**Department of Electrical and Electronics Engineering**

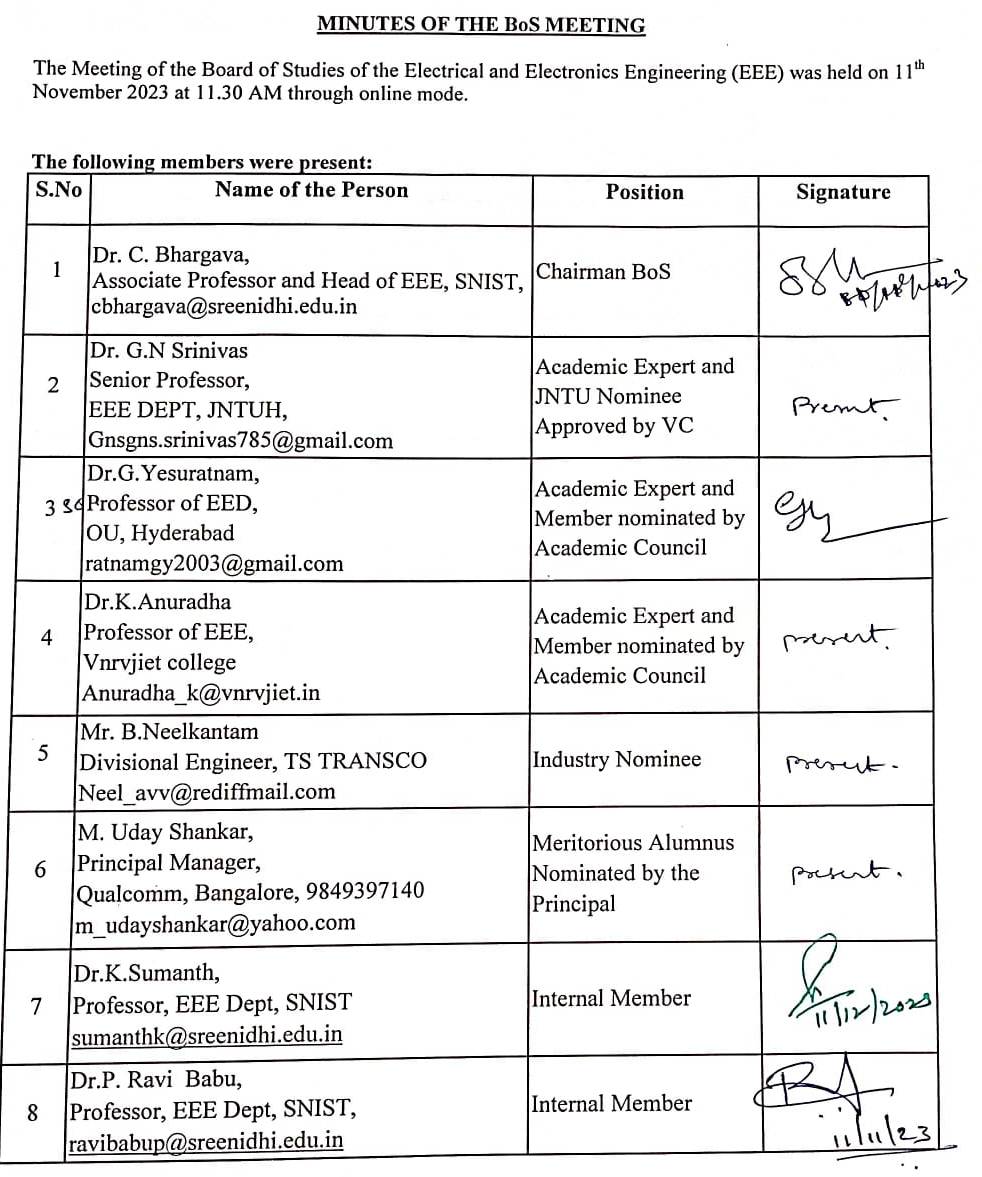
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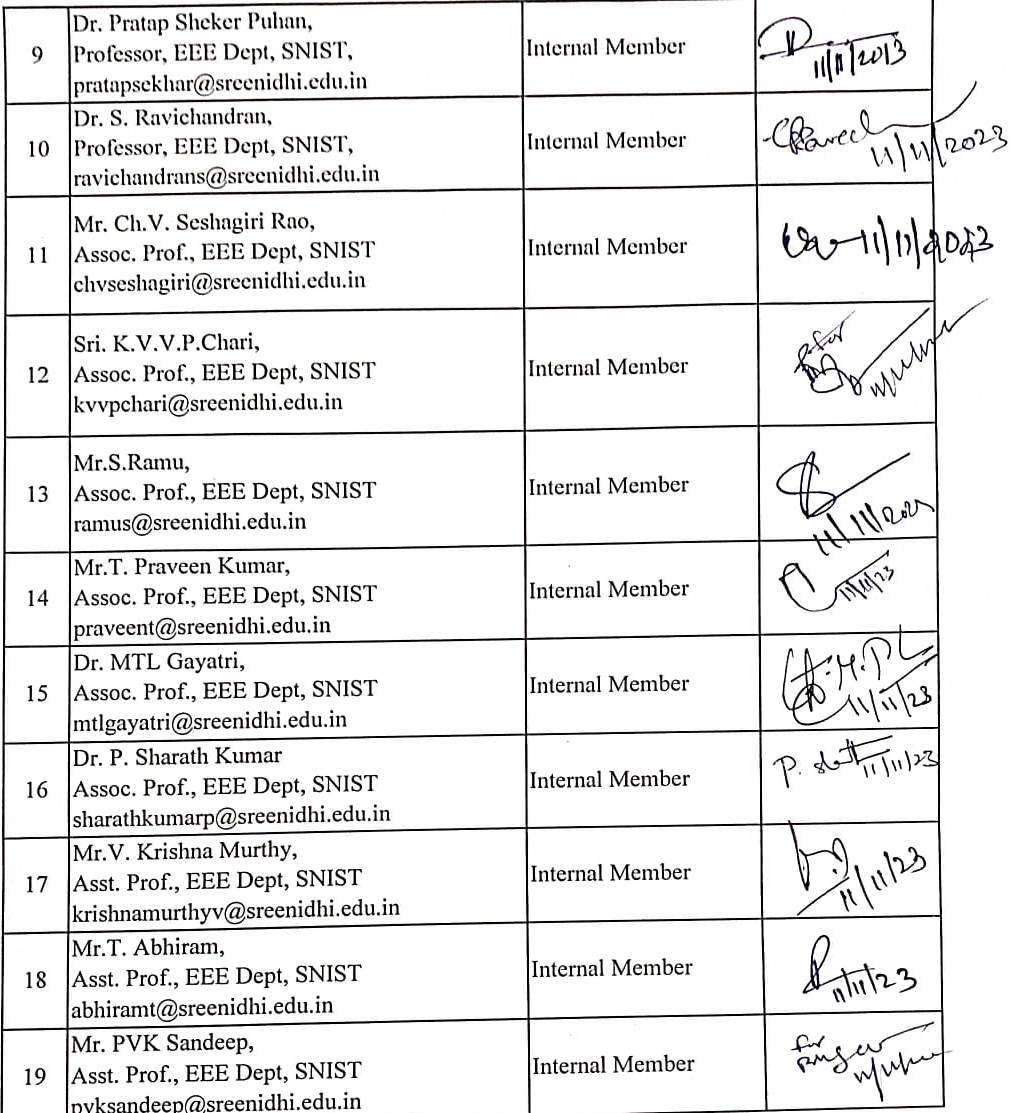
**Minutes of the 28th BOS meeting held on 30.10.2023 at 2:00 PM**

**(Hybrid mode)**

**=================================================================**

**Members Present**

****

****

**Leave of Absence**

|  |  |  |
| --- | --- | --- |
| **S. No.** | **Name of the member** | **Designation** |
| 1 |  | Member |
| 2 |  | Member |

The Chairman of the Academic Council of Sreenidhi Institute of Science and Technology, Dr. T. Ch.Siva Reddy, invited all the honorable members present online for the 28th Academic Council Meeting of SNIST. He presented the agenda and notes before the members. The decisions taken are presented hereunder:

|  |  |
| --- | --- |
| **Agenda Item No. 1** | **Confirmation of Minutes and Action Taken Report of the 27th Academic Council Meeting held on 12th September 2023**  Minutes of the 27th meeting of Academic Council held through circulation dated 31.03.2023 were sent to all the members and no comments have been received.    The BOS has approved the Minutes and Action taken report of the 26th Academic Council Meeting held on 12th September 2023 by circulation. |
| **Agenda Item No. 2** | The Almanacs for the above said Programs prepared by the Associate Dean Academics were discussed and were approved by the Council.  The Honorable Academic Council Members resolved to approve the Academic calendars of B.Tech and MBA for the Academic year: 2023-24 |
| **Agenda Item**  **27.20** | **Any other item with the permission of the chair.**  No other item was taken up except the agenda. |

**Concluding Remarks**

As there were no other items to be discussed, The Chairman of the Academic council Dr.T.Ch.Siva Reddy thanked all the members for according approvals for all the points presented in the 26th Academic council meeting.

|  |  |  |
| --- | --- | --- |
|  |  | Head of the Department  Electrical and Electronics Engineering |

**COURSE STRUCTURE**

**B.Tech Four Year Degree Course - (A-22 – Regulation)**

**\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_**

**Program objective:**

B. Tech in Electrical and Electronics Engineering program emphasizes the fundamentals of electrical & electronics in daily life.

The first two years of this program begins with a set of introductory courses, like Mathematics, physics, English, computer languages (C, C++), circuits and networks, DC machines and introduction to power systems which provide students with a firm foundation in mathematics, Electrical, as well as communication skills. These courses include weekly labs in which students use state-of-the art techniques and equipments to create solutions to interesting problems.

The last two years of study focuses on the concepts and techniques used in the design and development of advanced systems in electrical and electronics. In addition, students choose from a rich set of electives, which covers skills in demand. These advanced courses give broad opening for research and help them to choose specialization in their higher studies. A generous allotment of open electives allows students to learn foreign languages like French, German, Spanish; and it includes computing with a business focus.

Students in this program pursue an inter-disciplinary course of study that combines strong foundation in electrical and electronics with a focus on interdisciplinary areas. This program is designed for students who seek to blend their abilities with skills in demand and skills specific to another domain to solve problems in that domain.

Having completed this course, a student is prepared to work independently within a well structured design frame work in the job and for higher studies.

**VISION**

To emerge as a leading Electrical and Electronics Engineering Department in Technical Education and Research in India with focus to produce professionally competent and socially sensitive engineers capable of working in multidisciplinary global environment.

**MISSION**

1. To empower the students and provide the academic environment to pursue and attain competencies in their studies at undergraduate, post graduate level in Electrical & Electronics Engineering.
2. To develop liaison with academia, R&D institutions and electrical industry for hands-on training which enable the students to design and produce novel products for better society.
3. To inculcate interpersonal skills, team work, leadership qualities and professional ethics in students.
4. To enable the students to pursue higher studies and conduct research which will help them in developing the qualities for life-long learning and for a successful professional career.

**Program Educational Objectives of B. Tech**

**(Electrical and Electronics Engineering)**

**PEO-I**: To empower the students by providing necessary knowledge, critical thinking and problem solving capabilities in the field of Electrical and Electronics Engineering so that they can excel in their profession, in industry, higher studies and Research & Development.

**PEO-II**: To develop competencies in core and allied fields, so as to conduct experiments, comprehend, analyze, design and apply appropriate techniques / tools to arrive at optimal solutions to face real time challenges.

**PEO-III:** To inculcate the sense of responsibility towards ethics, Intellectual Property rights, good communication skills and entrepreneurship with adequate knowledge of project / finance management skills for betterment of society at large.

**PEO-IV:** To motivate the students to be academically excellent and also to be sensitive to Professional ethics, to acquire leadership skills and to be life-long learners for a successful professional career.

**Program Outcomes of EEE Department**

1. **Engineering knowledge:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4. **Conduct investigations of complex problems:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5. **Modern tool usage:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6. **The engineer and society:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7. **Environment and sustainability:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9. **Individual and team work:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10. **Communication:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one’s own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12. **Life-long learning:** Recognize the need for, and have the preparation and ability to engage in Independent and life-long learning in the broadest context of technological change.

**Program Specific Outcomes (PSO)**

1. Able to demonstrate the applications of knowledge gained into the recent technologies in the areas of Power systems, Power electronics and allied fields.
2. Recognize the need of self learning and ability to get into the advanced fields such as renewable energy systems and smart grids.

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**COURSE COMPONENT WISE CREDIT DISTRIBUTION**

**(SNIST-A22 Regulation Vs AICTE Model Curriculum)**

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **S.No** | **Component** | **AICTE Credits** | **SNIST Credits(A-20)** | **SNIST Credits(A-22)** |
| 1 | HSM | 12 | 13 | 12.5 |
| 2 | BS | 26 | 30 | 25.5 |
| 3 | ES | 20 | 25 | 18.5 |
| 4 | PC | 53 | 61 | 67.5 |
| 5 | PE | 18 | 15 | 15 |
| 6 | OE | 18 | 6 | 9 |
| 7 | PSI | 11 | 14 | 12 |
| 8 | MC | Non-Credit | Non-Credit | Non-Credit |
| **TOTAL CREDITS** | | **158** | **164** | **160** |

**EEE DEPT SEMESTER WISE CREDIT DISTRIBUTION**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No | | Dept | I/1 | I/2 | II/1 | II/2 | III/1 | III/2 | IV/1 | IV/2 |
| 1 | | EEE | 18 | 19 | 25 | 19 | 20 | 22 | 18 | 19 |
|  | | Total | 37 | | 44 | | 42 | | 37 | |
| Note: All End Examinations (Theory and Practical) are of Three hours duration. | | | | | | | | | |
| **T – Tutorial L - Theory P/D – Practical/Drawing** | | | | | | | | | |
| **C - Credits Int. - Internal Exam Ext. - External Exam** | | | | | | | | | |
| **Course code Definitions** | | | | | | | | | |
| BS- Basic Science Courses | | | | | | | | | |
| ES- Engineering Science Courses | | | | | | | | | |
| HS- Humanities and Social Sciences including Management courses | | | | | | | | | |
| PC-EEE Professional core courses | | | | | | | | | |
| PE -EEE Professional Elective courses | | | | | | | | | |
| OE-EEE Open Elective courses | | | | | | | | | |
| PS- Summer Industry Internship, Projects, Comprehensive Viva Voce, Technical Seminars. | | | | | | | | | |

**B.TECH IN ELECTRICAL AND ELECTRONICS ENGINEERING (EEE)**

**Course structure for B. Tech I Year I Semester EEE (2022-23)**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No** | **Course Category** | **Dept Course** | **Course code** | **Name of the Course** | **L** | **T** | **P** | **C** | **CIE** | **SEE** |
| 1. | BS | S&H | 9HC07 | Engineering Physics | 2 | 1 | 0 | 3 | 40 | 60 |
| 2. | ES | IT | 9FC01 | Problem Solving using C | 3 | 0 | 0 | 3 | 40 | 60 |
| 3. | BS | S&H | 9HC11 | Matrix Algebra and Calculus | 2 | 1 | 0 | 3 | 40 | 60 |
| 4. | HSM | S&H | 9HC01 | Essential English Language Skills | 2 | 0 | 0 | 2 | 40 | 60 |
| 5 | BS | S&H | 9HC66 | Engineering Physics Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 6 | ES | IT | 9FC61 | Problem Solving using C Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | HSM | S&H | 9HC61 | Oral Communication Lab – I | 0 | 0 | 2 | 1 | 40 | 60 |
| 8 | ES | MECH | 9BC01 | Engineering Graphics | 1 | 0 | 4 | 3 | 40 | 60 |
| 9 | HSM | S&H |  | Induction Program | 0 | 0 | 0 | 0 | 0 | 0 |
|  |  |  |  | Total | 12 | 4 | 10 | 18 | 320 | 480 |

**Course structure for B.Tech I Year II Semester EEE**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sl.No** | **Course Category** | **Dept Course** | **Course Code** | **Name of the Course** | **L** | **T** | **P** | **C** | **CIE** | **SEE** |
| 1. | BS | S&H | 9HC04 | Engineering Chemistry | 2 | 1 | 0 | 3 | 40 | 60 |
| 2. | PC | EEE | 9A201 | Electrical Circuits and Networks-I | 2 | 1 | 0 | 3 | 40 | 60 |
| 3. | BS | S&H | 9HC12 | Advanced Calculus | 2 | 1 | 0 | 3 | 40 | 60 |
| 4. | ES | CSE | 9EC01 | Data Structures | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | BS | S&H | 9HC64 | Engineering Chemistry Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 6 | HSM | S&H | 9HC62 | Oral communication Lab - II | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | ES | CSE | 9EC61 | Data Structures using C Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | ES | S&H | 9BC61 | Workshop/Manufacturing Processes Lab | 0 | 1 | 3 | 2.5 | 40 | 60 |
| Total | | | | | 15 | 3 |  | 19 | 320 | 480 |

**II Year – I Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Course Category** | **Dept Course** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **CIE** | **SEE** |
| 1 | BS | S&H | 9HC14 | Complex Variables and Transform Techniques | 2 | 1 | 0 | 3 | 40 | 60 |
| 2 | PC | ECE | 9CC05 | Digital Logic Design | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PC | ECE | 9CC01 | Electronic Devices and Circuits | 3 | 0 | 0 | 3 | 40 | 60 |
| **4** | PC | EEE | 9A312 | Measurements & Instrumentation | 2 | 0 | 0 | 2 | 40 | 60 |
| 5 | PC | EEE | 9A302 | Electro Magnetic Fields | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | PC | EEE | 9A303 | Electrical Machines – I | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | PC | EEE | 9A304 | Electrical Circuits & Networks – II | 2 | 0 | 0 | 2 | 40 | 60 |
| 8 | HSM | MBA | 9ZC01 | Business Economics and Financial Analysis | 3 | 0 | 0 | 3 | 40 | 60 |
| 9 | HSM | S&H | 9HC63 | Soft Skills Lab | 0 | 1 | 2 | 2 | 40 | 60 |
| 10 | PC | ECE | 9CC71 | Electronic Devices and Circuits Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 11 | PC | EEE | 9A371 | Electrical Circuits and Networks Analysis Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
|  | |  | **Total** | |  |  |  | **25** | **440** | **660** |

**II Year – II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No.** | **Course Category** | **Dept Course** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **CIE** | **SEE** |
| 1 | BS | S&H | 9HC15 | Probability and Statistics | 2 | 1 | 0 | 3 | 40 | 60 |
| 2 | BS | S&H | 9HC16 | Quantitative Aptitude and Logical Reasoning | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PC | EEE | 9A405 | Electrical Machines – II | 2 | 0 | 0 | 2 | 40 | 60 |
| 4 | HS | S&H | 9HC05 | Environmental Science | 3 | 0 | 0 | 0 | PASS/FAIL | |
| 5 | PC | EEE | 9A406 | Power System – I | 2 | 0 | 0 | 2 | 40 | 60 |
| 6 | PC | EEE | 9AC07 | Linear Control Systems | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | PC | ECE | 9CC04 | Analog Circuits | 3 | 0 | 0 | 3 | 40 | 60 |
| **8** | PC | EEE | 9A473 | Electrical Machines Lab – I | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | PC | EEE | 9A482 | Measurements & Instrumentation Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | PC | EEE | 9A491 | Technical Seminar | 0 | 1 | 0 | 1 | **100** | **--** |
|  |  |  |  | Summer Industry Internship-I is to be carried out during the summer vacation between 4th and 5th semesters |  |  |  |  |  |  |
|  | **Total** | | | |  |  |  | **19** | **420** | **480** |

**III Year – I Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Course Category** | **Dept Course** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **CIE** | **SEE** |
| 1 | PC | ECE | 9CC09 | IC Applications | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | PC | EEE | 9A508 | Electrical Machines – III | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PC | EEE | 9A509 | Power Electronics | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | PC | EEE | 9A510 | Power Systems – II | 3 | 0 | 0 | 3 | 40 | 60 |
| **5** | PE |  |  | Professional Elective – I | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | ES | CSE | 9EC22 | Python Programming concepts | 2 | 0 | 0 | 2 | 40 | 60 |
| 7 | MC | EEE | 9FC24 | Cyber Security | 2 | 0 | 0 | 0 | PASS/FAIL | |
| 8 | PC | EEE | 9A575 | Linear Control Systems and Simulation Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | PC | ECE | 9CC72 | Analog Circuits Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | PSI | EEE | 9A586 | Summer Industry Internship-I | 0 | 0 | 2 | 1 | 40 | 60 |
|  | **Total** | | | | **18** | **3** | **6** | **20** | **360** | **540** |

**Professional Elective –I**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9CC02 | Signals and Systems | Electronics |
| 9A525 | Advanced Control Systems | Control Systems |
| 9A531 | Smart Grid | Power Systems |
| 9A534 | HVDC and FACTS | Power Electronics |

**III Year – II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S. No** | **Course Category** | **Dept Course** | **Subject Code** | **Subject** | **L** | **T** | **P/D** | **C** | **CIE** | **SEE** |
| 1 | PC | ECM | 9DC05 | Microprocessors and Microcontrollers | 3 | 0 | 0 | 3 | 40 | 60 |
| 2 | PC | EEE | 9A611 | Switch Gear and Protection | 3 | 1 | 0 | 4 | 40 | 60 |
| 3 | HSM | S&H | 9HC03 | Universal Human Values | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | ES | MECH | 9BC04 | Elements of Mechanical Engineering | 2 | 0 | 0 | 2 | 40 | 60 |
| 5 | OE |  |  | Open Elective – I | 3 | 0 | 0 | 3 | 40 | 60 |
| 6 | PE |  |  | Professional Elective – II | 3 | 0 | 0 | 3 | 40 | 60 |
| 7 | MC | EEE | 9EC54 | Artificial Intelligence | 2 | 0 | 0 | 0 | PASS/FAIL | |
| 8 | PC | EEE | 9A677 | Electrical Machines Lab – II | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 9 | PC | ECE | 9CC76 | IC Applications Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 10 | PC | EEE | 9A686 | Comprehensive Viva Voce | 0 | 1 | 0 | 1 | 40 | 60 |
|  |  |  |  | Summer Industry Internship-I is to be carried out during the summer vacation between 6th and 7th semesters |  |  |  |  |  |  |
|  | **Total** | | | | **16** | **2** | **6** | **22** | **360** | **540** |

**Open Elective – I**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9ec42 | Programming in Java | Computer |
| 9ZC22 | Basics of Entrepreneurship | Entrepreneurship |
| 9ZC05 | Banking Operations, Insurance and Risk Management | Finance |
| 9ZC25 | Basics of Indian Economy | Social Sciences |
| 9ZC08 | Design literacy and Design Thinking | Innovation and Design Thinking |

**Professional Elective –II**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9A615 | Renewable Energy Sources | Power Systems |
| 9CC08 | Digital Signal Processing | Electronics |
| 9A624 | Digital Control Systems | Control Systems |
| 9A637 | Advanced Power Electronics | Power Electronics |

**IV Year – I Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| S.No | **Course Category** | **Dept Course** | **Subject Code** | **Subject** | L | T | P/D | C | **CIE** | **SEE** |
| 1 | PC | EEE | 9A714 | Power Systems Analysis and Control | 3 | 0 | 1 | 3.5 | 40 | 60 |
| 2 | PC | EEE | 9A716 | Drives & Utilization of Electrical Energy | 3 | 0 | 0 | 3 | 40 | 60 |
| 3 | PE | EEE |  | Professional Elective -III | 3 | 0 | 0 | 3 | 40 | 60 |
| 4 | OE |  |  | Open Elective – II | 3 | 0 | 0 | 3 | 40 | 60 |
| 5 | PSI | EEE | 9A787 | Summer Industry Internship-II | 0 | 0 | 2 | 1 | 40 | 60 |
| 6 | PC | EEE | 9A781 | Electrical workshop | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 7 | PC | EEE | 9A778 | Power Electronics & Simulation Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
| 8 | PC | ECM | 9DC71 | Microprocessors and Microcontrollers Lab | 0 | 0 | 3 | 1.5 | 40 | 60 |
|  | **Total** | | | | **17** | **0** | **6** | **18** | **320** | **480** |

**Professional Elective – III**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9A729 | Power System Deregulation | Power Systems |
| 9A735 | Electric and Hybrid Vehicles | Power Electronics |
| 9A739 | Optimal Control Systems | Control Systems |
| 9CC06 | Analog and Digital Communications | Electronics |

**Open Elective – II**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
|  | Operating System Concepts | Computer |
| 9ZC23 | Advanced Entrepreneurship | Entrepreneurship |
| 9ZC19 | Entrepreneurship Project Management and Structured Finance | Finance |
| 9ZC26 | Basics of Polity | Social Sciences |
| 9ZC09 | Co-Creation and Product Design | Innovation and Design Thinking |
| \* SWAYAM MOOCS Course: The department will identify the MOOCS Course from the available courses in SWAYAM portal for the semester | | |

**IV Year – II Semester**

|  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **S.**  **No.** | **Course Category** | **Dept Course** | **Subject**  **Code** | **Subject** | **L** | **T** | **P/D** | **C** | **CIE** | **SEE** |
| **1** | PE | EEE |  | Professional Elective – IV | 3 | 0 | 0 | 3 | 40 | 60 |
| **2** | PE | EEE |  | Professional Elective – V | 3 | 0 | 0 | 3 | 40 | 60 |
| **3** | OE |  |  | Open Elective - III | 3 |  |  | 3 | 40 | 60 |
| 4 | PSI | EEE |  | Project | 0 | 0 | 20 | 10 | 40 | 60 |
|  | **Total** | | | |  | **0** | **10** | **19** | **160** | **240** |

**Professional Elective – IV**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9A728 | Power Quality | Power Electronics |
| 9A817 | High Voltage Engineering | Power Systems |
| 9A827 | Reactive Power Control & Management | Control Systems |
| 9CC17 | Advanced Computer Architecture | Electronics |

**Professional Elective – V**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
| 9A820 | Electrical Distribution Systems | Power Systems |
| 9A826 | Programmable Logic Controllers | Control Systems |
| 9A833 | Switched Mode Power Conversion | Power Electronics |
| 9CC23 | Embedded C Programming | Electronics |

**Open Elective – III**

|  |  |  |
| --- | --- | --- |
| **Subject Code** | **Name of the subject** | **Stream** |
|  | Fundamentals of Computer Networks | Computer |
| 9ZC24 | Product and Services | Entrepreneurship |
| 9ZC15 | Financial Institutions, Markets and Services | Finance |
| 9ZC27 | Indian History, Culture and Geography | Social Sciences |
| 9ZC10 | Entrepreneurship & Business Design | Innovation and Design Thinking |

**L - Lectures; T - Tutorial; P/D - Practical / Drawing; C – Credit**

Note: All End Examinations (Theory and Practical) are of **Three** hours duration.

