co-ordinates – Area as double integral – Volume as triple integral –Beta and Gamma integrals – Properties – Simple problems.

**UNIT III –VECTORCALCULUS 9**

Gradient – Divergence and Curl – Directional derivative – Irrotational and Solenoidal vector fields – Vector integration: Green’s theorem in a plane – Gauss divergence theorem – stokes’ theorem(excluding proofs) – Simple applications involving cubes and rectangular parallelepiped.

**UNIT IV – COMPLEX VARIABLES 9**

Functions of a complex variable – Analytic functions – Necessary conditions and Sufficient conditions(excluding proofs) – Cauchy - Riemann equation – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions - Conformal mapping:  $w = c+z$ ,  $w = cz$ ,  $w = 1/z$  and Bilinear Transformation.

## **UNIT V – COMPLEX INTEGRATION**

**9**

Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Cauchy’s and Jordan’s Lemma(statement only) – Classification of singularities – Calculus of residues – Residue theorem – Application of residue theorem to evaluate real integrals along unit circle and semi-circle.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 Erwin Kreyszig, “Advanced Engineering Mathematics”, 7th Edition, Wiley India, 2007.
- 2 Grewal. B.S, “Higher Engineering Mathematics”, 40th Edition, Khanna Publications, New Delhi, 2007.

### **REFERENCE BOOKS**

- 1 Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, 2007.
- 2 Glyn James, “Advanced Engineering Mathematics”, 3rd Edition, Wiley India, 2007.
- 3 Jain R.K and Iyengar S.R.K, “Advanced Engineering Mathematics”, 3rd Edition, Narosa Publishing House Pvt. Ltd., 2007.
- 4 George, B Thomas J.R. and Ross L. Finney, “Calculus and Analytical Geometry”, 10<sup>th</sup> Edition, Addison Wesley, 2000.

**11USC201**

**ENVIRONMENTAL SCIENCE AND  
ENGINEERING**

**L T P C  
3 0 0 3**

***Course Objective***

*To learn the basic and create awareness of environment and ecology. To know about the role of an individual in preserving the natural resources and about the various legislations, acts and NGO's that aims to control pollution*

**UNIT – 1 ENVIRONMENT & ECOSYSTEM**

**9**

Introduction – Components of the environment – People, society and environment – Need for public awareness – Scope and importance – Environmental problems and sustainable development. Ecosystem – Concept – Ecosystem degradation – Structure and functions of an ecosystem – Producers, consumers and decomposers – Energy flow in the ecosystem – Water cycle – Carbon cycle – Oxygen cycle – Nitrogen cycle – Energy cycle – Food chain – Food web – Ecological pyramid – Types of ecosystem – Forest – Grassland – Desert – Aquatic ecosystem- Case Studies in current scenario.

**UNIT – 2 BIODIVERSITY & NATURAL RESOURCES**

**9**

Biodiversity – Introduction – Ecosystem, Species & Genetic diversity – Biogeographical classification of India – Value of biodiversity – Hotspots of biodiversity – Threats to biodiversity – Conservation of biodiversity. Resources – Introduction – Renewable & Non-renewable resources – Forest resource – deforestation – timber extraction – Water resources – Flood – Drought – Dam – Conflict over water – Food resource – Changes & effects by modern agricultural practices – Overgrazing – Land resource – landslide – Biomass – Some non-renewable sources – Mineral resources – Alternate energy sources- Case Studies in current scenario.

**UNIT – 3 POLLUTION**

**9**

Pollution – Classification of pollutants – Cause, Source, Effect and Control measures - Air pollution – Causes, types & sources of air pollutant – Effect of air pollutants – Control of air pollution – Water pollution – Source and effects - Thermal pollution – Radioactive pollution – Marine pollution – Pesticidal pollution – Groundwater pollution – Land pollution – Sources and effects of soil pollutant – Solid waste – Methods of solid waste disposal – Soil degradation – Solid waste management –

Recovery and conversion methods – Noise pollution – Sources, effects and control measures – An Introduction to E-Waste Management- Case Studies in current scenario.

**UNIT – 4 LEGAL ACTS & MAJOR ENVIRONMENTAL CONCERNS 9**

Environmental legislations – Acts – Water act – Air act – Environment act – Land act – Wildlife protection act – Forest acts – Functions of CPCB & SPCB. Water conservation – Rainwater harvesting – Reducing water demand – Watershed management. Disaster – Tsunami – Bhopal gas disaster – Minamata tragedy – Polythene – Disaster management – Nuclear accident – Flood, Earthquake, Cyclone and Landslide. Major issues in environment – Climate change, Global warming, Acid rain and Ozone layer depletion- Case Studies in current scenario.

**UNIT – 5 HUMAN POPULATION & ENVIRONMENT 9**

Population - Population explosion – Effects of population growth on resources – Urbanization - Family welfare programme – Environment and human health – Climate & health, Infectious & water related diseases, Cancer & environment – Human rights – Equity – Nutrition, health and human rights – HIV/AIDS – Women and child welfare - Role of information technology in protecting the environment – Role of individual in the prevention of pollution – Role of NGO's in protecting the environment- Case Studies in current scenario.

**Total Hours: 45**

**TEXT BOOKS**

- 1 Anubha Kaushik and C P Kaushik ‘Environmental Science and Engineering’ Third Edition, New age International(P) Limited, Publisher 2008. New Delhi
- 2 Aloka Debi, “Environmental Science and Engineering”, Universities Press, 2008. (UNIT – 1, 2,3,4,5)

**REFERENCE BOOKS**

- 1 Benny Joseph, ‘Environmental Science and Engineering’, Tata McGraw-Hill, New Delhi, 2006. (UNIT – 4: Major issues in environment)
- 2 Gilbert M. Masters, ‘Introduction to Environmental Engineering and Science’, Second Edition, Pearson Education, 2004.
- 3 Tyler Miller, Jr., ‘Environmental Science, Brooks/Cole a part of Cengage Learning, 2006.

**L T P C**

**11USP202      SCIENCE OF ENGINEERING MATERIALS      3   0   0   3**  
**(Common to all circuit branches)**

***Course Objective***

*To give an exposure to the Students on materials and their applications in the field of Technology, and also to create awareness towards the impact of the materials.*

**UNIT I: CRYSTAL STRUCTURE 9**

Definition of a Crystal – Crystal classification - Unit Cell – Bravais Lattice – Miller Indices – Bragg’s Law – Determination of Crystal structure by Debye Scherrer method - Crystal imperfections – Point, Line and Surface imperfections - Burger Vector

**UNIT II: COMPOSITIES 9**

Introduction, Features and benefits, structural characteristics, manufacturing techniques, Function of matrix and Reinforcement in composites. Classification of composites based on reinforcement, Types of composite materials. Applications.

**UNIT III: DIELECTRIC MATERIALS AND DEVICES 9**

Definition of dielectrics. Electric dipole moment. Electric polarization. Dielectric constant. Electric susceptibility. Polarisation mechanisms – Electronic, Ionic, Orientation and Space charge polarization. Variation of dielectric constant with temperature and frequency. Dielectric breakdown - Dielectric Breakdown mechanisms. Classification of insulators on temperature basis. Capacitance and transducer.

**UNIT IV:ADVANCED MATERIALS: 9**

Shape Memory Alloy (SMA) – Characteristics, Properties of NiTi alloy, Application, Advantages and Disadvantages of SMA. Superconductivity – Types of superconductors High Tc Superconductors, Comparison with low Tc superconductors. Application of Superconductors, Metallic glasses – Preparation, Properties and Applications

## **UNIT V: BIO MATERIALS**

**9**

Definition and classification of biomaterials. Construction materials, Impact of biomaterials. Mechanical Properties – wound healing process. Tissue response to implants. Safety and efficiency testing. Bio-compatibility. Biodegradable ceramics – Biodegradable synthetic polymers. Silicone rubber. Plasma polymerization. Micoorganism in polymeric implants. Bio polymers. Polymer sterilization.

**Total Hours: 45**

### **TEXT BOOKS**

- 1 William D Callister, Jr “Material Science and Engineering” John wiley and Sons, New York, 2007
- 2 Shaffer, J.P.Saxena, A, Antolorich, S D Sanders Jr. T.H. and Warner S.B., “The Science and Design of Engineering Materials”, The McGraw Hill Co. Inc, New York 1999

### **REFERENCE BOOKS**

- 1 Jayakumar, S “Materials Science”, RK Publishers, Coimbatore 2006.
- 2 Raghavan, V. “Materials Science and Engineering – A First Course” Prentice Hall of India, New Delhi 2004.
- 3 James F Shackelford S, “Introduction to Materials Science for Engineers”, Third Edition, Macmillan Publishing Company, Newyork, 1992.

**11UCK201**

**C PROGRAMMING**

**L T P C**  
**3 0 0 3**

***Course Objectives***

- *To learn the control structures of C language*
- *To write programs using Functions & Pointers*
- *To use different data types and multi-dimensional arrays in programs*
- *To write programs using structures and files*

**GETTING STARTED**

What is a Programming Language – What is a compiler - What is C – Getting started with C – The first C Program – Compilation and Execution – Receiving input – C instructions – Control instructions in C

**UNIT I - DECISION CONTROL STRUCTURE 9**

Decisions – if statement – if..else statement – Use of Logical operators – conditional operators

**UNIT II - LOOP & CASE CONTROL STRUCTURE 9**

Loops – while loop – for loop – Odd loop – break statement – continue statement – do.. while loop – Decisions using switch – switch Vs if else ladder – goto statement

**UNIT III - FUNCTIONS & POINTERS 9**

What is a function? – Passing values between functions – scope rule of functions – Calling convention - Advanced features of functions – function declaration and prototypes – call by value and call by reference - An Introduction to Pointers – Pointer Notations – Back to function calls – Conclusions – Recursion – Recursion and Stack

**UNIT IV - DATA TYPES & ARRAYS 9**

Integers(long, short, signed and unsigned) – Chars (Signed and unsigned) – Floats and doubles – Few More issues on data types – storage classes in C – What are arrays – more on arrays – Pointers and Arrays – Two Dimensional Arrays – Array of Pointers – Three Dimensional Array

## **UNIT V - STRUCTURES & FILES**

**9**

Why use structures – array of structure - additional features of structures – Uses of Structures – Data Organization – File operations – Counting Characters, Tabs, Spaces, - A file copy program – File opening modes – String I/O in Files – Text Files and Binary Files – Low level Disk I/O – I/O under windows.

**Total Hours: 45**

### **REFERENCE**

- 1 Yashavant P. Kanetkar, “Let Us C”, BPB Publications, 10<sup>th</sup> Edition, 2009
- 2 B. W. Kernighan, Dennis M. Ritchie, “The C Programming Language”, Pearson Education, 2003

|                 |                              |          |          |          |          |
|-----------------|------------------------------|----------|----------|----------|----------|
| <b>11UAK201</b> | <b>ENGINEERING MECHANICS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                              | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

### **Course Objectives**

Upon completion of this subject students should be able to:

- *Formulate problems in Statics and dynamics by choosing suitable system boundaries and identifying relevant forces and coordinate system*
- *Analyse the equilibrium of systems of forces in two and three dimensions*
- *Determine the loads and stresses experienced by components of common engineering structures such as trusses, frames and beams*
- *Describe and analyse the motion of particles and rigid bodies using three-dimensional vectors*
- *Apply the principles of impulse-momentum and work-energy to solve problems in the dynamics of simple machines.*

**Basics:** Units and Dimensions, Law of Mechanics, Vectorial representation forces and moments , Vector Operations - Addition, subtraction, dot product, cross product

### **UNIT I - STATICS OF PARTICLES 9**

Coplanar forces, Resolution and composition of forces, Equilibrium of a particle, Forces in space, Equilibrium of particle in space, Application to simple problems.

### **UNIT II - STATICS OF RIGID BODIES 9**

#### **Rigid Bodies:**

Moment of a force about a point, resultant of coplanar non concurrent force systems, Free body Diagram - Types of supports and reactions, Equilibrium of rigid bodies in two dimensions, problems in beams and simple frames only.

#### **Friction:**

Types of friction - Laws of Coulomb Friction, simple problems, ladder friction, screw and belt friction

### **UNIT III - PROPERTIES OF SURFACES AND SOLIDS 9**

Determination of centroid and centre of gravity of composite sections and solid objects. Area moment of inertia, parallel axis and perpendicular axis theorems, polar moment of inertia, problems

on composite sections (comprises rectangle, triangle, circle and semi circle only), Introduction to mass moment of Inertia - thin rectangular plate.

#### **UNIT IV - KINEMATICS OF PARTICLES**

**9**

Rectilinear motion of particles, Displacement, velocity , acceleration and their relationship, Relative motion, Curvilinear motion – Rectangular, Tangential and Normal components of acceleration, Problems in projectile motion and curved paths.

#### **UNIT V - KINETICS OF PARTICLES**

**9**

Newton’s second Law , D Alembert’s principle, Dynamic equilibrium , Work Energy equation of particles, Principles of impulse and momentum, application to simple problems.  
Collision of Elastic bodies – Direct central impact.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

#### **TEXT BOOKS**

- 1 S.Rajasekaran, G. Sankarasubramanian, “Fundamentals of Engineering Mechanics”, Vikas Publishing House pvt. Ltd., New Delhi.
- 2 M.S. Palanichamy, S. Nagan, “Engineering Mechanics – Statics and Dynamics”, Tata McGraw Hill publishing Company, New Delhi, 2008.

#### **REFERENCE BOOKS**

- 1 Dr. N. Kottiswaran, “Engineering Mechanics – Statics and Dynamics”, Sri Balaji Publication, Erode
- 2 Beer F.P and Johnson E.R., “Vector Mechanics for Engineers – Statics and Dynamics”, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2001.
- 3 R.C. Hibbeler, “Engineering Mechanics” , Pearson education Asia Pvt. Ltd.

|                 |                                       |          |          |          |          |
|-----------------|---------------------------------------|----------|----------|----------|----------|
| <b>11USH211</b> | <b>PHYSICAL SCIENCE LABORATORY II</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                       | <b>0</b> | <b>0</b> | <b>3</b> | <b>1</b> |

***Course Objective***

*To provide exposure to the students with hands-on experience on scientific equipments*

**PHYSICS LABORATORY II**

1. Comparative resistivities of alloy and metal – Meter Bridge.
2. Determination of efficiency of a solar cell.
3. Characteristics of photodiode.
4. Determination of lattice constant X-ray powder photograph.
5. Determination of Rigidity modulus- Torsion Pendulum
6. Determination of Young’s modulus of the material – Non uniform bending
7. Determination of Velocity of Ultrasonic waves – Ultrasonic Interferometer

**CHEMISTRY LABORATORY - II**

1. Estimation of hardness of water by EDTA method.
2. Estimation of Calcium ions and Magnesium ions by EDTA method.
3. Estimation of alkalinity of water sample.
4. Determination of Chloride in water by Argentometric method.
5. Determination of Dissolved Oxygen in waste water using Winkler’s titrimetry method.
6. Estimation of copper in brass by EDTA.

**Total Hours:30**

|                 |                                 |          |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|----------|
| <b>11UCK203</b> | <b>C PROGRAMMING LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                 | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**Course Objectives:**

- *To gain mastery over the C language*

**List of Programs / Experiments can be setup by the faculty with the following**

1. Programming concepts involving I/O statements.
2. Programming concepts involving conditional statements.
3. Programming concepts involving looping statements.
4. Programming concepts involving functions.
5. Programming concepts involving Arrays (1D, 2D).
6. Programming concepts involving Pointers.
7. Programming concepts involving Structures.
8. Programming concepts involving Files.

*Note: The above programs will be tuned to the various fundamental principles in the specific engineering branches*

**Total Hours: 30**

|  |          |          |          |          |
|--|----------|----------|----------|----------|
| <b>11UAK205 ENGINEERING PRACTICES LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|  | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

*Course Objectives:*

- *To provide fundamental knowledge and hands on experience to the students on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.*

### **GROUP A (MECHANICAL & CIVIL)**

#### **MECHANICAL ENGINEERING PRACTICE**

**Sheet Metal:** Study of tools, equipments and safety precautions, Different types of joints - knocked up, double grooving joints, Model making –Tray and Funnel.

**Welding:** Arc welding practice - butt joint, lap joints and tee joints, Demonstration of gas welding.

#### **CIVIL ENGINEERING PRACTICE**

**Plumbing:** Preparation of plumbing line sketches for (i) water supply lines (ii) sewage lines, Cutting and threading of PVC pipes, Basic pipe connection using valves, taps, couplings, unions, reducers, elbows in household fitting.

**Wood Work:** Sawing, planing, making common joints like T joint, dovetail joint, etc. using power tools, Study of joints in door panels and wooden furniture.

**Basic Construction Tools:** Demonstration of power tools like rotary hammer, demolition hammer, hand drilling machine, etc.

### **GROUP B (ELECTRICAL & ELECTRONICS)**

#### **ELECTRICAL ENGINEERING PRACTICE**

Safety aspects of electrical wiring, Basic household wiring using switches, fuse, indicator-lamp, etc., Preparation of wiring diagrams, Stair case light wiring, Fluorescent lamp wiring, Measurement of electrical quantities – voltage, current, power and energy, Study of iron-box, fan with regulator, Measurement of resistance to earth of an electrical equipment.

#### **ELECTRONICS ENGINEERING PRACTICE**

Study of electronic components and equipments, Resistor color coding, Soldering simple electronic circuits and checking continuity, Assembling electronic components on a small PCB and testing, Study of telephone, FM radio, low-voltage power supplies, Emergency lamp, UPS.

**Examination Pattern:** The Examination is to be conducted for both groups A & B, allotting 1½ for each group.

**Total Hours: :45**

|                 |   |          |          |          |          |
|-----------------|---|----------|----------|----------|----------|
| <b>11USM301</b> | <b>ENGINEERING MATHEMATICS – III</b>      | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 | <b>(Common to ECE, EEE, CSE &amp; IT)</b> | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

***Course objective***

*To provide strong foundation to the students to expose various emerging new areas of applied mathematics and appraise them with their relevance in Engineering and Technological field.*

**PRE-REQUISITE:**

Limit concepts, Integration, Periodic function, Basic terminologies of odd and even functions

**UNIT I-FOURIER SERIES 9**

Dirichlet's conditions – General Fourier series – Odd and even functions – Half range sine series – Half range cosine series – Complex form of Fourier Series – Parseval's identity – Harmonic Analysis.

**UNIT II- FOURIER TRANSFORMS 9**

Fourier integral theorem (without proof) – Fourier transform pair – Sine and Cosine transforms – Properties – Transforms of simple functions – Convolution theorem– Parseval's identity.

**UNIT III -PARTIAL DIFFERENTIAL EQUATIONS 9**

Formation of partial differential equations – Lagrange's linear equation – Solutions of standard types of first order partial differential equations - Linear partial differential equations of second and higher order with constant coefficients-Classification of PDE-Method of separation of variables.

**UNIT IV -Z -TRANSFORMS AND DIFFERENCE EQUATIONS 9**

Z-transforms - Elementary properties – Inverse Z-transform – Convolution theorem - Formation of difference equations – Solution of difference equations using Z- transforms.

**UNIT V- LAPLACE TRANSFORMS 9**

Laplace transforms – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions. Definition of Inverse Laplace transforms as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 Grewal, B.S, 'Higher Engineering Mathematics' 40th Edition, Khanna publishers, New Delhi, 2007
- 2 Erwin Kreyszig, 'Advanced Engineering Mathematics' , Eighth edition - Wiley India, 2007.

