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| b.Sc.,  physics with computer application |
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| |  | | --- | | **SYLLABUS** | | **from the academic year**  **2023-2024** | |
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| **TAMILNADU STATE COUNCIL FOR HIGHER EDUCATION, CHENNAI – 600 005** |
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**B.Sc. PHYSICS WITH COMPUTER APPLICATIONS**

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| **LEARNING OUTCOMES-BASED CURRICULUM FRAMEWORK GUIDELINES BASED REGULATIONS FOR UNDER GRADUATE PROGRAMME** | |
| **Programme:** | **B.Sc. PHYSICS WITH COMPUTER APPLICATIONS** |
| **Programme Code:** |  |
| **Duration:** | **3 Years (UG)** |
| **Programme Outcomes:** | **PO1: Disciplinary knowledge:** Capable of demonstrating comprehensive knowledge and understanding of one or more disciplines that form a part of an undergraduate Programme of study  **PO2: Communication Skills:** Ability to express thoughts and ideas effectively in writing and orally; Communicate with others using appropriate media; confidently share one’s views and express herself/himself; demonstrate the ability to listen carefully, read and write analytically, and present complex information in a clear and concise manner to different groups.  **PO3: Critical thinking:** Capability to apply analytic thought to a body of knowledge; analyse and evaluate evidence, arguments, claims, beliefs on the basis of empirical evidence; identify relevant assumptions or implications; formulate coherent arguments; critically evaluate practices, policies and theories by following scientific approach to knowledge development.  **PO4: Problem solving: Capacity** to extrapolate from what one has learned and apply their competencies to solve different kinds of non-familiar problems, rather than replicate curriculum content knowledge; and apply one’s learning to real life situations.  **PO5: Analytical reasoning**: Ability to evaluate the reliability and relevance of evidence; identify logical flaws and holes in the arguments of others; analyze and synthesize data from a variety of sources; draw valid conclusions and support them with evidence and examples, and addressing opposing viewpoints.  **PO6: Research-related skills**: A sense of inquiry and capability for asking relevant/appropriate questions, problem arising, synthesising and articulating; Ability to recognise cause-and-effect relationships, define problems, formulate hypotheses, test hypotheses, analyse, interpret and draw conclusions from data, establish hypotheses, predict cause-and-effect relationships; ability to plan, execute and report the results of an experiment or investigation  **PO7: Cooperation/Team work:** Ability to work effectively and respectfully with diverse teams; facilitate cooperative or coordinated effort on the part of a group, and act together as a group or a team in the interests of a common cause and work efficiently as a member of a team  **PO8: Scientific reasoning**: Ability to analyse, interpret and draw conclusions from quantitative/qualitative data; and critically evaluate ideas, evidence and experiences from an open-minded and reasoned perspective.  **PO9: Reflective thinking**: Critical sensibility to lived experiences, with self awareness and reflexivity of both self and society.  **PO10 Information/digital literacy:** Capability to use ICT in a variety of learning situations, demonstrate ability to access, evaluate, and use a variety of relevant information sources; and use appropriate software for analysis of data.  **PO 11 Self-directed learning**: Ability to work independently, identify appropriate resources required for a project, and manage a project through to completion.  **PO 12 Multicultural competence:** Possess knowledge of the values and beliefs of multiple cultures and a global perspective; and capability to effectively engage in a multicultural society and interact respectfully with diverse groups.  **PO 13: Moral and ethical awareness/reasoning**: Ability toembrace moral/ethical values in conducting one’s life, formulate a position/argument about an ethical issue from multiple perspectives, and use ethical practices in all work. Capable of demonstratingthe ability to identify ethical issues related to one‟s work, avoid unethical behaviour such as fabrication, falsification or misrepresentation of data or committing plagiarism, not adhering to intellectual property rights; appreciating environmental and sustainability issues; and adopting objective, unbiased and truthful actions in all aspects of work.  **PO 14: Leadership readiness/qualities:** Capability for mapping out the tasks of a team or an organization, and setting direction, formulating an inspiring vision, building a team who can help achieve the vision, motivating and inspiring team members to engage with that vision, and using management skills to guide people to the right destination, in a smooth and efficient way.  **PO 15: Lifelong learning:** Ability to acquire knowledge and skills, including „learning how to learn‟, that are necessary for participating in learning activities throughout life, through self-paced and self-directed learning aimed at personal development, meeting economic, social and cultural objectives, and adapting to changing trades and demands of work place through knowledge/skill development/reskilling. |
| **Programme Specific Outcomes:** | On successful completion of Bachelor of Physics with Computer Applications programme, the student should be able to:  **PSO1: Disciplinary Knowledge:** Understand the fundamental principles, concepts, and theories related to physics and computer science. Also, exhibit proficiency in performing experiments in the laboratory.  **PSO2: Critical Thinking:** Analyse complex problems, evaluate information, synthesize information, apply theoretical concepts to practical situations, identify assumptions and biases, make informed decisions and communicate effectively  **PSO3: Problem Solving:** Employ theoretical concepts and critical reasoning ability with physical, mathematical and technical skills to solve problems, acquire data, analyze their physical significance and explore new design possibilities.  **PSO4: Analytical & Scientific Reasoning:** Apply scientific methods, collect and analyse data, test hypotheses, evaluate evidence, apply statistical techniques and use computational models.  **PSO5: Research related skills:** Formulate research questions, conduct literature reviews, design and execute research studies, communicate research findings and collaborate in research projects.  **PSO6: Self-directed & Lifelong Learning:** Set learning goals, manage their own learning, reflect on their learning, adapt to new contexts, seek out new knowledge, collaborate with others and to continuously improve their skills and knowledge, through ongoing learning and professional development, and contribute to the growth and development of their field. |