**B. Tech EEE A22 REGULATION ELECTIVE STREAMS**

**PROFESSIONAL ELECTIVE STREAMS**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P/D** | **C** |
| **3** | **0** | **0** | **3** |

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
| **Professional Elective Streams** | **Professional Elective – I**  **(3-1)** | **Professional Elective – II**  **(3-2)** | **Professional Elective – III**  **(4-1)** | **Professional Elective – IV**  **(4-2)** | **Professional Elective – V**  **(4-2)** |
| **Power Systems** | Utilization of Electrical Energy | Renewable Energy Sources | Power System Deregulation | High Voltage Engineering | Electrical Distribution Systems |
| **Power Electronics** | HVDC and FACTS | Advanced Power Electronics | Power Semi-Conductor Drives | Electrical and Hybrid Vehicles | Switched Mode Power Conversion |
| **Control Systems** | Advanced Control Systems | Digital Control Systems | Optimal Control Systems | Reactive Power Control and Management | Programmable Logic Controllers |
| **Electronics** | Signals and Systems | Digital Signal Processing | Analog and Digital Communications | Advanced Computer Architecture | Embedded C Programming |

**OPEN ELECTIVES STREAMS**

|  |  |  |  |
| --- | --- | --- | --- |
| **L** | **T** | **P/D** | **C** |
| **3** | **0** | **0** | **3** |

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **Open Elective Streams** | **Open Elective (OE)** | | | | | |
| **Code** | **OE – I (3-2)** | **Code** | **OE – II (4-1)** | **Code** | **OE – III (4-2)** |
| **Computer** | 9EC42 | Programming in Java |  | Operating System Concepts |  | Fundamentals of Computer Networks |
| **Entrepreneurship Stream** | 9ZC22 | Basics of Entrepreneurship | 9ZC23 | Advanced Entrepreneur ship | 9ZC24 | Product and Services |
| **Social Sciences Stream** | 9ZC25 | Basics of Indian Economy | 9ZC26 | Basics of Polity and Ecology | 9ZC27 | Indian History, Culture and Geography. |
| **Finance Stream** | 9ZC05 | Banking Operations, Insurance and Risk Management | 9ZC19 | Entrepreneur ship Project Management and Structured Finance | 9ZC15 | Financial Institutions, Markets and Services |
| **Innovation and Design Thinking** |  | Design Literacy and Design Thinking |  | Co-Creation and Product Design |  | Entrepreneurs hip & Business Design |

**SWAYAM MOOCS Courses:**

The department will identify the MOOCS Course from the available courses in SWAYAM portal for the semester

**B.Tech. (EEE) III Year – I SEM**

**CODE: 9CC09 IC APPLICATIONS**

**L T P C**

**3 -- -- 3**

**Course Objectives**

* To maintain the right blend of theory and practice in analyzing and designing a wide variety of applications using IC 741 op-amps
* To acquaint the learners with a wide variety of IC logic families, and their applications.

**Course Outcomes**

**After studying this course, the students will be able to**

1. Demonstrate the concepts of Differential Amplifier and Operational Amplifier and their characteristics.
2. Design the basic circuits using IC 741 op-amp.
3. Explore, design and analyze active filters, timers, oscillators, voltage controlled oscillator DACs and ADCs, and IC regulators.
4. Classify and characterize the TTL/ECL/CMOS Logic Families and design of various logic gates using them.

**Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 |  | 2 | 2 |  |  |  |  |  |  |  |  | 2 | 3 |  |
| CO2 | 2 | 3 | 3 | 3 |  |  |  |  |  |  |  | 2 | 3 |  |
| CO3 | 2 | 3 | 3 | 3 |  |  |  |  |  |  |  | 3 | 3 |  |
| CO4 |  | 2 | 3 | 3 | 2 |  |  |  |  |  |  | 3 | 3 | 2 |
| Overall mapping | 2 | 3 | 3 | 3 | 2 |  |  |  |  |  |  | 3 | 3 | 2 |

**UNIT – I** [Lecture hrs – 9]: **OPAMP & ITS CHARACTERISTICS [T1] [CO1]**

Differential Amplifiers and its Characteristics. Op-Amp Block Diagram, Ideal OP-AMP Characteristics, DC and AC Characteristics. 741 Op-Amp and its Features and Characteristics. Parameters Measurement: Offset Voltage and Current, Slew Rate and CMRR. Frequency Compensation.

**UNIT – II** [Lecture hrs – 9]: **BASIC APPLICATIONS OF OP-AMPs [T1] [CO2]**

Adder/Subtractor, Difference Amplifier, Instrumentation Amplifier, Differentiator, Integrator, V/I & I/V Converters, Comparators, Multivibrators, Square and Triangular Waveform Generators, Clippers, Clampers, Peak Detector, S/H circuit.

**UNIT – III** [Lecture hrs – 9]: **FILTERs, TIMERs & PLLs [T1] [CO3]**

Filters:Introduction, Butterworth Filters- First and Second Order Active Filters- LPF, HPF, BPF, BRF. Introduction to 555 Timer, Functional Block, 555 timers as Monostable and AstableMultivibrators and Applications, Schmitt Trigger. Voltage Controlled Oscillator (IC 566), Phase Locked Loop.

**Applications: Design of visitors counter using 555 timer**

**UNIT – IV** [Lecture hrs – 9]: **OSCILLATORS, D/A AND A/D CONVERTERS, IC REGULATORS [T1] [CO3]**

Oscillators: Introduction, Design and Analysis of Wein Bridge, RC Phase shift Oscillators using op-amp. D/A Converters: Introduction, Characteristic Parameters, R-2R Ladder, Weighted Resistor, Inverter R-2R type D/A Converter, A/D Converters: Introduction, Characteristic Parameters, Counter Type, Dual Slope, Successive Approximation and Flash types A/D Converters, IC REGULATORS: Three terminal voltage regulators 7805, 7809, 7912, IC 723.

**UNIT – V** [Lecture hrs – 9]: **LOGIC FAMILIES [T2] [CO4]**

Classification of IC Logic Families, Multi emitter transistor logic. Standard TTL NAND & NOR Gate-Analysis & TTL Open Collector Outputs, Tristate TTL. Unsaturated logic- ECL logic family, ECL Inverter/Buffer, ECL NOR/OR logic. Electrical characteristics of logic gates.

**UNIT – VI** [Lecture hrs – 9]: **MOS& CMOS LOGIC FAMILY [T2] [CO4]**

NMOS & PMOS logic- Logic gates implementation, Passive pull up & active pull up , CMOS logic family- Design of logic gates and Boolean functions, CMOS Open Drain and Tristate Outputs, Comparison of Various Logic Families, IC interfacing, TTL driving CMOS & CMOS driving TTL.

**Applications: Design of 4x1 MUX using CMOS**

TEXT BOOKS

1. D. Roy Chowdhary, Linear Integrated Circuits , New Age Publications (P) Ltd, 2nd Edition, 2003.
2. John F. Wakerly, Digital Design Principles & Practices, PHI/ Pearson Education Asia, 3rd Ed., 2005.

**REFERENCES**

1. Ramakanth A. Gayakwad, Op-Amps & Linear ICs, PHI, 1987.
2. Sergio Franco, Design with Operational Amplifiers & Analog Integrated Circuits, McGraw Hill, 1988.
3. R.F. Coughlin & Fredrick Driscoll, Operational Amplifiers & Linear Integrated Circuits, PHI, 6th Edition.
4. K. Lal Kishore, Linear Integrated Circuit Application, Pearson Educations, 2005.

**B.Tech. EEE III year – I Sem**

**Code: 9A508 ELECTRICAL MACHINES - III**

**L T P C**

3 - 3

**Corse Objective:**

Students will understand about the detailed analysis of Synchronous generators and motors which are the prime source of electrical power generation and its utilities. Also concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

**Course Outcomes:**

After completion of this course the students are able to

1. Explain the constructional details and generation of EMF.
2. Ex plain the causes for harmonics and its suppression and also armature reaction.
3. Evaluate the performance of alternator by different methods.
4. Explain how to operate the alternators in parallel for load sharing and how to control the reactive power.
5. Analyze and explain applications of synchronous motor.
6. Explain the various applications of single phase induction motor and special purpose motors.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| Course Name/ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| Electrical Machines – III (EM-III) | X | X | X | X |  |  | X |  | X |  | X |  | X | X |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | Explain the constructional details and generation of EMF. | 3 | 3 | 3 |  |  |  |  |  |  |  |  |  |  |  |
| Unit – 2 | Explain the causes for harmonics and its suppression and also armature reaction. | 3 | 1 |  |  |  |  | 3 |  |  |  | 1 |  |  |  |
| Unit – 3 | Evaluate the performance of alternator by different methods. | 3 | 3 | 3 |  |  |  |  |  | 3 |  | 3 |  | 3 |  |
| Unit – 4 | Explain how to operate the alternators in parallel for load sharing and how to control the reactive power. | 3 | 3 | 1 | 3 |  |  |  |  |  |  |  |  |  | 1 |
| Unit – 5 | Analyze the power system for maintain constant frequency and explain applications of synchronous motor. | 3 | 2 | 3 | 3 |  |  | 3 |  |  |  | 3 |  |  |  |
| Unit – 6 | Explain the various applications of single phase induction motor and special purpose motors. | 3 |  | 1 |  |  |  |  |  | 2 |  | 3 |  | 3 | 2 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I CONSTRUCTION AND PRINCIPLE OF SYNCHRONOUS GENERATOR:**

Constructional Features, Armature windings, Integral slot and fractional slot windings, Distributed and concentrated windings, Distribution, Pitch and winding factors, E.M.F Equation.

**UNIT-II SYNCHRONOUS GENERATOR CHARACTERISTICS:**

Harmonics in generated E.M.F., Suppression of harmonics, Armature reaction, Leakage reactance, Synchronous reactance and impedance, Experimental determination, Phasor diagram, Load characteristics.

**UNIT – III REGULATION OF SYNCHRONOUS GENERATOR:**

Regulation by synchronous impedance method, M.M.F. method, Z.P.F. method and A.S.A. methods, Salient pole alternators, two reaction analysis, Experimental determination of Xd and Xq (Slip test) Phasor diagrams, Regulation of salient pole alternators.

**UNIT – IV PARALLEL OPERATION OF SYNCHRONOUS GENERATOR:**

Synchronizing alternators with infinite bus bars, synchronizing power torque, parallel operation and load sharing, Effect of change of excitation and mechanical power input, Analysis of short circuit current wave form, Determination of sub-transient, Transient and steady state reactance’s.

**UNIT – V SYNCHRONOUS MOTORS:**

Principal of operation, Phasor diagram, Power flow equation, Variation of current and power factor with excitation, Power circles, Synchronous condenser, Hunting and its suppression, Methods of starting.

**UNIT – VI SINGLE PHASE AND SPECIAL MOTORS:**

Single phase induction motor: constructional features and double revolving field theory, elementary idea of cross, Field theory, Split-phase motors, and Shaded pole motor.

Principle & performance of A.C. Series motor, Universal motor, Stepper motor and reluctance motor.

**TEXT BOOKS**

1. Electric Machines – I.J. Nagrath & D.P. Kothari, Tata Mc Graw-Hill Publishers, 5th Edition.

2. Electrical Machines - P.S. Bimbra, Khanna Publishers.

**REFERENCES:**

1. The Performance and Design of A.C. Machines – M. G. Say, ELBS and Ptiman & Sons.

2. Electric Machinery – A.E. Fitzgerald, C. Kingsley and S. Umans, Mc Graw-Hill Companies, 5th edition.

3. Theory of Alternating Current Machinery - Langsdorf, Tata Mc Graw-Hill, 2nd edition.

4. Electromachanics - III (Synchronous and single phase machines) -S. Kamakashiah, Right Publishers.

**III year B.Tech – I Sem**

**Code: 9A509 POWER ELECTRONICS**

**L T P C**

3 - 3

**Course Objective:**

Students will understand about the advent of semiconductor devices, Revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, Converters and choppers and their analysis.

**Course Outcomes:**

After completion of this course the students are able to

1. Understand the construction and operation of various power semiconductor devices and analyze about the series and parallel operation of SCRs.
2. Analyze the operation of different configurations of single phase converters for different loads.
3. Analyze the operation of different configurations of three phase converters for different loads.
4. Explain the operation of different type’s choppers.
5. Explain the operation of inverter and applications of inverters.
6. Explain the working of an AC voltage controller and Cyclo-Converters for different configurations.

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **Power Electronics(PE)** | X | X | X |  |  |  |  |  | X |  |  |  | X |  |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | Understand the construction and operation of various power semiconductor devices and analyze about the series and parallel operation of SCRs. | 3 | 3 | 1 | 1 | 1 |  | 1 |  |  |  |  | 2 | 3 | 1 |
| Unit – 2 | Analyze the operation of different configurations of single phase converters for different loads. | 3 | 1 | 2 | 1 | 1 |  | 1 |  |  |  |  | 2 | 2 | 1 |
| Unit – 3 | Analyze the operation of different configurations of three phase converters for different loads. | 3 | 3 | 3 | 2 | 1 |  | 1 |  |  |  |  | 2 | 2 | 2 |
| Unit – 4 | Explain the operation of different type’s choppers. | 3 | 3 | 2 | 2 | 1 |  | 1 |  |  |  |  | 2 | 1 | 2 |
| Unit – 5 | Explain the operation of inverter and applications of inverters. | 3 | 3 | 2 | 2 | 1 |  | 1 |  |  |  |  | 2 | 2 | 2 |
| Unit – 6 | Explain the working of an AC voltage controller and Cyclo-Converters for different configurations. | 3 | 2 | 3 | 2 | 1 |  | 1 |  |  |  |  | 2 | 2 | 2 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I POWER SEMI CONDUCTOR DEVICES:**

Thyristors, Silicon Controlled Rectifiers (SCR’s), BJT, Power MOSFET, Power IGBT, DIAC, TRIAC, GTO and their characteristics. Basic theory of operation of SCR, Static characteristics, Two transistor analogy, Turn on and turn off methods, Dynamic characteristics of SCR, Turn on and Turn off mechanism., SCR, UJT firing circuit, Series and parallel connections of SCR’s, Snubber circuit details, Specifications and Ratings of SCR’s, BJT, IGBT.

**UNIT – II SINGLE PHASE CONTROLLED CONVERTERS:**

Phase control technique, Single Phase Line commutated converters, Midpoint and Bridge connections; Half controlled and Fully controlled converters, Derivation of average load voltage and current with R and RL loads,

**UNIT – III THREE PHASE CONTROLLED CONVERTERS:**

Three phase half controlled and fully controlled bridge converters with R and RL loads, Effect of Source inductance, Waveforms, Numerical Problems.

**UNIT – IV CHOPPERS:**

Choppers, Time ratio control and Current limit control strategies, Step down choppers Derivation of load voltage and currents with R, RL and RLE loads, Step up Chopper, load voltage expression, Jones chopper and waveforms, Problems, Buck, Boost, Buck-Boost choppers.(Qualitative treatment).

**UNIT – V INVERTERS:**

Inverters, Single phase inverter, Half and Full bridge VSI & CSI inverters, Waveforms, Voltage control techniques for inverters, Three phase inverters with 120degrees and 180 degrees mode of conduction, Pulse width modulation techniques (Multiple Pulse and Sinusoidal), Numerical problems.

**UNIT –VI AC VOLTAGE CONTROLLERS & CYCLO CONVERTERS:**

AC voltage controllers, Single phase two SCR’s in anti parallel with R and RL loads, Derivation of RMS load voltage, current and power factor wave forms, Firing circuits, Numerical problems, Cyclo converters, Single phase midpoint cyclo converters with Resistive and inductive load (Principle of operation only), Bridge configuration of single phase cyclo converter (Principle of operation only), Waveforms

**TEXT BOOKS:**

1. Power Electronics - P.S. Bimbhra, Khanna Publishers, 5th edition.

2. Power Electronics Circuits, Devices and Applications - M. H. Rashid, Prentice Hall of India, 2nd edition.

**REFERENCES:**

1. Power Electronics - Vedam Subramanyam, New Age International (P) Limited, Publishers.

2. Power Electronics - V.R. Murthy 1st edition, OXFORD University Press.

3. Power Electronics - P.C. Sen,Tata Mc Graw Hill Publishing.

4. Power Electronics - M. D. Singh & K. B. Kanchandhani, Tata Mc Graw Hill Publishing Company.

**III YEAR B.TECH – I SEM**

**CODE: 9A510 POWER SYSTEMS-II**

**L T P C**

3 - 3

**Course Outcomes:**

1. Understand the importance of power factor and analyze the different methods of power factor and voltage control.
2. Analyze the factors affecting the economic aspects of power generation and tariff, different methods of tariff.
3. Learn about components of substation and different methods of grounding.
4. Learn about per unit system and symmetrical fault analysis.
5. Learn about symmetrical components, sequence impedances and unsymmetrical fault analysis.
6. Analyze different types of distribution systems.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **Power Systems – II** | X | X | X | X | X |  |  |  |  | X |  |  | **X** | **X** |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO 1** | **PSO2** |
| **5A831 – CO1** | 3 |  | 3 | 1 | 2 |  |  |  |  | 2 |  |  | 2 |  |
| **5A831 – CO2** | 1 |  |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **5A831 – CO3** | 2 | 3 |  |  | 3 |  |  |  |  |  |  |  |  |  |
| **5A831 – CO4** | 2 | 1 |  |  |  |  |  |  |  | 3 |  |  | 3 |  |
| **5A831 – CO5** | 1 |  | 2 |  | 1 |  |  |  |  |  |  |  |  |  |
| **5A831 – CO6** | 2 |  |  | 2 |  |  |  |  |  |  |  |  |  | 2 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I POWER FACTOR AND VOLTAGE CONTROL:**

Causes of low p.f, Methods of Improving p.f, Phase advancing and generation of reactive KVAR using static Capacitors, Most economical p.f. for constant KW load and constant KVA type loads, Numerical Problems.

Dependency of Voltage on Reactive Power flow, Methods of Voltage Control, Shunt Capacitors, Series Capacitors, Synchronous Capacitors, Tap changing and Booster Transformers

**UNIT-II ECONOMIC ASPECTS OF POWER GENERATION AND TARIFF METHODS:**

Costs of Generation and their division into Fixed, Semi - fixed and Running Costs, Desirable Characteristics of a Tariff Method, Tariff Methods, Flat Rate, Block-Rate, Two-part, Three –part and power factor tariff methods and Numerical Problems.

**UNIT - III SUBSTATIONS & GROUNDING:**

Classification of Substations, Air insulated substations, Indoor & Outdoor substations, Substations layout showing the location of all the substation equipment, Bus bar arrangements in the sub-stations, Simple arrangements like single bus bar, sectionalized single bus bar, and Main and transfer bus bar system with relevant diagrams.

**Gas insulated substations (GIS):** Advantages of Gas insulated substations, Single line diagram of gas insulated substations, Comparison of Air insulated substations and Gas insulated substations.

**NEUTRAL GROUNDING:**

Grounded and Ungrounded Neutral Systems, Effects of Ungrounded Neutral on system performance, Methods of Neutral Grounding, Solid, Resistance, Reactance, Arcing Grounds.

**UNIT – IV SHORT CIRCUIT ANALYSIS:**

Per Unit System of Representation, Per Unit equivalent reactance network of a three phase Power System, Numerical Problems.

**SYMMETRICAL FAULT ANALYSIS**

Short Circuit Current and MVA Calculations, Fault levels, Application of Series Reactors, Numerical Problems.

**UNIT-V SYMMETRICAL COMPONENT THEORY:**

Symmetrical Component Transformation, Positive, Negative and Zero sequence components: Voltages, Currents and Impedances.

Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems.

**UNSYMMETRICAL FAULT ANALYSIS:**

LG, LL, LLG faults with and without fault impedance, Numerical Problems

**UNIT-VI -GENERAL ASPECTS OF DISTRIBUTION SYSTEMS:**

**D.C. DISTRIBUTION SYSTEMS:**

Classification of Distribution Systems - Comparison of DC vs AC and Under-Ground vs Over - Head Distribution Systems- Requirements and Design features of Distribution Systems-Voltage Drop Calculations (Numerical Problems) in D.C Distributors for the following cases: Radial D.C Distributor fed one end and at the both the ends (equal/unequal Voltages) and Ring Main Distributor.

**A.C. DISTRIBUTION SYSTEMS:**

Voltage Drop Calculations (Numerical Problems) in A.C. Distributors for the following cases: Power Factor referred to receiving end voltage and with respect to respective load voltages.

**TEXT BOOKS**

1. Electrical Power Systems - C.L. Wadhawa New Age International (P) Limited, Publishers, 7th edition.

2. Principles of Power Systems - V.K Mehta and Rohit Mehta S.CHAND& COMPANY LTD., New Delhi.

3. Power System Analysis - John J. Grainger, William D. Stevenson, *McGraw-Hill international editions*.

**REFERENCES:**

1. A Text Book on Power System Engineering - M.L. Soni, P.V. Gupta, U.S. Bhatnagar and A. Chakraborti, Dhanpat Rai & Co. Pvt. Ltd.

2.Electrical Power Generation, Transmission and Distribution - S.N. Singh., PHI.

**III Year, B. Tech – I - Sem.**

**Code: 9CC02 SIGNALS AND SYSTEMS**

**(PROFESSIONAL Elective-I)**

**L T P C**

3 - 3

**Course Objectives:**

To study the concepts of signals and systems their characterization in the Time as well as frequency domains

To know the importance of sampling theorem and various sampling methods to convert continuous time signals into discrete time signals

**COURSE OUTCOMES:**

After studying this course, the students will be able to

1. Understand the concepts of signals, comparison of signals, orthogonal signal space and apply the orthogonality properties to understand the Fourier methods of signal analysis- Fouries series and Fourier Transforms.
2. Understand the concepts of systems, their characterization in the Time as well as Transformed domains and apply the mathematical tools, such as Convolution, Correlation and the Laplace transform to analyze signals and systems.
3. Determine the sampling frequency for any low pass and band pass signals applying the sampling theorem.
4. Distinguish between continuous and Discrete time signals and systems. Apply the concepts of Z-Transforms in the analysis of DT signals and systems.

**Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes**

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|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | 3 | 3 | 3 | 3 | 3 |  |  |  | 3 | 2 |  | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 3 |  |  |  | 3 | 2 |  | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 |  |  |  | 3 | 2 |  | 3 | 3 | 3 |
| CO4 | 3 | 3 | 3 | 3 | 3 |  |  |  | 3 | 2 |  | 3 | 3 | 3 |
| Overall | 3 | 3 | 3 | 3 | 3 |  |  |  | 3 | 2 |  | 3 | 3 | 3 |

**UNIT I** [Lecture hrs – 9]: **SIGNALS:**

Signals. Classification of Signals. Even, Odd, Periodic. Non-periodic. Energy and Power Signals. Exponential and Sinusoidal Signals. Concepts of Impulse Function. Unit Step Function. Signum Function. [T1, T2]

**Signal Analysis -** Analogy between Vectors and Signals. Orthogonal Signal Space. Signal Approximation using Orthogonal Functions. Mean Square Error. Closed or Complete Set of Orthogonal Functions. Orthogonality in Complex Functions. [T1, T2]

**Applications: The concepts of orthogonality find applications in DSP, DIP, DC, Design of experiments and so on.**

**Unit-II** [Lecture hrs – 10]: **FOURIER REPRESENTATION OF CONTINUOUS TIME SIGNALS**

**Periodic Signals**- Fourier Series, Dirichlet’s Conditions. Trigonometric. Exponential Fourier series. Fourier Spectrum.[T2]

**Non- Periodic Signals -** Fourier Transforms. Fourier Transform of Arbitrary Signal. Standard Signals. Fourier Transform of Periodic Signals. Properties of Fourier Transforms. Fourier Transforms Involving Impulse and Signum Function Introduction to Hilbert Transform. [T1, T2]

**Applications: Knowledge of signal bandwidth is necessary in the design of a filter; in the determination of the carrier frequency and also the sampling frequency and analog communication.**

**Unit-III** [Lecture hrs – 11]: **SIGNAL TRANSMISSION THROUGH LINEAR SYSTEMS**

Systems. Classification of Systems. Linear System. Impulse Response (IR) of a Linear System. Linear Time Invariant (LTI) System. Linear Time Variant (LTV) System. Transfer Function of a LTI System. Filter Characteristics of Linear Systems. Distortion Less Transmission Through a System. Signal Bandwidth. System Bandwidth. Ideal LPF, HPF and BPF Characteristics. Causality and Poly-Wiener Criterion for Physical Realization. Relationship between Bandwidth and Rise Time.[T2]

**Applications: The concept of system bandwidth is applied in the design of a practical filter or system.**

**Unit-IV** [Lecture hrs – 11]: **CONVOLUTION AND CORRELATION OF SIGNALS**

Concept of Convolution in Time Domain and Frequency Domain. Graphical Representation of Convolution. Convolution Properties. Cross Correlation and Auto Correlation of Functions. Properties of Correlation Function, Relation between Convolution and Correlation. Energy Density Spectrum, Parseval’s Theorem, Power density spectrum, Detection of periodic signals in the presence of Noise by Auto and Cross Correlations.[T2]

**Laplace Transforms -** Review of Laplace Transforms. Partial Fraction Expansion. Inverse Laplace Transform. Concept of Region of Convergence (ROC) for Laplace Transforms. Constraints on ROC for Various Classes of Signals. Properties of LT. Initial and final value theorems, Relation between LT and FT of a Signal. Laplace Transform of Certain Signals using Waveform Synthesis. Laplace Transform of Periodic Signals.[T1, T2]

**Applications: These math tools are required in the design, analysis and implementation of various filters, LT signals and systems.**

**Unit-V** [Lecture hrs – 9]: **SAMPLING**

Sampling Theorem. Graphical and Analytical Proof for Band Limited Signals. Impulse (Ideal) Sampling. Natural (Chopped) Sampling and Flat Top(S&H) Sampling. Reconstruction of Signal from its Samples. Effect of Under Sampling. Aliasing. Introduction to Band Pass Sampling.[T1, T2]

**Applications: Sampling techniques are applied in the conversion of analog to digital conversion**

**Unit-VI** [Lecture hrs – 8]: **Z–TRANSFORMS**

Fundamental Difference between Continuous and Discrete Time Signals. Discrete Time Signal Representation using Complex Exponential and Sinusoidal Components. Periodicity of Discrete Time using Complex Exponential Signal. Concept of Z- Transform of a Discrete Sequence. Distinction Between Laplace, Fourier and Z Transforms. Region of Convergence in Z-Transform. Constraints on ROC for Various Classes of Signals. Inverse Z-Transform. Properties of Z-Transforms. Initial and final value theorems. Introduction to Discrete Time Systems. [T2]

**Applications: Analysis and Synthesis of DT signals and systems.**

**TEXT BOOKS**

1. Signals, Systems and Communications- B. P. Lathi, BSPublications.

2. Signals and Systems – Anand Kumar, 2nd Edition, PHI Publications.

**REFERENCES**

1. Signals & Systems – Simon Haykin and Van Veen, 2nd Edition, WileyPublications.
2. Signal processing and Linear Syustems - B. P. Lathi, BSPublications.

3. Signals & Systems -A.V. Oppenheim, A.S. Willsky and S.H. Nawab, 2ndEdn, PHI Publications.

4. Linear Systems and Signal Processing - B. P. Lathi, Oxford University Press.

**III Year – I Sem. B.Tech**

**Code: 9A525 ADVANCED CONTROL SYSTEMS**

**(PROFESSIONAL ELECTIVE-I)**

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| **X** | **X** |  | **X** |  |  |  |  |  |  |  |  |

L T P C

3 - - 3

**Objective:**

Student will learn about state space, describing function, phase plane and stability analysis including controllability and observability. It also deals with modern control and optimal control systems.

**Course outcomes:**

Students will be able to

* + 1. Understand the controllability and observability.
    2. Understand the phase plane analysis.
    3. Understand the stability analysis.
    4. Know about Effect of state feedback on controllability and observability.
    5. Understand the minimization of functional of single function
    6. Study about formulation of optimal control problem

**UNIT – I STATE SPACE ANALYSIS**

State Space Representation, Solution of State Equation, State Transition Matrix, Canonical Forms – Controllable Canonical Form, Observable Canonical Form, Jordan Canonical Form.

**CONTROLLABILITY AND OBSERVABILITY**

Tests for controllability and observability for continuous time systems – Time varying case, minimum energy control, time invariant case, Principle of Duality, Controllability and observability form Jordan canonical form and other canonical forms.

**UNIT – II DESCRIBING FUNCTION ANALYSIS**

Introduction to nonlinear systems, Types of nonlinearities, describing functions, describing function analysis of nonlinear control systems.

**PHASE-PLANE ANALYSIS**

Introduction to phase-plane analysis, Method of Isoclines for Constructing Trajectories, singular points, phase-plane analysis of nonlinear control systems.

**UNIT-III STABILITY ANALYSIS**

Stability in the sense of Lyapunovs, Lyapunov’s stability and Lypanov’s instability theorems. Direct method of Lypanov for the Linear and Nonlinear continuous time autonomous systems.

**UNIT – IV MODAL CONTROL**

Effect of state feedback on controllability and observability, Design of State Feedback Control through Pole placement. Full order observer and reduced order observer.

**UNIT-V CALCULUS OF VARIATIONS**

Minimization of functional of single function, Constrained minimization. Minimum principle. Control variable inequality constraints. Control and state variable inequality constraints. Euler Lagrangine Equation.