### **REFERENCE BOOKS**

- 1 Ramana.B.V. 'Higher Engineering Mathematics' Tata Mc-Graw Hill Publishing Company limited, New Delhi, 2007.
- 2 Glyn James, 'Advanced Modern Engineering Mathematics', Third edition- Pearson Education 2007.
- 3 Bali.N.P and Manish Goyal 'A Textbook of Engineering Mathematics', Seventh Edition, Laxmi Publications (P) Ltd., 2007

|                 |                                      |          |          |          |          |
|-----------------|--------------------------------------|----------|----------|----------|----------|
| <b>11UCK311</b> | <b>DATA STRUCTURES AND ALGORITHM</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                      | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objective**

- To master the design and applications of linear, tree, and graph structures.
- To understand various algorithm design and analysis techniques.

**UNIT I - LINEAR STRUCTURES** **9**

Abstract Data Types (ADT) - List ADT - array based implementation – linked list implementation – doubly-linked lists - applications of lists - Stack ADT - Queue ADT-applications of stacks and queues

**UNIT II - TREE STRUCTURES** **9**

Need for non-linear structures – Tree ADT – tree traversals – Binary Tree ADT – expression trees – applications of trees – binary search tree ADT

**UNIT III - BALANCED SEARCH TREES AND INDEXING** **9**

AVL trees – Binary Heaps – Hashing – Separate chaining – open addressing – Linear probing

**UNIT IV - GRAPHS** **9**

Definitions – Topological sort – breadth-first traversal - shortest-path algorithms – minimum spanning tree – Prim's and Kruskal's algorithms – Depth-first traversal – applications of graphs

**UNIT V - ALGORITHM DESIGN AND ANALYSIS** **9**

Definitions and concepts only: Greedy algorithms - Divide and conquer - Dynamic programming - backtracking – branch and bound - algorithm analysis – asymptotic notations – recurrences - NP-complete problems

**Total Hours: 45**

**TEXT BOOKS**

- 1 M. A. Weiss, “Data Structures and Algorithm Analysis in C”, Pearson Education Asia, 2002.
- 2 ISRD Group, “Data Structures using C”, Tata McGraw-Hill Publishing Company Ltd., 2006

**REFERENCE**

- 1 A.V.Aho, J.E.Hopcroft, and J.D.Ullman, “Data Structures and Algorithms”, Pearson Education, 1983.

- 2 R. F. Gilberg, B. A. Forouzan, "Data Structures: A Pseudocode approach with C", Second Edition, Thomson India Edition, 2005.
- 3 Sara Baase and A. Van Gelder, "Computer Algorithms", Third Edition, Pearson Education, 2000
- 4 T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to algorithms", Second Edition, Prentice Hall of India Ltd, 2001.

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|-----------------|------------------------------------|----------|----------|----------|----------|
| <b>11UAK361</b> | <b>THERMAL AND FLUID MACHANICS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                    | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objective**

- *To expose the fundamentals of thermodynamics and to be able to use it in accounting for the bulk behaviour of the sample physical systems.*
- *To integrate the basic concepts into various thermal applications like IC engines, gas turbines, steam boiler, steam turbine.*
- *To understand the structure and the properties of the fluid.*
- *To understand the mathematical techniques and apply them to the solutions of practical flow problems.*

**UNIT I - BASIC CONCEPTS AND LAWS OF THERMODYNAMICS 9**

Classical approach: Thermodynamic systems - Boundary - Control volume - System and surroundings – Universe – Properties - State-process – Cycle – Equilibrium - Work and heat transfer – Point and path functions - First law of thermodynamics for open and closed systems - First law applied to a control volume - SFEE equations [steady flow energy equation] - Second law of thermodynamics - Heat engines - Refrigerators and heat pumps - Carnot cycle - Carnot theorem - Clausius inequality - Concept of entropy - Principle of increase of entropy .

**UNIT II - IC ENGINES AND GAS TURBINES 9**

IC Engines-Components & Functions- - Working Principle of four stroke and two stroke engines - Working principle of spark ignition and compression ignition engines - Applications of IC engines - Normal and abnormal combustion.

Open and closed cycle gas turbines – Ideal and actual cycles - Brayton cycle - Cycle with reheat, intercooling and regeneration – Applications of gas turbines for power generation.

**UNIT III - STEAM BOILERS AND TURBINES 9**

Formation of steam - Properties of steam – Steam power cycle (Rankine) - Modern features of high-pressure boilers – Mountings and accessories – Testing of boilers.

Steam turbines: Impulse and reaction principle – Velocity diagrams – Compounding and governing methods of steam turbines (qualitative treatment only) - Layout diagram and working principle of a steam power plant.

#### **UNIT IV - FLUID PROPERTIES AND FLOW CHARACTERISTICS**

**9**

Surface Tension – Capillarity – Viscosity – Newton’s Law – Fluid Pressure and Pressure Head - Fluid Velocity and Acceleration – Uniform and Steady Flow – Stream Lines and Path Lines – Reynold’s Number – Classification as Laminar and Turbulent Flow – Continuity Equation – Potential and Stream Functions.

#### **UNIT V - FLOW DYNAMICS**

**9**

Euler’s and Bernoulli’s Equations – Pressure Losses along the Flow – Categorisation into Major and Minor Losses - Flow through Circular Pipes – Poisseule’s Equation – Statement of Darcy – Weisbach equation – Friction factor – Hydraulic grade line.

**Total Hours: 45**

#### **TEXT BOOKS**

- 1 R. K. Rajput , “Fluid Mechanics and Hydraulic Machines”,S.Chand & Company (Ltd.) New Delhi.
- 2 Domkundwar, S., Kothandaraman, C.P. and Domkundwar, A.V., "Thermal Engineering", Dhanpat Rai and Co., 2002.

#### **REFERENCE**

- 1 K. L. Kumar, Engineering Fluid Mechanics, S. Chand & Company Ltd., 2002
- 2 Garde, R.J. and Mirajgaoker, A.G., “Engineering Fluid Mechanics”, Nem Chand Bros., Roorkee.
- 3 P.K. Nag, ‘Basic and Applied Engineering Thermodynamics’, Tata McGraw Hill, New Delhi, 2002.
- 4 Cengel, “Thermodynamics” An Engineering Approach, Third Edition – 2003, Tata Mc Graw Hill, New Delhi.

|                 |   |          |          |          |          |
|-----------------|---|----------|----------|----------|----------|
| <b>11UFK301</b> | <b>CIRCUIT THEORY AND NETWORK<br/>SYNTHESIS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |   | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objectives**

- *To solve the electrical network using mesh and nodal analysis by applying network theorems*
- *To understand the concept of transient and resonance*
- *To know the basic concepts of three-phase circuits and power measurement.*
- *To understand the two port networks and filters*

**UNIT I - NETWORK THEOREMS 9**

Mesh Analysis – Super Mesh – Nodal – super nodal - Linearity and Superposition theorem – Reciprocity –Thevenin and Norton equivalent circuits – Maximum power transfer for DC and AC circuits, Principle of duality

**UNIT II - TRANSIENTS AND RESONANCE 9**

Transient response of RL, RC and RLC Circuits for DC and AC input - logarithmic decrement - Resonance –Series and parallel resonance –Phasor diagram - frequency response – Q-factor and Bandwidth

**UNIT III - THREE PHASE CIRCUITS 9**

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads - balanced & unbalanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits

**UNIT IV - TWO PORT NETWORKS 9**

Network topology - Driving point impedance and admittance of one port networks - open circuit impedance and short circuit admittance of two port networks - transfer impedance and admittance - voltage and current ratio transfer functions – Z-parameters, Y-parameters, ABCD parameters - equivalent networks

**UNIT V - FILTERS 9**

Characteristics of ideal filters - low pass and high pass filters - attenuation and phase shift -constant K and M - derived filters - Band pass filters - Fundamentals of harmonics – odd and even harmonics – elimination methods

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

## **TEXT BOOKS**

- 1 William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, TMH publishers, 7th edition, New Delhi, 2010
- 2 Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Tata McGraw Hill, 2010

## **REFERENCE**

- 1 Ravish Singh, “Electrical Networks”, Tata Mc Graw Hill, New Delhi, 2008.
- 2 Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s series, Tata McGraw-Hill, New Delhi (2001).
- 3 Charles K. Alexander, Mathew N.O. Sadik, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, (2003).

|                         |                                |          |          |          |          |
|-------------------------|--------------------------------|----------|----------|----------|----------|
| <b>11UFK302</b>         | <b>ELECTRO MAGNETIC THEORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <i>Course Objective</i> |                                | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

*To impart knowledge on*

- *Concepts of electrostatics, electrical potential, energy density and their applications.*
- *Concepts of magnetostatics, magnetic flux density, scalar and vector potential and its applications.*
- *Faraday's laws, induced emf and their applications.*
- *Concepts of electromagnetic waves and Poynting vector.*

**UNIT I - INTRODUCTION 9**

Vector calculus – Sources and effects of electromagnetic fields - Different co-ordinate systems – Divergence, Curl, Gradient - Divergence theorem – Stoke's theorem

**UNIT II - ELECTROSTATIC 9**

Coulomb's Law – Electric field intensity – Field due to point and continuous charges – Gauss's law and application – Electrical potential – Electric field and equipotential plots – electric field in freespace – conductors – dielectric – dielectric polarization electric field in multiple dielectrics – boundary conditions – Poisson's and Laplace's equations – capacitance-energy density

**UNIT III – MAGNETOSTATICS 9**

Lorentz Law of force – magnetic field intensity – Biot-savart's Law – Ampere's Law – magnetic field due to straight conductors – circular loop – infinite sheet of current – magnetic flux density (B) – B in free space – conductor – magnetic materials – magnetization – magnetic field in multiple media – boundary conditions – scalar and vector potential – magnetic force – torque – inductance – energy density – magnetic circuits.

**UNIT IV ELECTRODYNAMIC FIELDS 9**

Faraday's laws, induced emf – Transformer and motional EMF, Conduction Current -Displacement current - Maxwell's equations (differential and integral forms) — Relation between field theory and circuit theory.

## **UNIT V ELECTROMAGNETIC WAVES**

**9**

Generation – Electro Magnetic Wave equations – Wave parameters; velocity, intrinsic impedance, propagation constant – Waves in free space, lossy and lossless dielectrics, conductors-skin depth, Poynting vector – Plane wave reflection and refraction.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 William H. Hayt, “Engineering Electromagnetics”, Tata McGraw Hill, 2001.
- 2 K.A. Gangadhar and P.M. Ramanathan, “Field Theory”, Khanna Publishers, 2008.

### **REFERENCE**

- 1 Ashutosh Pramanik, ‘Electromagnetism – Theory and Applications’, Prentice-Hall of India Private Limited, New Delhi, 2006.
- 2 Joseph. A.Edminister, ‘Theory and Problems of Electromagnetics’, Second edition, Schaum Series, Tata McGraw Hill, 1993.
- 3 Kraus and Fleish, ‘Electromagnetics with Applications’, McGraw Hill International Editions, Fifth Edition, 1999.

|                 |                                     |          |          |          |          |
|-----------------|-------------------------------------|----------|----------|----------|----------|
| <b>11UFK303</b> | <b>DC MACHINES AND TRANSFORMERS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                     | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objectives**

- *To introduce the concept of rotating machines and the principle of electromechanical energy conversion in single and multiple excited systems.*
- *To understand the generation of D.C. voltages by using different type of generators and study their performance.*
- *To study the working principles of D.C. motors and their load characteristics, starting and methods of speed control.*
- *To familiarize with the constructional details of different type of transformers, working principle and their performance.*
- *To understand the basic concepts in modeling of DC machines.*

**UNIT I - BASIC CONCEPTS OF ROTATING MACHINES 6**

Principles of electromechanical energy conversion – Single and multiple excited systems – m.m.f of distributed A.C. windings – Rotating magnetic field – Generated voltage – Torque in wound rotor machine.

**UNIT II: DC MACHINES 10**

Constructional details of DC machine - Principle of operation of DC generator- EMF equation - Armature reaction- Methods of excitation- Characteristics of DC generators – Parallel operation- Principle of operation of DC motor –Torque equation – Characteristics of series, shunt and compound motors – Starting of DC motors – Types of starters- Speed control of DC motors.

**UNIT III: TRANSFORMERS 10**

Constructional details of core and shell type transformers – Principle of operation – emf equation – Equivalent circuit – Transformer on load – Regulation – Parallel operation of single phase transformers – Auto transformer – Three phase transformers –All day efficiency- Tap changing transformers

**UNIT IV: TESTING OF DC MACHINES AND TRANSFORMERS 10**

Testing of DC machines – Brake test, Swinburne’s test, Retardation test and Hopkinson’s test- Testing of transformers – Polarity test, load test, open circuit and short circuit tests- Sumpner’s test.

## **UNIT V: MODELING OF DC MACHINES**

**9**

Modeling concepts of rotating machines- Kron's primitive machine- Voltage and torque equations- two axis model for DC machines (Qualitative Approach only)

**Total Hours: 45**

### **TEXT BOOKS**

- 1 D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002.
- 2 P.S. Bimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

### **REFERENCE**

- 1 A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
- 2 J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
- 3 P.S. Bhimbhra, 'Generalised Machines Theory', Khanna Publishers, 2003.

|                 |   |          |          |          |          |
|-----------------|---|----------|----------|----------|----------|
| <b>11UCK312</b> | <b>DATA STRUCTURES AND ALGORITHM<br/>LABORATORY</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |   | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**Course Objective**

- *To develop skills in design and implementation of data structures and their applications.*

**Experiments**

1. Implement singly and doubly linked lists.
2. Represent a polynomial as a linked list and write functions for polynomial addition.
3. Implement stack and use it to convert infix to postfix expression
4. Implement an expression tree. Produce its pre-order, in-order, and post-order traversals.
5. Implement binary search tree.
6. Implement insertion in AVL trees.
7. Implement priority queue using heaps
8. Implement hashing techniques
9. Implement Prim's and Kruskal's algorithms

**Total Hours:30**

|  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|--|----------|----------|----------|----------|
| <b>11UFK391 CIRCUITS AND NETWORKS LABORATORY</b> | <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**Prerequisite:**

1. Study of circuit elements – resistors, capacitors, inductors in series and parallel,
2. Study of CRO

**Experiments:**

1. Verification of laws – ohms law and Kirchoff's Law
2. Measurement of self inductance
3. Measurement of voltage, time period, frequency, phase of RL, RC, RLC circuits using CRO
4. Measurement of real power, reactive power, apparent power, power factor and impedance
5. Mesh and Nodal Analysis
6. Thevenin's and Norton's theorems
7. Maximum power transfer and superposition theorem
8. Transient response of RL, RC and RLC Circuits for DC and AC inputs
9. Series and Parallel resonance
10. Measurement of three phase power and power factor.

**Total Hours :30**

**11UFK392**

**DC MACHINES AND TRANSFORMERS  
LABORATORY**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

1. Open circuit and load characteristics of DC shunt generators.
2. Load characteristics of DC compound generator.
3. Load characteristics of DC series generator
4. Load characteristics of DC shunt
5. Load characteristics of compound motor.
6. Load characteristics of DC series motor.
7. Swinburne's test and speed control of DC shunt motor.
8. Hopkinson's test.
9. Load test on single-phase transformer
10. Three phase transformer connections.
11. Parallel operation of single phase transformers
12. Open circuit and short circuit tests on single phase transformer.
13. Sumpner's test on transformers.

Total Hours : 30

|                 |                                   |          |          |          |          |
|-----------------|-----------------------------------|----------|----------|----------|----------|
| <b>11USM405</b> | <b>ENGINEERING MATHEMATICS IV</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                   | <b>4</b> | <b>1</b> | <b>0</b> | <b>5</b> |

**Course Objectives**

*To provide strong foundation to the students to expose various emerging new areas of Optimization techniques and Graph Theory and appraise them with their relevance in Engineering and Technological field.*

**UNIT I - LINEAR PROGRAMMING**

**9**

Linear programming – Formulation – Graphical method – Simplex method – Revised Simplex method – Dual Simplex method – Big M Method – Two phase method.

**UNIT II – TRANSPORTATION AND ASSIGNMENT MODELS**

**9**

Mathematical formulation of Transportation problem – Methods for finding initial basic feasible solution – NWC Rule, LCM and Vogel’s approximation – MODI method for finding optimum solution – Assignment problem – Hungarian Algorithm.

**UNIT III – REPLACEMENT AND NETWORK MODELS**

**9**

Replacement Models: Replacement of items whose maintenance and repair cost increase with time (with and without money value) – Replacement of item that fails suddenly - Group Replacement. PERT-CPM: Uncertainty of PERT, Early Start, Early Finish, Late Start Late Finish and Float, Crashing of activity in CPM, Resource Levelling.

**UNIT IV - GRAPH THEORY**

**9**

Graphs –Sub graphs – Isomorphism – Representation of graphs – Degree of a graph – walks –paths – cycles – bipartite graphs – Euler graphs – Hamiltonian paths – Necessary and sufficient conditions for Euler graphs – connectivity – CPM and PERT networks – Critical path scheduling.

**UNIT V - TREES**

**9**

Trees – Characterizations of trees – properties of trees – Distance and center of tree – Rooted and Binary trees – Minimal spanning tree – Algorithms: Dijkstra’s, Prim’s and Kruskal’s algorithms.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

## **TEXT BOOKS**

- 1 H.A.Taha, "Operations Research", Prentice Hall of India, eighth Edition, 2006.
- 2 Kenneth H. Rosen, "Discrete Mathematics and its Applications", Fifth Edition, TMH, 2003.

## **REFERENCE BOOKS**

- 1 Kanti swarup, P.K.Gupta, Man mohan, "Operations research", ninth edition, S.Chand, New Delhi, 2001.
- 2 Hira and Gupta, "Introduction to Operations Research", S.Chand and Co., 2002
- 3 Narsingh Deo, "Graph theory with Applications to Engineering and Computer Science", Prentice Hall of India, 1997

|                 |  |          |          |          |          |
|-----------------|--|----------|----------|----------|----------|
| <b>11UBK451</b> | <b>PRINCIPLES OF COMMUNICATION<br/>ENGINEERING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |  | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objective**

- *To understand basic signals, analog modulation, demodulation and radio receivers.*
- *To explain the characteristics and model of transmission medium.*
- *To understand source digitization, digital multiplexing and modulation.*
- *To understand data communication system and techniques.*
- *To learn the basics of satellite and optical fibre communication systems.*

**UNIT I -MODULATION SYSTEMS 9**

Time and frequency domain representation of signals, amplitude modulation and demodulation, frequency modulation and demodulation, super heterodyne radio receiver. Frequency division multiplexing. Pulse width modulation.

**UNIT II - TRANSMISSION MEDIUM 9**

Transmission lines -Types, equivalent circuit, losses, standing waves, impedance matching, bandwidth; radio propagation – Ground wave and space wave propagation, critical frequency, maximum usable frequency, path loss, white Gaussian noise.

**UNIT III - DIGITAL COMMUNICATION 9**

Pulse code modulation, time division multiplexing, digital T-carrier system. Digital radio system. Digital modulation: Frequency and phase shift keying – Modulator and demodulator, bit error rate calculation.

**UNIT IV - DATA COMMUNICATION AND NETWORK PROTOCOL 9**

Data Communication codes, error control. Serial and parallel interface, telephone network, data modem, ISDN, LAN, ISO-OSI seven layer architecture for WAN.