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| **PO/PSO** | **PSO1** | **PSO2** | **PSO3** | **PSO4** | **PSO5** | **PSO6** |
| **PO1** |  |  |  |  |  |  |
| **PO2** |  |  |  |  |  |  |
| **PO3** |  |  |  |  |  |  |
| **PO4** |  |  |  |  |  |  |
| **PO5** |  |  |  |  |  |  |
| **PO6** |  |  |  |  |  |  |

**2. Highlights of the Revamped Curriculum**:

* Student-centric, meeting the demands of industry & society, incorporating industrial components, hands-on training, skill enhancement modules, industrial project, project with viva-voce, exposure to entrepreneurial skills, training for competitive examinations, sustaining the quality of the core components and incorporating application oriented content wherever required.
* The Core subjects include latest developments in the education and scientific front, advanced programming packages allied with the discipline topics, practical training, devising statistical models and algorithms for providing solutions to industry / real life situations. The curriculum also facilitates peer learning with advanced statistical topics in the final semester, catering to the needs of stakeholders with research aptitude.
* The General Studies and Statistics based problem solving skills are included as mandatory components in the ‘Training for Competitive Examinations’ course at the final semester, a first of its kind.
* The curriculum is designed so as to strengthen the Industry-Academia interface and provide more job opportunities for the students.
* The Statistical Quality Control course is included to expose the students to real life problems and train the students on designing a mathematical model to provide solutions to the industrial problems.
* The Internship during the second year vacation will help the students gain valuable work experience, that connects classroom knowledge to real world experience and to narrow down and focus on the career path.
* Project with viva-voce component in the fifth semester enables the student, application of conceptual knowledge to practical situations. The state of art technologies in conducting a Explain in a scientific and systematic way and arriving at a precise solution is ensured. Such innovative provisions of the industrial training, project and internships will give students an edge over the counterparts in the job market.
* State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature are incorporated as Elective courses, covering conventional topics to the latest DBMS and Computer software for Analytics.