**UNIT-VI OPTIMAL CONTROL**

Formulation of optimal control problem. Minimum time, Minimum energy, minimum fuel problems. State regulator problem. Output regulator problem. Tracking problem, Continuous-Time Linear Regulators.

**TEXT BOOKS:**

1. Modern Control System Theory – by M. Gopal, New Age International Publishers, 2nd edition,1996.

**REFERENCES:**

1. Modern Control Engineering – by K. Ogata, Prentice Hall of India, 3rd edition, 1998

2. Control Systems Engineering by I.J. Nagarath and M.Gopal, New Age International (P) Ltd.

3. Digital Control and State Variable Methods – by M. Gopal, Tata Mc Graw-Hill Companies, 1997.

4. Systems and Control by Stainslaw H. Zak , Oxford Press, 2003.

**B.Tech III Year – I Sem.**

**Code: 9A531 SMART GRID**

**(PROFESSIONAL ELECTIVE-II) L T P C**

**3 - - 3**

**Course Objective:**

To introduce the concepts of smart grids, architecture and control, tools and techniques that are used in smart grids are discussed in detail. To present the control of smart grids and the evolution of distributed generation technologies, various communication technologies.

**Course Outcomes:**

1. Understand the features of Smart Grid
2. Assess the role of automation and digitization in Transmission and Distribution
3. Analyze Smart grids and Distributed energy resources(DER) with evolutionary algorithms
4. Learn about various storage technologies, micro grid
5. Understand the importance of synchro phasor technology, data acquisition devices and their location.
6. Understand operation, Voltage and Frequency control of smart grid.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **SMART GRID** | **X** | **X** | **X** |  | **X** |  | **X** |  |  | **X** |  |  | **X** | **X** |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO**  **(Unit Wise)** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO 1** | **PSO2** |
| **5A831 – CO1** | 3 | 2 |  |  |  |  |  |  |  |  |  |  |  | 3 |
| **5A831 – CO2** | 3 |  | 2 |  |  |  |  |  |  |  |  |  |  | 3 |
| **5A831 – CO3** | 3 | 2 | 1 | 2 | 2 |  |  |  |  |  |  |  |  | 3 |
| **5A831 – CO4** | 3 |  |  |  |  |  | 2 |  |  |  |  |  | 1 | 3 |
| **5A831 – CO5** | 3 |  |  |  |  |  | 1 |  |  |  |  |  |  | 3 |
| **5A831 – CO6** | 3 | 2 |  |  |  |  |  |  |  |  |  |  | 1 | 3 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I INTRODUCTION TO SMART GRID:**

What is Smart Grid, Working definitions of Smart Grid and Associated Concepts –Smart Grid Functions-Traditional Power Grid and Smart Grid –New Technologies for Smart Grid – Advantages –Indian Smart Grid –Key Challenges for Smart Grid.

**UNIT – II SMART GRID ARCHITECTURE:**

Components and Architecture of Smart Grid Design –Review of the proposed architectures for Smart Grid. The fundamental components of Smart Grid designs –Transmission Automation – Distribution Automation –Renewable Integration

**UNIT – III TOOLS AND TECHNIQUES FOR SMART GRID:**

Computational Techniques –Static and Dynamic Optimization Techniques –Computational Intelligence Techniques –Evolutionary Algorithms –Artificial Intelligence techniques.

**UNIT – IV DISTRIBUTION GENERATION TECHNOLOGIES:**

Introduction to Renewable Energy Technologies –Micro grids –Storage Technologies –Electric Vehicles and plug –in hybrids –Environmental impact and Climate Change –Economic Issues.

**UNIT – V COMMUNICATION TECHNOLOGIES AND SMART GRID:**

Introduction to Communication Technology –Synchro Phasor Measurement Units (PMUs) –Wide Area Measurement Systems (WAMS).

**UNIT – VI CONTROL OF SMART POWER GRID SYSTEM:**

Load Frequency Control (LFC) in Micro Grid System –Voltage Control in Micro Grid System – Reactive Power Control in Smart Grid. Case Studies and Test beds for the Smart Grids.

**TEXT BOOKS:**

1. Stuart Borlase, Smart Grids, Infrastructure, Technology and Solutions, CRC Press, 2013

2. Gil Masters, Renewable and Efficient Electric Power System, Wiley-IEEE Press, 2004.

3. A.G. Phadke and J.S. Thorp, ―Synchronized Phasor Measurements and their Applications, Springer Edition, 2010.

4. T. Ackermann, Wind Power in Power Systems, Hoboken, NJ, USA, John Wiley, 2005.

**III year B.Tech – I Sem**

**CODE: 9A534 HVDC & FACTS**

**(PROFESSIONAL ELECTIVE-I)**

**L T P C**

**3 - 3**

**Objectives**:

Understand operating principles of HVDC systems and control aspects.

* + Deals with analysis of harmonics, filters, reactive power and power flow
  + Understand concepts and control aspects of FACTS devices.

**Course Outcomes**: The student will be able to

* 1. Acquire the knowledge to compare AC and HVDC systems in terms of power transmission and stability.
  2. Acquire knowledge on analysis of harmonics, filters, reactive power and power flow in HVDC systems.
  3. Acquire knowledge in improving the transmission capability and stability of the power system by applying FACTS controllers.

**CO-PO MAPPING TABLE (Overall Course Mapping) HVDC & FACTS**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| HVDC & FACTS |  | x | X | X |  |  |  |  | X |  | X |  | X |  |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **CO**  **(Unit Wise)** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit -1 |  | 1 | 3 | 3 |  |  |  |  | 3 |  | 3 |  | 1 | 1 |
| Unit -2 |  | 3 | 2 | 2 |  |  |  |  | 2 |  | 2 |  | 2 | 2 |
| Unit - 3 |  | 1 | 3 | 3 |  |  |  |  | 3 |  | 3 |  | 1 | 1 |
| Unit - 4 |  | 3 | 2 | 2 |  |  |  |  | 2 |  | 2 |  | 2 | 2 |
| Unit - 5 |  | 2 | 3 | 3 |  |  |  |  | 3 |  | 3 |  | 1 | 2 |
| Unit - 6 |  | 1 | 3 | 3 |  |  |  |  | 3 |  | 3 |  | 1 | 2 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I: INTRODUCTION**:

Comparison of AC and DC transmission systems, application of DC transmission, types of DC links, typical layout of a HVDC converter station. HVDC converters, pulse number, analysis of Graetz circuits with and without overlap, converter bridge characteristics.

**UNIT – II: CONVERTER & HVDC SYSTEM CONTROL**:

Principles o DC Link Control – Converters Control Characteristics – system control hierarchy, firing angle control current and extinction angle control starting and stopping of DC link.

**UNIT-III: HARMONICS, FILTERS AND REACTIVE POWER CONTROL**:

Introduction, generation of harmonics, AC and DC filters. Reactive Power Requirements in steady state, sources of reactive power, Power Flow Analysis in AC/DC Systems: Modeling of DC/AC converters, Controller Equations – Solutions of AC/DC load flow – Simultaneous method-Sequential method,

**UNIT-IV: Introduction to FACTS**:

Flow of power in AC parallel paths and meshed systems, basic types of FACTS controllers, brief description and definitions of FACTS controllers.

**UNIT –V: STATIC SHUNT COMPENSATORS:**

Objectives of shunt compensation, methods of controllable VAR generation, static VAR compensators, SVC and STATCOM, comparison between SVC and STATCOM.

**UNIT –VI: STATIC SERIES COMPENSATORS**:

GCSC, TSSC, TCSE & SSSC, Objectives of series compensator, Variable impedance type series compensators, Basic operating control schemes, Power angle characteristics, Control range and VA rating, External control.

Combined Compensators: Introduction, unified power flow controller (UPFC), basic operating principle, independent real and reactive power flow controller, control structure.

**TEXT BOOKS**:

1. HVDC Transmission – S Kamakshaiah, V. Kamaraju, Tata Mc. Graw Hill Publications, 1st Edition, 2011.

2. Understanding FACTS – Concepts and Technology of Flexible AC Transmission Systems” Narain G. Hingorani, Laszlo Gyugyi, Wiley India publications, 2011.

3. HVDC Transmission – J. Arrillaga, IEE, 2nd Edition, 1998.

4. Direct Current Transmission - E.W. Kimbark, Volume 1, John Wiley & Sons, 1971.

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|  |  | x |  |  | x |  |  | **X** |  |  |  |

**L T P/D C**

**3 0 0 3**

**III Year II semester**

**CODE: 9FC22 PYTHON PROGRAMMING CONCEPTS**

**Course Objectives:-**

After taking this course, you should be able to:

Use Python interactively, execute a Python script at the shell prompt, use Python types, expressions, and None, use string literals and string type, use Python statements (if...elif..else, for, pass, continue, . . . ), understand the difference between expressions and statements, understand assignment semantics, write and call a simple function., utilize high-level data types such as lists and dictionaries, understand the difference between mutable and immutable types, write a simple class and access methods and attributes, import and utilize a module, read from and write to a text file.

**Course Outcomes:**

CO1: Gains exposure towards Python versions and their specifications.

CO2: Build programs using primitive data types.

CO3: Write applications that include functions, modules, packages along with respective exceptional handling mechanism.

CO4: Writes applications using OO features of Python

CO5: Write applications using Files.

CO6: Hands on exposure on NumPy/Tkinter/Plotpy modules.

**UNIT -I:** **INTRODUCTION TO PYTHON:**

History, Features, Modes of Execution, Setting up path, working with Python Basic Syntax, Variable and Data Types, Operators. Conditional Statements (If, If- else, Nested if-else) Looping (for, While Nested loops) Control Statements (Break, Continue, Pass).

**Input-Output:** Printing on screen, Reading data from keyboard, Opening and closing file

**UNIT-II: FUNCTIONS:**

Defining a function, calling a function, Types of functions, Function Arguments, Anonymous functions, Global and local variables

**String Manipulation**: Accessing Strings, Basic Operations, String slices, Function and Methods

**Lists:** Accessing list, Operations, Working with lists Function and Methods

**Tuple:** Accessing tuples, Operations, Working.

**Dictionaries:** Accessing values in dictionaries, working with dictionaries, Properties Functions and Methods.

**UNIT-III:** **MODULES:**

Importing module, Math module, Random module, Packages

**Exception Handling:** Exception, Exception Handling, except clause, Try? Finally clause User Defined Exceptions

**Unit-IV:** **Python- OOPs concept:**

Class and object, Attributes, Inheritance, Overloading Overriding, Data hiding.

**Regular expressions**: Match function, Search function, Matching VS Searching, Modifiers Patterns.

**Unit -V**:

Introduction to Files, File Handling, Working with File Structure, Directories, Handling Directories

**Unit -VI:**

Case Study with NumPy/PlotPy/SciPy/GUI Programming, Introduction, Tkinter programming, Tkinter widgets

**TEXT BOOK:**

1. [Apress]-Beginning Python. From Novice to Professional, 2nd ed. - [Hetland] (2008)

**REFERENCE BOOKS:**

1. Introduction to Computation and Programming using Python, Revised and Expanded Edition, John V. Guttag, The MIT Press.

2. Programming Python, Fourth Edition by Mark Lutz, O'Relly

3. Python Programming using problem solving approach, Reema Thareja, Oxford Higher Education.

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| **B. Tech III Year I semester** | | | | | | |
| **Year/Sem** | **Sub. Code** | **Subject Name** | **L** | **T** | **P/D** | **C** |
| **III - I** | **9FC24** | **CYBER SECURITY** | **2** | **0** | **0** | **0** |

**Course Objectives:**

1. To familiarize with network security, network security threats, security services, and countermeasures.
2. To be aware of computer security and Internet security.
3. To study the defensive techniques against these attacks.
4. To familiarize with cyber forensics.
5. To be aware of cyber crime related to mobile and laptop etc.
6. To acquire knowledge relating to Cyberspace laws and Cyber crimes.
7. To understand ethical laws of computer for different countries, Offences under the Cyberspace and Internet in India.

**Course Outcomes:**

**At the end of this course the student will be able to**

1. The students will be able to understand cyber-attacks, types of cybercrimes.
2. Realize the importance of cyber security and various forms of cyber attacks and countermeasures.
3. Get familiar of cyber forensics.
4. Get familiar with obscenity and pornography in cyber space and understand the violation of Right of privacy on Internet.
5. Cyber laws and also how to protect them self and ultimately the entire Internet community from such attacks.
6. Elucidate the various chapters of the IT Act 2008, power of Central and State Government to make rules under IT Act 2008.

**UNIT-I: INTRODUCTION TO CYBER SECURITY**

Introduction to Cyber Security: Basic Cyber Security Concepts, layers of security, Vulnerability, threat, Harmful acts, motive of attackers, active attacks, passive attacks, Software attacks, hardware attacks, Spectrum of attacks, Taxonomy of various attacks, IP spoofing, Methods of defense, Security Models, risk management, Cyber Threats-Cyber Warfare, Cyber Crime, Cyber terrorism, Cyber Espionage, etc.,

**UNIT-II: CYBER FORENSICS:**

Introduction to cyber forensic, Historical background of Cyber forensics, Digital Forensics Science, The Need for Computer Forensics, Cyber Forensics and Digital evidence, Forensics Analysis of Email, Digital Forensics Lifecycle, Forensics Investigation, Challenges in Computer Forensics, Special Techniques for Forensics Auditing.

**UNIT-III: CYBERCRIME: MOBILE AND WIRELESS DEVICES:**

Introduction, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Organizational Security Policies and Measures in Mobile Computing Era, Laptops and desktop.

**UNIT-IV: CYBER SECURITY: ORGANIZATIONAL IMPLICATIONS:**

Introduction cost of cybercrimes and IPR issues, web threats for organizations, security and privacy implications, social media marketing: security risks and perils for organizations, social computing and the associated challenges for organizations.

**Cybercrime and Cyber terrorism:** Introduction, intellectual property in the cyberspace, the ethical dimension of cybercrimes the psychology, mindset and skills of hackers and other cyber criminals.

**UNIT-V: PRIVACY ISSUES:**

Basic Data Privacy Concepts: Fundamental Concepts, Data Privacy Attacks, Data linking and profiling, privacy policies and their specifications, privacy policy languages, privacy in different domains- medical, financial, etc.

**UNIT-VI: CYBERSPACE AND THE LAW &MISCELLANEOUS PROVISIONS OF IT ACT.**

Introduction to Cyber Security Regulations, International Law. The INDIAN Cyberspace, National Cyber Security Policy. Internet Governance – Challenges and Constraints, Computer Criminals, CIA Triad, Assets and Threats.

Other offences under the Information Technology Act in India, The role of Electronic Evidence and miscellaneous provisions of the IT Act.2008.

**Cybercrime: Examples and Mini-Cases**

Examples: Official Website of Maharashtra Government Hacked, Indian Banks Lose Millions of Rupees, Parliament Attack, Pune City Police Bust Nigerian Racket, e-mail spoofing instances. Mini-Cases: The Indian Case of online Gambling, An Indian Case of Intellectual Property Crime, Financial Frauds in Cyber Domain.

**TEXT BOOKS:**

1. Nina Godbole and SunitBelpure, Cyber Security Understanding Cyber Crimes, Computer Forensics and Legal Perspectives, Wiley

1. B. B. Gupta, D. P. Agrawal, Haoxiang Wang, Computer and Cyber Security: Principles, Algorithm, Applications, and Perspectives, CRC Press, ISBN 9780815371335, 2018.

**REFERENCE BOOKS:**

1. Cyber Security Essentials, James Graham, Richard Howard and Ryan Otson, CRC Press.
2. Introduction to Cyber Security, Chwan-Hwa(john) Wu,J. David Irwin, CRC Press T&F Group.

3. Debby Russell and Sr. G.T Gangemi, "Computer Security Basics (Paperback)”, 2ndEdition, O’ Reilly Media, 2006.

4. Wenbo Mao, “Modern Cryptography – Theory and Practice”, Pearson Education, New Delhi, 2006.

5. Cyberspace and Cybersecurity, George Kostopoulos, Auerbach Publications, 2012.

6. Cyber Forensics: A Field Manual for Collecting, Examining, and Preserving Evidence of Computer Crimes, Second Edition, Albert Marcella, Jr., Doug Menendez, Auerbach Publications, 2007.

7. Cyber Laws and IT Protection, Harish Chander, PHI, 2013

**III year B.Tech – I Sem**

**Code: 9A575 LINEAR CONTROL SYSTEMS AND SIMULATION LAB**

**L T P C**

**3 1.5**

**Course Objectives:**

This course aims to familiarize with the modeling of dynamical systems and the characteristics of control components like ac servo motor, Synchro and magnetic amplifier.

To **simulate and analyze the stability using MATLAB software and design** the compensators

**Course Outcomes:** After completing this course, student shall be able to

* + - 1. To explore the applications of control systems.
      2. To explore the concepts of control systems.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CS & S LAB** | 3 | 3 | 2 |  | 3 |  |  |  |  |  |  | **2** | **3** | **3** |

**The following experiments are to be conducted:**

1. Time response of Second order system

2. Characteristics of Synchro

3. Programmable logic controller – Study and verification of truth tables of logic gates, simple

Boolean expressions and application of speed control of motor.

4. Effect of feedback on DC servo motor

5. Transfer function of DC motor

6. Lag and lead compensation – Magnitude and phase plot

7. Characteristics of magnetic amplifiers

8. Characteristics of AC servo motor

9. PSPICE simulation of Op-Amp based Integrator and Differentiator circuits.

10. Linear system analysis (Time domain analysis, Error analysis) using MATLAB and State space model for classical transfer function using MATLAB

11. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB

**REFERENCE BOOKS:**

1. Simulation of Electrical and electronics Circuits using PSPICE –M.H. Rashid, M/s PHI Publications.

2. PSPICE A/D user’s manual – Microsim, USA.

3. MATLAB and its Tool Books user’s manual and – Mathworks, USA.

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| **M** | **H** | **M** | **M** |  |  |  |  | **M** |  | **M** |  |

**H: High M: Medium L: Low**

**II Year II Semester**

**Electrical and Electronics Engineering**

**Analog Circuits Lab**

**Code: 9CC72**

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| - | - | 3 | 1.5 |

**Course Objectives**

To prepare students to practice the design and analysis of any Analog electronics circuit.

**Course Outcomes:**

**At the end of the laboratory course, the students will be able to**

1. To understand the design and working of various linear and non-linear wave shaping circuits.
2. To demonstrate the working principle of various multivibrators and functionalities of various logic gates.
3. To perform and verify the working of oscillators, feedback amplifiers and voltage regulators.
4. To perform laboratory experiment to verify the conversion efficiency of various power amplifiers.

**Mapping of Course Outcomes with Program Outcomes andProgram specific outcomes**

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|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 |  | 3 |  | 3 |  |  |  | 2 |  |  | 1 | 2 | 2 | 2 |
| CO2 | 2 |  | 3 |  | 3 |  |  |  | 2 |  |  | 1 | 2 | 2 | 2 |
| CO3 | 2 |  | 3 |  | 3 |  |  |  | 2 |  |  | 1 | 2 | 2 | 2 |
| CO4 | 2 |  | 3 |  | 3 |  |  |  | 2 |  |  | 1 | 2 | 2 | 2 |
| Overall | 2 |  | 3 |  | 3 |  |  |  | 2 |  |  | 1 | 2 | 2 | 2 |

**Syllabus Content:**

**Part-A: Hardware based experiments**

1. Linear wave shaping.
2. Non Linear wave shaping – Clippers & clampers.
3. UJT Relaxation Oscillator
4. Astable and monostable Multivibrator.
5. Bistable Multivibrator.
6. Study of Logic Gates with discrete components.

**Part-B : Software Simulation based experiments (Multisim OR Pspice OR Tina Pro Or Equivalent Simulation Software)**

1. Common Emitter and Common Source amplifier
2. Voltage shunt and Feedback Amplifier
3. Cascade Amplifier (CE+CE, CE+CC)
4. RC Phase Shift Oscillator using Transistors
5. Class- A and Class-B Complementary Symmetry Power Amplifier
6. Series and Shunt Voltage Regulator.

**III year B.Tech – I Sem**

**Code: 9A586 SUMMER INDUSTRY INTERNSHIP – I**

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## *Course Objectives:*

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Pre-Requisites:** All Courses till this semester

**Course Outcomes: At the end of this course, the student will be able to**

* Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
* Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
* Inculcate an enthusiasm to use the creative ideas to build the innovative projects and prototypes which are meeting the current needs of the market and society as a whole.
* Improve their communicative skills and team skills largely improve.
* Work as an individual and in a team.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 3 in number during summer third year first semester at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship project. Project shall consist of design, fabrication, software development or building of prototype. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

Day to day work (internal guide 10M

external guide : 5M) : 15 marks

Report : 05 marks

Demonstration / presentation (internal presentation

is evaluated by HOD, senior faculty and internal guide) : 10 marks

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30 marks

End examination : 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the internal guide.

**III year B.Tech – II Sem**

**Code: 9DC05 MICROPROCESSOR AND MICROCONTROLLERS**

**L T P C**

**3 - 3**

***Course Objectives:*** *In this course the student will learn*

1. *The microprocessor and microcontroller architecture, instructions set and procedures of programming.*
2. *Understand the assembly language programs, pin diagram and timing diagrams for 8086 & 8051.*
3. *Understand and practice the interfacing related applications of 8255 with 8086 and serial communication.*
4. *Learn the usage of multiple interrupts of 8051, USART architecture, RS232.*

***Course Outcomes:****After completing this course****,*** *Students will be able to*

1. *Understanding the concepts of 8086 Architecture*
2. *Understanding the concepts of Instruction set & developing skills in writing assembly language programs.*
3. *Ability to interface keyboard, stepper motor ADC, DAC to 8086 using 8255*
4. *Understanding the concepts of 8051 Architecture*
5. *Exploring the concepts of instruction set of 8051*
6. *Ability to interface LED, LCD, Keyboard DAC, ADC with 8051*

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **MPMC** | X | X | X | X |  | X | X |  |  |  | X | X | X |  |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | CO.1 | 3 | 2 | 3 | 2 |  | 2 | 1 |  |  |  | 1 | 2 | **2** | **1** |
| Unit – 2 | CO.2 | 3 | 2 | 2 | 3 |  | 2 | 1 |  |  |  | 1 | 2 | **3** | **2** |
| Unit – 3 | CO.3 | 3 | 3 | 2 | 1 |  | 2 | 1 |  |  |  | 2 | 3 | **2** | **2** |
| Unit – 4 | CO.4 | 3 | 3 | 3 | 1 |  | 1 | 2 |  |  |  | 2 | 3 | **3** | **2** |
| Unit – 5 | CO.5 | 3 | 2 | 2 | 3 |  | 2 | 1 |  |  |  | 2 | 3 | **1** | **2** |
| Unit – 6 | CO.6 | 3 | 3 | 3 | 3 |  | 3 | 3 |  |  |  | 3 | 3 | **3** | **2** |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I: ARCHITECTURE OF 8086 MICROPROCESSOR:**

Memory segmentation, BIU and EU, General purpose registers, 8086 flag register and function of 8086 Flags. Pin diagram of 8086-Minimum mode and maximum mode of operation and Timing Diagram.

**UNIT – II: INSTRUCTION SET OF 8086:**

Addressing modes of 8086. Assembler directives. Simple programs, procedures, and macros. Assembly language programs involving logical, Branch & Call instructions, sorting, evaluation of arithmetic expressions, string manipulation. Introduction to DOS and BIOS interrupts.

***Applications: Design of an 8-bit Calculator***

**UNIT – III: INTERFACING WITH 8086:**

Interfacing with RAMs, ROMs along with the explanation of timing diagrams. 8255 PPI – various modes of operation. Interfacing with key boards, ADCs, and DACs Stepper Motor .Interrupt structure of 8086. Vector interrupt table. Interrupt service routines. 8259 PIC Architecture and interfacing cascading of interrupt controller and its importance.

***Applications: Interfacing of a Temperature sensor with 8086***

**UNIT – IV: THE 8051 ARCHITECTURE:**

Architecture of 8051 Micro controller, Memory Organization. Special Function Registers. Input/Output Ports and Circuits, External Memory, Counter and Timers, Serial data Input/Output, Interrupts.

**UNIT – V: INSTRUCTION SET OF 8051:**

Data Transfer and Logical Instructions. Arithmetic Operations, Decimal Arithmetic, Jump and Call Instructions, Simple programs.

Programs based on Timer Interrupts, External Hardware Interrupts, Serial communication interrupts Timers and counters.

**UNIT – VI: APPLICATIONS OF 8051:**

Interfacing with keyboards, LEDs, 7 segment LEDs, LCDs, Interfacing with ADCs. Interfacing with DACs, Concept of Multiple Interrupts.

**TEXT BOOKS:**

1. Advanced microprocessor & Peripherals - A.K.Ray & K.M.Bhurchandi, TMH, 2000.
2. Microprocessors and interfacing – Douglas V. Hall, TMH, 2nd Edition, 1999.
3. 8051 Microcontroller–Kenneth J. Ayala, Penram International/ Thomson, 3rd Edition, 2005.
4. The 8051 Microcontroller And Embedded Systems Using Assembly And C – Mazidi, Pearson Education India, 2nd edition, 2008.

**REFERENCES:**

1. Micro computer systems, The 8086/8088 Family Architecture, Programming and Design – Y.Liu and G.A. Gibson, PHI, 2nd Edition.
2. 8051 Micro Controllers and Embedded Systems – Dr. Rajiv Kapadia, Jaico Publishers.

**III year B.Tech – II Sem**

**Code: 9A611 SWITCH GEAR AND PROTECTION**

**L T P C**

**3 - 3**

**Course Objective:**

To understand about power system transients and effects, over voltages, the need of protection of electric equipment and the schemes, switchgear equipment design. To understand operations & characteristics of various electromagnetic and static relays schemes and their application.

**Course Outcomes**

1. Understand about power system transients and its effects.
2. Learn about protection against over voltages.
3. Learn about different types of circuit breakers and its importance.
4. Learn about different types of electromagnet relays.
5. Learn about different types of static relays.
6. Learn about generator, transformer and feeder protection.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **SWITCH GEAR & PROTECTION (5A611)** | X |  | X | X |  |  |  |  | X |  |  |  | **X** | **X** |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | CO.1 | 3 |  | 3 | 2 |  |  |  |  | 3 |  |  |  | **3** | **3** |
| Unit – 2 | CO.2 | 3 |  | 3 | 2 |  |  |  |  | 3 |  |  |  | **3** | **3** |
| Unit – 3 | CO.3 | 3 |  | 3 | 2 |  |  |  |  | 3 |  |  |  | **3** | **3** |
| Unit – 4 | CO.4 | 3 |  | 3 | 2 |  |  |  |  | 3 |  |  |  | **3** | **3** |
| Unit – 5 | CO.5 | 3 |  | 3 | 2 |  |  |  |  | 3 |  |  |  | **3** | **3** |
| Unit – 6 | CO.6 | 3 |  | 3 | 1 |  |  |  |  | 3 |  |  |  | **3** | **3** |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT –I POWER SYSTEM TRANSIENTS**

Types of System Transients - Travelling or Propagation of Surges - Attenuation, Distortion, Reflection and Refraction Coefficients - Termination of lines with different types of conditions - Open Circuited Line, Short Circuited Line, T-Junction, Lumped Reactive Junctions (Numerical Problems), Bewley’s Lattice Diagrams (for all the cases mentioned with numerical examples).

**UNIT – II PROTECTION AGAINST OVER VOLTAGES:**

Generation of Over Voltages in Power Systems, Protection against Lightning Over Voltages ,Valve type and Zinc-Oxide Lighting Arresters, Insulation Coordination -BIL, Impulse Ratio, Standard Impulse Test Wave, Volt-Time Characteristics.

**UNIT – III CIRCUIT BREAKERS:**

Elementary principles of arc interruption, Restriking Voltage and Recovery voltages, Restriking Phenomenon, Average and Max. RRRV, Numerical Problems, Current Chopping and Resistance Switching, Types and Numerical Problems, Auto recloser’s.

Description and Operation of following types of circuit breakers: Minimum Oil Circuit breakers, Air Blast Circuit Breakers, Vacuum and SF6 circuit breakers, CB ratings and Specifications.