**UNIT V - SATELLITE AND OPTICAL FIBRE COMMUNICATIONS 9**

Orbital satellites, geostationary satellites, look angles, satellite system link models, satellite system link equations; advantages of optical fibre communication - Light propagation through fibre, fibre loss, light sources and detectors.

**Total Hours :45**

## **TEXT BOOKS**

- 1 Wayne Tomasi, 'Electronic Communication Systems', Pearson Education, Third Edition, 2001
- 2 Roy Blake, 'Electronic Communication Systems', Thomson Delmar, 2<sup>nd</sup> Edition, 2002.

## **REFERENCE**

- 1 William Schweber, 'Electronic Communication Systems', Prentice Hall of India, 2002.
- 2 G. Kennedy, 'Electronic Communication Systems', McGraw Hill, 4<sup>th</sup> edition, 2002.
- 3 Miller, 'Modern Electronic Communication', Prentice Hall of India, 2003.

|                 |                                    |          |          |          |          |
|-----------------|------------------------------------|----------|----------|----------|----------|
| <b>11UCK411</b> | <b>OBJECT ORIENTED PROGRAMMING</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                    | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objective**

- *To study the object oriented programming principles, tokens, expressions, control structures and functions.*
- *To introduce the classes, objects, constructors and Destructors.*
- *To introduce the operator overloading, inheritance and polymorphism concepts in C++.*
- *To introduce constants, variables, data types, operators, classes, objects, methods, arrays and strings in Java.*
- *To introduce the programming approach in Java, interfaces and packages, multithreading, managing errors and exceptions and Applet programming.*

**UNIT I - OBJECT ORIENTED PROGRAMMING AND BASICS OF C++ 9**

Software crisis – Software evolution – A look at procedure oriented programming – Object oriented programming paradigm – Basic concepts of object oriented programming – Benefits of OOP – Object-oriented languages – Applications of OOP - What is C++? – A simple C++ program – More C++ statements – Structure of C++ Program. Tokens – Keywords – Identifiers and constants – Basic data types – User defined data types – Derived data types – Symbolic constants – Declaration of variables – Dynamic initialization of variables – Reference variables – Operators in C++ – Scope resolution operator – Manipulators – Type cast operator – Expressions and their types – Special assignment expressions – Control structures - The main function – Function prototyping – Call by reference – Return by reference – Inline functions – Default arguments – Function overloading.

**UNIT II - CLASSES AND OBJECTS 9**

Specifying a class – Defining member functions – Private member functions – Arrays within a class – Memory allocation for objects – Static data members – Static member functions – Arrays of objects – Objects as function arguments – Friendly functions – Returning objects. Constructors: Parameterized constructors – Multiple constructors in a class – Constructors with default arguments – Dynamic initialization of objects – Copy constructor – Dynamic constructors – Destructors.

**UNIT III - OPERATOR OVERLOADING, INHERITANCE AND POLYMORPHISM 9**

Defining operator overloading: Overloading unary, binary operators. Manipulation of strings using operators – Rules for overloading operators – Type Conversions - Defining derived classes – Single inheritance – Multilevel inheritance – Multiple inheritance – Virtual base classes – Abstract classes - Introduction to pointers to objects: This pointer – Pointers to derived classes – Virtual functions – Pure virtual functions.

## **UNIT IV - JAVA EVOLUTION, CONSTANTS, VARIABLES, DATA TYPES, OPERATORS, CLASSES, OBJECTS, METHODS, ARRAYS AND STRINGS** **9**

Java features: How Java differs from C and C++ - Simple Java program – Java program structures – Java tokens – Java statements – Implementing a Java program – Java virtual machine – Command line arguments - Constants – Variables – Data types – Scope of variables – Operators in Java. Defining a class – Adding variables and methods – Creating objects – Accessing class members - Constructors – Method overloading – Static members – Inheritance: Extending a class – Overriding methods - Final variables and methods - Final classes - Abstract methods and classes - Visibility control - Arrays - One dimensional array - Creating an array - Two-dimensional arrays - Strings - Vectors.

## **UNIT V - PROGRAMMING USING INTERFACES, PACKAGES, MULTITHREADING, MANAGING ERRORS AND EXCEPTIONS AND APPLETS** **9**

Defining interfaces – Extending interfaces – Implementing interfaces – Accessing interface variables – Java API packages – Creating, accessing and using a package – Adding a class to a package - Creating threads – Extending the thread class – Stopping and blocking a thread – Thread priority – Synchronization – Life cycle of a thread – Using thread methods. Types of errors: Exceptions – Syntax of exception handling code – Multiple catch statements – Using finally statements – Throwing our own exceptions - Preparing to write applets – Applet lifecycle – Creating an executable applet – Designing a web page – Applet tag – Adding applet to HTML file – Running the Applet.

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 E.Balagurusamy, 'Object Oriented Programming with C++', Second edition, Tata McGraw Hill, 2003.
- 2 E.Balagurusamy, 'Programming with JAVA- A Primer', Second edition, Tata McGraw Hill, 2003

### **REFERENCE BOOKS**

- 1 Herbert Schildt, 'C++ - The Complete Reference', Tata McGraw Hill, 1997.
- 2 Bjarne Stroustrup, 'The C++ Programming Language', Addison Wesley, 2000.
- 3 John .R .Hubbard, 'Schaums Outline Programming with C++', Tata McGraw Hill, 2003.
- 4 Kris Jasma, 'Java Programming – A Complete Reference', Galgotia publication, 1994.

|                 |  |          |          |          |          |
|-----------------|--|----------|----------|----------|----------|
| <b>11UFK401</b> | <b>ELECTRONIC DEVICES AND CIRCUITS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |  | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objective**

- *To acquaint the students with construction, theory and characteristics of the following electronic devices*
  - p-n junction diode*
  - Bipolar transistor*
  - Field effect transistor*
  - LED, LCD and other photo electronic devices*
- *To expose the students to various configurations of the amplifiers and oscillator circuits with feedback concepts.*
- *To learn the wave shaping process and circuits.*

**UNIT I - PN DIODE AND ITS APPLICATIONS 9**

Theory of p-n junction – p-n junction as diode – p-n diode currents – VI characteristics – Diode resistance – Temperature effect of p-n junction – Transition and diffusion capacitance of p-n diode – Diode switching times - Zener diodes - VI characteristics - Rectifiers: Half wave & full wave rectifier analysis – Inductor filter – Capacitor filter – Series and shunt voltage regulator – Switched mode power supply, Photodiode, LED, LCD characteristics and applications.

**UNIT II - BJT AND ITS APPLICATIONS 8**

Junction transistor – Transistor construction – Detailed study of currents in transistor – Input and output characteristics of CE, CB and CC configurations – Transistor hybrid model for CE configuration – Analytical expressions for transistor characteristics – Transistor switching times – voltage rating – Power transistors – Opto couplers.

**UNIT III - FET AND ITS APPLICATIONS 8**

Junction field effect transistor – Pinch off voltage – JFET volt-ampere characteristics – JFET small signal model - CS and CD configuration – MOSFETS and their characteristics - enhancement and depletion – FET as a variable resistor – Cascade and Cascode – Darlington connection – Uni junction transistor.

#### **UNIT IV - AMPLIFIERS AND OSCILLATORS**

**11**

Operating point – Fixed and self biasing of BJT – Small signal analysis of CE and CC amplifiers – Small signal analysis of CS amplifier - Power amplifiers – Differential amplifiers – Common mode and differential mode analysis for BJT - DC and AC analysis – Characteristics of tuned amplifiers – Single & double tuned amplifier - Characteristics of negative feedback amplifiers – Voltage / current, series/shunt feedback – Theory of sinusoidal oscillators – Stability of feedback circuits using Barkhausen criteria – Phase shift and Wien bridge oscillators – Colpitts, Hartley and crystal oscillators.

#### **UNIT V - PULSE CIRCUITS**

**9**

RC wave shaping circuits – Diode clampers and clippers – Multivibrators – Astable, Monostable and Bistable – Schmitt triggers – UJT based saw tooth oscillators

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

#### **TEXT BOOKS**

- 1 David A. Bell, 'Electronic Devices & Circuits', Prentice Hall of India/Pearson Education, IV Edition, Eighth printing, 2003.
- 2 Jacob Millma, Christos.C.Halkias and Satyabrata Jit, 'Electronic Devices and Circuits', Tata McGraw Hill, 2010.
- 3 Jacob Millman & Herbert Taub, 'Pulse, Digital & Switching Waveforms', Tata McGraw Hill, Edition 2000, 24<sup>th</sup> reprint, 2003.

#### **REFERENCE BOOKS**

- 1 Theodre. F. Boghert, 'Electronic Devices & Circuits', Pearson Education, VI Edition, 2003.
- 2 Robert Diffenderfer, "Electronic Devices – systems & applications", Cengage learning, 2005
- 3 Robert L Boylestad, "Electronic Devices and Circuit Theory", Pearson Education, tenth edition, 2009

|                 |   |          |          |          |          |
|-----------------|---|----------|----------|----------|----------|
| <b>11UFK402</b> | <b>SYNCHRONOUS AND INDUCTION<br/>MACHINES</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |   | <b>3</b> | <b>1</b> | <b>0</b> | <b>4</b> |

**Course Objectives**

*To impart knowledge on*

- *Construction and performance of salient and non – salient type synchronous generators.*
- *Principle of operation and performance of synchronous motor.*
- *Construction, principle of operation, Starting and speed control and performance of induction machines*
- *Construction, principle of operation and performance of single phase induction motors and special machines.*
- *To understand the basic concepts in modeling of AC machines.*

**UNIT I - SYNCHRONOUS GENERATOR 10**

Constructional details - Types of rotors – EMF equation - Synchronous reactance - Armature reaction - Voltage regulation – EMF, MMF, and ZPF methods – Synchronizing and parallel operation - Synchronizing torque - Change of excitation and mechanical input – Two reaction theory - Determination of direct and quadrature axis synchronous reactance using slip test

**UNIT II - SYNCHRONOUS MOTOR 9**

Principle of operation – Torque equation – Operation on infinite bus bars - V and Inverted V curves – hunting- Power input and power developed equations – Starting methods – Current loci for constant power input, constant excitation and constant power developed.

**UNIT III - THREE PHASE INDUCTION MOTOR 10**

Constructional details – Types of rotors – Principle of operation – Slip – Equivalent circuit – Slip-torque characteristics - Starting methods – speed control of three phase induction motors-Condition for maximum torque – Losses and efficiency – Load test - No load and blocked rotor tests - Circle diagram – Separation of no load losses – Double cage rotors – Induction generator – Synchronous induction motor.

## **UNIT IV - SINGLE PHASE INDUCTION MOTORS AND SPECIAL MACHINES 9**

Constructional details of single phase induction motor – Double revolving field theory and operation – Equivalent circuit – No load and blocked rotor test – Performance analysis – Starting methods of single-phase induction motors - Special machines - Shaded pole induction motor, reluctance motor, repulsion motor, hysteresis motor, stepper motor and AC series motor.

## **UNIT V - MODELLING OF AC MACHINES 7**

Modeling concepts of rotating machines- Kron's primitive machine- Voltage and torque equations- two axis model for AC machines (Qualitative Treatment only)

**Lecture Hours (45) + Tutorial Hours (15), Total Hours: 60**

### **TEXT BOOKS**

- 1 D.P. Kothari and I.J. Nagrath, 'Electric Machines', Tata McGraw Hill Publishing Company Ltd, 2002
- 2 P.S. Bhimbhra, 'Electrical Machinery', Khanna Publishers, 2003.

### **REFERENCE**

- 1 A.E. Fitzgerald, Charles Kingsley, Stephen.D.Umans, 'Electric Machinery', Tata McGraw Hill publishing Company Ltd, 2003.
- 2 J.B. Gupta, 'Theory and Performance of Electrical Machines', S.K.Kataria and Sons, 2002.
- 3 P.S. Bhimbhra, 'Generalised Machines Theory', Khanna Publishers, 2003.

|                 |                                 |          |          |          |          |
|-----------------|---------------------------------|----------|----------|----------|----------|
| <b>11UFK403</b> | <b>POWER GENERATION SYSTEMS</b> | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|                 |                                 | <b>3</b> | <b>0</b> | <b>0</b> | <b>3</b> |

**Course Objectives**

- *To expose the students to the basic concepts and structure of power generation systems*
- *To understand the generation of electricity from traditional and renewable sources*
- *To understand the concepts of grid interconnection and smart grid*

**UNIT I: INTRODUCTION 6**

Introduction to energy systems and resources Energy, sustainability & the environment Fossil fuels - past, present & future Remedies & alternatives for fossil fuels - Structure of electric power system - Types of Loads - Load curves and Load Duration Curves - Basic Definitions

**UNIT II: TRADITIONAL GENERATION SYSTEMS 12**

Conventional methods of power generations – Schematic arrangement and choice of site for hydel, thermal, diesel, nuclear, gas power plants –comparison of these power plants - pumped storage schemes – Principle of MHD power generation and advantages - Load sharing between base load and peak load plants; Co-generation – combined cycle power generation – lay out scheme and principle of operation.

**UNIT III: RENEWABLE POWER GENERATION SYSTEMS 12**

Need & Advantages of renewable sources - Solar Power and its applications – Solar thermal power plant –Wind energy estimation in World and in India – Types of wind energy systems – Biogas plant

**UNIT IV: OTHER RENEWABLE ENERGY SOURCES 9**

Tidal energy – Wave energy – Open and closed OTEC Cycles – Small hydro – Geothermal energy – Fuel cell systems – Concepts of Hybrid Systems

**UNIT V: GRID INTERCONNECTION 6**

Grid or interconnected system – merits of interconnected systems –Standalone systems – Introduction to Smart Grid and Emerging Technologies – Operating principles & models of Smart Grid Components

**Total Hours : 45**

## **TEXT BOOKS**

- 1 B H Khan, “Non Conventional Energy Sources” Tata McGraw-Hill Publishing Company Ltd, 2009
- 2 B.R. Gupta, “Generation of Electrical Energy”, Eurasia Publishing House (Pvt.) Ltd., 2002

## **REFERENCE**

- 1 G.D. Rai, “Non Conventional Energy Sources”, Khanna Publishers, 2002
- 2 Mukund R Patel, “Wind and Solar Power Systems”, CRC Press, 2004
- 3 <http://www.oe.energy.gov/smartgrid.htm>
- 4 <http://www.siemens.com>
- 5 <http://www.arewa.com>

**11UFK492**

**ELECTRONIC DEVICES AND CIRCUITS  
LABORATORY**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

1. Characteristics of PN junction diode and Zener diode
2. Single phase half wave and full wave rectifiers with inductive and capacitive filters
3. Characteristics of series and shunt regulators
4. Characteristics of Photo diode, phototransistor and study of light activated relay circuit.
5. Characteristics of Transistor under common emitter, common collector and common base configurations.
6. Characteristic of FET and UJT
7. Frequency response of a single stage RC Coupled amplifier with and without unbypassed emitter resistor
8. Differential amplifiers using FET.
9. RC Phase shift oscillators and Colpitt's Oscillator
10. Integrators, Differentiators, clippers and clampers
11. Schmitt triggers and UJT based Sawtooth Oscillator

**Total Hours : 45**

**11UFK491**

**SYNCHRONOUS AND INDUCTION  
MACHINES LABORATORY**

|          |          |          |          |
|----------|----------|----------|----------|
| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
| <b>0</b> | <b>0</b> | <b>3</b> | <b>2</b> |

**Experiments**

1. Regulation of three phase alternator by EMF and MMF methods
2. Parallel operation of three phase alternators
3. Regulation of three phase alternator by ZPF method
4. Regulation of three phase salient pole alternator by slip test
5. V and Inverted V curves of Three Phase Synchronous Motor.
6. Load test on three-phase induction motor.
7. No load and blocked rotor test on three-phase induction motor.
8. Separation of No-load losses of three-phase induction motor
9. Load test on single-phase induction motor
10. No load and blocked rotor test on single-phase induction motor.

**Total Hours: 30**

**11UCK412**

**OBJECT ORIENTED PROGRAMMING  
LABORATORY**

| <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> |
|----------|----------|----------|----------|
| <b>0</b> | <b>0</b> | <b>2</b> | <b>2</b> |

**Experiments**

1. String concatenation using dynamic memory allocation concept.
2. Implementation of arithmetic operations on complex numbers using constructor overloading.
3. To read a value of distance from one object and add with a value in another object using friend function.
4. Implementation of + and - operator overloading and implementation of addition operation of octal object with integer using operator overloading.
5. Implementation of addition and subtraction of two polynomial objects using operator overloading.
6. To compute the area of triangle and rectangle using inheritance and virtual function.
7. Writing simple programs in Java.
8. Use of interfaces in Java.
9. Developing packages in Java.
10. GUI Design in Java
11. Exception handling programs
12. Threads handling programs

**Total Hours: 30**

## **SEMESTER-V**

**OBJECTIVE**

*To provide strong foundation to the students to expose various emerging new areas of applied mathematics and appraise them with their relevance in Engineering and Technological field.*

**UNIT I - SOLUTION OF EQUATIONS AND EIGENVALUE PROBLEMS (9)**

Solution of equation - Fixed point iteration :  $x = g(x)$  method – Newton's method – Regula Falsi method, Solution of linear system by Gaussian elimination and Gauss-Jordan methods – Iterative methods - Gauss-Seidel methods - Inverse of a matrix by Gauss Jordan method – Eigen value of a matrix by power method.

**UNIT II - INTERPOLATION AND APPROXIMATION (9)**

Lagrangian Polynomials – Divided differences - Newton's forward and backward difference formulas– Interpolating with a cubic spine.

**UNIT III - NUMERICAL DIFFERENTIATION AND INTEGRATION (9)**

Differentiation using interpolation formulae – Numerical integration by trapezoidal and Simpson's 1/3 and 3/8 rules – Romberg's method – Two and Three point Gaussian quadrature formulas – Double integrals using trapezoidal and Simpson's rules.

**UNIT IV - INITIAL VALUE PROBLEMS FOR ORDINARY DIFFERENTIAL EQUATIONS (9)**

Single step methods: Taylor series method, Runge -Kutta method of fourth order for solving first , second order and simultaneous equations - Euler and Modified Euler method for solving first order ODE – Multistep methods: Milne's and Adam's predictor and corrector methods. Finite difference solution of second order ordinary differential equation

**UNIT V - BOUNDARY VALUE PROBLEMS IN ORDINARY AND PARTIAL DIFFERENTIAL EQUATIONS (9)**

Finite difference solution of one dimensional heat equation by explicit method – One dimensional wave equation and Two dimensional Laplace and Poisson equations.

**Lecture : 45, Tutorial : 15, Total : 60**

## **TEXT BOOKS**

1. Gerald C.F. and Wheatley, P.O. 'Applied Numerical Analysis', 6<sup>th</sup> edition Pearson Education Asia, New Delhi.
2. Dr M.K Venkatraman, Numerical Methods in Science and Engineering, The National Publishing Company, Chennai

## **REFERENCE BOOKS**

1. P. Kandasamy, K. Thilagavathy and K. Gunavathy, 'Numerical Methods', S.Chand Co. Ltd., New Delhi, 2003.
2. Veerajan ,T and Ramachandran.T, 'Numerical Methods with programming in 'C' Second Edition Tata McGraw Hill Pub.Co.Ltd, First reprint 2007.
3. Sankara Rao K 'Numerical Methods For Scientists and Engineers –3rd Edition Prentice Hall of India Private, New Delhi, 2007.