**Value additions in the Revamped Curriculum:**

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| --- | --- | --- |
| **Semester** | **Newly introduced Components** | **Outcome / Benefits** |
| **I** | **Foundation Course**  To ease the transition of learning from higher secondary to higher education, providing an overview of the pedagogy of learning Literature and analysing the world through the literary lens  gives rise to a new perspective. | * Instill confidence among students * Create interest for the subject |
| **I, II, III, IV** | **Skill Enhancement papers** (Discipline centric / Generic / Entrepreneurial) | * Industry ready graduates * Skilled human resource * Students are equipped with essential skills to   make them employable |
| * Training on language and communication skills enable the students gain   knowledge and  exposure in the competitive world. |
| * Discipline centric skill will improve the Technical knowhow of solving real life   problems. |
| **III, IV, V & VI** | Elective papers | * Strengthening the domain knowledge * Introducing the stakeholders to the State-of Art techniques from the streams of multi-disciplinary, cross disciplinary and inter disciplinary nature * Emerging topics in higher education/ industry/ communication network / health sector etc. are introduced with   hands-on-training. |

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| **IV** | Elective Papers | | * Exposure to industry moulds students into solution providers * Generates Industry ready graduates * Employment opportunities enhanced |
| **V Semester** | Elective papers | | * Self-learning is enhanced * Application of the concept to real situation is conceived resulting   in tangible outcome |
| **VI Semester** | Elective papers | | * Enriches the study beyond the course. * Developing a research framework and   presenting their  independent and  intellectual ideas effectively. |
| **Extra Credits:**  **For Advanced Learners / Honors degree** | | | * To cater to the needs of peer learners / research   aspirants |
| **Skills acquired from the Courses** | | Knowledge, Problem Solving, Analytical  ability, Professional Competency, Professional Communication and Transferrable Skill | |

**Credit Distribution for UG Programmes**

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| **Sem I** | **Credit** | **H** | **Sem II** | **Credit** | **H** | **Sem III** | **Credit** | **H** | **Sem IV** | **Credit** | **H** | **Sem V** | **Credit** | **H** | **Sem VI** | **Credit** | **H** |
| Part 1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | Part..1. Language – Tamil | 3 | 6 | 5.1 Core Course –\CC IX | 4 | 5 | 6.1 Core Course –  CC XIII | 4 | 6 |
| Part.2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | Part..2 English | 3 | 6 | 5.2 Core Course – CC X | 4 | 5 | 6.2 Core Course –  CC XIV | 4 | 6 |
| 1.3 Core Course – CC I | 5 | 5 | 2..3 Core Course – CC III | 5 | 5 | 3.3 Core Course – CC V | 5 | 5 | 4.3 Core Course – CC VII  Core Industry Module | 5 | 5 | 5. 3.Core Course CC -XI | 4 | 5 | 6.3 Core Course –  CC XV | 4 | 6 |
| 1.4 Core Course – CC II | 5 | 5 | 2.4 Core Course – CC IV | 5 | 5 | 3.4 Core Course – CC VI | 5 | 5 | 4.4 Core Course –  CC VIII | 5 | 5 | 5. 4.Core Course –/ Project with viva- voce  CC -XII | 4 | 5 | 6.4 Elective -VII Generic/ Discipline Specific | 3 | 5 |
| 1.5 Elective I Generic/ Discipline Specific | 3 | 4 | 2.5 Elective II Generic/ Discipline Specific | 3 | 4 | 3.5 Elective III Generic/ Discipline Specific | 3 | 4 | 4.5 Elective IV Generic/ Discipline Specific | 3 | 3 | 5.5 Elective V Generic/ Discipline Specific | 3 | 4 | 6.5 Elective VIII  Generic/ Discipline Specific | 3 | 5 |
| 1.6 Skill Enhancement Course SEC-1 | 2 | 2 | 2.6 Skill Enhancement Course SEC-2 | 2 | 2 | 3.6 Skill Enhancement Course SEC-4,  (Entrepreneurial Skill) | 1 | 1 | 4.6 Skill Enhancement Course SEC-6 | 2 | 2 | 5.6 Elective VI Generic/ Discipline Specific | 3 | 4 | 6.6 Extension Activity | 1 | - |
| 1.7 Skill Enhancement -(Foundation Course) | 2 | 2 | 2.7 Skill Enhancement Course –SEC-3 | 2 | 2 | 3.7 Skill Enhancement Course SEC-5 | 2 | 2 | 4.7 Skill Enhancement Course SEC-7 | 2 | 2 | 5.7 Value Education | 2 | 2 | 6.7 Professional Competency Skill | 2 | 2 |
|  |  |  |  |  |  | 3.8 E.V.S. | - | 1 | 4.8 E.V.S | 2 | 1 | 5.8 Summer Internship /Industrial Training | 2 |  |  |  |  |
|  | **23** | **30** |  | **23** | **30** |  | **22** | **30** |  | **25** | **30** |  | **26** | **30** |  | **21** | **30** |
| **Total – 140 Credits** | | | | | | | | | | | | | | | | | |