**UNIT – IV ELECTROMAGNETIC RELAYS:**

Principle of Operation and Construction of Attracted armature, Balanced Beam, Induction Disc and Induction Cup relays. Relays Classification, Instantaneous, DMT and IDMT types, Application of relays, over current, under voltage relays, Directional relays, Differential relays and Percentage Differential Relays.

Universal torque equation, Distance relays, Impedance, Reactance, Mho and Off-Set Mho relays, Characteristics of Distance Relays and Comparison

**UNIT – V STATIC RELAYS:**

Static Relays, Static Relays verses Electromagnetic Relays. Amplitude and phase comparators, coincidence type phase comparators, static over current relay, definite over current relay, static directional over current relay, static impedance relay, static reactance relay, advantages and disadvantages of static relays, Microprocessor based relays.

**UNIT – VI GENERATOR, TRANSFORMER, FEEDER AND BUS-BAR PROTECTION:**

Protection of generators against Stator faults, Rotor faults, and Abnormal Conditions. Restricted Earth fault and Inter turn fault Protection. Numerical Problems on % Winding Unprotected.

Protection of transformers, Percentage Differential Protection, Numerical Problem on Design of CT s Ratio, Buchholtz relay Protection.

Protection of Lines, Over Current, Carrier Current and Three-zone distance relay protection using Impedance relays, Translay Relay, Protection of Bus bars, Differential protection.

**TEXT BOOKS:**

1. Electrical Power Systems – C.L. Wadhwa, New Age international (P) Limited, Publishers, 3rd edition.

2. Protection and Switchgear - Bhavesh Bhalja, R. P. Maheshwari, N.G. Chothani, Oxford University Press, 1st edition.

3. Power System Protection and Switchgear – Badri Ram, D. N Viswakarma, TMH Publications.

**REFERENCES:**

1. Fundamentals of Power System Protection –Paithankar and S.R. Bhide.,PHI.

2. Art & Science of Protective Relaying – C R Mason, Wiley Eastern Ltd.

3. Switchgear and Protection – Sunil S Rao, Khanna Publlishers

4. A Text book on Power System Engineering – B.L. Soni, Gupta, Bhatnagar, Chakrabarthy, Dhanpat Rai & Co.

**III Year II Semester**

**Electrical and Electronics Engineering**

**UNIVERSAL HUMAN VALUES (UHV)**

**CODE: 9HC03**

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**Curricular Structure**

**Human Values Courses:** This course also discusses their role in their family. It, very briefly, touches issues related to their role in the society and the nature, which needs to be discussed at length in one more semester for which the foundation course named as “H-102 Universal Human Values 2: Understanding Harmony” is designed which may be covered in their III or IV semester. During the Induction Program, students would get an initial exposure to human values through Universal Human Values – I. This exposure is to be augmented by this compulsory full semester foundation course.

**OBJECTIVE:** The objective of the course is four fold:

1. Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence.

2. Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence

3. Strengthening of self-reflection.

4. Development of commitment and courage to act.

**COURSE TOPICS**: The course has 28 lectures and 14 practice sessions in 5 modules:

**Module 1: Course Introduction** - Need, Basic Guidelines, Content and Process for Value Education

1. Purpose and motivation for the course, recapitulation from Universal Human Values- I

2. Self-Exploration–what is it? - Its content and process; ‘Natural Acceptance’ and Experiential Validation- as the process for self-exploration

3. Continuous Happiness and Prosperity- A look at basic Human Aspirations

4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority

5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario

6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels.

Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking.

**Module 2: Understanding Harmony in the Human Being** - Harmony in Myself!

7. Understanding human being as a co-existence of the sentient ‘I’ and the material ‘Body’

8. Understanding the needs of Self (‘I’) and ‘Body’ - happiness and physical facility

9. Understanding the Body as an instrument of ‘I’ (I being the doer, seer and enjoyer)

10. Understanding the characteristics and activities of ‘I’ and harmony in ‘I’

11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail

12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one’s own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

**Module 3: Understanding Harmony in the Family and Society**- Harmony in Human-Human Relationship

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship

14. Understanding the meaning of Trust; Difference between intention and competence

15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship

16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals

17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family.

Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students’ lives.

**Module 4: Understanding Harmony in the Nature and Existence** - Whole existence as Coexistence

18. Understanding the harmony in the Nature

19. Interconnectedness and mutual fulfilment among the four orders of nature- recyclability and self-regulation in nature

20. Understanding Existence as Co-existence of mutually interacting units in all-pervasive space

21. Holistic perception of harmony at all levels of existence.

Include practice sessions to discuss human being as cause of imbalance in nature (film “Home” can be used), pollution, depletion of resources and role of technology etc.

**Module 5: Implications of the above Holistic Understanding**

22. Natural acceptance of human values

23. Definitiveness of Ethical Human Conduct

24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order

**Module 6: Harmony on Professional Ethics**

25. Competence in professional ethics:

a. Ability to utilize the professional competence for augmenting universal human order

b. Ability to identify the scope and characteristics of people-friendly and eco-friendly production systems,

c. Ability to identify and develop appropriate technologies and management patterns for above production systems.

26. Case studies of typical holistic technologies, management models and production systems

27. Strategy for transition from the present state to Universal Human Order:

a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers

b. At the level of society: as mutually enriching institutions and organizations

28. Sum up.

Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions eg. to discuss the conduct as an engineer or scientist etc.

**3. READINGS:**

**TEXT BOOK**

1. Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010

**REFERENCE BOOKS**

1.Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.

2.Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.

3.The Story of Stuff (Book).

4.The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi

5.Small is Beautiful - E. F Schumacher.

6.Slow is Beautiful - Cecile Andrews

7.Economy of Permanence - J C Kumarappa

8.Bharat Mein Angreji Raj - PanditSunderlal

9.Rediscovering India - by Dharampal

10.Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi

11.India Wins Freedom - Maulana Abdul Kalam Azad

12.Vivekananda - Romain Rolland (English)

13.Gandhi - Romain Rolland (English)

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| **H** |  | **M** |  |  |  |  |  |  |  |  | **L** |

**H: High M: Medium L: Low**

**B. Tech. II Year I semester**

**Electrical and Electronics Engineering**

**Code: 9EC42 PROGRAMMING IN JAVA**

**(OPEN ELECTIVE- I)**

**L T P/D C**

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**Course Objective:**

Understand the concepts of Object oriented programming principles of Java. Write the programs and execute using OOP principles such as garbage collection, overloading methods, constructors, recursion, string handling, String Tokenizer, inheritance and its types, packages, multithreading and threads.

### Course Outcomes:

1. Understand the concept of OOP with the need of constructing objects, and classes. Write programs using classes, objects, members of a class and the relationships among them needed for a speciﬁc problem.
2. Identify the purpose and usage of principles of inheritance and polymorphism. Implement concepts of polymorphism, encapsulation and method overloading.
3. Create Java application programs using sound OOP practices (e.g., interfaces and APIs) and proper program structuring (e.g., by using access control identiﬁers, automatic documentation through comments)
4. Students understand and implement error exception handling and multi- threading.
5. Students learn to create GUI for the specific applications.
6. Write programs for event-handling using various user interface components on applets.

UNIT-I

History of Java, Java buzzwords, data types, variables, simple java program, scope and life time of variables, operators, expressions, control statements, type conversion and costing, arrays, classes and objects – concepts of classes, objects, constructors, methods, access control, this keyword, overloading methods and constructors, string handling, String Tokenizer.

UNIT-II

Inheritance: Definition, single inheritance, benefits of inheritance, Member access rules, super class, polymorphism- method overriding, Dynamic method dispatch, using final with inheritance, abstract class, Base class object.

UNIT-III

Interfaces: definition, variables and methods in interfaces, differences between classes and interfaces, usage of implements and extends keyword, uses of interfaces.

Packages: Definition, types of packages, Creating and importing a user defined package. Applications using interface

UNIT-IV

Exception handling -exception definition, benefits of exception handling, exception hierarchy, usage of try, catch, throw, throws and finally, built in exceptions, creating user defined exceptions.

Multi-Threading: Thread definition, types of multitasking, uses of multitasking, thread life cycle, creating threads using Thread class and Runnable interface, synchronizing threads, daemon thread.

Applications of multithreading.

UNIT-V

Advantages of GUI over CUI ,The AWT class hierarchy, Component, Frame, user interface components- labels, button, scrollbars, text components, check box, check box groups, choices, lists panels – scroll pane, menu bar, graphics, layout, managers –boarder, grid, flow and card layouts.

Applications: developing calculator, developing feedback form, developing biodata. UNIT-VI

Event handling: Delegation event model, closing a Frame, mouse and keyboard events, Adapter classes.

Applets – Concepts of Applets, differences between applets and applications, life cycle of an applet, types of applets, creating applets, passing parameters to applets.

Applications: Developing of simple advertisements.

#### TEXT BOOKS

1. Java; the complete reference, 6th editon, Herbert schildt, TMH.
2. Introduction to Java programming 6th edition, Y. Daniel Liang, pearson education.

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**III Year B.Tech EEE - II Sem**

**CODE: 9ZC22 BASICS OF ENTREPRENEURSHIP**

**(OPEN ELECTIVE-I)**

**Course Objective:** The objective of the course is to make students understand the nature of Entrepreneurship, and its importance to business to the engineering students, which will allow them to get the required intuition and interest in starting their own start-up’s

**Course Outcomes:**

1. The students’ will acquire basic knowledge on Skills of Entrepreneurship.
2. The students’ will understand the techniques of selecting the customers through the process of customer segmentation and Targeting
3. Business Models and their validity are understood by the students’.
4. The basic cost structure, Revenue Streams and the pricing strategies are understood by the students’.
5. The students’ will acquire knowledge about the project management and its techniques.
6. The students’ get exposure on marketing strategies and business regulations for the Start up.

**Unit – I: Introduction to Entrepreneurship & Self Discovery:**

Define Entrepreneurship, Entrepreneurship as a Career option, Find your Flow, Stock of Your Means, Characteristics, Qualities and Skills of Entrepreneurship, Effectuation, Principles of Effectuation, Life as an Entrepreneur, Stories of Successful Entrepreneurs.

**Unit – II: Opportunity & Customer Analysis:**

Identify your Entrepreneurial Style, Methods of finding and understanding Customer Problems, Run Problem Interview, Process of Design Thinking, Identify Potential Problems worth Solving, Customer Segmentation, Niche Marketing and Targeting, Craft your Values Proportions, Customer-driven Innovation.

**Unit – III: Business Model & Validation:**

Introduction to Business Models, Lean approach to Business Model Canvas, Blue and Red Ocean Strategies, the Problem-Solution Fit, Build your Solution Demo, Solution Interview Method, Identify Minimum Viable Product (MVP), Product-Market fit test.

**Unit – IV: Economics & Financial Analysis:**

Revenue Analysis, Identify different Revenue Streams and Costs Analysis – Startup Cost, Fixed Cost and Variable Cost, Break Even Analysis, Profit Analysis, Introduction to Pricing, different Pricing Strategies, Sources of Finance, Bootstrapping and Initial Financing, Practice pitching to Investors and Corporate.

**Unit – V: Team Building & Project Management:**

Leadership Styles, Shared Leadership Model, Team Building in Venture, Roles and Responsibilities of team in venture, Explore collaboration tools and techniques, Brainstorming, Introduction to Project Management, Project Life Cycle, Create a Project Plan.

**Unit – VI: Marketing & Business Regulations:**

Positioning, Positioning Strategies, Branding, Branding Strategies, Selecting and Measuring Channels, Customer Acquisition, Selling Process, Selling Skills, Sales Plans. Business regulations – List of Required Registrations, Compliance Check List, Business Structures and Legal Entities.

**REFERENCES:**

1. Robert D Hisrich, Michael P Peters, Dean A Shepherd, Entrepreneurship, Sixth Edition, New Delhi, 2006.
2. Thomas W. Zimmerer, Norman M. Scarborough, Essentials of Entrepreneurship And Small Business Management, Fourth Edition, Pearson, New Delhi, 2006
3. Alfred E. Osborne, Entrepreneur’s Toolkit, Harvard Business Essentials, HBS Press, USA, 2005.
4. MadhurimaLall, ShikhaSahai, Entrepreneurship, Excel Books, First Edition, New Delhi, 2006.
5. S.S. Khanka, Entrepreneurial Development, S. Chand and Company Limited, New Delhi, 2007.
6. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
7. S.R. Bhowmik, M. Bhowmik, Entrepreneurship-A tool for Economic Growth   And A   
    key to Business Success, New Age International Publishers, First Edition,  (formerly   
    Wiley Eastern Limited), New Delhi, 2007.

* *https://www.wfglobal.org/*
* [*https://www.learnwise.org/#/IN/en/home/login*](https://www.learnwise.org/#/IN/en/home/login)*,*

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**III Year B.Tech EEE - II Sem**

**CODE: 9ZC05 BANKING OPERATIONS, INSURANCE AND RISK MANAGEMENT**

**(OPEN ELECTIVE-I)**

**Course Objective:** To make the students understand the concepts and principles of Indian Banking Business, Insurance Business and Capital market business products and services, which facilitate them to understand the nature of market

**Course Outcomes:**

1. Describe the new dimensions and products served by the banking system in INDIA.
2. Explain the credit control system and create awareness on NPA’s
3. Apply the knowledge of Insurance concepts in real life scenarios
4. Recognize the importance of regulatory and legal frame work of IRDA
5. Identify the risk management process and methods.
6. Calculate the diversity of risk and return

**UNIT I: INTRODUCTION TO BANKING BUSINESS:**

Introduction to financial services - History of banking business in India, Structure of Indian banking system: Types of accounts, advances and deposits in a bank. KYC norms, New Dimensions and products- E-Banking: Mobile-Banking, Net Banking, Digital Banking, Negotiable Instruments: Cheque system.

**UNIT II: BANKING SYSTEMS AND ITS REGULATION:**

**Banking Systems:** Branch Banking, Unit Banking, Correspondent Banking, Group Banking, Deposit Banking, Mixed Banking and Investment Banking - Banking Sector Reforms with special reference to Prudential Norms, Capital Adequacy Norms, Classification of Assets and NPA’s, Functions of RBI, Role of RBI in regulating Indian Banking. Banking Ombudsman scheme.

**UNIT III: INTRODUCTION TO INSURANCE:**

Introduction to insurance, Need and importance of insurance, principles of insurance, characteristics of insurance contract, branches of insurance and types of insurance: Life insurance and its products, General Insurance and its variants.

**UNIT IV: INSURANCE BUSINESS ENVIRONMENT:**

Procedure for issuing an insurance policy –Nomination - Surrender Value - Policy Loans – Assignment - Revivals and Claim Settlement; Insurance as a tax mitigation tool, Role of IRDA in Insurance Regulation.

**UNIT V: FINANCIAL MARKETS AND RISK MANAGEMENT:**

Introduction to Financial Markets: Money Market – Capital market; Introduction to Risk Management, meaning and classification of risks, Risk management process, Risk Management Approaches and Techniques.

**UNIT VI: DERIVATIVES AS A RISK MANAGEMENT TOOL:**

Introduction to Financial Derivatives, Advantages of Derivatives - types of Derivative Contracts - Forwards, Futures, Options and Swaps - Differences among Forwards, Futures and Option Contracts.

**REFERENCES:**

1. Varshney, P.N., Banking Law and Practice, Sultan Chand & Sons, New Delhi.
2. General Principles of Insurance Harding and Evantly
3. Mark S. Dorfman: Risk Management and Insurance, Pearson, 2009.
4. Scott E. Harringam Gregory R. Nichanus: Risk Management & Insurance, TMH, 2009.
5. Geroge E. Rejda: Principles of risk Management & Insurance, 9/e, pearson Education. 2009.
6. G. Koteshwar: Risk Management Insurance and Derivatives, Himalaya, 2008.

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**LL T P/D C**

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**III Year B.Tech EEE - II Sem**

**CODE: 9ZC25 BASICS OF INDIAN ECONOMY**

**(Common to all Branches)**

**(OPEN ELECTIVE-I)**

**Course objectives:** To provide basic knowledge relating to the Indian Economy thus making the students aware of the current aspects taking place in the Indian and world economy.

**Course Outcomes**:

1. Gain knowledge relating to Economics, various sectors and its growth
2. Will gain knowledge relating to various concepts of National income and related aggregates
3. Students will learn about Indian Industrial policy and benefits of LPG to India
4. Comprehend knowledge relating to Fiscal policy & Taxation system in India
5. Learn about inflation & business cycles.
6. Know about the BoP and its influence on economy.

**UNIT 1:** **INTRODUCTION TO ECONOMICS**:

Definition, Economics and economy, back ground of economy, sectors of the economy, types of economy, growth of economy, primary moving force of Economic growth in India, mixed economy.

**UNIT 2: NATIONAL INCOME AND RELATED AGGREGATES**

Aggregates related to National Income: Gross National Product (GNP), Net National Product (NNP), Gross and Net Domestic Product (GDP and NDP) - at market price, at factor cost; National Disposable Income (gross and net), Private Income, Personal Income and Personal Disposable Income; Real and Nominal GDP.

**UNIT 3: INDUSTRIAL POLICY & LIBERALIZATION OF ECONOMY**

Industrial policy in India, its objectives, Review of Industrial policies up to 1986, Industrial policy 1991 - causes of its implementation, benefits of Liberalization, privatization & Globalization to the Indian economy.

**UNIT 4: FISCAL POLICY & TAXATION SYSTEM**

Fiscal policy- Definition, objectives, importance, setbacks, recent fiscal policy of India, Reforms to strengthen the fiscal policy in India. Taxation system in India, methods of taxation, a good tax system, VAT, GST, Reforms in taxation.

**UNIT 5: INFLATION & BUSINESS CYCLES**:

Inflation – Definition, types, effects of inflation on various segments of the population and sectors of the economy, measures to control inflation, Business cycles: Introduction, Depression, Recovery, Boom, and Recession.

**UNIT 6: BALANCE OF PAYMENTS**

Balance of payments account - meaning and components; balance of payments deficit-meaning. Foreign exchange rate - meaning of fixed and flexible rates and managed floating. Determination of exchange rate in a free market

**REFERENCES:**

1. Indian Economy, Datt & Mahajan, 70th Edition, Sultan Chand publishers.
2. Indian Economy, Misra & Puri, 33rd Edition, Himalaya publishing house.
3. Latest Budget document by Ministry of Finance
4. Latest Economic survey
5. 12th Five year plan
6. News articles in The Hindu, The Business Line

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**L TL T P C**

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**III year B.Tech – II Sem**

**CODE: 9ZC08** **DESIGN LITERACY AND DESIGN THINKING**

**(OPEN ELECTIVE – I)**

**Course Objective:** The objective of the course is to make students understand the fundamental concepts of design thinking, and to familiarize with product design process and to motivate the students to ideate new products and services.

**Course Outcomes:**

1. The students gain the knowledge on the inputs required for design thinking and also gain familiarity on concepts related to design thinking.
2. The students learn the techniques of idea generation
3. The students gain knowledge on different phases of design thinking
4. The students realize the product design process.
5. The students gain familiarity on design thinking for service design.
6. The students gain knowledge on various cases related to design thinking.

**Unit – I: DESIGN THINKING –** Introduction to Design thinking, Principles of design thinking, Benefits of design thinking, Applications of Design thinking, Social Innovation, Impact of Design thinking, Design thinking tools and techniques. Innovation and Design thinking.

**Unit – II: IDEA GENERATION**: New Idea generation methods - Principles of Idea Generation, Techniques, Creativity thinking techniques and tools, types of creative thinking, select ideas from ideation methods.

**Unit – III: DESIGN THINKING FOUNDATIONS:** The Design Double Diamond: Discover-Define-Develop-Deliver, User-centric design approaches: Importance of user-centricity for design, Empathisation, Empathy Maps, Data collection from users and for users, Data Validation Responsible Innovation and Ethical Design:

**Unit – IV: PRODUCT DESIGN PROCESS**: Identification of opportunities, Problem Statement, Product planning, Characteristics of Successful product Development, New product development process, Stanford design thinking iterative model

**Unit – V:DESIGN THINKING FOR SERVICE DESIGN:** Attributes of a good service design, service design tools – blueprint, customer journey mapping Identifying the user needs in a service-driven economy; Process Flows and Customer Experience considerations for designing and improving services; 5 Why‟s; Service Delivery Pathways

**Unit – VI: CASE STUDIES ON DESIGN THINKING:** Case 1: Arcturus IV by John E. Arnold, Case – 2: How can we make AI to make things better for humans. Case – 3: User Centered Helmet Design by Prof. B.K. Chakravarthy- Part 1 and Part 2; Case – 4: Challenges of Reaching a Million Users by Prof. Chetan Solanki and Prof Jayendran V.

**TEXT BOOKS:**

1. Brown, T. (2008). Design thinking. *Harvard business review*, *86*(6), 84.
2. “Innovation by Design", Gerald H. (Gus) Gaynor, AMACOM {American Management Association), NYC, 2002
3. Ansell, C., &Torfing, J. (2014). Collaboration and design: new tools for public innovation. In *Public innovation through collaboration and design* (pp. 19-36). Routledge.
4. Lewrick, M., & Link, P. (2015). Design thinking tools: Early insights accelerate marketers’success. *Marketing Review St. Gallen*, *32*(1), 40-51.

**REFERENCES:**

1. Mæhlum, A. R. (2017). *Extending the TILES Toolkit-from Ideation to Prototyping* (Master's thesis, NTNU).
2. Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic books.
3. Design Thinking – A primer,Prof: Dr. BalaRamadurai, Indian Institute of Technology, Madras.

**Websites:**

1. [**www.smashingmagazine**](http://www.smashingmagazine) **.com**
2. **www.ID**

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**H: High M: Medium L: Low**

**B. Tech. III Year II semester**

**Electrical and Electronics Engineering**

**Code: 9BC04 ELEMENTS of MECHANICAL ENGINEERING**

(Common to All Branches except Mechanical Engineering)

**L T P/D C**

2 **-- -- 2**

**Course Objectives:**

*The main objective of the course is to offer the students fundamental knowledge of* First Law of Thermodynamics*. Working of SI and CI engines, working principle of different types of Turbines& pumps. properties of material and engineering application. Working principles of various types of power transmission systems*

**COURSE OUTCOMES:**

At the end of basic mechanical engineering a student should be able to

1. To acquire the knowledge of basic concepts of thermodynamics and analyze the p-v & t-s diagrams of the different cycles.
2. To acquire the knowledge two and four stroke engines, the function of components used in the steam power plant
3. To identify & understand the function of components used in VCR & VAR system, & about the working of hydraulic pumps & hydraulic turbines.
4. To identify & understand *properties of material and engineering application*
5. To acquire the knowledge *of various types of power transmission systems*
6. To acquire the knowledge the different NC and CNC machine.

**UNIT – I: ENERGY RESOURCES AND CONVERSION:**

Basic concepts of Thermodynamics – general classification of heat engines, Property and state, System, Boundary and surroundings, Zeroth Law, First Law of Thermodynamics and its applications- Joule’s experiment, reversible non-flow processes-Constant volume, constant pressure, constant temperature process, polytropic process, Second Law of Thermodynamics – Statements, Heat engines, Carnot cycle, Air standard cycles – Otto, Diesel Cycles.

**UNIT-II: INTERNAL COMBUSTION ENGINES:**

Internal combustion engines, definition, classification, components, working of four stroke cycle engines, SI and CI Engines, Performance parameters, Need for cooling, and lubrication of IC engines.

**Steam Power plant, Boiler, Steam Turbines:** Layout of steam power plant, Water tube and Fire tube Boilers: - Simple cross-tube boiler, Cochran, Babcock and Wilcox Boiler and High Pressure Boilers. (Benson & La-mount only).

**UNIT- III:**

1. **HYDRAULIC PUMPS & TURBINES:-** Centrifugal Pumps, Pelton wheel, Francis turbine and Kaplan Turbine -- Layout of Hydro electric power plant

b) **REFRIGERATION & AIR CONDITIONING SYSTEMS: -** Description of Vapour Compression and Vapour Absorption systems

**UNIT-IV: ENGINEERING MATERIALS:**

Classification, mechanical properties, Ferrous Materials – Constituents of Cast Iron & types of Cast Iron, Steels – manufacture by Bessemer converter, Arc furnace, types of steel, effect of alloying elements on steel, Stainless steel, Non- Ferrous Materials: Properties and applications of Aluminum & alloys, Copper and alloys, composite materials – types, fabrication methods, Ceramics – Properties and applications

**UNIT-V: TRANSMISSION OF MOTION AND POWER:**

Shafting, Belt drive, types of belt drive, types of belts, chain drives, types of chain drive, Pulleys, parts, types of pulleys, gear drive- classification, Terminology of spur gear, Gear trains – simple and compound, Clutches – purpose and basic principle of contact clutch, brakes - purpose and basic principle of block brake.

**UNIT-VI: ROBOT AND SENSORS:**

Introduction, definition, Robot component, **CNC Machine tools** – Introduction, Machine control, Vertical and Horizontal spindles, CNC drill, mill, boring and tapping, Adaptive control, NC and CNC turning centres.

**TEXT BOOKS:**

1. Mathur, M.L., Mehta, F.S. and Tiwari, R.P., Elements of Mechanical Engineering, Jain Brothers, New Delhi, 2005.

2. R.K. Rajput, “Elements of Mechanical Engineering”, Laxmi Publications, 1994.

**IV year B.Tech – I Sem**

**Code: 9A615 RENEWABLE ENERGY SOURCES**

**(Professional Elective – II)**

**L T P C**

**3 - 3**

**Course Objectives:**

Becomes familiar with solar energy, its radiation, Collection, storage and application and also gets introduced to other forms of Renewable Energy sources viz., the Wind energy, Biomass energy, geothermal energy and ocean energy.

**Course Outcomes:**

The student should be able to

1. Understand the role and potential of new and renewable energy sources realize the potential of solar energy, its impact on environment; define and understand the terms describing the different angles that one may incur in setting up a solar panel and be able to use the instruments for measuring solar radiation.
2. Demonstrates the knowledge of different techniques of solar collection and storage.
3. The student becomes familiar with the different types of horizontal and vertical axis wind mills and understands the performance characteristics of the same. The student also demonstrates the knowledge of different Bio-gas digesters and factors influencing its yield.
4. Aware of the potential of geothermal energy in India and will be able to characterize different types of geothermal wells.
5. Aware of the different methods of kinetic energy extraction from Ocean waves and tides and thermal energy extraction from Oceans.
6. Demonstrates the knowledge of Direct Energy Conversion in different phenomena viz., Joule Thomson effect, Seebeck effect, Peltier effect etc. and the principle of operation of Fuel Cells.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **Renewable Sources of Energy (RSE)** | X | X | X |  | X | X | X |  | X | X | X | X | X | X |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | Principles of Solar Radiation | 3 | 3 | 2 |  |  | 1 | 2 |  | 3 | 1 |  |  | 1 | 3 |
| Unit – 2 | Solar energy collection storage and applications | 3 | 3 | 3 | 1 | 2 | 3 | 2 | 1 | 1 |  |  | 2 | 1 | 3 |
| Unit – 3 | Wind energy and Bio mass | 3 | 3 | 3 |  | 2 | 2 | 2 |  | 1 |  |  | 2 | 1 | 3 |
| Unit – 4 | Geothermal Energy | 3 | 3 | 3 |  |  | 2 | 2 |  |  |  |  |  | 1 | 3 |
| Unit – 5 | OCEAN Energy | 3 | 3 | 3 |  |  | 2 | 2 |  |  |  |  |  | 1 | 3 |
| Unit – 6 | Direct Energy Conversion | 3 | 3 | 3 | 1 | 2 | 2 | 2 | 1 | 1 | 1 |  | 2 | 1 | 3 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I -PRINCIPLES OF SOLAR RADIATION**:

Role and potential of new and renewable source, The solar energy option, Environmental impact of solar power, Physics of the sun, the solar constant, Extraterrestrial and terrestrial solar radiation, Solar radiation on titled surface, Instruments for measuring solar radiation and sun shine, Solar radiation data.

**UNIT-II- SOLAR ENERGY COLLECTION STORAGE AND APPLICATIONS**: Flat plate and concentrating collectors, Classification of concentrating collectors, orientation and thermal analysis, advanced collectors.