**11UFK501                      MEASUREMENTS AND INSTRUMENTATION                      3 0 0 3**

### **AIM**

To provide adequate knowledge of measurements techniques using electrical and electronic instruments.

### **OBJECTIVES**

- *Introduction to general instrument system, error, calibration etc.*
- *Emphasis is laid on analog and digital techniques used to measure voltage, current, energy, power and non-electrical parameters.*
- *To have an adequate knowledge of comparison methods of measurement.*
- *Elaborate discussion about storage & display devices.*
- *Exposure to various transducers and data acquisition system.*

### **UNIT I – MEASUREMENT OF VOLTAGE, CURRENT, POWER AND ENERGY 9**

Functional elements of an instrument - Static and dynamic characteristics-Errors in measurement -Principles of operation of permanent magnet moving coil, moving iron, dynamometer –Calibration of voltmeters and ammeters – Power measurement by three ammeter and three voltmeter method – Induction type wattmeter – Energy meter – Calibration of energy meter & wattmeter.

### **UNIT II –MEASUREMENT OF RLC AND SIGNAL CONVERTERS 9**

Wheatstone, Kelvin, Wien, Hay, Maxell, Anderson and Schering bridges – Q meter – Potential transformer & current transformers – KVA meters – Power factor meter – Megger. A/D and D/A converters -Multiplexing and demultiplexing -Data acquisition systems - grounding techniques.

### **UNIT III - ELECTRONIC ANALOG AND DIGITAL MEASUREMENTS 9**

DC and AC voltmeters - differential voltmeters - AC current measurements – Multimeters – Signal generator – Wave analyzer – Harmonic distortion analyzer - Spectrum analyzer correlator. Digital displacement transducers, increment and absolute –Digital method of

measuring displacement & velocity – Digital alpha numeric display – Digital methods of measurement of frequency – Phase difference.

#### **UNIT IV – TRANSDUCERS**

**9**

Classification of transducers - Selection of transducers resistive, capacitive and inductive transducers- Piezo electric transducers - Optical and digital transducers - pH electrodes - transducers for measurement of displacement, temperature, level, flows, pressure, velocity and acceleration.

#### **UNIT V - ELECTRICAL AND ELECTRONICS INSTRUMENTS**

**9**

Single and three phase watt meters- Energy meter- Magnetic measurements - Instrument transformers - Instruments for measurement of torque, speed, frequency, phase. General purpose oscilloscope – CRT screen characteristics – Vertical & horizontal amplifiers–Delay line – Time base and sweep trigger circuits synchronization – Sampling oscilloscope –Digital storage oscilloscope – Typical measurements using CRO – Moving coil recorders – XY plotters

**Lecture : 45, Tutorial : 0, Total : 45**

#### **TEXT BOOKS**

1. Sawhney. A.K., “Course in Electrical & Electronics Measurement & Instrumentation”, Dhanpat Rai & Sons, 2007.
2. Doebelin, E.O.: " Measurement Systems- Application and Design", McGraw Hill Publishing Company, 2008.
3. Kalsi, H.S, “Electronic Instrumentation” TMH, 2010.

#### **REFERENCE BOOKS**

1. Cooper, W.D., and Helfrick, A.D., “Electronic Instrumentation and Measurement Techniques”, Third Edition, Prentice Hall of India, 2001
2. Woolvert, G.A., “Transducers in Digital Systems”, Peter peregrines Ltd., England, 1988
3. Bouwens, A.J., “Digital Instrumentation”, McGraw Hill, 2004.

**OBJECTIVES**

- *To expose the students to the basic scenario and concepts of transmission and distribution systems*
- *To study about transmission line performance and insulators*
- *To understand the concepts of overhead and underground transmission*

**UNIT I - INTRODUCTION****9**

Transmission & Distribution Scenario of India - Introduction to Electrical Power System- Types of AC and DC distributors - Radial and ring main systems- Distributed and concentrated loads - Interconnection -HVDC and EHV AC transmission

**UNIT II - POWER TRANSMISSION SYSTEMS****9**

Overhead Lines Parameters of single and double circuits: Resistance, inductance and capacitance of solid, stranded and bundled conductors- Skin effect - Proximity effect - Symmetrical and unsymmetrical spacing and transposition-Application of self and mutual GMD; interference with neighbouring communication circuits- Typical configuration, conductor types and electrical parameters of 400, 220, 110, 66 and 33 kV lines.

**UNIT III - MODELLING AND PERFORMANCE OF TRANSMISSION LINES****9**

Short and Medium transmission lines - Phasor diagrams - Nominal T and  $\pi$  methods - Line regulation – Efficiency- Rigorous solution for long line - ABCD constants - Ferranti effect – Tuned power lines - Surge impedance and surge impedance loading- shunt and series compensation- Corona – Factors affecting corona .

**UNIT IV - INSULATORS AND UNDERGROUND CABLES****9**

Types of insulators- Potential distribution over a string of suspension insulators - Methods of increasing string efficiency - Underground cables: Introduction-Types of cables, Capacitance of Single-core cable, Grading of cables, Power factor and heating of cables, Capacitance of 3-core belted cable, D.C cables - Insulation resistance.

## **UNIT V - MECHANICAL DESIGN OF LINES AND GROUNDING**

**9**

Mechanical design of transmission line- Stress and Sag Calculation – Effect of wind and ice - Supports at different levels – Stringing chart- Methods of grounding – Peterson coil- Substations, Types of Substations –

**Lecture : 45, Tutorial : 0, Total : 45**

### **TEXT BOOKS**

1. Mehta, V.K., Rohit Mehta , “Principles of Power Systems”, S.Chand & Company Private Limited, New Delhi, 2004.
2. Singh S.N, “Electric Power Generation, Transmission and Distribution”, Prentice Hall of India Private Limited, New Delhi, 2003.

### **REFERENCE BOOKS**

1. B.R.Gupta, ‘Power System Analysis and Design’, S.Chand, New Delhi, 2003.
2. Weedy B.M., Cory B.J., “Electric Power Systems”, John Wiley & Sons Limited, England, 4th Edition, Reprint, November 2001.
3. Hadi Saadat, ‘Power System Analysis,’ Tata McGraw Hill Publishing Company’, 2003
4. Wadhwa, C.L., “Electrical Power Systems”, New Age International Publishers Limited, New Delhi, 2006, 4th Edition, Reprint Aug, 2007.

# 11UFK503 LINEAR INTEGRATED CIRCUITS

L T P C

3 0 0 3

## AIM

To introduce the concepts for realizing functional building blocks in ICs, fabrications & application of ICs.

## OBJECTIVES

- *To study the IC fabrication procedure.*
- *To study characteristics; realize circuits; design for signal analysis using Op-amp ICs.*
- *To study the applications of Op-amp.*
- *To study internal functional blocks and the applications of special ICs like Timers, PLL circuits, regulator Circuits, ADCs.*

## UNIT I - IC FABRICATION

9

IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. Fabrication of diodes, capacitance, resistance and FETs.

## UNIT II - CHARACTERISTICS OF OPAMP

9

Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator.

## UNIT III - APPLICATIONS OF OPAMP

9

Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter (R-2R ladder and weighted resistor types), A/D converter - Dual slope, successive approximation and flash types.

**UNIT IV - SPECIAL ICs****9**

555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs.

**UNIT V - APPLICATION ICs****9**

IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs.

**L = 45 Total = 45****TEXT BOOKS**

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, PHI, 2008.
2. D.Roy Choudhary, Shail B.Jain, 'Linear Integrated Circuits', III edition, New Age International Private Limited, 2007.

**REFERENCE BOOKS**

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997

**AIM**

To introduce the fundamentals of Digital Circuits, combinational and sequential circuit.

**OBJECTIVES**

- *To study various number systems and to simplify the mathematical expressions using Boolean functions – simple problems.*
- *To study implementation of combinational circuits*
- *To study the design of various synchronous and asynchronous circuits.*
- *To expose the students to various memory devices.*

**UNIT I - BOOLEAN ALGEBRA****9**

Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

**UNIT II - COMBINATIONAL CIRCUITS****9**

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

**UNIT III - SYNCHRONOUS SEQUENTIAL CIRCUITS****9**

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

**UNIT IV - ASYNCHRONOUS SEQUENTIAL CIRCUIT****9**

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

**UNIT V - PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC****FAMILIES****9**

Memories: RAM, ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

**L = 45 Total = 45****TEXT BOOKS**

1. M. Morris Mano, 'Digital Design', Pearson Education, 2006.
2. John M. Yarbrough, 'Digital Logic, Application & Design', Cengage learning, 2009.

## **REFERENCE BOOKS**

1. Charles H.Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition, 2002.
2. Floyd, 'Digital Fundamentals', 8<sup>th</sup> edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3<sup>rd</sup> edition, Pearson Education, 2002.

**AIM**

To provide sound knowledge in the basic concepts of linear control theory and design of control system.

**OBJECTIVES**

- *To understand the methods of representation of systems and to derive their transfer function models.*
- *To provide adequate knowledge in time response of systems and steady state error analysis.*
- *To accord basic knowledge in obtaining the open loop and closed-loop frequency responses of systems.*
- *To understand the concept of stability and methods of stability analysis.*

**UNIT I - MATHEMATICAL MODELS OF PHYSICAL SYSTEMS****9**

Basic elements in control systems – Open and closed loop systems – Electrical analogy of mechanical and thermal systems – Transfer function – Synchros – AC and DC servomotors – Block diagram reduction techniques – Signal flow graphs.

**UNIT II - TIME RESPONSE****9**

Time response – Time domain specifications – Types of test input – I and II order system response – Error coefficients – Generalized error series – Steady state error – P, PI, PID modes of feedback control.

**UNIT III - FREQUENCY RESPONSE****9**

Frequency response – Bode plot – Polar plot – Determination of closed loop response from open loop response – Correlation between frequency domain and time domain specifications.

**UNIT IV - STABILITY OF CONTROL SYSTEM****9**

Characteristics equation – Location of roots in S plane for stability – Routh Hurwitz criterion – Root locus construction – Effect of pole, zero addition – Gain margin and phase margin – Nyquist stability criterion.

## **UNIT V - STATE VARIABLE ANALYSIS**

**9**

Concept of state – State Variable & State Model – State models for linear & continuous time systems – Solution of state & output equation – Controllability - Observability

**Lecture : 45, Tutorial : 15, Total: 60**

### **TEXT BOOKS**

1. I.J. Nagrath and M. Gopal, 'Control Systems Engineering', New Age International Publishers, 2003.
2. Benjamin C. Kuo, Automatic Control systems, Pearson Education, New Delhi, 2003.

### **REFERENCE BOOKS**

1. K. Ogata, 'Modern Control Engineering', 4th edition, PHI, New Delhi, 2002.
2. Norman S. Nise, Control Systems Engineering, 4th Edition, John Wiley, New Delhi, 2007.
3. Samarajit Ghosh, Control systems, Pearson Education, New Delhi, 2004
4. M. Gopal, 'Control Systems, Principles and Design', Tata McGraw Hill, New Delhi, 2002.

**OBJECTIVE**

*To train the students in the measurement of displacement, resistance, inductance, torque and angle etc., and to give exposure to AC, DC bridges and transient measurement.*

**List of Experiments****Prerequisites:**

1. Calibration of meters (ammeter, voltmeter, wattmeter).
2. Measurement of voltage, frequency and phase difference using CRO using Lissajous figures.

**Experiments:**

1. Measurement of energy using energy meter
2. AC bridges and DC bridges
3. Instrumentation amplifiers and A/D converters
4. Measurement of displacement using LVDT and pressure transducer
5. Measurement of Power using current and potential transformer.
6. Determination of transfer function of DC Generator
7. Determination of transfer function of DC Motor
8. Analog simulation of Type - 0 and Type – 1 systems
9. DC and AC position control systems
10. Digital simulation of first and second order systems
11. Stepper motor control system
12. Stability analysis of linear systems using MATLAB

**AIM**

To study various digital & linear integrated circuits used in simple system configuration.

**EXPERIMENTS:**

1. Study of Basic Digital IC's. (Verification of truth table for AND, OR, EXOR, NOT, NOR, NAND, JK FF, RS FF, D FF)
2. Implementation of Boolean Functions, Adder/ Subtractor circuits.
3. Code converters, Parity generator and parity checking, Excess-3, 2s Complement, Binary to Gray code using suitable IC's .
4. Encoders and Decoders
5. Design and Implementation of 4-bit shift registers in SISO, SIPO, PISO, PIPO modes using suitable IC's.
6. Counters: Design and implementation of 4-bit modulo counters as synchronous and Asynchronous types using FF IC's and specific counter IC.
7. Multiplex/ De-multiplex: Study of 4:1; 8:1 multiplexer and Study of 1:4; 1:8 demultiplexer
8. Timer IC application: Study of NE/SE 555 timer in Astable, Monostable operation.
9. Application of Op-Amp: Slew rate verifications, inverting and non-inverting amplifier, Adder, comparator, Integrator and Differentiator.
10. Study of Analog to Digital Converter and Digital to Analog Converter: Verification of A/D conversion using dedicated IC's.
11. Study of VCO and PLL ICs: Voltage to frequency characteristics of NE/ SE 566 IC and Frequency multiplication using NE/SE 565 PLL IC.

**P : 45    Total Hours: 45**

**List of Experiments**

1. Listening Comprehension
2. Reading comprehension and vocabulary
3. Speaking: Group discussion; verbal and non-verbal communication; speaking on situational topics
4. Writing Skills
5. Letter Writing / Resume / Report preparation:
6. Presentation skills
7. Group Discussion
8. Interview skills
9. Soft Skills

**P : 45    Total hours : 45**

**SEMESTER-VI**

**AIM**

To introduce the concept of analyzing discrete time signals & systems in the time and frequency domain.

**OBJECTIVES**

- *To classify signals and systems & their mathematical representation.*
- *To analyse the discrete time systems.*
- *To study various transformation techniques & their computation.*
- *To study about filters and their design for digital implementation.*
- *To study about a programmable digital signal processor & quantization effects.*

**UNIT – I INTRODUCTION****9**

Need and advantages of Digital Signal Processing; Classification of systems: Continuous, discrete, linear, causal, stable, dynamic, recursive, time variance; Classification of signals: Continuous and Discrete, Energy and Power; Signal representation by singularities; Typical signal processing operations: convolution, correlation and transformation; Typical DSP system: ADC/DAC - Sampling, Quantization, Quantization error, Nyquist rate, Aliasing effect.

**UNIT - II DISCRETE TIME SYSTEM ANALYSIS****9**

Z-transform and its properties, inverse z-transforms; difference equation – Solution by z transform, application to discrete systems - Stability analysis, frequency response– Fourier transform of discrete sequence – Discrete Fourier series– Convolution using Z-transform and Fourier transform.

**UNIT - III DISCRETE TRANSFORMS****9**

DFT – Definition - properties, Computation of DFT using FFT algorithm – DIT & DIF - FFT using radix 2 – Butterfly structure; Computation of IDFT using DFT. Wavelet transform: MRA by the Wavelet method.

**UNIT - IV DESIGN OF DIGITAL FILTERS****9**

IIR design: Approximation of analog filter design - Butterworth and Chebyshev; Digital design using impulse invariant and bilinear transformation - Warping, pre-warping - Frequency transformation.

FIR design: Windowing Techniques – Need and choice of windows – Linear phase characteristics. FIR & IIR filter realization – Parallel & cascade forms.

**UNIT - V DSP HARDWARE****9**

Architecture for signal processing - Van Neumann and Harvard architecture; Architecture and features of TMS 320C54 signal processing chip.

**Lecture : 45, Tutorial : 15, TOTAL : 60**

**TEXT BOOKS**

- 1 J.G. Proakis and D.G. Manolakis, 'Digital Signal Processing Principles, Algorithms and Applications', Pearson Education, New Delhi, 2003 / PHI.
- 2 S.K. Mitra, 'Digital Signal Processing – A Computer Based Approach', Tata McGraw Hill, New Delhi, 2001.

**REFERENCE BOOKS**

- 1 Alan V. Oppenheim, Ronald W. Schafer and John R. Buck, 'Discrete – Time Signal Processing', Pearson Education, New Delhi, 2003.
- 2 B. Venkataramani, M. Bhaskar, 'Digital Signal Processors, Architecture, Programming and Applications', Tata McGraw Hill, New Delhi, 2003.
- 3 S. Salivahanan, A. Vallavaraj, C. Gnanapriya, 'Digital Signal Processing', TataMcGraw Hill, New Delhi, 2003.

**OBJECTIVE**

- *To create an awareness on Engineering Ethics and Human Values.*
- *To instill Moral and Social Values and Loyalty*
- *To appreciate the rights of Others*

**UNIT – I HUMAN VALUES****6**

Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

**UNIT - II ENGINEERING ETHICS****6**

Senses of 'Engineering Ethics' - Variety of moral issued - Types of inquiry – Moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - Consensus and controversy – Models of Professional Roles - Theories about right action - Self-interest - Customs and religion - Uses of ethical theories.

**UNIT - III ENGINEERING AS SOCIAL EXPERIMENTATION****6**

Engineering as experimentation - engineers as responsible experimenters - codes of ethics – A balanced outlook on law - the challenger case study

**UNIT - IV SAFETY, RESPONSIBILITIES AND RIGHTS****6**

Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - The three mile island and Chernobyl case studies. Collegiality and loyalty - Respect for authority - Collective bargaining - Confidentiality - Conflicts of interest - occupational crime - professional rights - employee rights -Intellectual Property Rights (IPR) - discrimination.

**UNIT - V GLOBAL ISSUES****6**

Multinational corporations - Environmental ethics - computer ethics – weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors - moral leadership-sample code of Ethics (Specific to a particular Engineering Discipline ).

**Lecture : 30, Tutorial : 0, TOTAL : 30**

## **TEXT BOOKS**

- 1 Mike Martin and Roland Schinzinger, "Ethics in engineering", McGraw Hill, New York 1996.
- 2 Govindarajan M, Natarajan S, Senthil Kumar V. S, " Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
- 3 Charles D. Fleddermann, "Engineering Ethics", Pearson Education/ Prentice Hall, New Jersey, 2004 (Indian Reprint now available)

## **REFERENCE BOOKS**

- 1 Charles E Harris, Michael S. Protchard and Michael J Rabins, " Engineering Ethics – Concepts and Cases", Wadsworth Thompson Learning, United States, 2000 (Indian Reprint now available )
- 2 John R Boatright, " Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.
- 3 Edmund G Seebauer and Robert L Barry, " Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, Oxford, 2001

**OBJECTIVES**

- *To study about power electronic circuits for voltage and current control.*
- *To learn the switching characteristics of transistors and SCRs.*
- *To learn controlled rectification AC supplies.*
- *To study of converters and inverters.*
- *To learn about motor control, SMPS and UPS.*

**UNIT I -POWER ELECTRONICS DEVICES****9**

Characteristics of power devices – characteristics of SCR, TRIAC, GTO, power transistors – power MOSFET, IGBT, IGCT– two transistor model of SCR – SCR Protection circuits - turn on methods of SCR - series and parallel operations of SCRs - SCR Driver circuits.

**UNIT II -CONTROLLED RECTIFIERS****9**

Converters – single phase – three phase – half controlled and fully controlled rectifiers – Waveforms of load voltage and line current under constant load current – effect of transformer leakage inductance – dual converter.

**UNIT III - DC TO DC CONVERTER****9**

Classification of Choppers- Step-down and step-up chopper-Time ratio control and current limit control – Buck, boost, buck-boost converter, concept of Resonant switching - Voltage, current and load-commutated choppers.