**Choice Based Credit System (CBCS), Learning Outcomes Based Curriculum Framework (LOCF) Guideline Based Credit and Hours Distribution System**

**for all UG courses including Lab Hours**

**First Year – Semester-I**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course SEC-1 | 2 | 2 |
| Foundation Course | 2 | 2 |
|  |  | **23** | **30** |

**Semester-II**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language – Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-2 | 2 | 2 |
| Skill Enhancement Course -SEC-3 (Discipline / Subject Specific) | 2 | 2 |
|  |  | **23** | **30** |

**Second Year – Semester-III**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 14 |
| Part-4 | Skill Enhancement Course -SEC-4 (Entrepreneurial Based) | 1 | 1 |
| Skill Enhancement Course -SEC-5 (Discipline / Subject Specific) | 2 | 2 |
| E.V.S | - | 1 |
|  |  | **22** | **30** |

**Semester-IV**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| Part-1 | Language - Tamil | 3 | 6 |
| Part-2 | English | 3 | 6 |
| Part-3 | Core Courses & Elective Courses including laboratory [in Total] | 13 | 13 |
| Part-4 | Skill Enhancement Course -SEC-6 (Discipline / Subject Specific) | 2 | 2 |
| Skill Enhancement Course -SEC-7 (Discipline / Subject Specific) | 2 | 2 |
| E.V.S | 2 | 1 |
|  |  | **25** | **30** |

**Third Year**

**Semester-V**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based | 22 | 26 |
| **Part-4** | Value Education | 2 | 2 |
| Internship / Industrial Visit / Field Visit | 2 | 2 |
|  |  | **26** | **30** |

**Semester-VI**

|  |  |  |  |
| --- | --- | --- | --- |
| **Part** | **List of Courses** | **Credit** | **No. of Hours** |
| **Part-3** | Core Courses including Project / Elective Based & LAB | 18 | 28 |
| **Part-4** | Extension Activity | 1 | - |
| Professional Competency Skill | 2 | 2 |
|  |  | **21** | **30** |

**Consolidated Semester wise and Component wise Credit distribution**

|  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- |
| **Parts** | **Sem I** | **Sem II** | **Sem III** | **Sem IV** | **Sem V** | **Sem VI** | **Total Credits** |
| **Part I** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part II** | 3 | 3 | 3 | 3 | - | - | 12 |
| **Part III** | 13 | 13 | 13 | 13 | 22 | 18 | 92 |
| **Part IV** | 4 | 4 | 3 | 6 | 4 | 1 | 22 |
| **Part V** | - | - | - | - | - | 2 | 2 |
| **Total** | 23 | 23 | 22 | 25 | 26 | 21 | **140** |

**\*Part I. II, and Part III components will be separately taken into account for CGPA calculation and classification for the under graduate programme and the other components. IV, V have to be completed during the duration of the programme as per the norms, to be eligible for obtaining the UG degree.**