Different methods, Sensible, Latent heat and stratified storage, solar ponds. Solar Applications- solar heating/cooling technique, solar distillation and drying, photovoltaic energy conversion.

**UNIT – III WIND ENERGY**:

Sources and potentials, Horizontal and vertical axis windmills, Performance characteristics, Betz criteria

**BIO-MASS**: Principles of Bio-Conversion, Anaerobic/aerobic digestion, Types of Bio-gas digesters, Gas yield, Combustion characteristics of bio-gas, Utilization for cooking, I.C. Engine operation and economic aspects.

**UNIT – IV GEOTHERMAL ENERGY**:

Resources, types of wells, methods of harnessing the energy, Potential in India.

**UNIT-V OCEAN ENERGY**:

OTEC, Principles utilization, Setting of OTEC plants, Thermodynamic cycles. Tidal and wave energy, Potential and conversion techniques, Mini-hydel power plants and their economics.

**UNIT-VI DIRECT ENERGY CONVERSION**:

Need for DEC, Carnot cycle, Limitations, principles of DEC. Thermoelectric generators, seebeck, Peltier and joul Thomson effects, Figure of merit, materials, Applications, MHD generators, Principles, Dissociation and ionization, Hall effect, Magnetic flux, MHD accelerator, MHD Engine, Power generation systems, Electron gas dynamic conversion, economic aspects. Fuel cells – principles - Faraday’s law’s - Thermodynamic aspects - selection of fuels and operating conditions.

**TEXT BOOKS:**

1. Non-Conventional Energy Sources - G.D. Rai

2. Renewable Energy Technologies - Ramesh & Kumar /Narosa.

**REFERENCES:**

1. Renewable energy resources - Tiwari and Ghosal/ Narosa.

2. Non-Conventional Energy - Ashok V Desai /Wiley Eastern.

3. Non-Conventional Energy Systems - K Mittal /Wheeler

4. Solar Energy - Sukhame

**L T P/D C**

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**IV Year B.Tech – I Sem**

**CODE: 9CC09 DIGITAL SIGNAL PROCESSING**

**(PROFESSIONAL ELECTIVE-II)**

***Course objectives***: To develop skills for analyzing and synthesizing algorithms and systems that process discrete time signals, with emphasis on realization and implementation.

***Course outcomes****:*

1. *Distinguish between CT and DT signals and systems and understand the growing need of DSP and study the concepts of discrete time signals and systems.*
2. *Represent periodic DT signals as a Fourier series; non-periodic DT signals as a Fourier Transform and use a powerful mathematical tool called DFT.*
3. *Compute the Fourier Transform of DT signals using the FFT algorithms.*
4. *Realize a digital IIR filter in several forms and structures for a given transfer function H(z)and can design IIR filter as per specifications .*
5. *Design of digital FIR filters by several methods as per the given specifications and can realize FIR Filter*
6. *Understand the need and implement the multirate sampling techniques.*

***Mapping of Course Outcomes with Program Outcomes***

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|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 | PSO3 |
| CO1 | 2 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 3 | 3 | 3 |  |
| CO2 | 2 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |  |
| CO3 | 1 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |  |
| CO4 | 2 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |  |
| CO5 | 1 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 | 3 |
| CO6 | 1 | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 | 3 |
| Overall |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 3 | 3 | 3 | 3 |

**UNIT I : INTRODUCTION:**

Introduction to Digital Signal Processing: Discrete time signals & sequences, Periodicity, linear shift invariant systems, stability, and causality, Linear constant coefficient difference equations, Block diagram representation of linear constant-coefficient difference equations, Frequency domain representation of discrete time signals and systems.

**Applications: Contents form the foundation for DSP.**

**UNIT II : DISCRETE FOURIER TRANSFORM:**

Discrete Fourier series representation of periodic sequences, Discrete-Time Fourier Transform(DTFT), Discrete Fourier transform (DFT): Properties of DFT, Relation between Z-transform and DFT, Convolution: Linear and circular convolutions, Overlap add and Overlap save methods, Computation of DFT.

**Applications: Analysis of DT signals-Periodic and Aperiodic.**

**UNIT III: FAST FOURIER TRANSFORMS:**

Fast Fourier transforms (FFT) - Radix-2 decimation in time and decimation in frequency FFT Algorithms, Inverse FFT.

**Applications: Design of spectrally efficient system such as OFDM system.**

**UNIT IV: DIGITALIIR FILTERS**:

ANALOG FILTER APPROXIMATIONS – Butterworth and Chebyshev Approximations.

IIR DIGITAL FILTERS: Design of IIR Digital filters from analog filters-Impulse Invariance, Step invariance and Bilinear Transformation methods, Design Examples, Analog-Digital transformations.Basic structures of IIR systems, Transposed forms,

**Applications: Design of IIR digital filter conforming to given specifications.**

**UNITV: DIGITALFIR FILTERS**:

FIR DIGITAL FILTERS:Characteristics of FIR Digital Filters, frequency response, Design of FIR Digital Filters using Fourier series method, Windowing Techniques-Rectangular, Triangular, Hamming, Hanning and Bartlett’s Windows, Steps in Kaiser windowing method, Frequency Sampling technique, Comparison of IIR and FIR filters.Basic structures of FIR systems

**Applications: Design of FIR digital filter conforming to given specifications.**

**UNIT VI: MULTIRATE DIGITAL SIGNAL PROCESSING**:

Decimation, interpolation, sampling rate conversion. Introduction to DSP Processors.

**Applications of Multirate Digital Signal processing: Design of digital filter banks and quadrature mirror filters etc**.

**TEXT BOOKS:**

1. Digital Signal Processing – Alan V. Oppenheim, Ronald W. Schafer, PHI Ed., 2006
2. Digital Signal Processing, Principles, Algorithms, and Applications: John G. Proakis, Dimitris G. Manolakis, Pearson Education / PHI, 2007.
3. Digital Signal Processing: A Modern Introduction, Ashok Ambardar, 9th Indian Reprint, 2012, Cengage Learning.

**REFERENCE BOOKS:**

* + - 1. Digital Signal Processing: Andreas Antoniou, TATA McGraw Hill , 2006
      2. Digital Signal Processing: MH Hayes, Schaum’s Outlines, TATA Mc-Graw Hill, 2007.
      3. DSP Primer - C. Britton Rorabaugh, Tata McGraw Hill, 2005.
      4. Fundamentals of Digital Signal Processing using MatLab – Robert J. Schilling, Sandra L. Harris, Thomson, 2007

5. Discrete Time Signal Processing – A.V.Oppenheim

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**IV Year B.Tech – I Sem.**

**Code: 9A624 DIGITAL CONTROL SYSTEMS**

**(Professional Elective – II)**

**L T P C**

**3 - - 3**

**Objective:**

This subject deals with different mathematical methods of optimization.

**Course outcomes:**

Students will be able to

1. Understand the Sampling And Reconstruction.
2. Understand the Z – Transforms.
3. Understand the State Space Analysis.
4. Know about Stability Analysis.
5. Understand the Design Of Discrete Time Control System By Conventional Methods.
6. Study about State Feedback Controllers And Observers.

**UNIT – I SAMPLING AND RECONSTRUCTION**

Introduction, Examples of Data control systems – Digital to Analog conversion and Analog to Digital conversion, sample and hold operations.

**UNIT-II THE Z – TRANSFORMS**

Introduction, Linear difference equations, pulse response, Z – transforms, Theorems of Z – Transforms, the inverse Z – transforms, Modified Z- Transforms.

**Z-PLANE ANALYSIS OF DISCRETE-TIME CONTROL SYSTEM**

Z-Transform method for solving difference equations; Pulse transforms function, block diagram analysis of sampled – data systems, mapping between s-plane and z-plane.

**UNIT – III STATE SPACE ANALYSIS**

State Space Representation of discrete time systems, Pulse Transfer Function Matrix solving discrete time state space equations, State transition matrix and its Properties, Methods for Computation of State Transition Matrix, Discretization of continuous time state – space equations.

**CONTROLLABILITY AND OBSERVABILITY**

Concepts of Controllability and Observability, Tests for controllability and Observability. Duality between Controllability and Observability, Controllability and Observability conditions for Pulse Transfer Function

**UNIT – IV STABILITY ANALYSIS**

Mapping between the S-Plane and the Z-Plane – Primary strips and Complementary Strips – Constant frequency loci, Constant damping ratio loci, Stability Analysis of closed loop systems in the Z-Plane. Jury stability test – Stability Analysis by use of the Bilinear Transformation and Routh Stability criterion.

**UNIT– V DESIGN OF DISCRETE TIME CONTROL SYSTEM BY CONVENTIONAL METHODS**

Transient and steady – State response Analysis – Design based on the frequency response method – Bilinear Transformation and Design procedure in the w-plane, Lead, Lag and Lead-Lag compensators and digital PID controllers.

**UNIT – VI STATE FEEDBACK CONTROLLERS AND OBSERVERS**

Design of state feedback controller through pole placement – Necessary and sufficient conditions, Ackerman’s formula. State Observers – Full order and Reduced order observers.

**TEXT BOOKS:**

1. Discrete-Time Control systems - K. Ogata, Pearson Education/PHI, 2nd Edition

**REFERENCES:**

1. Digital Control Systems, Kuo, Oxford University Press, 2nd Edition, 2003.

2. Digital Control and State Variable Methods by M.Gopal, TMH.

**IV Year B.Tech – I Sem.**

**Code: 9A637 ADVANCED POWER ELECTRONICS**

**(Professional Elective – II)**

**L T P C**

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**Course Objective:**

• To introduce students to the basic theory of advanced power semiconductor devices and their practical applications in power electronics.

• To familiarize students to the principle of operation, design and synthesis of different power conversion circuits and their applications.

• To provide strong foundation for further study of power electronic circuits and systems.

**Course Outcomes:**

*At the end of the course, a student will be able to:*

**1. Relate** semiconductor physics to properties of modern power semiconductor devices, and **combine** circuit mathematics and characteristics of linear and non‐linear devices.

**2. Describe** basic operation and **compare** performance of various phase controlled rectifiers.

**3. Design** and **Analyze DC-DC** power converter circuits and learn to **select** suitable power electronic devices by **assessing** the requirements of application fields.

**4. Formulate** and **analyze** a power electronic design at the system level and **assess** the performance of isolated converters.

**5. Identify** the critical areas in application levels and **derive** typical alternative solutions, **select** suitable power converters to control Electrical Motors and other industry grade apparatus.

**6. Recognize** the role power electronics play in the improvement of energy usage efficiency and the **applications** of power electronics in emerging areas.

**UNIT – I - MODERN POWER SEMICONDUCTOR DEVICES:**

Modern power semiconductor devices- MOS turn off Thyristor (MTO)-Emitter Turn off Thyristor (ETO) – Integrated Gate- Commutated Thyristor (IGCT) – MOS – controlled Thyristors (MCTs) – Static Induction Circuit – comparison of their features.

**UNIT – II - PHASE CONTROLLED RECTIFIERS:**

Principle of phase controlled converter operation, single phase full converters, dual converters, three phase full and semi converters, reactive power, power factor improvements – extinction angle control, symmetrical angle control and PWM control.

**UNIT – III - DC-DC CONVERTERS:**

Study of class – A, B, C, and D choppers, non – isolated DC-DC converters, buck boost, buck-boost converters under continuous and discontinuous conduction operation.

**UNIT – IV – ISOLATED DC-DC CONVERTERS:**

Isolated DC-DC converters forward, fly-back, push-pull, half-bridge and full –bridge converters Relationship between I / P and O/P voltages. Expression for filter inductor and capacitors.

**UNIT – V** - **INVERTERS:**

Single phase and three – phase inverters, 1200 and 1800 modes of operation, PWM techniques: single, multiple and sinusoidal PWM techniques, selective harmonic elimination, space vector modulation, current source inverter, multi- Current source inverter, techniques for reduction of harmonics.

**UNIT –VI – MULTILEVEL INVERTERS:**

Diode clamped multi level inverters, capacitors clamped multilevel inverters, cascaded H bridge inverter, SPWM, SVPWM and other modulation techniques, applications of multilevel inverters, techniques for reduction for harmonics.

**TEXT BOOKS:**

1. Power Electronics – Circuits, Devices & Applications: M.H.Rashid, PHI

2. Power Electronics: Converters, Applications: Ned Mohan, T.M. Undeland, William P.Robbins, John Wiley & Sons.

**REFERENCES:**

1. Switch Mode Power Supply Handbook: Keith H.Billing, MC Graw Hill International Edition 1996.

2. Switching Power supply Design: Abrahan L.Pressman, Mc.Graw Hill International Second Edition, 1996.

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| **B. Tech III Year II semester** | | | | | | |
| **Year/Sem** | **Sub. Code** | **Subject Name** | **L** | **T** | **P/D** | **C** |
| **III - II** | **9EC54** | **ARTIFICIAL INTELLIGENCE** | **2** | **0** | **0** | **0** |

**Course objective:**

To learn the distinction between optimal reasoning vs human like reasoning. To understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities. To learn different knowledge representation techniques. To understand the applications of AI, namely game playing, theorem proving, and machine learning.

**COUR****SE OUTCOMES:**

**At the end of this course the student will be able to**

1. Learn the distinction between optimal reasoning Vs human like reasoning and formulate an efficient problem space for a problem expressed in natural language. Also select a search algorithm for a problem and estimate its time and space complexities.
2. Apply AI techniques to solve problems of game playing, theorem proving, and machine learning.
3. Learn different knowledge representation techniques.
4. Understand the concepts of state space representation, exhaustive search, heuristic search together with the time and space complexities.
5. Comprehend the applications of Probabilistic Reasoning and Bayesian Networks.
6. Analyze Supervised Learning Vs. Learning Decision Trees

**UNIT - I**

Introduction to AI, Intelligent Agents, Problem-Solving Agents, Searching for Solutions, Breadth-first search, Depth-first search, Hill-climbing search, Simulated annealing search, Local Search in Continuous Spaces.

**UNIT-II**

Games, Optimal Decisions in Games, Alpha–Beta Pruning, Defining Constraint Satisfaction Problems, Constraint Propagation, Backtracking Search for CSPs, Knowledge-Based Agents, Logic, Propositional Logic, Propositional Theorem Proving: Inference and proofs, Proof by resolution, Horn clauses and definite clauses.

**UNIT-III**

Representation, Syntax and Semantics of First-Order Logic, Using First Order Logic, Knowledge Engineering in First-Order Logic. Inference in First-Order Logic: Propositional vs. First-Order Inference, Unification and Lifting, Forward Chaining, Backward Chaining, Resolution. **Knowledge Representation:** Ontological Engineering, Categories and Objects, Events.

**UNIT-IV**

Definition of Classical Planning, Algorithms for Planning with State Space Search, Planning Graphs, other Classical Planning Approaches, Analysis of Planning approaches. Hierarchical Planning, Planning and Acting in Nondeterministic Domains, Multi agent Planning.

**UNIT-V**

Acting under Uncertainty, Basic Probability Notation Bayes’ Rule and Its Use, Probabilistic Reasoning: Representing Knowledge in an Uncertain Domain, The

Semantics of Bayesian Networks, Efficient Representation of Conditional Distributions, Approximate Inference in Bayesian Networks, Relational and First- Order Probability, Other Approaches to Uncertain Reasoning; Dempster-Shafer theory.

**Unit-VI**

Learning: Forms of Learning, Supervised Learning, Learning Decision Trees.

**TEXT BOOKS**:

1. Artificial Intelligence A Modern Approach, Third Edition, Stuart Russell and Peter Norvig, Pearson Education.

**REFERENCES:**

1. Artificial Intelligence, 3rd Edn., E. Rich and K. Knight(TMH)
2. Artificial Intelligence, 3rd Edn., Patrick Henny Winston, Pearson Education.
3. Artificial Intelligence, Shivani Goel, Pearson Education.
4. Artificial Intelligence and Expert systems – Patterson, Pearson Education.

**III year B.Tech – II Sem**

**Code: 9A677 ELECTRICAL MACHINES LAB – II**

**L T P C**

**3 1.5**

**Course Outcomes: After completing this course, student shall be able to**

* 1. Understand the concepts studied in theory subject.
  2. Understand the applications of the concepts.

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **Electrical Machines Lab –II (EM-II)** | 3 | 3 | 3 |  |  |  |  | 1 | 2 |  |  | 2 | 3 | 2 |

**The following experiments are required to be conducted:**

1. O.C. & S.C. Tests on Single phase Transformer

2. Sumpner’s test on a pair of single phase transformers

3. Scott connection of transformers

4. No-load & Blocked rotor tests on three phase Induction motor

5. Regulation of a three –phase alternator by synchronous impedance & m.m.f. methods

6. V and Inverted V curves of a three—phase synchronous motor.

7. Equivalent Circuit of a single phase induction motor

8. Determination of Xd and Xq of a salient pole synchronous machine

9. Brake test on three phase Induction Motor

10. Regulation of three-phase alternator by Z.P.F. and A.S.A methods

**III year B.Tech – I Sem**

**IC APPLICATIONS LAB**

**Code: 9CC76**

**L T P C**

**0 0 3 1.5**

**Prerequisites:** EDC, ECA, STLD.

**Course Objectives:**

The objectives of this course are

* To Design and analyze the various circuits and systems using IC 741 op-amp.
* To Design and analyze the various circuits and systems using Digital ICs.

**Course Outcomes**: After studying this course, the students will be able to

* An ability to explore the applications of IC 741 OP-AMP.
* An ability to design Active filters and its applications
* An ability to understand and implement generate square and Triangular waveforms using 555 Timers
* An ability to design D to A converters and its applications

***Mapping of Course Outcomes with Program Outcomes***

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| CO1 | 3 | 3 | 2 | 3 | 3 |  |  |  | 2 | 3 |  | 3 |
| CO2 | 3 | 2 |  | 2 | 3 |  |  |  | 3 | 3 |  | 3 |
| CO3 | 3 |  | 3 |  | 2 |  |  |  |  | 3 |  | 3 |
| CO4 | 3 | 2 | 3 |  | 3 |  |  |  | 2 | 3 |  |  |
| CO5 | 3 | 2 | 3 |  | 3 |  |  |  |  |  |  |  |
| CO6 | 2 |  | 3 | 3 | 3 |  |  |  | 2 | 3 |  | 3 |

***Syllabus Content***

**(IC Application Lab)**

**Design and testing of**

1. OP AMP Modes (-ve feed back) – Inverting, Non inverting, Differential amp, Unity gain.
2. OP AMP Applications – Adders, Subtractor.
3. OP AMP Applications – Comparator Circuits.
4. OP AMP Applications – clipper Circuits.
5. Square wave generator using OP AMP
6. Triangular wave generator using OP AMP
7. Active Filter Applications – LPF, HPF (first order)
8. Oscillators-RC phase shift , wein bridge.
9. IC 555 Timer – Monostable
10. IC 555 Timer -Astable .
11. 4 bit DAC using OP AMP.
12. IC 723 voltage regulator

**B. Tech. III Year II semester**

**Code: 9A686 COMPREHENSIVE VIVA- VOCE**

**L T P/D C**

**- 1 - 1**

## *Course Objectives:*

Prepare students in basics and advanced relevant courses to revise and face technical interviews for enhancing employability**.**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
|  | 3 |  |  |  |  | 3 |  | 2 | 2 | 2 |  | 2 | 3 | 2 |

**Course Outcomes:**

**At the end of this course, the student will be able to**

|  |
| --- |
| 1. Assess the relevant courses they have undergone till the completion of that academic year. |
| 1. Comprehend the concepts in the core subjects and the elective subjects, to make them ready to face technical interviews which improve their employability skills. |

Comprehensive Viva Voce will be conducted in third year second semester for 100 marks. Out of 100 marks 30 marks are evaluated internally and 70 marks for external evaluation.

**Internal:**

Comprehensive Viva Voce is conducted twice in a semester and evaluated for 30 marks each and average will be considered for internal.

Internal Examination : 30 Marks

End examination : 70 Marks.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, and subject experts.

**IV year B.Tech – I Sem**

**Code: 9A714 POWER SYSTEM ANALYSIS AND CONTROL**

**L T P C**

**3 - 1 3.5**

**OBJECTIVE:**

This subject deals with Economic operation of Power Systems, Hydrothermal scheduling and modeling of turbines, generators and automatic controllers. It emphasizes on single area and two area load frequency control and reactive power control.

**Course outcomes:**

1. Understand about importance of network matrices and usefulness in power system analysis.
2. Analyze the power system under different types of faults.
3. Analyze the power system under steady state condition for voltage and power flow calculations.
4. Analyze the power system for maintain constant frequency in single area.
5. Analyze the power system for maintain constant frequency in two area.
6. Analyze the power system for maintaining steady state and transient stability.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **Power System Analysis and Control (PSAC)** | X | X | X | X |  |  | X |  | X |  | X |  |  | X |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | Understand about importance of network matrices and usefulness in power system analysis. | 3 | 3 | 1 |  |  |  |  |  | 3 |  |  |  | 3 | 3 |
| Unit – 2 | Analyze the power system under different types of faults. | 3 | 1 |  |  |  |  | 3 |  |  |  | 3 |  |  |  |
| Unit – 3 | Analyze the power system under steady state condition for voltage and power flow calculations. | 3 | 3 | 3 |  |  |  |  |  | 3 |  | 3 |  | 2 |  |
| Unit – 4 | Analyze the power system for maintain constant frequency in single area. | 3 |  |  | 3 |  |  |  |  |  |  |  |  | 2 | 1 |
| Unit – 5 | Analyze the power system for maintain constant frequency in two area. | 3 |  |  |  |  |  | 3 |  |  |  |  |  |  |  |
| Unit – 6 | Analyze the power system for maintaining steady state and transient stability | 3 |  | 3 | 3 |  |  |  |  | 2 |  |  |  | 2 | 2 |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT -I POWER SYSTEM NETWORK MATRICES:**

Graph Theory: Definitions, Bus Incidence Matrix, YBus formation by Direct and Singular Transformation Methods, Numerical Problems*.*

**FORMATION OF ZBUS:** Partial network, Algorithm for the Modification of ZBus Matrix for addition element for the following cases: Addition of element from a new bus to reference, Addition of element from a new bus to an old bus, Addition of element between an old bus to reference and Addition of element between two old busses (Derivations and Numerical Problems), Modification of ZBus for the changes in network (Problems).

**UNIT – II LOAD FREQUENCY CONTROL SINGLE AREA:**

Speed governor, turbine, generator and power system simplified models, excitation system model, Necessity of keeping frequency constant. Definitions of Control area, Single area control, Block diagram representation of an isolated power system, Steady state analysis, Dynamic response, uncontrolled case.

**UNIT – III LOAD FREQUENCY CONTROL TWO AREA:**

Load frequency control of 2-area system, uncontrolled case and controlled case, tie-line bias control, Proportional plus Integral control of single area and its block diagram representation, steady state response, Load Frequency Control and Economic dispatch control.

**UNIT –IV POWER FLOW STUDIES:**

Necessity of Power Flow Studies, Derivation of Static load flow equations, Load flow solutions using Gauss Seidel Method, Acceleration Factor, Load flow solution with and without P-V buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses), Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and finding Line Flows/Losses for the given Bus Voltages.

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form, Load Flow Solution with or without PV Busses, Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods, Comparison of Different Methods, DC load Flow.

**UNIT –V POWER SYSTEM STATE STABILITY ANALYSIS:**

Concepts of Steady State, Dynamic and Transient Stabilities, Steady State Stability Power Limit, Power Angle Curve and Determination of Steady State Stability and Methods to improve steady state stability, Derivation of Swing Equation, Determination of Transient Stability by Equal Area Criterion, Application of Equal Area Criterion, Critical Clearing Angle Calculation - Solution of Swing Equation: Point-by-Point Method, Methods to improve Stability, Application of Auto Reclosing and Fast Operating Circuit Breakers.

**UNIT-VI ECONOMIC OPERATION OF POWER SYSTEMS:**

Optimal operation of Generators in Thermal Power Stations, Heat rate Curve, Cost Curve, Incremental fuel and Production costs, Input-output characteristics, Optimum generation allocation with line losses neglected. Optimum generation allocation including the effect of transmission line losses, Loss Coefficients, General transmission line loss formula. Hydrothermal scheduling.

**TEXT BOOKS:**

1. Electrical Power Systems *–* C.L. Wadhwa, Newage International, 6th Edition.

*2.*  Modern Power System Analysis–I.J. Nagrath & D.P. Kothari, Tata Mc Graw Hill Publishing Company Ltd, 2nd edition.

3. Power System Analysis- T.K. Nagasarkar, M.S. Sukhija, Oxford University Press, 2nd edition.

**REFERENCES:**

1. Power System Analysis and Design *–* J. Duncan Glover and M.S. Sarma., THOMPSON, 3rd Edition.

2. Electric Energy systems Theory – O.I. Elgerd, Tata Mc Graw Hill Publishing Company Ltd., 2nd edition.

3. Power System Analysis *–* Grainger and Stevenson, Tata McGraw Hill.

4. Power System Analysis *–* Hadi Saadat, Tata Mc Graw Hill Publishing, 2nd Edition.

**IV Year B.Tech – I Sem**

**CODE: 9A716 DRIVES & UTILIZATION OF ELECTRICAL ENERGY**

**L T P/D C**

**3 - 0 3**

**Course Objective:**

It gives the detailed study of all varieties of Electric drives and their applications to electrical engineering.

**Course Outcomes:**

The student will able to:

1. Know the importance of different type of electric drives, selection of motor based on starting and running characteristics, required speed control, tolerance of temperature rise, Particular applications of electric drives, and understands different types of industrial loads, Continuous, Intermittent and variable loads etc.
2. Understanding about basic requirements of drives and discussed about different DC drives.
3. Discussed about different types of Dynamics of electrical drives.

4. Know the importance of advantages of DC Motor Drives.

5. Know the importance of advantages of AC Motor Drives.

6. Understands System of electric traction and track electrification. Understand and Calculations of tractive effort, power, specific energy consumption for a given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| Drives & Electric Traction | X |  | X | X |  | X |  |  | X | X |  |  | X |  |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | CO-1 | 3 | 2 |  |  |  |  |  |  |  |  |  |  | 3 |  |
| Unit – 2 | CO-2 | 3 | 2 | 1 |  |  |  |  |  |  |  |  |  | 2 |  |
| Unit – 3 | CO-3 | 3 | 2 | 1 |  |  |  |  |  |  |  |  |  | 3 |  |
| Unit – 4 | CO-4 | 3 | 2 | 1 |  |  |  |  |  |  |  |  |  | 2 |  |
| Unit – 5 | CO-5 | 3 | 2 | 1 |  |  |  |  |  |  |  |  |  | 3 |  |
| Unit – 6 | CO-6 | 3 | 2 | 1 |  |  |  |  |  |  |  |  |  | 2 |  |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – I DRIVE APPLICATIONS:**

Type of electric drives, Choice of motor, starting and running characteristics, Speed control, Temperature rise, Particular applications of electric drives, Types of industrial loads, Continuous, Intermittent and variable loads, Load equalization.

**UNIT – II: INTRODUCTION TO ELECTRIC DRIVES:**

**Introduction to electric drives:** Advantages of Electric drives, Parts of Electrical Drives, Electric Motors, Power Modulators, Sources, Choice of Electric Drives and selection of drives for various applications.

**UNIT – III: DYNAMICS OF ELECTRICAL DRIVES:**

**Dynamics of electrical drives:** Fundamental torque equation, components of load torque, speed-torque characteristics of loads, Nature and classification of load torques, speed-torque convention & multi- quadrant operation. Equivalent values of drive parameters, loads with rotational motion, loads with translational motion, measurement of moment of inertia, components of load torques. Steady state stability, dynamic stability, load equalization. Basic principles of closed-loop control.

**UNIT – IV DC MOTOR DRIVES:**

**DC Motor Drives:** Speed control of DC motors using single-phase and three-phase fully controlled and half controlled rectifiers in continuous and discontinuous mode of operation. Single quadrant, two quadrant and four quadrant chopper controlled drives in continuous and discontinuous mode of operation.

**UNIT – V AC MOTOR DRIVES**

**Induction Motor Drives:** Speed control of cage induction motor with *v/f* control; slip power recovery scheme, static Scherbius and Krammer methods. Variable frequency and variable voltage control using VSI and CSI. AC and DC dynamic breaking methods.