**UNIT IV - DC TO AC CONVERTER****9**

DC to AC converters: Inverters– Types – voltage source and current source inverters – single phase bridge inverters – three phase bridge inverters – PWM inverters - Series inverter control of AC output voltage – Harmonic reduction.

**UNIT V - AC TO AC CONVERTERS****9**

Single phase AC voltage controllers – Multistage sequence control - single and three phase cycloconverters (No analysis) –Power factor control and Matrix converters.

Applications: UPS – HVDC systems – SMPS – FACTS (SVC ,UPFC).

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Rashid M.H., Power Electronics Circuits, Devices and Applications, Prentice Hall India, 3<sup>rd</sup> Edition, New Delhi, 2004.
2. Singh.M.D and Kanchandani-'Power Electronics'-Tata McGraw-Hill & Hill publication Company Ltd New Delhi-2007.
3. P.S.Bimbra "Power Electronics" Khanna Publishers, Fourth edition 2010.

### **REFERENCE BOOKS**

1. Ned Mohan, Tore.M.Undeland, William.P.Robbins, 'Power Electronics: Converters, Applications and Design, John Wiley & sons , Singapore, 2003.
2. Philip T.Krein, "Elements of Power Electronics" Oxford University Press, 2004 Edition.

**OBJECTIVES**

- *To expose the students to the need of power system planning and concepts of modeling of power system components*
- *To understand the concepts of power flow and fault analysis on power system*
- *To understand the concepts of stability*

**UNIT I -INTRODUCTION****9**

Need for system analysis in planning and operation of power system – Distinction between steady state and transient state – Per phase analysis of symmetrical three-phase system. General aspects relating to power flow, short circuit and stability analysis - Per unit representation.

**UNIT II – MODELING OF VARIOUS COMPONENTS/ACCESSORIES** 9

Primitive network and its matrices – Bus incidence matrix – Bus admittance and bus impedance matrix formation - Z-bus building algorithm - Equivalent circuit of transformer with off-nominal-Tap ratio. Modeling of generator, load and transmission line for power system analysis.

**UNIT III – POWER FLOW ANALYSIS****9**

Problem definition – Bus classification – Derivation of power flow equation – Solution by Gauss–Seidel, Newton–Raphson and Fast decoupled load flow methods - Computation of slack bus power, transmission loss and line flow.

**UNIT IV – SHORT CIRCUIT ANALYSIS****9**

Need for short circuit study- Approximations in modeling – Fault MVA- Symmetrical short circuit analysis – Thevenin's equivalent representation - Unsymmetrical Fault Analysis - Symmetrical component transformation – sequence impedances – sequence networks – Types of unsymmetrical fault - unsymmetrical fault analysis on an Unloaded generator- unsymmetrical analysis on power system.

## **UNIT V - STABILITY ANALYSIS**

**9**

Concept of stability in power system - Swing equation - Stability limits - Methods of improving stability limits- Solution of swing equation by Euler's method and Runge- Kutta method – Power angle equations - Equal area criterion - Critical clearing angle and Time

**Lecture : 45, Tutorial : 15, TOTAL : 60**

### **TEXT BOOKS**

1. John J. Grainger and Stevenson Jr. W.D., "Power System Analysis", Tata McGraw Hill, 1st Edition, 2003.
2. Nagrath. I.J, Kothari. D.P, "Modern Power system Analysis", Tata McGraw Hill Pub. Co. Ltd., 3rd Edition, 2003.

### **REFERENCE BOOKS**

1. Hadi Saadat, 'Power System Analysis', Tata McGraw Hill Publishing Company Ltd., New Delhi, 2002.E.W.
2. C.L. Wadhwa, "Electrical Power systems", Second edition, Wiley Eastern Limited,1993.
3. D.P.Kothari , I.J. Nagarath, 'Power System Engineering',Tata McGraw-Hill Publishing Company Ltd., NewDelhi, 2007

**11UFK604 MICROPROCESSORS AND MICRO CONTROLLERS 3 0 0 3****AIM**

To introduce Microprocessor Intel 8085, 8086 and the Micro Controller 8051

**OBJECTIVES**

- *To study the Architecture of 8085, 8086 & 8051.*
- *To study the addressing modes & instruction set of 8085, 8086 & 8051.*
- *To introduce the need & use of Interrupt structure.*
- *To develop skill in simple program writing.*
- *To introduce commonly used peripheral/ interfacing ICs*

**UNIT I - 8085 PROCESSOR 9**

8085: Functional block diagram - Signals– Memory interfacing – I/O ports and data transfer concepts – Timing Diagram – Interrupt structure, 8086 Architecture.

**UNIT II - PROGRAMMING OF 8085 PROCESSOR 9**

Instruction format and addressing modes – Assembly language format – Data transfer, Data manipulation & control instructions – Programming: Loop structure with counting & Indexing - Look up table - Subroutine instructions stack.

**UNIT III - PERIPHERAL INTERFACING 9**

Study of Architecture and programming of ICs: 8255 PPI, 8259 PIC, 8251 USART, 8279 Key board display controller and 8253 Timer/ Counter – Interfacing with 8085 - A/D and D/A converter interfacing.

**UNIT IV - MICRO CONTROLLER 8051 9**

Functional block diagram - Instruction format and addressing modes – Interrupt structure – Timer –I/O ports – Serial communication, Simple programming.

**UNIT V - MICRO CONTROLLER PROGRAMMING & APPLICATIONS 9**

Data Transfer, Manipulation, Control & I/O instructions – Simple programming exercises key board and display interface – Closed loop control of DC shunt motor- stepper motor control.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

- 1 R.S. Gaonkar, 'Microprocessor Architecture Programming and Application', Wiley Eastern Ltd., New Delhi,
- 2 Muhammad Ali Mazidi & Janice Gilli Mazidi, 'The 8051 Micro Controller and Embedded Systems', Pearson Education, 2007.

### **REFERENCE BOOKS**

- 1 Antonakos, 'The Pentium microprocessor', Pearson Education, 2007
- 2 Kenneth Ayala, 'The 8051Microcontroller', Thomson, 2005
- 3 N.K De and P.K Sen, 'Electric Drives', Prentice Hall of India, 2005

**11UFK605**

**ELECTRICAL MACHINE DESIGN**

**L T P C**

**3 1 0 4**

**AIM**

To expose the students to the concept of design of various types of electrical machines.

**OBJECTIVES**

*To provide sound knowledge about constructional details and design of various electrical machines.*

- *To study mmf calculation and thermal rating of various types of electrical machines.*
- *To design armature and field systems for D.C. machines.*
- *To design core, yoke, windings and cooling systems of transformers.*
- *To design stator and rotor of induction machines.*
- *To design stator and rotor of synchronous machines and study their thermal behaviour.*

**UNIT I – INTRODUCTION**

**9**

Considerations and limitations in design; Choice of specific electric and magnetic loadings. Concept of magnetic circuit – MMF calculation for various types of electrical machines – Real and apparent flux density of rotating machines – Leakage reactance calculation for transformers, induction and synchronous machine.

**UNIT II - D.C. MACHINES**

**9**

Output equation – Main dimensions – Choice of number of poles – Armature design – Design of air gap - Design of field poles and field coil – Design of commutator and brushes.

**UNIT III - TRANSFORMERS**

**9**

Output rating of single phase and three phase transformers – Optimum design of transformers – Design of core, yoke and windings for core and shell type transformers – Design of tanks and cooling tubes of transformers.

**UNIT IV - INDUCTION MOTORS**

**9**

Output equation – main dimensions – design of stator – design of squirrel cage and slip ring rotor – performance calculation from designed data.

## **UNIT V - SYNCHRONOUS MACHINES**

**9**

Output equation – Main dimensions – Short circuit ratio – Design of stator and rotor of cylindrical pole and salient pole machines – Design of damper winding - Design of field coil – Cooling of large alternators

**Lecture: 45, Tutorial: 15, TOTAL: 60**

### **TEXT BOOKS**

1. A.K. Sawhney, 'A Course in Electrical Machine Design', Dhanpat Rai and Sons, New Delhi, 2003.
2. S.K. Sen, 'Principles of Electrical Machine Design with Computer Programmes', Oxford and IBH Publishing Co.Pvt Ltd., New Delhi, 1987
3. R.K. Agarwal, 'Principles of Electrical Machine Design', S.K.Kataria and Sons, Delhi, 2002.

### **REFERENCE BOOKS**

1. V.N. Mittle and A. Mittle, 'Design of Electrical Machines', Standard Publications Distributors, Delhi, 2002
2. V.N Mittle and A.Mittle, 'Design of Electrical Machines', Standard Publications and Distributors , Delhi , 2002.
3. Sheppard J.Salen, 'FEA of Electrical Machines', Springer International Edition, First Indian reprint, 2007.

**OBJECTIVE**

*Program a DSP chip to filter signals using either assembly language or a C compiler for the chip. This filter could be a FIR or IIR filter. The student should understand how to design algorithms for implementation.*

**LIST OF EXPERIMENTS****USING TMS320C5X/54XX:**

1. Generation of Signals
2. Linear Convolution
3. Implementation of a FIR filter
4. Implementation of an IIR filter
5. Calculation of FFT

**USING MATLAB CODES**

1. Representation of basic signals.
2. Verification of sampling theorem.
3. Computation of Circular Convolution.
4. Checking stability of LTI systems.
5. Finding Fast Fourier Transform.
6. Design Chebyshev analog and Digital filters.
7. Design of Butterworth analog and Digital filters.
8. Design and analysis of FIR filter using windows.

**OBJECTIVES**

- *To provide the student an opportunity to understand the operation, function and interaction between various components and sub-systems used in Power Electronic Converters.*
- *To impart to the student with knowledge in design, modeling and simulation of Power Electronic Converter based systems.*

**LIST OF EXPERIMENTS**

1. VI characteristics of SCR & TRIAC.
2. VI characteristics of POWER MOSFET & IGBT.
3. Switching characteristics of SCR and IGBT.
4. Single-phase and three-phase half controlled Rectifiers.
5. Single phase and three-phase fully controlled Rectifiers.
6. Step up and step down chopper.
7. Single phase IGBT inverter.
8. Resonant dc-to-dc converter
9. Single & Four quadrant chopper.
10. Three-phase AC voltage controllers.
11. Single-phase cycloconverter.
12. Simulation of Power Electronic circuits using Multi-SIM, Simulink and PSCAD.

### **OBJECTIVES**

- *To perform simple arithmetic operations using assembly language program.*
- *To write an assembly language program using the control instructions*

### **LIST OF EXPERIMENTS**

1. Study of 8085 microprocessor, 8086 microprocessor, 8051 microcontroller kit
2. Programming for 8/16 bit Arithmetic operations Using 8085: Addition / subtraction / multiplication / division.
3. Programming with control instructions Using 8085: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions, Hex. / ASCII / BCD code conversions.
4. Programming for Arithmetic operations Using 8086: Addition / subtraction / multiplication / division.
5. Programming with control instructions Using 8086: Increment / Decrement, Ascending / Descending order, Maximum / Minimum of numbers, Rotate instructions, Hex. / ASCII / BCD code conversions.
6. Interface Experiments: A/D Interfacing , D/A Interfacing, Traffic light controller.
7. Interface Experiments: Simple experiments using 8251, 8279, 8254.
8. Programming for 8/16 bit Arithmetic operations Using 8051: Addition / subtraction / multiplication / division.
9. Interfacing and Programming of DC Motor Speed control using 8085.
10. Interfacing and Programming of Stepper Motor control using 8085.

**P : 45 TOTAL : 45**

**SEMESTER-VII**

**OBJECTIVES**

- *To expose the students to the basic ideas of power system protection and its needs*
- *To understand the various types of relays and apparatus protection schemes*
- *To understand the concepts circuit breaker operation and also the various over voltages impressed on power systems and protective measures for them*

**UNIT I - PROTECTIVE RELAYS****9**

Principles and need for protective schemes – Nature and causes of faults – Types of faults – Power system earthing - Zones of protection and essential qualities of protection – Protection scheme – Construction and characteristics of relays – Over current relays – Directional, distance and differential relays – Under frequency relays – Negative sequence relays – Static relays – Microprocessor based relays.

**UNIT II - APPARATUS PROTECTION****9**

Apparatus protection – Generator and transformer protection – Protection of bus bars, transmission lines, CT's & PT's and their application in protective schemes

**UNIT III - THEORY OF CIRCUIT INTERRUPTION****9**

Physics of arc phenomena and arc interruption. Restriking voltage & Recovery voltage, rate of rise of recovery voltage, current chopping, interruption of capacitive current, resistance switching – DC circuit breaking.

**UNIT IV - CIRCUIT BREAKERS****9**

Switch gear – Fault clearing process – Interruption of current – Types of Circuit Breakers – Air blast, oil, SF<sub>6</sub> and Vacuum circuit breakers – Comparative merits of different circuit breakers – Testing of circuit breakers – Circuit breaker ratings.

**UNIT V: PROTECTION AGAINST OVER VOLTAGES****9**

Causes of over voltages – Methods of protection against over voltages – Ground wires, Peterson coil, surge absorbers, surge diverters – Relay co-ordination – Selection of protective system – Insulation co-ordination.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. B.Ravindranath and N.Chander, “Power System Protection and Switchgear”, New Age International (P) Ltd., 1st Edition 1997 (Reprint 2006)
2. C.L. Wadhwa, ‘Electrical Power Systems’, New Age International (P) Ltd., 2005.

### **REFERENCE BOOKS**

1. Y.G.Paithankar and S.R.Bhide, “Fundamentals of power system protection”, Prentice Hall of India Pvt. Ltd., New Delhi – 2003.
2. M.L. Soni, P.V. Gupta, V.S. Bhatnagar, A. Chakrabarti, ‘A Text Book on Power System Engineering’, Dhanpat Rai & Co., 1998.
3. Badri Ram, Vishwakarma, ‘Power System Protection and Switchgear’, Tata McGraw Hill, 2001.

**OBJECTIVES**

- *To understand the stable steady-state operation and transient dynamics of a motor-load system.*
- *To study and analyze the operation of the converter / chopper fed dc drive and to solve simple problems.*
- *To study and understand the operation of both classical and modern induction motor drives.*
- *To understand the differences between synchronous motor drive and induction motor drive and to learn the basics of permanent magnet synchronous motor drives.*
- *To analyze and design the current and speed controllers for a closed loop solid-state DC motor drive and simulation using a software package*

**UNIT I - DRIVE CHARACTERISTICS****9**

Equations governing motor load dynamics - Steady state stability - Multi quadrant dynamics - Acceleration, deceleration, starting and stopping - Load torque characteristics of various drives.

**UNIT II - CONVERTER / CHOPPER FED DC MOTOR DRIVE****9**

Steady state analysis of the single and three-phase fully controlled converter fed separately excited D.C motor drive - Continuous and discontinuous conduction Time ratio and current limit control - 4 quadrant operation of converter.

**UNIT III - INDUCTION MOTOR DRIVES****9**

Stator voltage control – Energy efficient drive - V/f control, constant air-gap flux – Field weakening mode - Voltage/current fed inverters - Block diagram of vector control - Closed loop control.

**UNIT IV - SYNCHRONOUS MOTOR DRIVES****9**

V/f control and self-control of synchronous motor – Marginal angle control and power factor control - Permanent magnet synchronous motor Black diagram of closed loop control.

## **UNIT V - DESIGN OF CONTROLLERS FOR DRIVES**

**9**

Transfer function for DC motor, load and converter – Closed loop control with current and speed feedback - Armature voltage control and field weakening mode control, Design of controllers: Current controller and speed controller - Converter selection and characteristics

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Gopal K.Dubey, 'Power Semi conductor controlled drives', Prentice Hall Inc., New Jersey 1989.
2. Bimal K. Bose. 'Modern Power Electronics and AC Drives', PHI / Pearson Education, 2002.

### **REFERENCE BOOKS**

1. N.K.De and S.K.Sen, "Electrical Drives" PHI, 9th print, 2006.
2. Krishnan, 'Electric Motor & Drives Modelling, Analysis and Control', Prentice Hall of India, 2001.
3. S.K.Pillai, "A First course on Electrical Drives", Wiley Eastern Limited, 1993.
4. Gopal K.Dubey, "Fundamentals of Electrical Drives", Narosa Publishing House, 1992.

**AIM**

To introduce the functional building blocks of an embedded system for developing a real time system application.

**OBJECTIVES**

- *Introduce to features that build an embedded system.*
- *To help students to understand the interaction that the various components within an embedded system have with each other.*
- *Techniques of inter facing between processors & peripheral device related to embedded processing.*
- *To enable writing of efficient programs on any dedicated processor.*
- *To introduce the concepts of Real time operating systems.*

**UNIT I - INTRODUCTION TO EMBEDDED SYSTEM****9**

Introduction to functional building blocks of embedded systems – Register, memory devices, ports, timer, interrupt controllers using circuit block diagram representation for each categories.

**UNIT II - PROCESSOR AND MEMORY ORGANIZATION****9**

Structural units in a processor; selection of processor & memory devices; shared memory; DMA; interfacing processor, memory and I/O units; memory management – Cache mapping techniques, dynamic allocation - Fragmentation. Case study: Required Memory devices for an Automatic Washing machine, Chocolate vending machine and for a Digital Camera and Voice recorder.

**UNIT III - DEVICES & BUSES FOR DEVICES NETWORK****9**

I/O devices; timer & counting devices; serial communication using I<sup>2</sup>C, CAN, USB buses; parallel communication using ISA, PCI, PCI/X buses, arm bus; interfacing with devices/ports, device drivers in a system – Introduction.

**UNIT IV - I/O PROGRAMMING AND SCHEDULE MECHANISM****9**

Intel I/O instruction – Transfer rate, latency; interrupt driven I/O - Non-maskable interrupts; software interrupts, writing interrupt service routine in C & assembly languages; preventing interrupt overrun; disability interrupts.

Multi threaded programming – Context switching, premature & non-premature multitasking, semaphores. Scheduling – Thread states, pending threads, context switching, round robin scheduling, priority based scheduling, assigning priorities, deadlock, watch dog timers.

**UNIT V - REAL TIME OPERATING SYSTEM (RTOS)**

**9**

Introduction to basic concepts of RTOS, RTOS – Interrupt handling, task scheduling; embedded system design issues in system development process – Action plan, use of target system, emulator, use of software tools.

**L = 45 TOTAL = 45**

**TEXT BOOKS**

1. P. Rajkamal, 'Embedded System – Architecture, Programming, Design', Tata McGraw Hill, 2003.
2. Daniel W. Lewis, 'Fundamentals of Embedded Software', Prentice Hall of India, 2004.

**REFERENCE BOOKS**

1. David E. Simon, 'An Embedded Software Primer', Pearson Education, 2004.
2. Frank Vahid, 'Embedded System Design–A Unified Hardware & Software Introduction', John Wiley, 2002.
3. Sriram V. Iyer, Pankaj Gupta, 'Embedded Real Time Systems Programming', Tata McGraw Hill, 2004.
4. Steve Heath, 'Embedded System Design', second edition, Elsevier, 2003.

**AIM**

To introduce the technology & concepts of VLSI.

**OBJECTIVES**

- *To introduce MOS theory / Manufacturing Technology.*
- *To study inverter / counter logic / stick / machine diagram / sequential circuits.*
- *To study address / memory / arithmetic circuits.*
- *To introduce FPGA architecture / principles / system design*
- *To introduce design methodology.*

**UNIT I - BASIC MOS TRANSISTOR****9**

Enhancement mode & Depletion mode – Fabrication (NMOS, PMOS, CMOS, BiCMOS) Technology – NMOS transistor current equation – second order effects – MOS Transistor Model.