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| **Methods of Evaluation** | | |
| **Internal Evaluation** | Continuous Internal Assessment Test | 25 Marks |
| Assignments |
| Seminars |
| Attendance and Class Participation |
| **External Evaluation** | End Semester Examination | 75 Marks |
|  | Total | 100 Marks |
| **Methods of Assessment** | | |
| **Recall (K1)** | Simple definitions, MCQ, Recall steps, Concept definitions | |
| **Understand/ Comprehend (K2)** | MCQ, True/False, Short essays, Concept explanations, Short summary or  overview | |
| **Application (K3)** | Suggest idea/concept with examples, Suggest formulae, Solve problems,  Observe, Explain | |
| **Analyze (K4)** | Problem-solving questions, Finish a procedure in many steps, Differentiate | |
|  | between various ideas, Map knowledge | |
| **Evaluate (K5)** | Longer essay/ Evaluation essay, Critique or justify with pros and cons | |
| **Create (K6)** | Check knowledge in specific or offbeat situations, Discussion, Debating or  Presentations1 | |

**B.Sc Physics with Computer Applications Credit Distribution**

|  |  |  |  |
| --- | --- | --- | --- |
| **First Year – Semester – I** | | | |
| **Part** | **List of courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil Paper | 3 | 6 |
| **Part II** | English Paper | 3 | 6 |
| **Part-III** | Core Course – I **Properties of Matter & Sound** | 5 | 5 |
| Core Course – II **Electronics** | 5 | 5 |
| Elective Course I (Generic / Discipline Specific)  **Allied Mathematics - I** | 3 | 4 |
| **Part-IV** | Skill Enhancement Course SEC 1 | 2 | 2 |
| Skill Enhancement Course | 2 | 2 |
| **TOTAL** |  | **23** | **30** |
| **First Year – Semester – II** | | | |
|  | | | |
| **Part** | **List of courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil Paper | 3 | 6 |
| **Part II** | English Paper | 3 | 6 |
| **Part III** | Core Course III – **Heat, Thermodynamics and Statistical Physics** | 5 | 5 |
| Core Course IV – **Physics Core Practical-I** | 5 | 5 |
| Elective Course II (Generic / Discipline Specific)  **Allied Mathematics II** | 3 | 4 |
| **Part IV** | Skill Enhancement Course SEC 2 | 2 | 2 |
| Skill Enhancement Course SEC-3 | 2 | 2 |
| **TOTAL** |  | **23** | **30** |

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| --- | --- | --- | --- |
| **Second Year – Semester – III** | | | |
|  | | | |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil | 3 | 6 |
| **Part II** | English | 3 | 6 |
| **Part III** | Core Course –V **General Mechanics and Classical Mechanics** | 5 | 5 |
| Core Course –VI **Physics Core Practical-II** | 5 | 5 |
| Elective Course III (Generic / Discipline Specific)  **Programming Techniques Using C** | 3 | 4 |
| **Part IV** | Skill Enhancement Course SEC 4 (NME) | 1 | 1 |
| Skill Enhancement Course SEC 5  (Entrepreneurial Skills) | 2 | 2 |
|  | EVS | - | 1 |
| **TOTAL** |  | **22** | **30** |
| **Second Year – Semester – IV** | | | |
|  | | | |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part I** | Language – Tamil | 3 | 6 |
| **Part II** | English | 3 | 6 |
| **Part III** | Core Course –VII **Optics and Spectroscopy** | 5 | 5 |
| Core Course –VIII **Physics Core Practical-III** | 5 | 5 |
| Elective Course IV (Generic / Discipline Specific)  **Java Programming** | 3 | 3 |
| **Part IV** | Skill Enhancement Course SEC 6 (NME) | 2 | 2 |
| Skill Enhancement Course SEC 7 | 2 | 2 |
|  | EVS | 2 | 1 |
| **TOTAL** |  | **25** | **30** |