**Synchronous Motor Drives:** Speed control methods of synchronous motor drive.

**UNIT – VI ELECTRIC TRACTION:**

System of electric traction and track electrification. Review of existing electric traction systems in India. Special features of traction motor, Mechanics of train movement. Speed-time curves for different services – trapezoidal and quadrilateral speed time curves. Calculations of tractive effort, power, specific energy consumption for given run, effect of varying acceleration and braking retardation, adhesive weight and coefficient of adhesion.

**TEXT BOOKS:**

1. Utilization of Electric Power & Electric Traction - J.B. Gupta, S.K. Kataria & Sons, 9th edition.

2. Fundamentals of Electric Drives – G K Dubey, Narosa Publications.

**REFERENCES:**

1. Utilization of Electrical Power including Electric drives and Electric traction - N.V. Suryanarayana, New Age International (P) Limited, 1st edition.

2. Generation, Distribution and Utilization of electrical Energy - C.L. Wadhwa, New Age International (P) Limited, 1st revised edition.

3. Modern Power Electronics and AC Drives – B.K.Bose, PHI.

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**L T P/D C**

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**III Year B.Tech EEE - I Sem**

**CODE:** 9EC76 **OPERATING SYSTEMS CONCEPTS**

**(OPEN ELECTIVE-II)**

**Course Objectives:**

Learn the basics of Operating Systems. Understand process management and synchronization. Learn principles of memory, I/O and file management in a secured environment.

**Course Outcomes:**

**At the end of this course, the student will be able to**

1. Describe the basic functionalities and structure of the Operating System
2. Explain the concepts and implementations of: Processes, Process Scheduling. Describe, contrast and compare various types of Operating systems like Windows and Linux.
3. Comprehend the concepts of Synchronization and Deadlocks in the Operating System
4. Discuss the concepts of Memory Management (Physical and Virtual memory)
5. Explain the concepts of File System with regard to directory and disk management algorithms.
6. Students understand the concepts of I/O systems, protection and security in a case study given

**UNIT 1:** **INTRODUCTION:**

Concept of Operating Systems, Generations of Operating systems, Types of Operating Systems, OS Services, Types of OS Services, System Calls, Types of System Calls, Structure of an OS- single structure, layered approach.

**UNIT 2:** **PROCESSES:**

Definition, Process Relationship, Different states of a Process, Process State transitions, Process Control Block (PCB), Context switching. Process Vs Thread **Process Scheduling**: Foundation and Scheduling objectives, Types of Schedulers, Scheduling criteria: CPU utilization, Throughput, Turnaround Time, Waiting Time, Response Time; Scheduling algorithms: Pre-emptive and Non pre-emptive, FCFS, SJF, RR; Multiprocessor Scheduling

**UNIT 3:** **INTER-PROCESS COMMUNICATION:**

Critical Section, Race Conditions, Mutual Exclusion, Hardware Solution, Strict Alternation, Peterson’s Solution, The Producer\ Consumer Problem, Semaphores, Monitors, Message Passing, Classical IPC Problems: Reader’s & Writer Problem, Dinning Philosopher Problem etc.

**UNIT 4:** **DEADLOCKS:**

Definition, Necessary and sufficient conditions for Deadlock, Deadlock Prevention, Deadlock Avoidance: Banker’s algorithm, Deadlock detection and Recovery.

**UNIT 5:** **MEMORY MANAGEMENT:**

Basic concept, Logical and Physical address map, Memory allocation: Contiguous Memory allocation – Fixed and variable partition–Internal and External fragmentation and Compaction; Paging: Principle of operation – Page allocation – Hardware support for paging, Protection and sharing, Disadvantages of paging.

**Virtual Memory**: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, Working Set, Dirty page/Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC),

Not recently used (NRU) and Least Recently used (LRU).

**UNIT 6:** **I/O Hardware:**

I/O devices, Device controllers, Direct memory access Principles of I/O

Software: Goals of Interrupt handlers, Device drivers, Device independent I/O software,

Secondary-Storage Structure: Disk structure, Disk scheduling algorithms

**File Management**: Concept of File, Access methods, File types, File operation, Directory structure, File System structure, Allocation methods (contiguous, linked, indexed), Free-space management (bit vector, linked list, grouping), directory implementation (linear list, hash table),

**Disk Management:** Disk structure, Disk scheduling - FCFS, SSTF, SCAN, C-SCAN, Disk reliability, Disk formatting, Boot-block, Bad blocks

**TEXT BOOKS:**

1. Operating System Concepts Essentials, 9th Edition by AviSilberschatz, Peter Galvin, Greg Gagne, Wiley Asia Student Edition.
2. Operating Systems: Internals and Design Principles, 5th Edition, William Stallings, Prentice Hall of India.

**REFERENCE BOOKS:**

1. Operating System: A Design-oriented Approach, 1st Edition by Charles Crowley, Irwin Publishing
2. Operating Systems: A Modern Perspective, 2nd Edition by Gary J. Nutt, Addison- Wesley
3. Design of the Unix Operating Systems, 8th Edition by Maurice Bach, Prentice-Hall of India
4. Understanding the Linux Kernel, 3rd Edition, Daniel P. Bovet, Marco Cesati, O'Reilly and Associates

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**L T P/D C**

**2 - 0 2**

**B. Tech. III Year II semester**

CODE: **9ZC23 ADVANCED ENTREPRENEURSHIP**

**(Common to all Branches)**

**(OPEN ELECTIVE – II)**

**Course Objective:** The course is designed to impart the necessary managerial skills and tactics required for an emerging Entrepreneur for the Engineering students to enhance their prospects as an Entrepreneur.

**Course Outcomes:**

1. The Students’ gain knowledge on the stages of Start-up and the turbulence environment it undergoes and the stages related to growth of the Start-up.
2. The Students are exposed to the various business models and critically evaluating the effectiveness of the business models and products
3. The students understand the method of business traction, create roles and build their A- team
4. The students understand the various channels of revenue building and exploration of new revenue avenues.
5. The students understand the need of sales planning and people plan and also financial modeling
6. The students are exposed to the legal implications affecting the company’s prospects and identifying right mentors and advisors to support start-ups

**UNIT – I: FUNDAMENTALS OF ENTREPRENEURSHIP & REFINING BUSINESS MODEL AND PRODUCT:**

Fundamentals and key concepts of entrepreneurship, refining the business model, products and services, pivoting, types of business models, business model evolution, generating new business models, analyzing the business model, adding new customer segment, product manager, significance and role of product manager.

**UNIT – II: BUSINESS PLANNING & EXPLORING REVENUE:**

Business plan, sales plan, hiring sale team, people plan, financial planning, financial forecasting, create a procurement plan, negotiating role play, understanding primary revenue sources, exploring customer lifecycle for growth customers, exploring and identify secondary sources of revenue,

**UNIT- III: FUNDING THE GROWTH & BUILDING THE A-TEAM:**

Overview of funding, funding options for an entrepreneur, explore the right funding options, create funding plan, pitch deck, introduction to building A-Team, pitching to attract the talent, setting your team, defining roles, hiring the A-Team members.

**UNIT- IV: BRAND AND CHANNEL STRATEGY & LEVERAGING TECHNOLOGIES:**

Introduction to branding, drawn the venture’s golden circle, positioning and positioning statements, creating brand name, logo, social media handle, Identify right channels, leaping ahead with technology, digital marketing for startups, plan a social media campaign, digital collaboration, store documents online, other technology platforms, make tech plan, platform wish list.

**UNIT V: MEASURING PROGRESS AND LEGAL MATTERS:**

Metrics for customer acquisition (CAC, CLV, and ARPU), metrics for customer retention and satisfaction, find CAC, CLV and ARPU, key financial metrics, communicate metrics, new revenue stream through key financial metrics, re-forecasting of financial plan, identify professional help for legal and compliance requirements, searching of trademark and brand name and company name.

**UNIT –VI: SEEKING SUPPORT AND FINAL PROJECT:**

Mentors help to create successful startups, identify mentors and advisors, importance of mentors and advisors, scout the board of directors, overview on final project, capstone project presentation, contents of capstone project.

**Books Recommended:**

1. Entrepreneurship Rajeev Roy “” oxford ,2012
2. Entrepreneurship Development Khanka, ,S.Chand 2012

**References:**

1. Small Scale industries and Entrepreneurship Vasanth Desai “Himalya publishing 2012
2. Robert Hisrich et al “entrepreneurship TMH 2012
3. Entrepreneurship Development Khanka, ,S.Chand 2012
4. Entrepreneurship Development B. Janikairam and M Rizwana
5. e-source: - [www.learnwise.org](http://www.learnwise.org)

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**L T P/D C**

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**III Year II semester**

**CODE: 9ZC19 ENTREPRENEURSHIP, PROJECT MANAGEMENT AND STRUCTURED FINANCE**

**(OPEN ELECTIVE-II)**

**Course Objective:** The objective of the course is to make students understand the nature of Entrepreneurship, its importance and to create an awareness regarding the systematic planning and implementation of projects; highlight the components of structured finance and establish a framework of CMBS with respect to Servicing Agreements

**Course Outcomes:**

1. Students will understand the nature of Entrepreneurship and its importance
2. Will gain knowledge regarding project, its life cycle and organization
3. Will gain knowledge relating to project formulation and implementation
4. Comprehend the components of structured finance
5. Establish a framework of CMBS
6. Students will gain knowledge relating to the CRE Servicing

**UNIT I: CONCEPTS OF ENTREPRENEURSHIP:**

Definition of Entrepreneurship, Evolution of Entrepreneurship, Classification of Entrepreneurs**,** Characteristics of Entrepreneur**,** Selection of Product and the means required for starting an enterprise, Financing and Financial incentives available, Success rate of entrepreneurs – a case study.

**UNIT-II: BASICS OF PROJECT MANAGEMENT:**

Concept and characteristics of a project - types of projects - Objectives of project management - Project Organizational structure - Project life cycle - Challenges and problems of project management - Qualities & functions of a project manager.

**UNIT III: PROJECT FORMULATION AND IMPLEMENTATION:**

Generation of Project Ideas; Monitoring the environment; Preliminary Screening of Projects; Feasibility study; Project Selection. Detailed Project Report: Market, Technical, Financial and Economic aspects. Pre-requisites for Successful Project Implementation; Control of in-progress Projects (Gantt chart, PERT, CPM); Project Risk Management Process, Post-audit; Abandonment Analysis

**UNIT-IV: INTRODUCTION TO STRUCTURED FINANCE**:

Term Loans, Bonds/Debentures, Types of debentures, Issue of debt instruments. Structured Finance: Evolution, Securitization process, characteristics, and structured finance products (ABS, CDO, MBS, CDS)

**UNIT-V: COMMERCIAL MORTAGAGE LOAN BASICS**:

Definition and characteristics of CMBS, CMBS Vs other Mortgage Backed Securities, CMBS three level perspective: property level, loan level, bond level; Life cycle of commercial real estate loans – Loan cycle, Key players in loan cycle; Property types and characteristics, property performance.

**UNIT- VI: BASICS OF CRE SERVICING:**

Introduction to servicing, Role of the Servicer, Servicing approaches, Influence of technology, Ethics in commercial servicing, Servicing – sources of income, Overview of servicing agreements, Pooling & Servicing agreement, Sub servicing agreement.

**REFERENCES:**

1. H. Nandan, Fundamentals of Entrepreneurship, Prentice Hall of India, First Edition, New Delhi, 2007.
2. Jeffrey K. Pinto “Project Management”, 2nd edition, Pearson
3. Dhandapani Alagiri “Structured Finance – Concepts & Perspectives”, ICFAI University press.
4. Projects by Prasanna Chandra, McGraw-Hill Publishing Co. Ltd
5. Project Management: Systems approach to Planning Scheduling and Controlling, H. Kerzner.
6. The Complete Real Estate Documents by Mazyar M. Hedayat, John J. Oleary
7. The Fundamentals of Listing and Selling Commercial Real Estate - By Keim K. Loren (Author)

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**III Year II semester**

**CODE: 9ZC26 BASICS OF POLITY**

**(Common to all Branches)**

**(OPEN ELECTIVE-II)**

**Course Objectives:**

To provide basic knowledge relating to the Indian Polity, thus making the students appreciate the current aspects related to polity.

**Course Outcomes:**

1. Gain knowledge relating to the Indian Constitution and the Preamble to the Constitution.
2. Gain knowledge relating to the fundamental rights and duties of the Indian citizens and the directive principles of state policy.
3. Students will learn about the federal structure and judiciary of India.

**UNIT 1: INTRODUCTION TO SALIENT FEATURES OF CONSTITUTION**

Significance of the Constitution, Distinction between Written and Unwritten Constitution, Composition of the Constituent Assembly and the role and objectives of the Drafting Committee, Main features and the nature of the Constitution of India. Preamble to the Constitution and its relevance; Basic principles of Preamble and their reflection in the constitutional provisions.

**UNIT 2: FUNDAMENTAL RIGHTS, DUTIES AND DIRECTIVE PRINCIPLES OF STATE POLICY**

Fundamental Rights and Duties of Citizens- Importance of Rights and Duties, Dignity of an individual, Safeguards against deprivation of life and personal liberty; Writs for the protection of Fundamental Rights; Meaning of Directive Principles of State Policy, Classification of the Directive Principles, Role of Directive Principles, Role of Directive Principles in the establishment of economic and social democracy.

**UNIT 3: GOVERNMENT AND JUDICIARY**

Legislative, financial and judicial powers of the President; Appointment of Prime Minister and constitution of Council of Ministers; Powers and functions of Prime Minister; Individual and collective responsibility; Powers and discretionary powers of the Governor; Appointment of the Chief Minister, Formation of the Council of Ministers; Powers and jurisdiction of the Supreme Court and High Courts of India.

**REFERENCES**

* Indian Polity - M. Laxmikanth, 5th Edition, McGraw Hill Education, Chennai
* Environment And Ecology A Complete Guide for Civil Services Preliminary and Main Examinations – R. Rajgopalan, 2017, Oakbridge Publishing Pvt. Limited.
* Introduction to Constitution of India – Dr. Durga Das Basu, 22nd Edition, 2015, LexisNexis
* Our Constitution – Subhash C Kashyap, 5th Edition, 2015, National Book Trust, India

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**III Year II Sem**

**CODE: 9ZC09 COCREATION AND PRODUCT DESIGN**

**(OPEN ELECTIVE- II)**

**Course Objective:** The objective of the course is to make students understand the fundamental concepts of design thinking, and to familiarize with product design process and to motivate the students to ideate new products and services.

**Course Outcomes:**

1. The students gain the knowledge on the inputs required for human centric design thinking the students learn the techniques of idea generation.
2. The students gain knowledge on exploring the different phases of Ideation process.
3. The students grasp the awareness on emerging technologies and understand 3d printing in manufacturing.
4. The students gain familiarity on development of prototypes.
5. The students understand reverse engineering methods in product development.
6. The students have access to information on IPR, and patent application.

**UNIT – I: HUMAN CENTERED DESIGN:**

Understanding user and Customer perspectives, Identify insights and opportunities, Interviewing, User Experience design. Frame your design challenge**.** Empathy tools and techniques.

**UNIT – II: IDEATION PROCESS:**

Articulation of Problem Statement, Visualizing Ideas, Communicating ideas and compelling story telling, Brainstorming, Divergent thinking in exploring solutions, 3- box thinking, 3-box framework and Box-3 ideation.

**UNIT – III: EMERGING TECHNOLOGIES AND DESIGN:**

Emerging technologies, utilization and growth, Automation through Industry 4.0, IOT for Network and Intelligent world, efficient and effective manufacturing aided by Robotics, Custom manufacturing by Additive / 3D printing, Augmented reality for product and process.

**UNIT – IV: PROTOTYPING**:

Introduction to Prototype, types of prototype, prototyping strategies, Design consideration in the five stages of the product life cycle. Prototype building by different engineering disciplines. Testing Solution and taking the solution to the users. Create a pitch for your design.

**UNIT – V: REVERSE ENGINEERING IN PRODUCT DEVELOPMENT:**

Reversing engineering methods, identifying the bad features in a product, reduction in size and weight, usage of new materials, importance of ergonomics in product development, environmental considerations in design, and safety considerations in design.

**UNIT – VI: INTELLECTUAL PROPERTY RIGHTS:**

Introduction to IPR, Patents – Types of Patents, elements of patentability, Patents registration Procedure, Patent office and Appellate Board, Rights and Duties of Patentee, Restoration of Lapsed patents.

**TEXT BOOKS:**

1. Philip Kosky, Robert T. Balmer, William D. Keat, George Wise, “Exploring Engineering: An Introduction to Engineering and Design”, 4th edition, Elsevier, 2016.
2. David Ralzman, “History of Modern Design”, 2nd edition, Laurence King Publishing Ltd., 2010 3. An AVA Book, “Design Thinking”, AVA Publishing, 2010.
3. Ingle, B. R. (2013). *Design thinking for entrepreneurs and small businesses: Putting the power of design to work*. Apress.
4. Norman, D. A. (2016). *Living with complexity*. MIT press.
5. Chapman, J. (2017). *Routledge handbook of sustainable product design*. Taylor & Francis.
6. Nithyananda, K.V. (2019), IPR, protection and Management, India, Cengage learning India.

**REFERENCES:**

1. G. Pahl, W.Beitz, J. Feldhusen, KH Grote, “Engineering Design: A Systematic Approach”, 3rd edition, Springer, 2007. 2. Tom Kelley, Jonathan Littman, “Ten Faces in Innovation”, Currency Books, 2006.
2. Kumar, V. (2012). *101 design methods: A structured approach for driving innovation in your organization*. John Wiley & Sons.
3. Chapman, J. (2012). *Designers Visionaries and Other Stories: A Collection of Sustainable Design Essays*. Taylor & Francis.
4. Garrett, J. J. (2010). *The elements of user experience: user-centered design for the web and beyond*. Pearson Education.
5. Neeraj, P. &Khusdeep, D (2014), IPR, India, IN: PHI Learning.

**L T P/D C**

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**IV Year B.Tech – I Sem**

**Code: 9A729 POWER SYSTEM DEREGULATION**

**(PROFESSIONAL ELECTIVE-III)**

Course Outcomes: At the end of the course, the student will be able to:

**CO1:** Grasp the knowledge of need of restructuring of power system, different entities in deregulated environment, different market place mechanism and reasons and objectives of deregulation of various power systems across all.

**CO2:** Acquire knowledge of basic concepts of economics and applied them to solve practical applications through numerical analysis.

**CO3:**Grasp the knowledge of various market models, levels of competition exist among these models and features of electricity as a commodity.

**CO4:** Acquire the knowledge, importance, effects and classification of Congestion Management methods and able to calculate ATC using different mechanisms.

**CO5:**Gain the information about various ancillary services and markets for these services in National and International scenario.

**CO6:** Familiar with different pricing mechanism of electric energy and trading of power under deregulated environment and also know about how to access market power through different indices.

***Mapping Matrix of CO's and PO's***

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| **COs** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **CO1** | 2 | 2 | - | - | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 2 |
| **CO2** | 3 | 3 | 3 | 3 | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 3 |
| **CO3** | 2 | 2 | 1 | 2 | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 3 |
| **CO4** | 2 | 3 | 1 | 2 | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 3 |
| **CO5** | 2 | 3 | - | - | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 2 |
| **CO6** | 3 | 3 | 3 | 3 | - | 3 | 3 | 3 | - | - | - | 3 | 3 | 3 |
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**UNIT – I: OVERVIEW OF KEY ISSUES IN ELECTRIC UTILITIES**:

Introduction –Restructuring models –Independent system operator (ISO) –Power Exchange -Market operations –Market Power –Standard cost –Transmission Pricing –congestion Pricing –Management of Inter zonal/Intra zonal Congestion.

**UNIT- II: OASIS: OPEN ACCESSES SAME-TIME INFORMATION SYSTEM:**

Structure of OASIS -Posluing of Information –Transfer capability on OASIS –Definitions Transfer Capability Issues –ATC –TTC –TRM –CBM calculations –Methodologies to calculate ATC

**UNIT – III: ELECTRICITY PRICING:**

Introduction –electricity Price Volatility Electricity Price Indexes –challenges to Electricity Pricing –Construction of Forward Price Curves –Short-time Price Forecasting.

**UNIT – IV: POWER SYSTEM OPERATION IN A COMPETITIVE ENVIRONMENT:**

Introduction –Operational Planning Activities of ISO-The ISO in Pool Markets –The ISO in Bilateral Markets –Operational Planning Activities of a Genco

**UNIT – V: ANCILLARY SERVICES MANAGEMENT:**

Introduction –Reactive Power as an Ancillary Service –a review –Synchronous Generators as Ancillary Service Providers.

**UNIT – VI: RELIABILITY AND DEREGULATION:**

Reliability Analysis, The network Model, Reliability Costs, Hierarchical Levels, Reliability and Deregulation, Performance Indicators

**TEXT BOOKS:**

1. 1. Kankar Bhattacharya, Math H.J. Boller, JaapE.Daalder, Operation of Restructured Power System, Klum, er Academic Publisher –2001.
2. 2. AshikurBhuiya: Power System Deregulation: Loss Sharing in Bilateral Contracts and Generator Profit Maximization, Publisher VDM Verlag, 2008.
3. 3. Mohammad Shahidehpour, and Muwaffaqalomoush, Restructured Electrical Power systems, Marcel Dekker, Inc. 2001.
4. 4. Loi Lei Lai Power system Restructuring and Deregulation, Jhon Wiley & Sons Ltd., England.

**L T P/D C**

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**IV Year B.Tech – I Sem**

**Code: 9A735 ELECTRIC AND HYBRID VEHICLES**

**(PROFESSIONAL ELECTIVE-III)**

# **Course Objective:**

To introduce the fundamental concepts, principles, analysis and design of hybrid and electric vehicles and to deliver and discuss the about architecture, power electronics based drive control systems, battery management systems and grid integration issues of Electric and Hybrid vehicles.**Course Outcomes:**

After learning the course the students should be able to:

1. Understand the working of Electric Vehicles and hybrid vehicles, dynamics of the E&HVs.
2. Discuss different energy storage technologies used for hybrid electric vehicles and their control.
3. Develop the electric propulsion unit and various motor drives for electric vehicles.
4. Demonstrate different configurations of electric vehicles and its components, hybrid vehicle configuration by different techniques, series E&HVs design.
5. Design and sizing of parallel E&HVs and design optimization and energy management.
6. Analyze different power converter topologies used for electric vehicle batteries, possible grid integration issues.

**UNIT – I: ELECTRIC AND HYBRID ELECTRIC VEHICLES:**

Configuration of Electric Vehicles, Performance of Electric Vehicles, Traction motor characteristics, Tractive effort and Transmission requirement, Vehicle performance, Tractive effort in normal driving, Energy consumption Concept of Hybrid Electric Drive Trains, Architecture of Hybrid Electric Drive Trains, Series Hybrid Electric Drive Trains, Parallel hybrid electric drive trains

**UNIT – II: ENERGY STORAGE FOR EV AND HEV:**

Energy storage requirements, Battery parameters, Types of Batteries, Modeling of Battery, Fuel Cell basic principle and operation, Types of Fuel Cells, PEMFC and its operation, Modeling of PEMFC, Super Capacitors

**UNIT – III: ELECTRIC PROPULSION:**

EV consideration, DC motor drives and speed control, Induction motor drives, Permanent Magnet Motor Drives, Switch Reluctance Motor Drive for Electric Vehicles, Configuration and control of Drives

**UNIT – IV: DESIGN OF ELECTRIC AND HYBRID ELECTRIC VEHICLES**

Series Hybrid Electric Drive Train Design: Operating patterns, control strategies, Sizing of major components, power rating of traction motor, power rating of engine/generator, design of PPS

**UNIT – V: PARALLEL HYBRID ELECTRIC DRIVE TRAIN DESIGN:**

Control strategies of parallel hybrid drive train, design of engine power capacity, design of electric motor drive capacity, transmission design, energy storage design

**UNIT – VI: POWER ELECTRONIC CONVERTER FOR BATTERY CHARGING**

Charging methods for battery, Termination methods, charging from grid, The Z-converter, Isolated bidirectional DC-DC converter, Design of Z- converter for battery charging, High-frequency transformer based isolated charger topology, Transformer less topology

**REFERENCE BOOKS:**

1. M. Ehsani, Y. Gao, S. Gay and Ali Emadi, Modern Electric, Hybrid Electric, and Fuel Cell Vehicles: Fundamentals, Theory, and Design, CRC Press, 2005
2. Iqbal Husain, Electric and Hybrid Vehicles: Design Fundamentals, CRC Press, 2003
3. Sheldon S. Williamson, Energy Management Strategies for Electric and Plug-in Hybrid Electric Vehicles, Springer, 2013.
4. C.C. Chan and K.T. Chau, Modern Electric Vehicle Technology, OXFORD University Press, 2001.
5. Chris Mi, M. Abul Masrur, David Wenzhong Gao, Hybrid Electric Vehicles Principles And Applications With Practical Perspectives, Wiley Publication, 2011.

**IV year B.Tech – I Sem**

**CODE: 9A739 OPTIMAL CONTROL SYSTEMS**

**(PROFESSIONAL ELECTIVE-III)**

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Course outcomes:

* + 1. To provide basic concepts related to optimal control and its position in optimization.
    2. To teach the calculus of extrema and parameter optimization by the method of Lagrange multipliers.

1. To teach the Optimality Principle and Dynamic Programming.
2. To teach variational calculus and Pontragin’s minimum principle.
3. To provide a solution approach for the Hamilton Jacobi-Bellman equation.
4. To provide the solution for Linear Optimal Control Problem (The Matrix Riccati Equation).

**UNIT I: INTRODUCTION TO OPTIMAL CONTROL PROBLEMS:**

An overview of optimization problem - concepts and terms related to optimization - constrained and unconstrained problems and their solutions using different techniques.

**UNIT II: CONVEX SET AND CONVEX FUNCTION**:

Convex set and convex function - convex optimization problem - quadratic optimization problem - Karush - Kuhn - Tucker (KKT) necessary and sufficient conditions for quadratic programming problem.

**UNIT III: INTERIOR POINT METHOD FOR CONVEX OPTIMIZATION**

Interior point method for convex optimization - linear programming - primal and dual problems and basic concept of multi - objective optimization problem. Concept of functional, different types of performance indices, Euler - Lagrange equation.

**UNIT IV: CALCULUS OF VARIATION TO OPTIMAL CONTROL PROBLEM**

Calculus of variation to optimal control problem - Fundamental concepts, functionals of a single function, functional involving several independent functions, necessary conditions for optimal control, linear regulator problems. Linear quadractic regulator, remarks on weighting matrices, solution of Riccati equation.

**UNIT V & VI: FREQUENCY DOMAIN INTERPRETATION OF LINEAR QUADRATIC REGULATOR**

Frequency domain interpretation of linear quadratic regulator, robustness studies. Dynamic programming, Pontrygin’s minimum principle, time optimal control, concept of system and signal norms, statement of problem and its solution.

**TEXT BOOKS**:

1. Jasbir S. Arora, Introduction to optimum design, Elesevier, 2005.

2. A Ravindran, K.M. Ragsdell, and G.V. Reklaitis, Engineering optimization : Methods and applications, Wiley India Edition.

3. Donald E.Kirk, Optimal Control Theory an Introduction, Prentice - Hall Network series – First edition, 1970.

**REFERENCE BOOKS:**

1. D.S. Naidu, Optimal control systems, CRC Press, First edition, 2002.

2. Arturo Locatelli, Optimal control: An Introduction, Birkhauser Verlag, 2001.

3. S.H.Zak, Systems and Control, Indian Edition, Oxford University, 2003.

4. Niclas Anreasson, Anton Evgrafov and Michael Patriksson, An introduction to continuous optimization, Overseas Press (India) Pvt. Ltd.