**UNIT II - MOS CIRCUIT DESIGN PROCESS****9**

MOS Layers- Stick Diagrams- Design rules and layout –Sheet resistance –Area capacitance of layers –NMOS Inverter –CMOS inverter -Switching characteristics. Rise time. Fall time – super buffers -Latch-up problem in CMOS Circuits.

**UNIT III - CMOS CIRCUIT AND LOGIC DESIGN****9**

Pass Transistor and Transmission gates- NMOS and CMOS Logic gates- CMOS Combinational Logic Design-Clocked Sequential Logic Circuits

**UNIT IV - PROGRAMMABLE LOGIC DEVICES****9**

Read Only Memory (ROM)- PLA, PAL- Field Programmable Logic Array (FPGA)- Types of ASICs – Physical Design flow – Programming Technology - Anti fuse - Static RAM - EPROM and EEPROM technology - PREP Benchmarks - Actel ACT - Xilinx LCA – Altera FLEX - Altera MAX - Xilinx I/O blocks.

**UNIT V - DESIGN METHODOLOGIES****9**

Introduction to VLSI Design methodologies - Review of VLSI Design automation tools - Algorithmic Graph Theory and Computational Complexity - Tractable and Intractable problems - General purpose methods for combinatorial optimization.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. D.A.Pucknell, K.Eshraghian, 'Basic VLSI Design', 3<sup>rd</sup> Edition, Prentice Hall of India, New Delhi, 2003.
2. Eugene D.Fabricius, 'Introduction to VLSI Design', Tata McGraw Hill, 2005.

### **REFERENCE BOOKS**

1. N.H.Weste, K.Eshraghian, 'Principles of CMOS VLSI Design: a system perspective', Pearson Education, India, 2002.
2. M.J.S .Smith, "Application Specific Integrated Circuits, Addison –Wesley Longman Inc., 1997.
3. S.H. Gerez, "Algorithms for VLSI Design Automation", John Wiley & Sons, 2002.

**LIST OF EXPERIMENTS**

1. Computation of Parameters and Modeling of Transmission Lines
2. Formation of Bus Admittance and Impedance Matrices and Solution of Networks.
3. Load Flow Analysis - I : Solution of Load Flow And Related Problems Using Gauss-Seidel Method
4. Load Flow Analysis - II: Solution of Load Flow and Related Problems Using Newton-Raphson
5. Fault Analysis
6. Transient and Small Signal Stability Analysis: Single-Machine Infinite Bus System
7. Transient Stability Analysis of Multi-machine Power Systems
8. Electromagnetic Transients in Power Systems
9. Load – Frequency Dynamics of Single- Area and Two-Area Power Systems
10. Economic Dispatch in Power Systems.

**P= 45 Total = 45**

**LIST OF EXPERIMENTS**

1. Simulation of closed loop control of converter fed DC motor.
2. Simulation of closed loop control of chopper fed DC motor.
3. Simulation of VSI fed three-phase induction motor.
4. Simulation of three-phase synchronous motor drive.
5. Speed control of DC motor using three-phase Rectifier.
6. Speed control of three-phase induction motor using PWM inverter.
7. DSP based closed loop drive for induction motor.
8. Induction motor speed control using FPGA.
9. Speed control of Brush Less DC motor.
10. DSP based chopper fed DC motor drive.
11. Switched Reluctance Motor Drive using DSP.
12. PLC based drives.

**P= 45 Total = 45**

## PROJECT

|          |                   | L | T | P | C | CA  | FE | TOTAL |
|----------|-------------------|---|---|---|---|-----|----|-------|
| 11UFK799 | Project : Phase I | 0 | 0 | 6 | 4 | 100 | -  | 100   |

## ELECTIVES

|                      |  | L | T | P | C | CA | FE | TOTAL |
|----------------------|--|---|---|---|---|----|----|-------|
| <b>ELECTIVE - I</b>  |  |   |   |   |   |    |    |       |
| 11UFE701             | POWER SYSTEM OPERATION AND CONTROL                         | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE702             | SPECIAL ELECTRICAL MACHINES                                | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE703             | ADVANCED CONTROL THEORY                                    | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE704             | DIGITAL IMAGE PROCESSING                                   | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UAK661             | TOTAL QUALITY MANAGEMENT                                   | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| <b>ELECTIVE - II</b> |  |   |   |   |   |    |    |       |
| 11UFE705             | BIOMEDICAL INSTRUMENTATION                                 | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE706             | HIGH VOLTAGE ENGINEERING                                   | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE707             | COMPUTER AIDED ANALYSIS AND DESIGN OF ELECTRICAL APPARATUS | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE708             | COMPUTER NETWORKS  | 3 | 0 | 0 | 3 | 20 | 80 | 100   |
| 11UFE709             | PLC AND INDUSTRIAL AUTOMATION                              | 3 | 0 | 0 | 3 | 20 | 80 | 100   |

**\*ONLY ONE ELECTIVE SUBJECT CAN BE OPTED FROM EACH ELECTIVES**

**ELECTIVE-I**

**OBJECTIVES**

- *To expose the students to the basic concepts of power system operation*
- *To understand the concepts of power system control*
- *To understand computer control of power systems*

**UNIT I - INTRODUCTION****9**

System load variation: System load characteristics, load curves - Daily, weekly and annual, load-duration curve, load factor, diversity factor. Reserve requirements: Installed reserves, spinning reserves, cold reserves, hot reserves. Overview of system operation: Load forecasting, unit commitment, load dispatching. Overview of system control: Governor control, LFC, EDC, AVR, system voltage control, security control.

**UNIT II -SYSTEM OPERATION****9**

Economic dispatch – Incremental cost curve, co-ordination equations without loss and with loss, solution by direct method and  $\lambda$ -iteration method. (No derivation of loss coefficients.) Base point and participation factors-Economic dispatch controller added to LFC. Statement of Unit Commitment (UC) problem; constraints in UC: Spinning reserve, thermal unit constraints, hydro constraints, fuel constraints and other constraints; UC solution methods: Priority-list methods, forward dynamic programming approach (numerical problems only in priority-list method using full-load average production cost).

**UNIT III -SYSTEM CONTROL – REAL POWER – FREQUENCY CONTROL** **9**

Fundamentals of speed governing mechanism and modeling: Speed-load characteristics – Load sharing between two synchronous machines in parallel; concept of control area, LFC control of a single-area system: Static and dynamic analysis of uncontrolled and controlled cases, Economic Dispatch Control. Multi-area systems: Two-area system modeling; static analysis, uncontrolled case; tie line with frequency bias control of two area system derivation, state variable model.

## **UNIT IV-SYSTEM CONTROL – REACTIVE POWER – VOLTAGE CONTROL 9**

Typical excitation system, modeling, static and dynamic analysis, stability compensation; Generation and absorption of reactive power: Relation between voltage, power and reactive power at a node; methods of voltage control - Shunt reactors – Shunt capacitors – Series capacitors – Synchronous condensers – Static VAR systems- Tap-changing transformer - System level voltage control.

## **UNIT V - COMPUTER CONTROL OF POWER SYSTEMS 9**

Energy control centre: Functions – Monitoring, data acquisition and control. System hardware configuration – SCADA and EMS functions: Network topology determination, state estimation, security analysis and control. Various operating states: Normal, alert, emergency, in-extremis and restorative.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Olle. I. Elgerd, 'Electric Energy Systems Theory – An Introduction', Tata McGraw Hill Publishing Company Ltd, New Delhi, Second Edition, 2003.
2. Allen.J.Wood and Bruce F.Wollenberg, 'Power Generation, Operation and Control', John Wiley & Sons, Inc., 2003.

### **REFERENCE BOOKS**

1. Prabha Kundur, "Power System stability and control" - EPRI Series, McGraw Hill Inc., 1994
2. D.P. Kothari and I.J. Nagrath, 'Modern Power System Analysis', Third Edition, Tata McGraw Hill Publishing Company Limited, New Delhi, 2003.
3. PSR Moorthy - Power System Operation & Control, Tata McGraw Hill publication,1992.
4. Dr S Mukhopadhyaya - Modern power system control and operation, Roorkee Publishing House, Roorkee, 1983.

**OBJECTIVES**

*To impart knowledge on*

- *Construction, principle of operation and performance of synchronous reluctance motors.*
- *Construction, principle of operation, control and performance of stepping motors.*
- *Construction, principle of operation, control and performance of switched reluctance motors.*
- *Construction, principle of operation, control and performance of permanent magnet brushless D.C. motors.*
- *Construction, principle of operation and performance of permanent magnet synchronous motors.*

**UNIT I - SYNCHRONOUS RELUCTANCE MOTORS****9**

Constructional features – Types – Axial and Radial air gap motors– Operating principles – Variable Reluctance and Hybrid Motors –Voltage and Torque Equations - Phasor diagram - Characteristics– Linear and Vernier motor.

**UNIT II - STEPPING MOTORS****9**

Constructional features – Principle of operation – Variable reluctance motor – Hybrid motor – Single and multi stack configurations – Theory of torque predictions– Modes of excitations – Characteristics – Linear and non-linear analysis Drive circuits.

**UNIT III - SWITCHED RELUCTANCE MOTORS****9**

Constructional features – Rotary and Linear SRMs - Principle of operation – Torque production – Steady state performance prediction- Analytical method -Power Converters and their controllers – Methods of Rotor position sensing – Sensorless operation – Closed loop control of SRM - Characteristics.

**UNIT IV - PERMANENT MAGNET BRUSHLESS D.C. MOTORS****9**

Permanent Magnet materials – Magnetic Characteristics – Permeance coefficient -Principle of operation – Types – Magnetic circuit analysis – EMF and torque equations –Commutation - Power controllers – Motor characteristics and control.

## **UNIT V - PERMANENT MAGNET SYNCHRONOUS MOTORS**

**9**

Principle of operation – EMF and torque equations – Reactance – Phasor diagram – Power controllers - Converter - Volt-ampere requirements – Torque speed characteristics - Microprocessor based control.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. T.J.E. Miller, ‘Brushless Permanent Magnet and Reluctance Motor Drives’, Clarendon Press, Oxford, 1989.
2. T.Kenjo, ‘Stepping motors and their microprocessor controls’, Oxford University press, New Delhi, 2000.

### **REFERENCE BOOKS**

1. R.Krishnan, ‘Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application’, CRC Press, New York, 2001.
2. D.P.Kothari and I.J.Nagrath, ‘Electric machines’, Tata Mc Graw hill publishing company, New Delhi, Third Edition, 2004.
3. Irving L.Kosow, “Electric Machinery and Transformers” Pearson Education, II Edition, 2007.

11UFE703

ADVANCED CONTROL THEORY

L T P C

3 0 0 3

### AIM

To gain knowledge in analysis of non-linear system and digital control of linear system

### OBJECTIVES

- *To study the description and stability of non-linear system*
- *To study the conventional technique of non-linear system analysis*
- *To study the analysis Discrete time system using Conventional techniques*
- *To study the analysis of Digital control system using State space formulation*
- *To study the three ways of designing compensation for a control system.*

### UNIT I - COMPENSATOR DESIGN

9

Performance criteria – Lag, lead and lag-lead networks – Compensator design using bode plots and root locus

### UNIT II - STATE VARIABLE DESIGN

9

Design by state feedback – output feedback – Pole assignment technique – Design of state and output feedback controllers – Design of reduced and full order observers – PI feedback – Dynamic state feedback.

### UNIT III - SAMPLED DATA CONTROL SYSTEM

9

Introduction to Sample data control systems –Sampling process, signal reconstruction, difference equation, Z-transform, Z-transfer function – Inverse Z transform, Z-transform analysis of sampled data control system, Z and S domain Relationship

### UNIT IV - NON-LINEAR SYSTEMS

9

Types of non-linearity – Typical examples – Equivalent linearization - Phase plane analysis – Limit cycles – Describing functions- Analysis using Describing functions.

### UNIT V- STABILITY

9

Stability concepts – Equilibrium points – BIBO and asymptotic stability – Direct method of Liapunov – Application to non-linear problems – Frequency domain stability criteria - Popov's method and its extensions.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

- 1 M.Gopal, "Digital control and state variable methods" Tata McGraw Hill Publishing Company Ltd., II Edition 2007.
- 2 I.J. Nagarth and M. Gopal, "Control systems engineering ", New Age International, IV Edition, 2006

### **REFERENCE BOOKS**

- 1 M.Gopal, "Modern control system theory", New Age International (Revised II edition), 2005.
- 2 K. Ogata , "Digital control systems", Prentice Hall of India Pvt. Ltd, 2002.
- 3 B.C. Kuo, "Automatic Control systems", Wiley India, VIII Edition, 2009.

11UFE704

DIGITAL IMAGE PROCESSING

L T P C

3 0 0 3

### AIM

To introduce the student to various image processing techniques.

### OBJECTIVES

- *To study the image fundamentals and mathematical transforms necessary for image processing.*
- *To study the image enhancement techniques and restoration procedures.*
- *To study the image segmentation and representation techniques.*
- *To study the image compression procedures.*

### UNIT I - DIGITAL IMAGE FUNDAMENTALS

9

Elements of digital image processing systems- Elements of visual perception- psycho visual model- brightness- contrast- hue- saturation- mach band effect- Color image fundamentals - RGB- HSI models- Image sampling- Quantization- dither- Two dimensional mathematical preliminaries

### UNIT II - IMAGE TRANSFORMS

9

1D DFT- 2D transforms – DFT- DCT- Discrete Sine, Walsh- Hadamard- Slant- Haar- Wavelet Transform

### UNIT III - IMAGE ENHANCEMENT AND RESTORATION

9

Spatial domain enhancement: gray level transformations - histogram modification and specification techniques- Image averaging- Directional Smoothing- Median- Geometric mean- Harmonic mean- Contra harmonic and Yp mean filters- Homomorphic filtering- Color image enhancement.

Image Restoration – degradation model- Unconstrained and Constrained restoration- Inverse filtering: Removal of blur caused by uniform linear motion- Wiener filtering- Geometric transformations: spatial transformations- Gray- Level interpolation

**UNIT IV - IMAGE SEGMENTATION AND REPRESENTATION 9**

Point- line and edge detection- Edge linking- Region based segmentation: Region splitting and merging. Image representation: chain codes – polygonal approximations – signatures – boundary segments – skeletons

**UNIT V - IMAGE COMPRESSION 9**

Need for data compression-Error free compression: variable length coding, bit plane coding, LZW coding. Lossy compression: Transform coding, wavelet coding. Compression standards: binary image compression standard, still image compression standards, video compression standards.

**L = 45 Total = 45**

**TEXT BOOKS**

1. Rafael C. Gonzalez, Richard E. Woods, 'Digital Image Processing', Pearson Education, Inc., 2009.
2. Anil K. Jain, 'Fundamentals of Digital Image Processing', Prentice Hall of India, 2002

**REFERENCE BOOKS**

1. David Salomon : 'Data Compression – The Complete Reference', Springer Verlag New York Inc., 2<sup>nd</sup> Edition, 2001
2. William K. Pratt, 'Digital Image Processing', John Wiley, New York, 2002.
3. Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, ' Digital Image Processing using MATLAB', Pearson Education, Inc., 2004.

**OBJECTIVES**

- *To understand the Total Quality Management concept and principles and the various tools available to achieve Total Quality Management.*
- *To understand the statistical approach for quality control.*
- *To create an awareness about the ISO and QS certification process and its need for the industries.*

**UNIT I - INTRODUCTION****9**

Introduction - Need for quality - Evolution of quality - Definition of quality - Dimensions of manufacturing and service quality - Basic concepts of TQM - Definition of TQM – TQM Framework - Contributions of Deming, Juran and Crosby – Barriers to TQM.

**UNIT II - TQM PRINCIPLES****9**

Leadership – Strategic quality planning, Quality statements - Customer focus – Customer orientation, Customer satisfaction, Customer complaints, Customer retention - Employee involvement – Motivation, Empowerment, Team and Teamwork, Recognition and Reward, Performance appraisal - Continuous process improvement – PDCA cycle, 5s, Kaizen - Supplier partnership – Partnering, Supplier selection, Supplier Rating.

**UNIT III TQM TOOLS & TECHNIQUES I****9**

The seven traditional tools of quality – New management tools – Six-sigma: Concepts, methodology, applications to manufacturing, service sector including IT – Bench marking – Reason to bench mark, Bench marking process – FMEA – Stages, Types.

**UNIT IV TQM TOOLS & TECHNIQUES II****9**

Quality circles – Quality Function Deployment (QFD) – Taguchi quality loss function – TPM – Concepts, improvement needs – Cost of Quality – Performance measures.

**UNIT V - QUALITY SYSTEMS****9**

Need for ISO 9000- ISO 9000-2000 Quality System – Elements, Documentation, Quality auditing- QS 9000 – ISO 14000 – Concepts, Requirements and Benefits – Case studies of TQM implementation in manufacturing and service sectors including IT.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

## **TEXT BOOKS**

1. Dale H. Besterfield, et al., "Total Quality Management", Pearson Education Asia, III Edition, Indian Reprint, 2006.
2. James R. Evans and William M. Lindsay, "The Management and Control of Quality", (6th Edition), South-Western (Thomson Learning), 2005.

## **REFERENCE BOOKS**

1. Oakland, J.S. "TQM – Text with Cases", Butterworth – Heinemann Ltd., Oxford, Third Edition, 2003.
2. Suganthi, L and Anand Samuel, "Total Quality Management", Prentice Hall (India) Pvt. Ltd., 2006.
3. Janakiraman, B and Gopal, R.K., "Total Quality Management – Text and Cases", Prentice Hall (India) Pvt. Ltd., 2006

**ELECTIVE-II**

**OBJECTIVES**

- *To introduce the student to various sensing and measurement devices of electrical origin.*
- *To provide the latest ideas on devices of non-electrical devices.*
- *To bring out the important and modern methods of imaging techniques.*
- *To provide an acquaintance of the physiology of the heart, lung, blood circulation and circulation respiration. Methods of different transducers used.*

**UNIT-I PHYSIOLOGY AND TRANSDUCERS****9**

Cell and its structure – Resting and Action Potential – Nervous system: Functional organisation of the nervous system – Structure of nervous system, neurons - synapse – transmitters and neural communication – Cardiovascular system – respiratory system – Basic components of a biomedical system - Transducers – selection criteria – Piezo electric, ultrasonic transducers - Temperature measurements - Fibre optic temperature sensors.

**UNIT- II ELECTRO – PHYSIOLOGICAL MEASUREMENTS****9**

Electrodes –Limb electrodes –floating electrodes – pregelled disposable electrodes - Micro, needle and surface electrodes – Amplifiers: Preamplifiers, differential amplifiers, chopper amplifiers – Isolation amplifier. ECG – EEG – EMG – ERG – Lead systems and recording methods – Typical waveforms. Electrical safety in medical environment: shock hazards – leakage current- Instruments for checking safety parameters of biomedical equipments.

**UNIT-III NON-ELECTRICAL PARAMETER MEASUREMENTS****9**

Measurement of blood pressure – Cardiac output – Heart rate – Heart sound – Pulmonary function measurements – spirometer – Photo Plethysmography, Body Plethysmography – Blood Gas analysers : pH of blood –measurement of blood, pCO<sub>2</sub>, pO<sub>2</sub>, finger-tip oxymeter - ESR, GSR measurements .