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| **Third Year – Semester – V** | | | |
| **Part** | **List of Courses** | **Credits** | **No. of Hours** |
| **Part III** | Core Course IX **Relativity and Quantum Mechanics** | 4 | 5 |
| Core Course X **Solid State Physics** | 4 | 5 |
| Core Course XI **Atomic Physics and Lasers** | 4 | 5 |
| Core Course / Project with Viva Voce CC- XII **Microprocessor 8085 and Microcontroller** | 4 | 5 |
| Elective Course V (Generic / Discipline Specific)  **Python Programming** | 3 | 4 |
| Elective Course VI (Generic / Discipline Specific)  **Relational Database Management System** | 3 | 4 |
| **Part IV** | Value Education | 2 | 2 |
| Summer Internship/Industrial Training | 2 | - |
| **TOTAL** |  | **26** | **30** |
| **Third Year – Semester – VI** | | | |
|  | | | |
| **Part** | **List of Courses** | **Credits** | **No. of Hrs** |
| **Part III** | Core Course XIII **Electricity and Electromagnetism** | 4 | 6 |
| Core Course XIV **Nuclear and Particle Physics** | 4 | 6 |
| Core Course XV **Physics Core Practical-IV** | 4 | 6 |
| Elective Course VII (Generic / Discipline Specific)  **Mobile Application Development Lab** | 3 | 5 |
| Elective Course VIII (Generic / Discipline Specific)  **Internet of Things** | 3 | 5 |
| **Part IV** | Extension Activity | 1 | - |
| Professional Competency Skill | 2 | 2 |
| **TOTAL** |  | **21** | **30** |

**TOTAL CREDITS:** 23 +23 +22 +25+26+21 **=140 Credits**

**MODEL SYLLABUS FOR CORE PHYSICS PAPERS**

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| --- | --- |
| **COURSE** | FIRST SEMESTER - FOUNDATION COURSE |
| **COURSE TITLE** | **INTRODUCTORY PHYSICS** |
| **HOURS** | 2 |
| **CREDITS** | 2 |
| **COURSE**  **OBJECTIVES** | To help students get an overview of Physics before learning their core courses. To serve as a bridge between the school curriculum and the degree programme. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Scalars and vectors – addition, subtraction of vectors – units and dimensions – standard physics constants – temperature scales – Metrics – measuring instruments: vernier calipers, screw gauge, travelling microscope, spectrometer |
| **UNIT-II** | Precision, error and order of accuracy - types of errors - intrinsic, absolute and relative error, uncertainty and random error, systematic and instrumental error - setting errors - percentage errors - order of accuracy - order of accuracy in averages and in graphs. |
| **UNIT-III** | Practical testing of meters - galvanometer - voltmeter - ammeter - ohmmeter - multimeter - applications of multimeter - sensitivity of multimeter - sensor - transducer - classification of transducers based on principles |
| **UNIT-IV** | P and N type semiconductors – semiconductor diodes - Half-wave Rectifiers - Full-wave Rectifiers - Zener Diode and Voltage Regulation – Principle and working of LED, Photo diode, Solar Cell |
| **UNIT-V** | Decimal, binary, octal and hexadecimal number systems - inter conversion - 8421 BCD code - Gray code - binary to Gray conversion - Gray to binary conversion - ASCII code – complements (1’s, 2’s, 9’s and 10’s) |
| **TEXT BOOKS** | 1. D. S. Mathur & P. S. Hemne, 2000, Mechanics, Revised Edition, S.Chand & Co. 2. C S Rangan, G.R. Sharma and V SV Mani (1983) Instrumentation Devices and Systems 2nd edn.Tata McGraw-Hill Publishing Co. Ltd. 3. John R. Taylor, 2022, An Introduction to Error Analysis, University Science Books 4. V.K. Mehta, (2004) Principles of Electronics, 2nd edition, S.Chand & Co. New Delhi. 5. Ronald J. Tocci., Digital Systems-Principles and Applications, 6/e. PHI. New Delhi. 1999. |
| **REFERENCEBOOKS** | 1. Millman and Halkias (2010) Integrated Electronics, 2nd edition, McGraw Book Co. International Ed., New Delhi 2. Francis W.Sears, Mark W. Zemansky (1998) University Physics 6th ed. Narosa Publishing House. 3. A.K. Sawhney and Puneet Sawhney (1995) A course in Electrical and Electronic Measurements and Instrumentation 19th edn. Dhanpat Rai & Co. Pvt. Ltd. 4. M. Nelkon, J.M Ogborn (2004) Advanced Level Practical Physics, 3nd ed. Heinmann Educational Books Ltd, London. |
| **WEBLINKS** | 1. http://hyperphysics.phy-astr.gsu.edu/hbase/index.html 2. https://phys.libretexts.org/Bookshelves/University\_Physics/Book%3A\_Physics\_(Boundless)/3%3A\_Two-Dimensional\_Kinematics/3.2%3A\_Vectors |