**IV year B.Tech – I Sem**

**CODE: 9CC06 ANALOG & DIGITAL COMMUNICATIONS**

**(PROFESSIONAL ELECTIVE-III)**

**Course Objectives:**

1. To develop ability to analyze system requirements of analog and digital communication systems.
2. To understand the generation, detection of various analog and digital modulation techniques.
3. To acquire theoretical knowledge of each block in AM, FM transmitters and receivers.
4. To understand the concepts of baseband transmissions, source coding and channel coding**.**

**Course Outcomes**: Upon completing this course, the student will be able to

1. Analyze and design of various continuous wave and angle modulation and demodulation techniques
2. Understand the effect of noise present in continuous wave and angle modulation techniques.
3. Attain the knowledge about AM , FM Transmitters and Receivers
4. Analyze and design the various Pulse Modulation Techniques.
5. Understand the concepts of Digital Modulation Techniques and Baseband transmission, source coding and channel coding.

**Mapping of Course Outcomes with Program Outcomes and Program Specific Outcomes**

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| CO1 | 3 | 3 | 3 | 3 | 1 | 2 |  | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO2 | 3 | 3 | 3 | 3 | 2 | 2 |  | 2 | 1 | 1 | 1 | 3 | 3 | 3 |
| CO3 | 3 | 3 | 3 | 3 | 3 | 2 |  |  | 1 |  | 1 | 2 | 2 | 3 |
| CO4 | 3 | 2 | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 1 | 1 | 2 | 2 | 3 |
| Overall mapping | 3 | 3 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 1 | 1 | 3 | 3 | 3 |

**UNIT – I** [Lecture hrs – 9]: **AMPLITUDE MODULATION**

Need for modulation, Amplitude Modulation - Time and frequency domain description, single tone modulation, power relations in AM waves, Generation of AM waves - Switching modulator, Detection of AM Waves - Envelope detector, DSBSC modulation - time and frequency domain description, Generation of DSBSC Waves - Balanced Modulators, Coherent detection of DSB-SC Modulated waves, COSTAS Loop, SSB modulation - time and frequency domain description, frequency discrimination and Phase discrimination methods for generating SSB, Demodulation of SSB Waves, principle of Vestigial side band modulation.

**Applications: AM transmitter system**

**UNIT –II** [Lecture hrs – 9]: **ANGLE MODULATION**

Basic concepts of Phase Modulation, Frequency Modulation: Single tone frequency modulation, Spectrum Analysis of Sinusoidal FM Wave using Bessel functions, Narrow band FM, Wide band FM, Constant Average Power, Transmission bandwidth of FM Wave - Generation of FM Signal- Armstrong Method, Detection of FM Signal: Balanced slope detector, Phase locked loop, Comparison of FM and AM., Concept of Pre-emphasis and de-emphasis.

**Applications: Design of a 88-108 MHz FM system using FDM**

**UNIT – III: TRANSMITTERS**

Classification of Transmitters, AM Transmitters, FM Transmitters

**Receivers**

Radio Receiver - Receiver Types - Tuned radio frequency receiver, Superhetrodynereceiver, RF section and Characteristics - Frequency changing and tracking, Intermediate frequency, Image frequency, AGC, Amplitude limiting, FM Receiver, Comparison of AM and FM Receivers.

**Applications: Design of an AM transmitter system.**

**UNIT – IV: PULSE MODULATION**

Types of Pulse modulation- PAM, PWM and PPM. Comparison of FDM and TDM.

**Pulse Code Modulation**

PCM Generation and Reconstruction, Quantization Noise, Non-Uniform Quantization and Companding, DPCM, Adaptive DPCM, DM and Adaptive DM, Noise in PCM and DM.

**Applications: Design of E1 and T1 digital-carrier systems**

**UNIT – V: DIGITAL MODULATION TECHNIQUES**

ASK- Modulator, Coherent ASK Detector, FSK- Modulator, Non-Coherent FSK Detector, BPSK- Modulator, Coherent BPSK Detection. Principles of QPSK, Differential PSK and QAM.

**Baseband Transmission and Optimal Reception of Digital Signal**

A Baseband Signal Receiver, Probability of Error, Optimum Receiver, Coherent Reception, ISI, Eye Diagrams.

**Applications: Design of MODEM for voice transmission**

**Unit-VI: SOURCE CODING**

Introduction, advantages, Shannon’s theorem for Channel capacity, Huffman code, Shannon-Fano coding, bandwidth –S/N trade off.

**CHANNEL CODING**

Introduction - types of errors, redundancy, detection vs correction, forward error correction versus retransmission; linear block codes, error detection and correction capabilities of linear block codes, Hamming code, cyclic codes: encoding, syndrome calculation, decoding, CRC codes – hardware realization; convolutional codes: encoding using state, tree and trellis diagrams, decoding using Viterbi algorithm

**APLLICATIONS: Design of channel coding for 3G**

**TEXTBOOKS:**

1. Analog and Digital Communications – Simon Haykin, John Wiley, 2005.
2. Electronics Communication Systems-Fundamentals through Advanced-Wayne Tomasi, 5th Edition, 2009, PHI.

**REFERENCE BOOKS:**

1. Principles of Communication Systems - Herbert Taub, Donald L Schilling, GoutamSaha, 3rd Edition, McGraw-Hill, 2008.
2. Electronic Communications – Dennis Roddy and John Coolean , 4th Edition , PEA, 2004
3. Electronics & Communication System – George Kennedy and Bernard Davis, TMH 2004

Analog and Digital Communication – K. Sam Shanmugam, Willey, 2020.

**B. Tech. IV Year I Semester**

**CODE: 9A787 SUMMER INDUSTRY INTERNSHIP – II**

**L T P/D C**

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## *Course Objectives:*

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

**Pre-Requisites:** All Courses till this semester

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
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**Course Outcomes:**

**At the end of this course, the student will be able to**

* Use the concepts learned in the courses, so far, in conceptualizing, designing and executing the modules of the projects.
* Exhibit the interest in learning the modern tools and technologies through the bridge courses arranged in the college, beyond the curriculum, and hence developing the software.
* Inculcate an enthusiasm to use the creative ideas to build the innovative projects which are meeting the current needs of the market and society as a whole.
* Improve their communicative skills and team skills largely improve.
* Work as an individual and in a team.

A summer industry internship project shall be carried out by a group of students consisting of 2 to 3 in number during summer fourth year first semester at industries. This work shall be carried out under the guidance of the faculty assigned as internal guide as well as external guide at industry where students are carrying out summer industry internship project. Project shall consist of design, fabrication, software development or building of prototype. This can be of interdisciplinary nature also.

There will be 100 marks in total with 30 marks of internal evaluation and 70 marks of external

The **internal evaluation** shall consist of:

Day to day work (internal guide 10M

external guide : 5M) : 15 marks

Report : 05 marks

Demonstration / presentation (internal presentation

is evaluated by HOD, senior faculty and internal guide) : 10 marks

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30 marks

End examination : 70 Marks.

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External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The end examination will be carried out by a committee consisting of an external examiner, head of the department, a senior faculty member and the supervisor.

**IV year B.Tech – I Sem**

**Code: 9A781 ELECTRICAL WORKSHOP**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| ELECTRICAL WORKSHOP |  |  |  | 3 |  | 3 |  | 3 | 2 | 1 | 1 | 2 | 1 | 1 |

**Course Outcomes:**

1. Ability to understand how a power contactor works and basic control circuit.

2. Ability to connect properly a basic interlocking circuit

3. Ability to analyze importance of star- Delta Starter

4. Ability to develop an inching circuit.

5. Ability to analyze role and importance of interlocking of group of drives

6. Ability to Study different protections to a motor.

7. Ability to know various parts in a three-phase motor

8. Ability to analyze single phase motors.

9. Ability to Differentiate protections given as under voltage and over voltage to a DOL starter.

10. Ability to test transformer oil and know its usefulness as insulator and as heat absorber.

**The list of Experiments:**

1. Direct On-Line Starter

2. Forward And Reverse Starter Wiring And Testing

3. Star-Delta Starter Wiring and Testing Suitable For 5 Ho Motor

4. Inching (Jogging) Circuit for Ac Motor

5. Interlocking Of Group of Drives

6. Study of Phase Failure Relay (Single Phase Preventer)

7. 3-Phase Squirrel Cage Induction Motor Dismantling, Assembling and Testing

8. 1-Phase Capacitor Start Capacitor Run Induction Motor Dis-Mantling, Assembling and Testing

9. Wiring Undervoltage Relay To A Dol Starter

10. Testing Of Dielectric Strength of Transformer Oil

**IV year B.Tech – II Sem**

**Code: 9A778 POWER ELECTRONICS AND SIMULATION LAB**

**L T P C**

**3 1.5**

**Course Objective:**

The primary objective of this laboratory is to **provide the students with a basic foundation for analysis, design, test and control of power electronics converters by simulation and experimentation**.

**Course Outcomes: After completing this course, student shall be able to**

1. **Correlate theoretical and practical analysis of AC-AC, DC-AC and DC-DC converters.**
2. Also analyze the characteristics of MOSFET, IGBT, SCR and SCR firing CKTs.

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **PE&S Lab** | 3 |  | 3 | 2 | 2 |  | 1 |  |  |  | 1 |  | **2** |  |

**The Experiments in Power Electronics Lab**

1. Study of Characteristics of SCR, MOSFET & IGBT

2. Gate firing circuits for SCR’s

3. Single Phase AC Voltage Controller with R and RL Loads

4. DC Jones chopper with R and RL Loads

5. Single Phase Parallel inverter with R and RL loads

6. Single Phase Cycloconverter with R and RL loads

7. Three Phase half controlled bridge converter with R-load

8. Single Phase series inverter with R and RL loads

9. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE loads.

10. PSPICE simulation of resonant pulse commutation circuit and Buck chopper.

11. PSPICE simulation of single phase Inverter with PWM control.

**REFERENCE BOOKS:**

1. Simulation of Electric and Electronic circuits using PSPICE – by M. H. Rashid, M/s PHI Publications.

2. PSPICE A/D user’s manual – Microsim, USA.

3. PSPICE reference guide – Microsim, USA.

4. MATLAB and its Tool Books user’s manual and – Math-works, USA.

**VI year B.Tech – I Sem**

**Code: 9DC71 MICROPROCESSORS AND MICROCONTROLLERS LAB**

**L T P C**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **MPMC Lab** | 3 | 2 | 3 | 2 | 2 | 2 | 1 |  |  |  | 1 | 2 | **2** |  |

***Course Objectives:***

*a. Familiarize the architecture of 8086 processor, assembling language programming and interfacing with various modules.*

*b. The student can also understand of 8051 Microcontroller concepts, architecture, programming and application of Microcontrollers.*

*c. Student able to do any type of VLSI, embedded systems, industrial and real time applications by knowing the concepts of Microprocessor and Microcontrollers.*

***Course Outcomes:***

* *Analyze and apply working of 8086.*
* *Compare the various interface techniques. Analyze and apply the working of 8255, 8279,8259, 8251, 8257 ICs and design and develop the programs.*
* *Learning the Communication Standards.*

**Cycle - I**

Introduction to MASM/TASM, KIEL IDE, Familiarization with 8086, 8051 Kits

**8086 ALP using kit and MASM**

1. Basic arithmetic and logical operations

2. Code conversion decimal arithmetic programs

3. String manipulation programs

4. Display a message on the screen of a computer using DOS / BIOS interrupts.

**Cycle – II**

**Following peripherals and interfacing experiments to be implemented on 8086 and 8051 kits**

1. A/D and D/A interfacing

2. Serial interfacing with PC

3. Keyboard and display interfacing

4. Stepper motor controller

5. Traffic light controller

6. Real Time clock interface with 8051 using 12C

**IV year B.Tech – II Sem**

**Code: 9A828 POWER QUALITY**

**(PROFESSIONAL ELECTIVE – IV)**

**L T P C**

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**Course Objective**

The course is designed for the students to learn the issues related to power quality and various power quality problems. The course will also help students to learn about harmonic elimination and application of power quality conditioners and also helps the students to know about power quality monitoring and classification techniques

**Course Outcome**

1. To reliably identify the sources of various power quality problems and issues
2. To estimate the impact of various power quality problems such as SAG, interruption etc
3. To educate the harmful effects of transient over voltage and different protection scheme
4. To educate the terms harmonics in power quality
5. To decide the compensators and filters to keep the power quality indices within the standard

***UNIT – I: TERMS & DEFINITIONS***:

General Classes of Power Quality Problems, Transients, Long Duration Voltage Variations, Short-Duration Voltage Variations, Voltage Imbalance, Waveform Distortion, Voltage Fluctuations, Power Frequency Variations, Power Quality Terms.

***UNIT – II: VOLTAGE SAGS & INTERRUPTIONS***:

Sources of Sags and Interruptions, Estimating Voltage Sag Performance, Fundamental Principles of Protection, Solutions at the End-User Level, Evaluating the Economics of Different Ride-Through Alternatives, Motor Starting Sags, Utility System Fault-Clearing Issues.

(Chapter-2: 2.2 to 2.10 and Chapter-3: 3.1 to 3.7)

***UNIT –III: TRANSIENT OVER VOLTAGES***:

Sources of Transient over Voltages, Principle of over Voltage Protection, Devices for Over Voltage Protection, Utility Capacitor-Switching Transients, Utility System Lightning Protection, Managing Ferro-resonance, Switching Transient Problems with Loads, Computer Tools for Transient Analysis.

***UNIT – IV: FUNDAMENTALS OF HARMONICS***:

Harmonic Distortion, Voltage Versus Current Distortion, Harmonics Versus Transients, Power System Quantities under Non-sinusoidal Conditions, Harmonic Indices, Harmonic Sources from Commercial Loads, Locating Harmonic Sources, System Response Characteristics, Effects of Harmonic Distortion, Inter-harmonics.

(Chapter-4: 4.1 to 4.8 and Chapter-5: 5.1 to 5.11)

***UNIT – V: LONG DURATION VOLTAGE VARIATIONS***:

Principles of Regulating the Voltage, Devices for Voltage Regulation, Utility Voltage Regulator Application, Capacitors for Voltage Regulation, End-User Capacitor Application, Regulating Utility Voltage with Distributed resources, Flicker.

***UNIT – VI: POWER QUALITY MONITORING***:

Monitoring Considerations, Historical Perspective of Power Quality Measuring Instruments, Power Quality Measurement Equipments, Assessment of Power Quality Measurement Data, Application of Intelligent Systems, Power Quality Monitoring Standards. (Chapter-7: 7.1 to 7.7 and Chapter-11: 11.1 to 11.6)

1. **TEXT BOOK**:
2. 1.“***Electrical Power Systems Quality***” By Roger C. Dugan, Mark F. Mcgranaghan, Surya Santoso & H.Wayne Beaty, 2nd Edition, TMH Education Private Ltd., New Delhi.

**REFERENCES:**

1. Power System Quality Assessment, J.Arrilaga, N.R.Watson, S.Chen, John Wiley & Sons.

2. Understanding Power Quality Problems: Voltage Sags & Interruptions, M.H.J. Boller IEEE, 1999

**IV year B.Tech – II Sem**

**Code: 9A817 HIGH VOLTAGE ENGINEERING**

**(PROFESSIONAL ELECTIVE-IV)**

**L T P C**

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**Course Objective :**

This subject deals with the detailed analysis of Breakdown occur in gaseous, Liquids and solid dielectrics. Information about generation and measurement of High voltage and current. In addition the High voltage testing methods are also discussed.

**Course Outcomes:**

1. Learn about applications of different insulating materials.
2. Learn about breakdown in gas, liquid and solid insulating materials.
3. Analyze different methods of generation and measurement of high voltages.
4. Study about high voltage phenomenon and insulation coordination.
5. Study about non destructive testing of material and electrical apparatus.
6. Learn about different tests done on different electrical equipments.

**UNIT - I INTRODUCTION TO HIGH VOLTAGE TECHNOLOGY AND APPLICATIONS:**

Electric Field Stresses, Gas / Vacuum as Insulator, Liquid Dielectrics, Solids and Composites, Estimation and Control of Electric Stress, Numerical methods for electric field computation, Surge voltages, their distribution and control, Applications of insulating materials in transformers, Rotating machines, Circuit breakers, Cable power capacitors and bushings.

**UNIT – II BREAK DOWN IN GASEOUS, LIQUID AND SOLID DIELECTRICS:**

Gases as insulating media, Collision process, Ionization process, Townsend’s criteria of breakdown in gases, Paschen’s law. Liquid as Insulator, Pure and commercial liquids, Breakdown in pure and commercial liquids.

Intrinsic breakdown, electromechanical breakdown, Thermal breakdown, Breakdown of solid dielectrics in practice, Breakdown in composite dielectrics, Solid dielectrics used in practice.

**UNIT – III GENERATION AND MEASUREMENT OF HIGH VOLTAGES AND CURRENTS:**

Generation of High Direct Current Voltages, Generation of High alternating voltages, Generation of Impulse Voltages, Generation of Impulse currents, Tripping and control of impulse generators.

Measurement of High Direct Current voltages, Measurement of High Voltages Alternating and impulse, Measurement of High Currents-direct, alternating and Impulse, Oscilloscope for impulse voltage and current measurements.

**UNIT – IV OVER VOLTAGE PHENOMENON AND INSULATION CO-ORDINATION:**

Natural causes for over voltages, Lightning phenomenon, Over voltage due to switching surges, system faults and other abnormal conditions, Principles of Insulation Coordination on High voltage and Extra High Voltage power systems.

**UNIT – V NON-DISTRUCTIVE TESTING OF MATERIAL AND ELECTRICAL APPARATUS:**

Measurement of D.C Resistively, Measurement of Dielectric Constant and loss factor, Partial discharge measurements.

**UNIT – VI HIGH VOLTAGE TESTING OF ELECTRICAL APPARATUS:**

Testing of Insulators and bushings, Testing of Isolators and circuit breakers, Testing of cables, Testing of Transformers, Testing of Surge Arresters, Radio Interference measurements.

**TEXT BOOKS:**

1. High Voltage Engineering **–** M.S. Naidu and V. Kamaraju, TMH Publications, 3rd Edition.

2. High Voltage Engineering Fundamentals **–** E. Kuffel, W.S. Zaengl, J. Kuffel by Elsevier, 2nd Edition.

**REFERENCE BOOKS:**

1. High Voltage Engineering **–** C.L. Wadhwa, New Age Internationals (P) Limited.

2. High Voltage Insulation Engineering **–** Ravindra Arora, Wolfgang Mosch, New Age International (P) Limited.

**B.Tech IV Year – II Sem.**

**Code: 9A827 REACTIVE POWER CONTROL & MANAGEMENT**

**(Professional Elective-IV)**

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**Objective:**

This subject deals with reactive power control and management.

**Course outcomes:**

Students will be able to

* + 1. Understand the load compensation.

1. Understand the Steady – State Reactive Power Compensation in Transmission System.
2. Understand the Reactive Power Coordination.
3. Know about Demand Side Management.
4. Understand the User Side Reactive Power Management
5. Study about Reactive Power Management in Electric Traction Systems and Arc Furnaces.

**UNIT-I: LOAD COMPENSATION**

Objectives and specifications – reactive power characteristics – inductive and capacitive approximate biasing – Load compensator as a voltage regulator – phase balancing and power factor correction of unsymmetrical loads- examples.

**UNIT-II: STEADY – STATE REACTIVE POWER COMPENSATION IN TRANSMISSION SYSTEM**

Uncompensated line – types of compensation – Passive shunt and series and dynamic shunt compensation –examples.

**Transient state reactive power compensation in transmission systems:**

Characteristic time periods – passive shunt compensation – static compensations- series capacitor compensation –compensation using synchronous condensers – examples

**UNIT-III: REACTIVE POWER COORDINATION**

Objective – Mathematical modeling – Operation planning – transmission benefits – Basic concepts of quality of power supply – disturbances- steady –state variations – effects of under voltages – frequency –Harmonics, radio frequency and electromagnetic interferences.

**UNIT-IV: DEMAND SIDE MANAGEMENT**

Load patterns – basic methods load shaping – power tariffs- KVAR based tariffs penalties for voltage flickers and Harmonic voltage levels.

**Distribution side Reactive power Management:**

System losses –loss reduction methods – examples – Reactive power planning – objectives – Economics Planning capacitor placement – retrofitting of capacitor banks.

**UNIT-V: USER SIDE REACTIVE POWER MANAGEMENT**

KVAR requirements for domestic appliances – Purpose of using capacitors – selection of capacitors – deciding factors – types of available capacitor, characteristics and Limitations.

**UNIT-VI: REACTIVE POWER MANAGEMENT IN ELECTRIC TRACTION SYSTEMS AND ARC FURNACES:**

Typical layout of traction systems – reactive power control requirements – distribution transformers- Electric arc furnaces – basic operations- furnaces transformer –filter requirements – remedial measures –power factor of an arc furnace.

**REFERENCES:**

1. Reactive power control in Electric power systems by T.J.E. Miller, John Wiley and sons, 1982.

2. Reactive power Management by D.M. Tagare, Tata McGraw Hill, 2004.

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| **Syllabus for B. Tech (E.E.E.) IV Year I semester** | | | | | | |
| **Year/Sem** | **Sub. Code** | **Subject Name** | **L** | **T** | **P/D** | **C** |
| **IV - I** | **9CC17** | **Advanced Computer Architecture (PE-IV)** | **3** | **0** | **0** | **3** |

**Course Objectives:** Students will learn about

1. Various basic computer architectures, data representations and instruction sets.
2. Arithmetic unit, control unit and efficient computation using pipelining
3. Memory organization and optimization
4. I/O Communications and interfaces

**Course Outcomes:** After completing this course, student should be able to

1. To analyze the internal architecture of the computer
2. Understand the different data types and instruction set, of the computer
3. Understand the memory structure of the computer and learn CISC & RISC.
4. Understand processor structure and function and know the input output interfacings

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| **CO** | **COMPUTER ORGANIZATION AND ARCHITECTURE** | PO 1 | PO 2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 | *To analyze the internal architecture of the computer* | 1 | 1 |  |  |  |  |  |  |  |  |  |  | 1 |  |
| CO2 | *Understand the different data types and instruction set, of the computer* | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  | 2 |  |
| CO3 | *Understand the memory structure of the computer and learn CISC & RISC* | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  | 2 |  |
| CO4 | *Understand processor structure and function and know the input output interfacings* | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  | 2 |  |
| CO | | 2 | 2 | 2 |  |  |  |  |  |  |  |  |  | 2 |  |

**UNIT – I: INTRODUCTION:**

Organization and Architecture, Structure and Function **–** Computer Evolution -Brief history of computers – Designing for performance.

**Computer System**: Components, Function – Interconnection Structures – Bus interconnection – PCI.

**UNIT – II: INSTRUCTION SET:**

Characteristics – Operand Types – Operation Types – Addressing Modes – Instruction formats

**CPU:** Computer Arithmetic operations: ALU – Integer Representation and Arithmetic – Floating Point Representation and Arithmetic.

**UNIT – III: COMPUTER MEMORY SYSTEM OVERVIEW**

Cache Memory Principles - Elements of Cache Design

**Internal Memory** - Semiconductor Main Memory - Error Correction - Advanced Dram Organization

**External Memory** - Magnetic Disk – Raid

**UNIT – IV: CHARACTERISTICS OF CISC AND RISC**

**Control unit:** Micro–Operations – Control of Processors – Hardwired Implementation.

**Micro Programmed Control**: Basic concepts – Control Memory - Microinstruction Sequencing – Conditional branching – Mapping of instruction – Microinstruction Execution – Microprogram Example

**UNIT – V: PROCESSOR STRUCTURE AND FUNCTION**

Processor Organization - Register Organization - Instruction Cycle - Instruction Pipelining - Instruction Execution Characteristics - The Use of a Large Register File - Compiler-Based Register Optimization - Reduced Instruction Set Architecture - RISC Pipelining

**UNIT – VI: INPUT/OUTPUT**

External Devices - I/O Modules - Programmed I/O - Interrupt - Driven I/O - Direct Memory Access - I/O Channels and Processors.

**TEXT BOOKS:**

1. William Stallings, “Computer Organization and Architecture – Designing for Performance”,

Prentice Hall, 9th Edition, 2013

2. John P.Hayes, “Computer Architecture and Organization”, Tata McGraw Hill, 3rd Edition, 2002.

**REFERENCES:**

1. Patterson, D. A., and Hennessy, J. L., “Computer Organization and Design: The Hardware/Software Interface”, Morgan Kaufmann Publishers, 4th Edition, 2008.
2. D.A.Godse A.P.Godse, Computer Architecture & Organization, Technical Publications, 2007.
3. Carl Hamacher, Zvonko Vranesic and Safwat Zaky, “Computer Organization”, Tata McGraw Hill, 5th Edition, 2002.
4. Morris Mano, “ Computer Systems Architecture “, 3rd Edition, Pearson PHI Publication, 1993

**IV Year B.Tech – II Sem**

**CODE: 9A820 ELECTRICAL DISTRIBUTION SYSTEMS**

**(PROFESSIONAL ELECTIVE – V)**

**L T P C**

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**Course Objective:**

Knowledge of distribution system modeling, and understanding of various factors like coincidence factor, contribution factor, loss factor etc helps in how loads effects the system .Various models of feeders & substations and location of faults and protective devices gives awareness to students their usage in practical applications.

**Course Outcomes:**

By the end of the unit the student will be able to

1. Know the importance of terms used in distribution system such as load factor, loss factor etc and how these are interred related.
2. Know the importance of different voltages in primary & secondary distribution systems and types of feeders in our country.
3. Identify the importance of location of optimal sub –station through theoretical methods.
4. Calculate power loss and voltage drop in balanced lines and derivations connected with these.
5. Understand various types of protective devices and where and how these are used and the general procedure to coordinate protective devices.
6. Understand the importance of power factor voltage control and how to improve it with various types of correction equipments and best location for them in a system so as to give optimum results.

**CO-PO MAPPING TABLE (Overall Course Mapping)**

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **ELECTRICAL DISTRIBUTION SYSTEM** | **x** | **x** |  |  |  |  |  |  |  |  |  |  | x |  |

**COURSE (UNIT WISE) OUTCOME MAPPING WITH POS**

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| **CO**  **(Unit Wise)** | **Statement** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | PSO 1 | PSO2 |
| Unit – 1 | Know the importance of terms used in distribution system such as load factor, loss factor etc and how these are interred related | 3 | 1 | 1 | 1 |  | 1 |  |  |  | 1 |  |  | 3 |  |
| Unit – 2 | Know the importance of different voltages in primary & secondary distribution systems and types of feeders in our country. | 3 | 2 | 1 |  | 1 |  | 1 | 1 |  |  |  |  | 3 |  |
| Unit – 3 | Identify the importance of location of optimal sub –station through theoretical methods. | 2 | 3 |  |  | 2 | 1 | 2 |  | 1 | 1 | 2 | 2 | 3 |  |
| Unit – 4 | Calculate power loss and voltage drop in balanced lines and derivations connected with these. | 3 | 2 | 2 |  |  |  |  |  |  | 2 |  |  | 3 |  |
| Unit – 5 | Understand various types of protective devices and where and how these are used and the general procedure to coordinate protective devices. | 3 | 3 | 2 |  | 3 |  |  |  |  |  |  | 2 | 3 |  |
| Unit – 6 | Understand the importance of power factor voltage control and how to improve it with various types of correction equipments and best location for them in a system so as to give optimum results | 3 | 2 |  |  |  |  |  |  |  |  |  | 1 | 3 |  |

**NOTE:** L, M, H are the Low, Medium and High Levels of contribution

**UNIT – 1 GENERAL CONCEPT**

Introduction to distribution systems, Load modeling and characteristics. Coincidence factor, contribution factor loss factor - Relationship between the load factor and loss factor. Classification of loads (Residential, Commercial, Agricultural and Industrial) and their characteristics.

**UNIT – II DISTRIBUTION FEEDERS**

Design Considerations of Distribution Feeders: Radial and loop types of primary feeders, Voltage levels, Feeder loading; Basic design practice of the secondary distribution system.

**UNIT – III SUBSTATIONS**

Location of Substations: Rating of distribution substation, Service area within primary feeders. Benefits derived through optimal location of substations.

**UNIT – IV SYSTEM ANALYSIS** Voltage drop and power-loss calculations: Derivation for voltage drop and power loss in lines, Manual methods of solution for radial networks, Three phase balanced primary lines.

**UNIT – V PROTECTION & CO-ORDINATION**

Objectives of distribution system protection, Types of common faults and procedure for fault calculations. Protective Devices: Principle of operation of Fuses, Circuit Reclosures, line sectionalizes and circuit breakers.

Coordination of Protective Devices: General coordination procedure.