**UNIT-IV MEDICAL IMAGING****9**

Radio graphic and fluoroscopic techniques – Computer tomography – MRI – Ultrasonography – Endoscopy – Thermography – Different types of biotelemetry systems and patient monitoring – Introduction to Biometric systems.

## **UNIT-V ASSISTING AND THERAPEUTIC EQUIPMENTS**

**9**

Pacemakers – Defibrillators – Ventilators – Nerve and muscle stimulators – Diathermy – Heart – Lung machine – Audio meters – Dialysers – Lithotripsy

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. R.S.Khandpur, 'Hand Book of Bio-Medical instrumentation', Tata McGraw Hill Publishing Co Ltd., II Edition 2003.
2. Leslie Cromwell, Fred J.Weibell, Erich A.Pfeiffer, 'Bio-Medical Instrumentation and Measurements', II edition, Pearson Education PHI, 2002.

### **REFERENCES**

1. M.Arumugam, 'Bio-Medical Instrumentation', Anuradha Agencies, 2003.
2. Joseph J.carr and John M. Brown, "Introduction to Biomedical equipment technology", PHI, IV Edition, 2001.
3. John G. Webster, "Medical Instrumentation Application and Design", Wiley -India Edition III Edition, 2008.
4. C.Rajarao and S.K. Guha, 'Principles of Medical Electronics and Bio-medical Instrumentation', Universities press (India) Ltd, Orient Longman ltd, 2000.

**11UFE706****HIGH VOLTAGE ENGINEERING****3 0 0 3****OBJECTIVES**

- *To expose the students to the basic causes of over voltages in power systems*
- *To understand the generation and measurement of high voltages and currents*
- *To understand the concepts of high voltage testing*

**UNIT I - OVER VOLTAGES IN ELECTRICAL POWER SYSTEMS 9**

Causes of over voltages and its effect on power system – Lightning, switching surges and temporary over voltages - Protection against over voltages.

**UNIT II-ELECTRICAL BREAKDOWN IN GASES, SOLIDS AND LIQUIDS 9**

Gaseous breakdown in uniform and non-uniform fields – corona discharges – Vacuum breakdown - conduction and breakdown in pure and commercial liquids – breakdown mechanisms in solid and composite dielectrics.

**UNIT III-GENERATION OF HIGH VOLTAGES AND HIGH CURRENTS 9**

Generation of High DC, AC, impulse voltages and currents. Tripping and control of impulse generators.

**UNIT IV-MEASUREMENT OF HIGH VOLTAGES AND HIGH CURRENTS 9**

Measurement of High voltages and High currents – Digital techniques in high voltage measurement.

**UNIT V-HIGH VOLTAGE TESTING & INSULATION COORDINATION 9**

High voltage testing of electrical power apparatus – Power frequency, impulse voltage and DC testing – International and Indian standards – Insulation Coordination.

**Lecture : 45, Tutorial : 0, TOTAL : 45****TEXT BOOKS**

1. M.S. Naidu and V. Kamaraju, 'High Voltage Engineering', Tata McGraw Hill, III Edition, 2004.

## **REFERENCE BOOKS**

1. E. Kuffel and W.S. Zaengl, 'High Voltage Engineering Fundamentals', Butterworth – Heinemann, II Edition, 2000.
2. C.L.Wadwa, "High Voltage Engineering", New Age International, 2007.
3. E. Kuffel and M. Abdullah, 'High Voltage Engineering', Pergamon press, Oxford, 1970.

**11UFE707 COMPUTER AIDED ANALYSIS AND DESIGN OF  
ELECTRICAL APPARATUS**

**L T P C  
3 0 0 3**

**OBJECTIVES**

- *To study the structure and behaviour of processors, memories and input and output units and to study their interactions*

**UNIT I – INTRODUCTION 9**

Conventional design methodology overview – Computer aided design aspects – Need for CAD – Nature of design problems- Analysis and synthesis approaches-advantages.

**UNIT II - FINITE ELEMENT ANALYSIS 9**

Mathematical formulation – Discretisation – Shape functions – Stiffness matrix – Solution techniques – Post processing.

**UNIT III - CAD PACKAGES 9**

Recent developments – Preprocessing – Modeling - Meshing – Boundary conditions - Material characteristics – Problem formulation – Solution – Post processing.

**UNIT IV - CAD SOFTWARE 9**

Program files – Installation – Screen menu structure\_ Fixing the size of a drawing – Set up option- On line help- Text fonts, Shapes – Blocks – Copy – Array- Erasing facilities -Editing – Fill – Zoom pan – Hatching – Isoplane – Elevation – View point – Dimension techniques – Introduction to 3D drawing.

**UNIT V - DESIGN EXAMPLES 9**

Design of actuator – Solenoid -Transformer - Induction motor – Synchronous machines - Switched reluctance motor.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

**TEXT BOOKS**

- 1 P.P. Silvester and Ferrari, 'Finite Element for Electrical Engineers', Cambridge University Press, 1984.
- 2 M.V.K. Chari and P.P. Silvester, "Finite Elements in Electric and Magnetic Field Problems", John Wiley, 1980.
- 3 D.A. Lowther and P.P. Silvester, 'Computer Aided Design in Magnetics', Springer Verlag, Newyork, 1986.

## **REFERENCE BOOKS**

- 1 M Ramamoorthy, “ Computer Aided, Analysis and Design of Electrical equipment”
- 2 George, Omura, “Mastering AutoCAD”, BPB Publications, New Delhi, 1988.
- 3 Sham Tickoo, “AutoCAD 2002 with applications” Tata McGraw Hill Publishing Company limited, New Delhi, 2001.

**AIM** To introduce the concept, terminologies, and technologies used in modern data communication and computer networking.

### OBJECTIVES

- *To introduce the students the functions of different layers.*
- *To introduce IEEE standard employed in computer networking.*
- *To make students to get familiarized with different protocols and network components.*

### UNIT I - DATA COMMUNICATIONS

9

Components – Direction of Data flow – Networks – Components and Categories – Types of Connections – Topologies – Protocols and Standards – ISO / OSI model – Transmission Media – Coaxial Cable – Fiber Optics – Line Coding – Modems – RS232 Interfacing sequences.

### UNIT II - DATA LINK LAYER

9

Error – Detection and correction – Parity – LRC – CRC – Hamming code – Flow Control and Error control: stop and wait – Go back N ARQ – Selective repeat ARQ- Sliding window techniques – HDLC.LAN: Ethernet IEEE 802.3, IEEE 802.4, and IEEE 802.5 – IEEE 802.11–FDDI, SONET – Bridges.

### UNIT III - NETWORK LAYER

9

Internetworks - Packet Switching and Datagram approach – IP addressing methods – Subnetting – Routing – Distance Vector Routing – Link State Routing – Routers.

### UNIT IV - TRANSPORT LAYER

9

Duties of transport layer – Multiplexing – Demultiplexing – Sockets – User Datagram Protocol (UDP) – Transmission Control Protocol (TCP) – Congestion Control – Quality of services (QOS) – Integrated Services.

### UNIT V - APPLICATION LAYER

9

Domain Name Space (DNS) – SMTP, FDP, HTTP, WWW – Security – Cryptography.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

## **TEXT BOOKS**

1. Behrouz A. Foruzan, "Data communication and Networking", Tata McGraw-Hill, 2004.

## **REFERENCE BOOKS**

1. James .F. Kurose & W. Rouse, "Computer Networking: A Topdown Approach Featuring", Pearson Education, 2012.
2. Larry L.Peterson & Peter S. Davie, "Computer networks", Morgan Kaufmann Publications, V Edition, 2011.
3. Andrew S. Tannenbaum, "Computer Networks", PHI, Fourth Edition, 2003.
4. William Stallings, "Data and Computer Communication", Sixth Edition, Pearson Education, 2000.

**11UFE709****PLC AND INDUSTRIAL AUTOMATION****3 0 0 3****OBJECTIVE**

- *To provide strong foundation to the students to expose emerging in the area of industrial automation and PLC Hardware and Software.*

**UNIT I - INTRODUCTION TO INDUSTRIAL AUTOMATION****9**

Requirements of industrial automation- Industrial electrical equipment requiring control and integration through PLC –Functions of the central or distributed control panels in a plant- Conventional central relay and interlock panels and the various components used - Advantages of PLC based system .

**UNIT II - PLC CONFIGURATION FOR MEETING PLANT CONTROL FUNCTION****9**

PLC configuration and various components of the PLC- CPU, I/O cards, power supply, memory, extension boards, communication boards- Overall Plant motor list from mechanical supplier - Deriving the required control elements, various sensors and functions- Area wise segregation of PLC depending on the locations of the inputs and outputs- Concept of parallel and serial (remote) inputs and outputs – Optimizing the overall cost of PLC and the control cabling.

**UNIT III - PLC HARDWARE****9**

Detailed specifications of low, medium and high end PLC components like, CPU, Digital input and output modules, Analog input and output modules, special function modules parallel I/O-s and remote I/O-s – Special communication cables for the remote I/O-s - Segregation of the functions depending on the time critical or non- critical nature to decide parallel or remote I/Os- Deciding the memory size and capability based on program size and data – Cubicalization of the PLC and the I/O modules to optimize plant control cable cost – Assignment by using E-plan software or otherwise to detail the PLC and I/O-Switch their addressing –Location of PLC in the plant to optimize the cable cost –Cubicle layout

**UNIT - IV PLC SOFTWARE****9**

Getting started with PLC programming system- PC based programming software- Modes of PLC programming - Configuring PLC memory for program and data- Data types and addressing modes- Input and output configuration and addressing- PLC programming instructions- Basic instructions, medium end instructions and high end instructions- Testing

and trouble shooting of the program software– Execution times and estimation overall PLC cycle time – Optimization of the cycle time - Use of hard-ware and software interrupts- Introduction to IEC 1131-3 for PLC programming- Assignment for writing PLC software and testing the same in laboratory .

## **UNIT - V INTEGRATED AUTOMATION SYSTEM ELEMENTS**

**9**

Introduction to integrated automation system and the various levels like level '0', level'1',level'2'- Introduction to field bus, control bus and information bus- Use of different protocols for interfacing with other automation system and drives- HMI-s and their functions for the various plant information- Integration of PLCs with plant HMI-s located at different strategic locations – Concept of client- server HMI-s and development and run type HMI-s - Assignment of screen development for a typical plant requirement

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Frank D Petruzella, “Programmable Logic Controllers”, Tata McGraw Hill Publishers, III Edition, 2005.
2. Kevin Collins, “PLC Programming for Industrial Automation”, Meadow books, 2007.

### **REFERENCE BOOKS**

1. W.Bolton, “Programmable Logic Controllers”, Newnes Publication , IV Edition, 2006.
2. Gary Dunning, “Introduction to Programmable Logic Controllers”, Delmar Thomson Learning, II Edition, 2001.
3. Siemens- PLC Handbook for total automation
4. Allen-Bradley handbook for total automation

**SEMESTER-VIII**

**OBJECTIVES**

- *To expose the students to the basic applications of electrical energy in lighting, heating and welding*
- *To understand the use of electricity for traction, electrolysis and industrial applications*
- *To understand the concepts of energy conservation and its importance*

**UNIT I -ILLUMINATION****9**

Introduction – Definition and meaning of terms used in illumination Engineering – Classification of light sources. Incandescent lamps, sodium vapour lamps, mercury vapour lamps, fluorescent lamps – Design of illumination systems – Indoor lighting schemes – Factory lighting halls – Outdoor lighting schemes – Flood lighting – Street lighting – Energy saving lamps.

**UNIT II -HEATING AND WELDING****9**

Introduction – advantages of Electric heating – Modes of heat transfer – Methods of electric heating – Resistance heating – Arc furnaces – Induction heating – Dielectric heating. Electric welding – Types – Resistance welding – Arc welding – Radiation welding – Requirements of good weld – Preparation of work – Electrodes – Power supply for arc welding.

**UNIT III - ELECTRIC TRACTION****9**

Introduction – Requirements of an ideal traction system – Supply systems – Mechanics of train movement – Tractive effort – Specific energy consumption – Traction motors and control – Multiple units - Braking methods - Current collection systems-Recent trends in electric traction.

**UNIT IV -ELECTROLYTIC PROCESS AND STORAGE OF ELECTRICITY** **9**

Electrolysis – Polarization factor – Preparation of work for electroplating – tanks and other equipment – Method of charging and maintenance – Nickel – Iron and Nickel – Cadmium batteries – Components and materials – Capacity rating of batteries – Battery chargers.

## **UNIT V- ENERGY CONSERVATION**

**9**

Economics of generation – Definitions – Load curves – Number and size of units – Cost of electrical energy – Tariff – Need for electrical energy conservation-methods – Energy efficient equipment – Energy management – Energy auditing - Power quality – Effect on conservation

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. E. Openshaw Taylor, “Utilization of Electrical Energy in SI Units” Orient Longman Private Limited, 2003.
2. J.B.Gupta, Utilization Electric power and Electric Traction, S.K.Kataria and Sons, 2000.

### **REFERENCE BOOKS**

1. H.Partab, “Art and Science of Utilization of Electrical Energy”, Dhanpat Rai and Co., New Delhi – 2004.
2. C.L.Wadhwa, “Generation, Distribution and Utilization of Electrical Energy”, New Age International Pvt. Ltd., 2003.
3. Dr.N.V.Suryanarayana, Utilization of Electric power, Wiley Eastern Limited, New Age International Limited, 1993.
4. R.K.Rajput, Utilization of Electrical Power, Laxmi publications (P) Ltd., 2007.

### **PROJECT**

|          |                    | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> | <b>CA</b> | <b>FE</b> | <b>TOTAL</b> |
|----------|--------------------|----------|----------|----------|----------|-----------|-----------|--------------|
| 11UFK899 | Project : Phase II | 0        | 0        | 18       | 12       | 20        | 80        | 100          |

### **ELECTIVES**

| <b>ELECTIVE - III</b> |  |          |          |          |          |           |           |              |  |
|-----------------------|--|----------|----------|----------|----------|-----------|-----------|--------------|--|
|                       |  | <b>L</b> | <b>T</b> | <b>P</b> | <b>C</b> | <b>CA</b> | <b>FE</b> | <b>TOTAL</b> |  |
| 11UFE801              | Intellectual Property Rights           | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE802              | Microprocessor based System design     | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE803              | Switched Mode Power Converters         | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE804              | Principles of Management               | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE805              | RTOS                                   | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| <b>ELECTIVE - IV</b>  |  |          |          |          |          |           |           |              |  |
| 11UFE806              | Advances in Soft Computing             | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE807              | Digital System Design using VHDL       | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE808              | Virtual Instrumentation                | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE809              | Computer Organization and Architecture | 3        | 0        | 0        | 3        | 20        | 80        | 100          |  |
| 11UFE810              | Power Quality                          | 3        | 0        | 3        | 3        | 20        | 80        | 100          |  |

**\*ONLY ONE ELECTIVE SUBJECT CAN BE OPTED FROM EACH ELECTIVES**

**ELECTIVE-III**

|                 |   |                |
|-----------------|---|----------------|
|                 |   | <b>L T P C</b> |
| <b>11UFE801</b> | <b>INTELLECTUAL PROPERTY RIGHTS (IPR)</b> | <b>3 0 0 3</b> |

## **OBJECTIVES**

- *To create an awareness on Intellectual Property Rights (IPR)*
- *To understand patents and copyrights*
- *To know about application procedures of IPR*

## **UNIT I - TYPES OF PROPERTY 9**

Introduction – Invention and Creativity – Intellectual Property (IP) – Importance – Protection of IPR – Basic types of property - Movable Property - Immovable Property - Intellectual Property.

## **UNIT II - PATENTS AND APPLICATION PROCEDURES 9**

IP – Patents – Copyrights and related rights – Trade Marks and rights arising from Trademark registration – Definitions – Industrial Designs and Integrated circuits – Protection of Geographical Indications at national and International levels – Application Procedures..

## **UNIT III - INTERNATIONAL PARTICES 9**

International convention relating to Intellectual Property – Establishment of WIPO – Mission and Activities – History – General Agreement on Trade and Tariff (GATT).

## **UNIT IV - LEGISLATIONS AND POLICY 9**

Indian Position Vs WTO and Strategies – Indian IPR legislations – Commitments to WTO- Patent Ordinance and the Bill – Draft of a national Intellectual Property Policy – Present against unfair competition.

## **UNIT V - CASE STUDIES 9**

Case Studies on – Patents (Basumati rice, turmeric, Neem, etc.) – Copyright and related rights – Trade Marks – Industrial design and Integrated circuits – Geographic indications – Protection against unfair competition.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

## TEXT BOOKS

1. Subbaram N.R. “Handbook of Indian Patent Law and Practice “, S. Viswanathan Printers and Publishers Pvt. Ltd., 1998.
2. Birgitte Andersen ,“Intellectual Property Rights: Innovation, Governance and the Institutional Environment”, [Edward Elgar Publishing](#), 2006

## REFERENCE BOOKS

1. D.Vaver, “Intellectual Property Rights: Critical Concepts in Law, Volume 2” , Routledge, 2006
2. Karla C. Shippey, “A short course in international intellectual property rights”, III Edition , World Trade Press, 2009
3. Intellectual Property Today : Volume 8, No. 5, May 2001, [www.iptoday.com].
4. Using the Internet for non-patent prior art searches, Derwent IP Matters, July 2000



**TEXT BOOKS**

- 1 M.Rafiqzaman, “Microprocessors and Microcomputer based system design”, CRC press- Inc,Boca rattan,Florida, II Edition,1995.
- 2 John Uffenbeck, “The 80x86 Family, Design, Programming and Interfacing”, Third Edition, Pearson Education, 2002.

**REFERENCE BOOKS**

- 1 [Daniel Tabak](#), “Advanced Microprocessors”, McGraw-Hill, II Edition, 1996.
- 2 Altera Max + Plus II Programmable Logic Development Altera Corporation –Manual
- 3 Walter Triebel/Avatar Singh , “The 68000 and 68020 Microprocessors, Architecture, Software, and Interfacing Techniques”, Prentice Hall , Inc. Publishing Company, 1991
- 4 <http://www.altera.com/html/literature/lsoft.html>

**OBJECTIVE**

- *To provide strong foundation to the students to expose emerging in the area of industrial automation and PLC Hardware and Software.*

**UNIT I - INTRODUCTION****9**

Reactive Elements in Power Electronic Systems, Design of inductor, Design of transformer, Capacitors for power electronic applications.

**UNIT II – SWITCHED MODE POWER CONVERTERS****9**

Basic concepts of Switched Mode power converters, DC-DC converters Characteristics, constituent elements, operating principles.

**UNIT III – ANALYSIS OF CONVERTERS****9**

Steady state analysis, stress and sizing of elements, control methods, duty ratio, current programmed, frequency programmed and sliding mode control, Dynamic analysis and frequency domain models.

**UNIT IV – RESONANT CONVERTERS****9**

Classification of resonant converters, Basic resonant circuit concepts, Load resonant converters, Resonant switch converters, Zero voltage switching.

**UNIT V –DESIGN OF SWITCHED MODE CONVERTERS****9**

Design of feedback compensators, unity power factor rectifiers, resistor emulation principle and applications to rectifiers.