**UNIT – VI POWER FACTOR IMPROVEMENT & VOLTAGE CONTROL**

Capacitive compensation for power-factor control, Different types of power capacitors, Shunt and series capacitors, Effect of shunt capacitors (Fixed and switched), Power factor correction, capacitor allocation - Economic justification - Procedure to determine the best capacitor location.

Voltage Control: Equipment for voltage control, Effect of series capacitors, Effect of AVB / AVR, line drop compensation.

**TEXT BOOK:**

1. “Electric Power Distribution system, Engineering” – Turan Gonen, Mc Graw-hill 2nd edition.

2. Electric Power Distribution – A.S. Pabla, Tata Mc Graw-hill, 4th edition.

**REFERENCES:**

1. Electrical Power Distribution and Automation – S.Sivanagaraju, V.Sankar, Dhanpat Rai publishers. Rai & Co, 1st edition.

1. Electrical Power Distribution Systems – V.Kamaraju, Right Publishers, 2nd edition.

**IV Year B.Tech – II Sem.**

**Code: 9A826 PROGRAMMABLE LOGIC CONTROLLERS**

**(Professional Elective – V)**

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Course Learning Outcome:

At the end of the course, students will be able to –

1. recognize the fundamental principles of programmable logic controller
2. program PLC using standard programming techniques
3. develop and design PLC based application

**UNIT – I**: PLC: Characteristics, Operation, function, Types of PLC, Architecture Of PLC Applications of PLC, PC v/s PLC.

**UNIT –II:** Overview of I/O system. Classification: serial, parallel, discrete, analog special. Direct I/O, Parallel I/O, Serial I/O, discrete input modules: DC input, AC input, Rectifier with filter, Isolation, logic section. Discrete output modules: operating principals, Analog input modules: single ended, differential input, Common AC source, isolation, protection. Configuration, power line conditioner.

**UNIT – III**: Ladder diagram: of logic gates, multiplexer, Ladder diagram for different logical conditions or logical equations or truth table, Timers: types of timer, Characteristics. Function of timer in PLC. Classification of a PLC timer. Ladder diagram using timer, PLC counter. Ladder diagram using counter.

**UNIT – IV:** Introduction of Management Hierarchy of an industry, Industrial control process, Parallel and Serial communication interface. Simplex, Half duplex, full duplex. RS 232- DB-25 connector, DB-9 connector, RS 422, EIA 485 interface, Introduction of industrial network. Bus topology, Ring topology, Star topology, Tree topology.

**UNIT – V**: basic Concept, History and Hierarchy of DCS, Functions of each level, Advantages and Disadvantages, Architecture of SCADA .Working of SCADA.

**UNIT – VI**: PLC, DCS and SCADA suitability .Applications: Thermal power plant, Irrigation and Cement factory.

**TEXT BOOKS:**

* + - 1. Programmable Logic Controllers and Industrial Automation an Introduction Mitra, Madhuchanda; Gupta, Samarjit Sen Param International Publishing (India) Pvt. Ltd., New Delhi, Latest edition.

1. 2. Programmable logic controllers: principles and applications Webb, John W.; Reis, Ronald A. PHI Learning Pvt. Ltd. New Delhi, Latest edition.
2. 3 Programmable logic controls: principles and applications NIIT PHI Learning Pvt. Ltd. New Delhi, Latest edition.
3. 4. Practical SCADA for Industry Bailey, David; Wright, Edwin Newnes , Burlington, MA

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**IV Year B.Tech – II Sem.**

**Code: 9A833 SWITCH MODE POWER CONVERSION**

**(Professional Elective – V)**

**L T P C**

**3 - - 3**

**Course Objective:**

Understand the concepts of buck, boost converters, voltage, current fed converters, phase modulation technique, buck, boost, design of drive circuits for switching devices and mechanisms of loop stabilization.

**Course Outcomes:**

Students will able to

1. Describe Basic topologies of buck, boost converters, buck-boost converters, and cuk converter.
2. Explain Voltage mode and current mode control of converters.
3. Explain types of resonant converters, methods of control and phase modulation technique.
4. Explain Application of state-space averaging to switching converters.
5. Understand Design of filter inductor & capacitor, and power transformer.
6. Understand mechanisms of loop stabilization.

**UNIT- I: DC/DC CONVERTERS:**

Basic topologies of buck, boost converters, buck-boost converters, and cuk converter, isolated DC/DC converter topologies—forward, and fly-back converters, half and full bridge topologies, modeling of switching converters.

**UNIT –II: CURRENT MODE AND CURRENT FED TOPOLOGIES:**

Voltage mode and current mode control of converters, peak and average current mode control, its advantages and limitations, voltage and current fed converters.

**UNIT – III: RESONANT CONVERTERS:**

Need for resonant converters, types of resonant converters, methods of control, phase modulation technique with ZVS in full-bridge topology, series resonant converter and resonant transition converter.

**UNIT – IV: CONVERTER TRANSFER FUNCTIONS:**

Application of state-space averaging to switching converters, derivation of converter transfer functions for buck, boost, and fly-back topologies.

**UNIT – V: POWER CONVERTER DESIGN:**

Design of filter inductor & capacitor, and power transformer, Ratings for switching devices, current transformer for current sensing, design of drive circuits for switching devices, considerations for PCB layout.

**UNIT –VI: CONTROLLER DESIGN:**

Introduction, mechanisms of loop stabilization, shaping E/A gain vs. frequency characteristic, conditional stability in feedback loops, stabilizing a continuous mode forward converter and discontinuous mode fly-back converter, feed-back loop stabilization with current mode control, the right-half plane zero.

**TEXT BOOKS:**

1. Ned Mohan Tore M. Undeland: Power Electronics: Converters, Applications, and Design, Edition3, John Wiley & Sons, 2007.

2. Abraham I. Pressman, Switching Power Supply Design‖, Mc Graw Hill International, Second Edition, 1999.

3. P.C. Sen: Modern Power Electronics, S. Chand-2004.

4. Andrzej M. Trzynadlowski Introduction to Modern Power Electronics, 2nd Edition, illustrated Publisher John Wiley & Sons, 2010.

5. Muhammad H. Rashid, Power electronics hand book, ISBN: 81 8147 367 1.

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| **Syllabus for B. Tech (E.E.E.)** | | | | | | |
| **Year/Sem** | **Sub. Code** | **Subject Name** | **L** | **T** | **P/D** | **C** |
| **IV - II** | **9CC23** | **Embedded C Programming (Professional Elective – V)** | **3** | **0** | **0** | **3** |

***Course Objectives:***

*The objectives of this course are*

* *To provide basic knowledge in embedded system design using Embedded C.*
* *To make the learners understand concept and applications of Embedded C Programming in various fields including industrial automation.*

***Course Outcomes****: After studying this course, the students will be able to*

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| *CO1* | *Demonstrate the use of development software for a particular application and choosing appropriate OS.* |
| *CO2* | *Understanding and building basic embedded system using 8051.Understanding its design* |
| *CO3* | *Design of embedded systems and implementation of switch reading.* |
| *CO4* | *Demonstrate the concepts of OOP’s theory inheritance and functions in embedded C to support modular programming.* |
| *CO5* | *Learning the need for real time implementation in Embedded C.* |
| *CO6* | *Case study of ‘Intruder Alarm” to achieve real time hands on.* |

***Mapping of Course Outcomes with Program Outcomes***

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|  | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 | PSO1 | PSO2 |
| CO1 |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 3 | 3 | 3 |
| CO2 |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |
| CO3 |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |
| CO4 |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |
| CO5 |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 2 | 3 | 3 |
| Overall |  | 3 | 3 | 3 | 3 |  |  |  | 2 |  |  | 3 | 3 | 3 |

**UNIT – I: PROGRAMMING EMBEDDED SYSTEMS IN C**

Introduction ,What is an embedded system, Which processor should you use, Which programming language should you use, Which operating system should you use, How do you develop embedded software, Conclusions

**UNIT – II: INTRODUCING THE 8051 MICROCONTROLLER FAMILY**

Introduction, What’s in a name, The external interface of the Standard 8051, Reset requirements, Clock frequency and performance, Memory issues, I/O pins, Timers, Interrupts, Serial interface, Power consumption ,Conclusions

**UNIT – III: READING SWITCHES**

Introduction, Basic techniques for reading from port pins, Example: Reading and writing bytes, Example: Reading and writing bits (simple version), Example: Reading and writing bits (generic version), The need for pull-up resistors, Dealing with switch bounce, Example: Reading switch inputs (basic code), Example: Counting goats, Conclusions

**UNIT – IV: ADDING STRUCTURE TO THE CODE**

Introduction, Object-oriented programming with C, The Project Header (MAIN.H), The Port Header (PORT.H), Example: Restructuring the ‘Hello Embedded World’ example, Example: Restructuring the goat-counting example, Further examples, Conclusions

**UNIT – V: MEETING REAL-TIME CONSTRAINTS**

Introduction, Creating ‘hardware delays’ using Timer 0 and Timer 1, Example: Generating a precise 50 ms delay, Example: Creating a portable hardware delay, Why not use Timer 2?, The need for ‘timeout’ mechanisms, Creating loop timeouts, Example: Testing loop timeouts, Example: A more reliable switch interface, Creating hardware timeouts, Example: Testing a hardware timeout, Conclusions

**UNIT – VI: CASE STUDY: INTRUDER ALARM SYSTEM**

Introduction, The software architecture, Key software components used in this example, running the program, the software, Conclusions

**TEXT BOOKS:**

1. Embedded C - Michael J. Pont, 2nd Ed., Pearson Education, 2008

**REFERENCE BOOKS:**

1. PICmicro MCU C-An introduction to programming, The Microchip PIC in CCS C - Nigel Gardner

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**L T P/D C**

**2 - 0 2**

**B. Tech. IV Year I semester**

**CODE: 9EC77 FUNDAMENTALS OF COMPUTER NETWORKS**

**(OPEN ELECTIVE – III)**

**Course Objective:**

1. The objective of the course is to equip the students with a general overview of the concepts and fundamentals of computer networks.
2. Familiarize the students with the standard models for the layered approach to communication between machines in a network and the protocols and functions of the various layers.

**Course Outcomes:**

**At the end of this course, the student will be able to**

1. Classify network topologies and apply the same to different networks with the knowledge acquired from the network reference models and fundamentals of computer networks
2. Illustrate the design issues of data link layer and detect the transmission errors and flow control problems
3. Categorize the Channel allocation issues, MAC protocols such as ALOHA, CSMA and CSMA/CD and MAC addresses with IEEE 802.X and wireless LAN.
4. Distinguish the knowledge of the several routing algorithms and Internetworking concepts.
5. Obtain and use the skills of subnetting and routing mechanisms
6. Distinguish the knowledge of the functions of transport and application layer

**UNIT I:** **INTRODUCTION:**

Uses of Computer Networks, Types of networks: WAN, LAN, MAN, Network Topologies, Reference models: OSI, TCP/IP.

**Physical Layer:** Transmission media: magnetic media, twisted pair, coaxial cable, fiber optics, wireless transmission.

**UNIT II:** **DATA LINK LAYER**:

Design issues in data link layer: framing, flow control, error control, Error Detection and Correction: Parity, CRC checksum, Hamming code, Flow Control: Sliding Window Protocols, Applications: Data link layer protocols HDLC, PPP.

**UNIT III:** **MEDIUM ACCESS SUB LAYER:**

Channel allocation problem, MAC Protocols: ALOHA, CSMA, CSMA/CD, MAC addresses, IEEE 802.X, Standard Ethernet, Wireless LANS. Bridges, Types of Bridges.

**UNIT IV:** **NETWORK LAYER:**

Design issues in Network Layer, Virtual circuit and Datagram Subnets-Routing algorithm: Shortest path routing, Flooding, distance vector routing, Link state routing, Hierarchical routing, Broad casting, Multi casting, Routing for mobile hosts.

Internetworking: Concatenated Virtual Circuits, Connectionless internetworking, Tunneling, Internetwork routing, Fragmentation

**UNIT V:** **NETWORK LAYER IN INTERNET**:

IPv4, IP addresses, Sub netting, Super netting, NAT Internet control protocols: ICMP, ARP, RARP, DHCP**.**

Congestion Control: Principles of Congestion, Congestion Prevention Policies. Congestion Control in datagram Subnet: Choke packet, load shedding, jitter control. Quality of Service: Leaky Bucket algorithm and token bucket algorithm.

**UNIT VI: TRANSPORT LAYER:**

Transport Services, Connection establishment, Connection release and TCP and UDP protocols.

**Application Layer**: Domain name system, FTP, HTTP, SMTP, [WWW.](http://WWW/)

### TEXT BOOKS:

1. Computer Networks — Andrew S Tanenbaum, 4th Edition. Pearson Education/PHI
2. Data Communications and Networking – Behrouz A. Forouzan, Third Edition TMH.
3. Data Communication and Networks-Bhushan Trivedi-OXFORD Publications.

**REFRENCES:**

1. An Engineering Approach to Computer Networks-S. Keshav, 2nd Edition, Pearson Education
2. Understanding communications and Networks, 3rd Edition, W.A. Shay, Thomson

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**L T P/D C**

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**B. Tech. IV Year II semester**

**CODE: 9ZC24 PRODUCT & SERVICES**

**(OPEN ELECTIVE – III)**

**Course Objectives**: This course helps to provide the basic concepts of Product and Services. This course will enable the students to study areas of basic insights in product management and Services Design.

**Course Out Comes**:

1. The students will be introduced to basic concepts of product.
2. Will enlighten the students with the process of new product development and stages in the process.
3. Will help the students understand the concept of product testing, product planning and the preparatory groundwork for launching a new product
4. Will help the students to understand the nature of services, its differences with the goods and the application of marketing principles for services.
5. Will enlighten the students to understand the attributes of a good service design and the tools for producing and distributing the services.
6. To make the students understand about the importance of quality of services and also introduce some measurement scales to evaluate the service quality.

**UNIT- I: INTERPRETATIONS ON PRODUCT**

Meaning of Product, Product Market Fit Analysis, Product Levels, Product Mix, Product Pruning, and Product Cannibalization. Types of Product Classification

**UNIT- II: PRODUCT INNOVATION and VALIDATION**

New products-What is a new product, New Product Development Process, Idea generation Systems, Concept test, Product testing, Pre-launch, Market test, Final evaluation using “Stage / Gate Process, Product Validity, Break Even Analysis, Financial and Market Analysis.

**UNIT- III: LAUNCHING PRODUCT**

Cost Analysis, Steps to fix the final price, Promotion planning, Digital Marketing and Methods, Retailing, Types of Retailing online Retailing, Post Market Analysis of the Launch

**UNIT - IV: INTRODUCTION TO SERVICE:**

Meaning and Definition of Service, Characteristics of Services, Classification of Service, Five levels of Service, Service verses Physical Goods, 7 P’s for Marketing of Services, Services cape.

**UNIT – V: SERVICE PROCESS DESIGN and SERVICE DISTRIBUTION:**

Service Design Meaning, Tools for Service Design, Attributes of a Good Design Customer involvement in the Production Process, Role of Intermediaries, Methods of Distribution of Services

**UNIT – VI: QUALITY OF SERVICE:**

Definition of Service Quality, Elements of Service Quality, Service Quality Measuring Tools; SERVQUAL Scale, Service Quality Gap Analysis, Objective Service Metrics, Cost of Quality in Service, Challenges and Problems of Service Quality in India.

**ESSENTIAL READINGS:**

* Dr. S.L. Gupta, Product Management, Wisdom Publications
* C.Merle Crawford ,New Product Management
* Valarie A.Zeithaml& Mary Jo-Bitner: Services Marketing—Integrating Customer Focus Across the Firm, 3/e, Tata McGraw Hill, 2007.
* Thomas J.Delong&Asish Nanda: Managing Professional Servies—Text and Cases, McGraw-Hill International, 2006.
* Christopher Lovelock: Services Marketing People, Technology, Strategy, Fourth Edition, Pearson Education, 2006

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**L T P/D C**

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**B. Tech. IV Year II semester**

**CODE: 9ZC15 FINANCIAL INSTITUTIONS, MARKETS AND SERVICES**

**(OPEN ELECTIVE – III)**

**Course Objective:** The objective of the course is to provide to students an understanding of Financial Markets, the major Institutions involved and the Services offered within this framework.

**Course Outcomes:**

1. This unit enables the students to understand the financial structure and the financial sector reforms after 1991.
2. The unit gives the exposure on the role of RBI and the Regulating and credit policies adopted by the RBI.
3. The students get awareness on the role of Non-Banking financial institutions and the role of financial institutions in India.
4. The unit educates the students to know the role of regulatory bodies like SEBI and also to know the capital and money market instruments
5. The unit equips the students to understand about the asset fund based financial services
6. The students will get exposure about the investment banking and merchant banking.

**UNIT I: INTRODUCTION:**

The structure of financial system, Equilibrium in financial markets, Indicators of Financial Development, Financial system and Economic Development, Financial Sector Reforms after 1991.

**UNIT II: BANKING INSTITUTIONS**:

Structure and Comparative performance, Functions and Role of RBI, Competition, Interest rates, Spread; Bank Capital Adequacy norms; Banking Innovations – BPLR to Base rate, Core Banking System, Financial Inclusion, Current rates: Policy rates, Reserve Ratios, Exchange rates, Lending/ Deposit rates.

**UNIT III: NON BANKING FINANCIAL INSTITUTIONS:**

Structure and functioning of Unit Trust of India and Mutual Funds, Growth of Indian Mutual funds and their Regulation, Role of AMFI. Performance of Non-Statutory Financial Organizations: IFCI, IRBI, NABARD, SIDBI and SFCs.

**UNIT IV: FINANCIAL AND SECURITIES MARKETS**:

Role and functions of SEBI, Structure and functions of Call Money Market, Government Securities Market – T-bills Market, Commercial Bills Market, Commercial paper and Certificate of Deposits; Securities Market – Organization and Structure, Listing, Trading and Settlement, SEBI and Regulation of Primary and Secondary Markets.

**UNIT V: ASSET/FUND BASED FINANCIAL SERVICES:**

Lease Finance, Consumer Credit and Hire purchase Finance, Factoring - Definition, Functions, Advantages, Evaluation, Forfeiting, Bills Discounting, Housing Finance, Venture Capital Financing. Fee-based Advisory services: Stock Broking, Credit Rating.

**UNIT VI: INVESTMENT BANKING AND MERCHANT BANKING**:

Investment Banking: Introduction, Functions and Activities, Underwriting, Banker to an Issue, Debenture Trustees and Portfolio managers, Challenges faced by Investment Bankers.

Merchant Banking: Definition, Merchant Banks Vs Commercial Banks, Services of Merchant Banks.

**REFERENCES:**

1. L.M. Bhole: Financial Institutions and Markets, TMH, 2009.
2. E. Gordon, K. Natarajan: Financial Markets and Services, Himalaya Publishing House, 2013.
3. Vasant Desai: Financial Markets and Financial Services, Himalaya,2009
4. Pathak: Indian Financial Systems, Pearson, 2009
5. M.Y. Khan: Financial Services, TMH, 2009.
6. S. Gurusamy: Financial Services and System, Cengage,2009
7. Justin Paul and Padmalatha Suresh: Management of Banking and Financial Services, Pearson, 2009.
8. Gomez, Financial Markets, Institutions and Financial Services, PHI, 2012.
9. R M Srivatsava: Dynamics of Financial Markets and Institutions in India, Excel, 2013.

**L T P/D C**

**3 - 0 3**

**B. Tech. IV Year II semester**

**CODE: 9ZC27 INDIAN HISTORY, CULTURE AND GEOGRAPHY**

**(Common to all branches)**

**(OPEN ELECTIVE – III)**

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**Course Objectives**: To equip the students with necessary knowledge relate to ancient, medieval and modern Indian and its culture and also facts relating to existence of earth.

**Course Outcomes**:

1. To appreciate and understand our Indian History, Culture and Indian heritage.
2. To understand secularism of our country.
3. To appreciate and understand the social reformers who brought revolutionary changes in Indian society.
4. To understand earth evolution and world climatic change.
5. To understand India Oceanography,
6. Able to enhance and understand Indian monsoons, Indian agriculture.

**UNIT I: ANCIENT INDIAN HISTORY**

Fundamental Unity of Indian Harappan and Vedic Civilization – Evolution of Caste System – ainism and Buddhism – Gandhara Art., Political unification of India under Mauryas and Guptas, Historical evolution of Satavahanas., Contribution of Pallavas and Cholas to Art – Chola Administrative Systems .

**UNIT II: MEDIEVAL INDIA AND CULTURE**

Influence of Islam on Indian Culture – The Sufi, Bhakthi and Vishnavite movements, Historical Achievements of Vijayanagara Rulers, Contribution of Shershah and Akbar to the evolution of administration system in India – Cultural Development under Mughals.

**UNIT III: MODERN INDIA**

Western Impact on India – Introduction of Western Education – Social and Cultural awakening and social reform movements – Raja Rama Mohan Roy – Dayananda Saraswathi – Theosophical Society – Ramakrishna Paramahamsa and Vivekananda – Iswara Chandra Vidyasagar and Veeresalingam – Emancipaition of women and struggle against Caste. Rise of Indian Nationalism – Mahatma Gandhi – Non Violence and Satyagraha – Eradication of untouchability – Legacy of British rule.

**UNIT IV:** **GEO MORPHOLOGY AND CLIMATOLOGY**

The Origin and Evolution of the Earth, Interior of the Earth, Distribution of Oceans and Continents, Minerals and Rocks, Geomorphic Processes, Landforms and their Evolution Composition and Structure of Atmosphere, Solar Radiation, Heat Balance and Temperature.  
Atmospheric Circulation and Weather Systems, World Climate and Climate Change.

**UNIT V: OCEANOGRAPHY**

Water (Oceans), Movements of Ocean Water, Physical features of India viz., The Mountains in the North , The Northern Plains, The Peninsular Plateau, The Great Indian Desert, The Coast; and The Islands.

**UNIT VI: PHYSICAL FEATURES OF INDIA AND INDIA’S MONSOON**

India’s monsoon, winter, summer (pre-monsoon), rainy (monsoon), autumn (post-monsoon), Indian Agriculture, Agriculture and colonialism, Indian Agriculture after Independence Major Crops and yields, Horticulture, Organic farming.

**REFERENCES:**

1. Sharma .R.S., (2011).Indian Ancient past., Oxford Publications.
2. Nitin Singhaniya.,(2017). Indian Culture and Heritage., Publisher: Mcgraw TestPrep., Second Edition.
3. Certificate of Physical and Human Geography, Goh Cheng Leong, Oxford University Press.
4. Bipin Chandra.(2000). India’s Struggle for Independence., Penguin Global Publishers
5. Saveendra Singh: Physical Geograpghy.,Prayag Pustak Bhavan ISBN-10: 8186539298, 1st Edition Number of Pages : 641 Pages Publication : Year 2006.
6. Majumdar, R. C. et al. *An Advanced History of India* London: Macmillan. 1960. ISBN 0-333-90298-X
7. Basham, A.L: The wonder that was India, New York: Grove Press, 1954. (OUP, Madras 1983)
8. Basham, A.L: Cultural heritage of India, Vols.I to IV, Oxford University Press, Delhi, 1975.

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**IV Year II Sem**

**9ZC10 ENTREPRENEURSHIP AND BUSINESS DESIGN**

**(OPEN ELECTIVE – III)**

**Course Objective:** The objective of the course is to make students understand the essentials of building their start-ups and to familiarize with business design process develop business models, and market their product.

**Course Outcomes:**

1. The students gain the knowledge on the essentials of entrepreneurship and the key role played by the entrepreneurs.
2. The students gain knowledge on exploring the different phases of UI /UX.
3. The students grasp the attentiveness on designing a business strategy.
4. The students gain familiarity on designing and delivery of services.
5. The students understand reverse engineering methods in product development.
6. The students have access to information on IPR, and patent application.

**UNIT – I: INTRODUCTION TO ENTREPRENEURSHIP**:

Meaning of Entrepreneurship. Reasons feeding the Entrepreneurial fire. Understanding Entrepreneurship as a Process. Multiple roles of Entrepreneur: Intrapreneur, Inventor, Coordinator, Manager and Controller. Psychological and behavioral aspects of First-Generation Entrepreneur.

**UNIT – II: INTRODUCTION TO UI/UX:**

Human centred design and benefits, the distinction between UX and UI, UX process – user research, prototyping strategies, UI principles, UI analysis, UI design, UI components and Responsive design.

**UNIT – III: DESIGNING A BUSINESS STRATEGY:**

Define a problem and frame a strategic question, map the lives of users, journey mapping and ideation, color theory, killing the ideas through Stage Gate Models, pitching of full-fledged, idea, choosing the Start-Up Team.

**UNIT – IV: DESIGNING SERVICES AND SERVICES DELIVERY:**

Services as solutions, Service delivery pathways, rapid branding and marketing strategies, key metrics for Design thinking. Types of New services, Mix of core services and secondary and enhancing services, service flower and service design matrix.

**UNIT – V: BUSINESS MODEL:**

Meaning of business model, Difference between business model and business planning, the business model canvas, Risks and Assumptions, Validation of business models, building solution demo and MVP, revenue streams and pricing strategies.

**UNIT – VI: ENTREPRENEURIAL FUNDING AND RISK MANAGEMENT:**

Bootstrapping, Angel Investors, Venture capitalists, Private equity funding, customer acquisition, return on equity and Break even analysis, Risk propensity Vs. Risk avoidance, Locus of control of entrepreneur, Risk estimation techniques, risk avoidance strategies.

**TEXT BOOKS**

1. Adrian McEwen, Hakim Cassimally – “Designing the Internet of Things”, Wiley Publications, 2012
2. Hedman, J., & Kalling, T. (2003). The business model concept: theoretical underpinnings and empirical illustrations. *European journal of information systems*, *12*(1), 49-59.
3. Cabrera, J. (2017). *Modular Design Frameworks: A Projects-based Guide for UI/UX Designers*. Apress.

**REFERENCES**

1. J. Chris Leach & Ronald W. Melicher “Entrepreneurial Finance, Fourth Edition”, South Western, Cengage Learning, 2012.
2. Robert D. Hisrich &VelandRamadani – “E­ffective Entrepreneurial Management, Strategy, Planning, Risk Management, and Organization”, Springer, 2017.
3. Mæhlum, A. R. (2017). *Extending the TILES Toolkit-from Ideation to Prototyping* (Master's thesis, NTNU).
4. Norman, D. (2013). *The design of everyday things: Revised and expanded edition*. Basic

**IV Year B.Tech – II Sem**

**CODE: 9A883 PROJECT**

**L T P/D C**

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## *Course Objectives:*

To enhance the knowledge on selecting a project, learn related tools and enhance programming and communication skills for employability.

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| **Course Name/ PO** | **PO1** | **PO2** | **PO3** | **PO4** | **PO5** | **PO6** | **PO7** | **PO8** | **PO9** | **PO10** | **PO11** | **PO12** | **PSO1** | **PSO2** |
| **MAIN PROJECT** | 3 | 2 | 3 | 3 | 3 | 2 | 3 | 2 | 3 | 2 | 3 | 2 | 2 | 2 |

**Course Outcomes: At the end of this course, the student will be able to**

1. Develop plans with relevant people to achieve the project's goals
2. Break work down into tasks and determine handover procedures
3. Identify links and dependencies, and schedule to achieve deliverables
4. Estimate the human and physical resources required, and make plans to obtain the necessary resources
5. Allocate roles with clear lines of responsibility and accountability with team spirit.

6.     Design and develop the software or prototype to meet societal needs

A project shall be carried out by a group of students consisting of 2 to 3 in number in fourth year second semester. This work shall be carried out under the guidance of the faculty assigned as internal guide and shall involve design, fabrication, software development or any other significant activity. This can be of interdisciplinary nature also.

Out of total 100 marks for project work (in the final year second semester), 30 marks shall be for Internal Evaluation and 70 marks for the External Evaluation at the end of the Semester.

External Evaluation of the project (viva-voce) shall be conducted by a committee appointed by the Chief Superintendent. The committee consists of an external examiner, HOD, a Senior Faculty Member and Internal Guide.

**Division of marks for internal assessment – 30 marks**

**Division of Marks for External Evaluation – 70 Marks**