**Lecture : 45, Tutorial : 0, TOTAL : 45****TEXT BOOKS**

1. Keng C. Wu, “Switch-Mode Power Converters: Design and Analysis”, [Elsevier](#) Academic Press, 2006.
2. [K. Kit Sum](#), “Switch Mode Power Conversion: Basic Theory and Design”, M. Dekker, 1984

## **REFERENCE BOOKS**

1. Issa Batarseh, 'Power Electronic Circuits', John Wiley, 2004.
2. Philip T Krein,' Elements of Power Electronics ', Oxford Press, 1997.
3. Switched Mode Power Conversion, Course Notes, CCE, IISc, 2004

**OBJECTIVES**

- *To study the historic development of Management thoughts*
- *To learn the nature and purpose of planning, forecasting and decision making*
- *To learn the concepts of organizing, delegation of authority and HRD concepts*

**UNIT I - HISTORICAL DEVELOPMENT OF MANAGEMENT THOUGHTS 9**

Definition of Management – Management is science or Art – Comparison of Management and Administration – Development of Management thoughts – Contribution of F.W Taylor and H.Fayol's – Types of Business organization.

**UNIT II - PLANNING 9**

Nature and purpose of planning – Planning process – Types of planning – Objectives –Setting objectives – Policies – Planning promises – Process of MBO – Forecasting in planning – Decision making steps and process.

**UNIT III - ORGANISING 9**

Nature and purpose – Formation of organizations – Formal and informal organization – Organization chart and manual – Types of organization structure – Line and staff authority – Departmentalization – Delegation of authority – Centralization and decentralization – Advantages and disadvantages – Staffing – Selection and recruitment process – Techniques – HRD – Managerial effectiveness.

**UNIT IV - DIRECTING 9**

Scope – Human factors in directing - Integrating objectives –Leadership – Types and theories of leadership – Motivation – Motivation theories – Motivational techniques – Job satisfaction – Job enrichment – Communication – Process of communication – Barrier in communication – Effective communication – Impact of technology in organization communication.

**UNIT V - CONTROLLING 9**

System and process of controlling – Requirement for effective control – Budgetary and non-budgetary control techniques – Use of computers and IT in Management control – Productivity problems and management – Control and performance – Direct and preventive

control – Reporting – Global business environment – Globalization and liberalization – Intervention management and global theory of management.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

#### TEXT BOOKS

1. Harold Kooritz & Heinz Weihrich “Essentials of management” Tata McGraw Hill, VII Edition, 2006.
2. Joseph L.Massie “Essentials of Management” Pearson Education, 4<sup>th</sup> Edition 2003.

#### REFERENCE BOOKS

1. Tripathy PC and Reddy PN, “Principles of Management”, Tata Mcgraw Hill, IV Edition, 2008.
2. Decenzo David, Robbin Stephen A,”Personnel and human Reasons Management” Wiley – India, VIII Edition, 2009.
3. JAF Stomer, Freeman R.E and Daniel R Gilbert Management, Pearson Education, 6<sup>th</sup> Edition, 2004.
4. Fraidoon Mazda, “Engineering Management” Addison Wesley 2000.

**OBJECTIVES**

- *To create an awareness on Operating Systems.*
- *To know about application procedures of RTOS*

**UNIT I - INTRODUCTION TO EMBEDDED SYSTEM****9**

Introduction - Embedded systems description, definition, design considerations & requirements - Overview of Embedded system Architecture (CISC and RISC) - Categories of Embedded Systems - Embedded processor selection & tradeoffs - Embedded design life cycle - Product specifications - Hardware/software partitioning - Iterations and implementation - Hardware software integration - Product testing techniques – ARM 7

**UNIT II - OPERATING SYSTEM OVERVIEW****9**

Introduction –Advantage and Disadvantage of Using RTOS – Multitasking – Tasks - Real Time Kernels – Scheduler - Non-pre-emptive Kernels - Pre-emptive Kernels – Re-entrancy- Re-entrant Functions – Round Robin Scheduling - Task Priorities - Static Priorities – Mutual Exclusion – Deadlock – Intertask Communication – Message Mailboxes – Message Queues - Interrupts - Task Management – Memory Management - Time Management – Clock Ticks.

**UNIT III - TASK MANAGEMENT****9**

Introduction -  $\mu$ C/OS-II Features - Goals of  $\mu$ C/OS-II - Hardware and Software Architecture – Kernel Structures: Tasks –Task States – Task Scheduling – Idle Task – Statistics Task – Interrupts Under  $\mu$ C/OS-II – Clock Tick -  $\mu$ C/OS-II Initialisation. Task Management: Creating Tasks – Task Stacks – Stack Checking – Task’s Priority – Suspending Task – Resuming Task. Time Management: Delaying a Task – Resuming a Delayed Task – System Time. Event Control Blocks- Placing a Task in the ECB Wait List – Removing a Task from an ECB wait List.

**UNIT IV - SEMAPHORE MANAGEMENT****9**

Semaphore Management Overview – Signaling a Semaphore. Message Mailbox Management: Creating a Mailbox – Deleting Mailbox – Waiting for a Message box – Sending Message to a Mailbox- Status of Mailbox Message Queue Management: Creating

Message Queue – Deleting a Message Queue – Waiting for a Message at a Queue – Sending Message to a Queue – Flushing a Queue.

## **UNIT V - MEMORY MANAGEMENT**

**9**

Memory Control Blocks – Creating Partition- Obtaining a Memory Block – Returning a Memory Block .Getting Started with  $\mu$ C/OS-II – Installing  $\mu$ C/OS-II – Porting  $\mu$ C/OS-II: Development Tools – Directories and Files – Testing a Port - IAR Workbench with  $\mu$ C/OS-II -  $\mu$ C/OS-II Porting on a 8051 CPU – Implementation of Multitasking - Implementation of Scheduling and Rescheduling – Analyze the Multichannel ADC with help of  $\mu$ C/OS-II.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Jean J. Labrosse, “MicroC/OS – II The Real Time Kernel”, CMP Books, II Edition, 2002.
2. Colin Walls, “Building a Real Time Operating System”, Elsevier Science, 2009

### **REFERENCE BOOKS**

1. David Seal, “ARM Architecture Reference Manual”, Addison Wesley, 2000.
2. Steve Furbe, “ARM System-on-Chip Architecture”, Pearson Education, II Edition, 2001.

**ELECTIVE-IV**

11UFE806

ADVANCES IN SOFT COMPUTING

L T P C

3 0 0 3

## AIM

To introduce the fundamentals of Fuzzy logic, Neural networks and Genetic algorithm.

## OBJECTIVES

- *To study basics of Fuzzy logic and modelling*
- *To study various Genetic algorithms*
- *To study basics of various Neural networks.*
- *To expose the students to Neuro fuzzy modeling and its applications.*

## UNIT I - FUZZY LOGIC

9

Introduction to Neuro – Fuzzy and soft Computing – Fuzzy Sets – Basic Definition and Terminology – Set-theoretic operations – Member Function Formulation and parameterization – Fuzzy Rules and Fuzzy Reasoning - Extension principle and Fuzzy Relations – Fuzzy If-Then Rules – Fuzzy Reasoning – Fuzzy Inference Systems – Mamdani Fuzzy Models-Sugeno Fuzzy Models – Tsukamoto Fuzzy Models – Input Space Partitioning and Fuzzy Modeling.

## UNIT II - GENETIC ALGORITHM

9

Derivative-based Optimization – Descent Methods – The Method of steepest Descent – Classical Newton's Method – Step Size Determination – Derivative-free Optimization – Genetic Algorithms – Simulated Annealing – Random Search – Downhill Simplex Search.

## UNIT III - NEURAL NETWORKS

9

Introduction -Supervised Learning Neural Networks – Perceptrons - Adaline – Back propagation Multilayer perceptrons – Radial Basis Function Networks – Unsupervised Learning and Other Neural Networks – Competitive Learning Networks – Kohonen Self – Organizing Networks – Learning Vector Quantization – Hebbian Learning.

## UNIT IV - NEURO FUZZY MODELING

9

Adaptive Neuro-Fuzzy Inference Systems – Architecture – Hybrid Learning Algorithm – learning Methods that Cross-fertilize ANFIS and RBFN – Coactive Neuro-Fuzzy Modeling – Framework – Neuron Functions for Adaptive Networks – Neuro Fuzzy Spectrum.

## **UNIT V- APPLICATIONS**

**9**

Printed Character Recognition – Inverse Kinematics Problems – Automobile Fuel Efficiency prediction – Soft Computing for Color Recipe Prediction.

**L = 45 Total = 45**

### **TEXT BOOKS**

1. J.S.R.Jang, C.T.Sun and E.Mizutani, “Neuro-Fuzzy and Soft Computing”, PHI, Pearson Education 2004.
2. Davis E.Goldberg, “Genetic Algorithms:Search, Optimization and Machine Learning”, Addison Wesley, N.Y.,1989.

### **REFERENCE BOOKS**

1. S.Rajasekaran and G.A.V.Pai, “Neural Networks, Fuzzy Logic and Genetic Algorithms”, PHI, 2003.
2. R.Eberhart, P.simpson and R.Dobbins,” Computational Intelligence” PC Tools”, AP Professional, Boston 1996.

11UFE807

DIGITAL SYSTEM DESIGN USING VHDL

L T P C

3 0 0 3

### AIM

To introduce the fundamentals of Digital logic design with VHDL.

### OBJECTIVES

- *To introduce design concept and VHDL.*
- *To study implementation techniques using various PLDs*
- *To study the design of various combinational, synchronous and asynchronous circuits.*
- *To expose the students to design and testing.*

### UNIT I – INTRODUCTION TO DESIGN

9

Design concepts – Design Process, design of Digital hardware, Variables and functions, truth tables, Boolean Algebra – Synthesis using Gates – Introduction to CAD Tools – VHDL.

### UNIT II – IMPLEMENTATION TECHNOLOGY

9

MOS Logic gates – PLDs – practical aspects, implementation details for SPLDs, CPLDs and FPGAs, optimized implementation of logic functions - multilevel synthesis, analysis of multilevel circuits – minimization techniques.

### UNIT III – DESIGN OF COMBINATIONAL CIRCUITS

9

Number representation – signed, unsigned, combinational circuits – adder, multiplier, multiplexer, decoder and encoder, code converters - using signal assignment statements - concurrent and sequential – process and case statements, operators.

### UNIT IV – DESIGN OF SEQUENTIAL CIRCUITS

9

Latch – Flip-flops, registers and counters, finite state machines using CAD tools. Basic design steps with examples - Design of simple processor, vending machine controller.

### UNIT V – DIGITAL SYSTEM DESIGN

9

Building block circuits – Design examples – clock synchronization, testing of logic circuits – fault model, test set – path sensitizing, testing of sequential circuits.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

## **TEXT BOOKS**

- 1 Stephen Brown, Zvonko Vranesic, “Fundamentals of digital logic design with VHDL”, Tata McGraw-Hill Publishing company limited, 2009.
- 2 Volnei.A.Pedroni, “Circuit design with VHDL”, PHI Learning Private Limited, 2009.

## **REFERENCE BOOKS**

- 1 Douglas L. Perry, “VHDL Programming by example”, Tata McGraw-Hill Publishing company limited, 2009.
- 2 J.Bhasker, “A VHDL primer”, Prentice-Hall India Learning Private Limited, 2003.

**AIM**

To introduce the concepts of Virtual instrumentation.

**OBJECTIVES**

- *To introduce concepts of Labview software.*
- *To study graphical programming, interfacing instruments and its protocols.*
- *To introduce data acquisition methods.*
- *To introduce signal processing and network automation tools.*

**UNIT I - REVIEW OF DIGITAL INSTRUMENTATION****9**

Representation of analog signals in the digital domain – Review of quantization in amplitude and time axes, sample and hold, sampling theorem, ADC and DAC.

**UNIT II - GRAPHICAL PROGRAMMING AND LABVIEW****9**

Concepts of graphical programming – LABVIEW software – Concept of VIs and sub VI - Display types – Digital – Analog – Chart and Graphs. Loops - structures - Arrays – Clusters. Local and global variables – String and file I/O. Timers and dialog controls.

**UNIT III - INSTRUMENT INTERFACES AND PROTOCOLS****9**

RS232, RS 422, RS 485 and USB standards - IEEE 488 standard – Introduction to bus protocols of MOD bus and CAN bus. Electronic standards for signals – noise and EMI effects. Signal conditioning chassis and extension modules. Image acquisition cards.

**UNIT IV - PC BASED DATA ACQUISITION****9**

Concept of PC based data acquisition – Typical on board DAQ card – Resolution and sampling frequency - analog inputs and outputs – Single-ended and differential inputs –DAQ cards terminal boxes - Use of timer-counter and analog outputs on the universal DAQ card.

## **UNIT V - SIGNAL PROCESSING AND NETWORK BASED AUTOMATION 9**

Mathematical tools for statistical calculation – Signal processing tools- Windowing and filtering tools –Control system tools – PID controller – CRO – function generator – illustration and case study – Web publishing tool –configuring VI server.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Sanjeev Gupta, ‘Virtual Instrumentation using LabVIEW’ , TMH, 2004
2. Jovitha Jerome, ‘Virtual Instrumentation using LabVIEW’, Prentice Hall, 2010

### **REFERENCE BOOKS**

1. Gary W. Johnson, Richard Jennings, “Lab-view Graphical Programming”, Tata McGraw Hill Professional Publishing, IV Edition, 2006.
2. Peter W. Gofton, ‘Understanding Serial Communications’, Sybex International, II Revised edition ,1994 .
3. Robert H. Bishop, ‘Learning with Lab-view 2009’, Prentice Hall, 2009.
4. Kevin James, ‘PC Interfacing and Data Acquisition: Techniques for Measurement, Instrumentation and Control’, Newness, 2000.

**AIM**

To study the structure and behaviour of processors, memories, input-output units and to study their interactions

**OBJECTIVES**

- *To study the various representations of data, register transfer language for micro operations and organizations and design of digital computer*
- *To teach the concept of micro program control unit ,CPU, stack and instruction formats*
- *To illustrate the technique to communicate with input and output devices*
- *To study the organization and operation of various memories and memory management hardware*

**UNIT I - DATA REPRESENTATION, MICRO-OPERATIONS, ORGANIZATION AND DESIGN 9**

Data representation: Data types, complements, fixed–point representation, floating-point representation, other binary codes, error detection codes. Register transfer and micro operations: Register transfer language, register transfer, bus and memory transfers, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit- Basic computer organization and design: Instruction codes, computer registers, computer instructions, timing and control, instruction cycle, memory reference instructions, input output and interrupt. Complete computer description, design of basic computer, design of accumulator logic.

**UNIT II - CONTROL AND CENTRAL PROCESSING UNIT 9**

Micro programmed control: Control memory, address sequencing, micro-program example, design of control unit-Central processing unit: General register organization, stack organization, instruction formats, addressing modes, data transfer and manipulation, program control, reduced instruction set computer.

**UNIT III - COMPUTER ARITHMETIC, PIPELINE AND VECTOR PROCESSING 9**

Computer arithmetic: Addition and subtraction, multiplication algorithms, division algorithms, floating-point arithmetic operations, decimal arithmetic unit, decimal arithmetic

operations-Pipeline and vector processing: Parallel processing, pipelining, arithmetic pipeline, instruction pipeline, RISC pipeline, vector processing array processors.

#### **UNIT IV - INPUT-OUTPUT ORGANIZATION**

**9**

Input-output organization: Peripheral devices, input-output interface, asynchronous data transfer, modes of transfer, priority interrupt, direct memory access, input-output processor, serial communication.

#### **UNIT V - MEMORY ORGANIZATION**

**9**

Memory organization: Memory hierarchy, main memory, auxiliary memory, associative memory, cache memory, virtual memory, memory management hardware.

**Lecture : 45, Tutorial : 0, TOTAL : 45**

#### **TEXT BOOKS**

- 1 Morris Mano, "Computer System Architecture", 3rd Edition, Pearson Education, 2008.
- 2 Vincent P.Heuring and Harry F.Jordan, "Computer Systems Design and Architecture", Pearson Education Asia Publications, II Edition, 2008.

#### **REFERENCE BOOKS**

- 1 John P.Hayes, 'Computer Architecture and Organization', III Edition, WCB/Tata McGraw Hill, 1998
- 2 Andrew S.Tanenbaum, 'Structured Computer Organization', V Edition, Prentice Hall of India/Pearson Education, 2006.
- 3 William Stallings, 'Computer Organization and Architecture', VII Edition, Prentice Hall of India/Pearson Education, 2008.

**OBJECTIVES**

- *To expose the students to the issues of power quality*
- *To understand the concepts degrading the quality of power*
- *To understand the solutions to upgrade the quality of power*

**UNIT I - INTRODUCTION****9**

Definitions – Power quality, Voltage quality – Power quality issues: Short duration voltage variations, Long duration voltage variations, Transients, Waveform distortion, Voltage imbalance, Voltage fluctuation, Power frequency variations – Sources and Effects of power quality problems – Power quality terms – Power quality and Electro Magnetic Compatibility

**UNIT II - SHORT AND LONG INTERRUPTIONS****9**

Short Interruptions: Introduction – Origin of short interruptions: Voltage magnitude events due to re-closing, Voltage during the interruption – Monitoring of short interruptions – Influence on induction motors, Synchronous motors, Adjustable speed drives, Electronic equipments – Single phase tripping: Voltage during fault and post fault period, Current during fault period – Prediction of short Interruptions-Long Interruptions: Definition – Failure, Outage, Interruption – Origin of interruptions – Causes of long interruptions – Principles of regulating the voltage – Voltage regulating devices, Applications: Utility side, End-User side –Reliability evaluation – Cost of interruptions.

**UNIT III - VOLTAGE SAG AND TRANSIENTS****9**

Voltage Sag: Introduction – Definition – Magnitude, Duration – Causes of Voltage Sag – Load influence on voltage sags on Adjustable speed drives, Power electronics loads, Sensitive loads - Stochastic assessment of voltage sags - Overview of mitigation methods- Transients: Definition – Power system transient model – Principles of over voltage protection - Types and causes of transients – Devices for over voltage protection - Capacitor switching transients –Lightning transients – Transients from load switching.

**UNIT IV - WAVEFORM DISTORTION****9**

Introduction – Definition and terms – Harmonics, Harmonics indices, Inter harmonics, Notching – Voltage Vs Current distortion – Harmonics Vs Transients – Sources and effects

of harmonic distortion – System response characteristics – Principles of controlling harmonics – Standards and limitation

## **UNIT V - POWER QUALITY SOLUTIONS**

**9**

Introduction – Power quality monitoring : Need for power quality monitoring, Evolution of power quality monitoring, Deregulation effect on power quality monitoring – Brief introduction to power quality measurement equipments and power conditioning equipments – Planning, Conducting and Analyzing power quality survey – Mitigation and control techniques - Active Filters for Harmonic Reduction

**Lecture : 45, Tutorial : 0, TOTAL : 45**

### **TEXT BOOKS**

1. Roger C. Dugan, Mark F. McGranaghan and H.Wayne Beaty, "Electrical Power Systems Quality", McGraw-Hill, New York, 2nd Edition, 2002.
2. Sankaran.C, "Power Quality", CRC Press, Washington, D.C., 2002

### **REFERENCE BOOKS**

- 1 Barry W.Kennedy, "Power Quality Primer", McGraw-Hill, New York, 2000.
- 2 Math H.J. Bollen, "Understanding Power Quality Problems: Voltage Sags and Interruptions", IEEE Press, New York, 2000.
- 3 Arrillaga.J, Watson.N.R and Chen.S, "Power System Quality Assessment", John Wiley & Sons Ltd., England, 2000.