**METHOD OF EVALUATION:**

|  |  |  |
| --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** |
| 25 | **75** | **100** |

**COURSE OUTCOMES:**

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

|  |  |  |
| --- | --- | --- |
| **COURSE OUTCOMES** | **CO1** | Apply concept of vectors to understand concepts of physics and solve problems |
| **CO2** | Explain the theory of error analysis and estimate the percentage of errors in the experimental values |
| **CO3** | Demonstrate the use of mechanical, electrical and electronic instruments required for performing experiments in this course |
| **CO4** | Differentiate the various number systems in use and do the numerical conversion |
| **CO5** | Justify the need for various semiconductor devices and understand their characteristics and working |

**MAPPING WITH PROGRAM OUTCOMES:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **1** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO3** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO4** | **3** | **3** | **3** | **1** | **1** | **3** |
| **CO5** | **3** | **3** | **3** | **2** | **1** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **15** | **10** | **5** | **15** |

**CORE PHYSICS SYLLABI**

|  |  |
| --- | --- |
| **COURSE** | FIRST SEMESTER – CORE |
| **COURSETITLE** | **PROPERTIES OF MATTER AND SOUND** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | Study of the properties of matter leads to information which is of practical value to both the physicist and the engineers. It gives us information about the internal forces which act between the constituent parts of the substance. Students who undergo this course are successfully bound to get a better insight and understanding of the subject. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **ELASTICITY:** Hooke’s law – stress-strain diagram – elastic constants –Poisson’s ratio – relation between elastic constants and Poisson’s ratio – work done in stretching and twisting a wire – twisting couple on a cylinder – rigidity modulus by static torsion– torsional pendulum (with and without masses) |
| **UNIT-II** | **BENDING OF BEAMS:** cantilever– expression for bending moment – expression for depression at the loaded end of the cantilever– oscillations of a cantilever – expression for time period – experiment to find Young’s modulus – non-uniform bending– experiment to determine Young’s modulus by Koenig’s method – uniform bending – expression for elevation – experiment to determine Young’s modulus using microscope |
| **UNIT-III** | **FLUID DYNAMICS:** *Surface tension*: definition – molecular forces– excess pressure over curved surface – application to spherical and cylindrical drops and bubbles – determination of surface tension by Jaegar’s method–variation of surface tension with temperature  *Viscosity*: definition – streamline and turbulent flow – rate of flow of liquid in a capillary tube – Poiseuille’s formula –corrections – terminal velocity and Stoke’s formula– variation of viscosity with temperature |
| **UNIT-IV** | **WAVES AND OSCILLATIONS:** Simple Harmonic Motion (SHM) – differential equation of SHM – graphical representation of SHM – composition of two SHM in a straight line and at right angles – Lissajous's figures- free, damped, forced vibrations –resonance and Sharpness of resonance.  Laws of transverse vibration in strings –sonometer – determination of AC frequency using sonometer –determination of frequency using Melde’s string apparatus |
| **UNIT-V** | **ACOUSTICS OF BUILDINGS AND ULTRASONICS:**  Intensity of sound – decibel – loudness of sound –reverberation – Sabine’s reverberation formula – acoustic intensity – factors affecting the acoustics of buildings.  *Ultrasonic waves*: production of ultrasonic waves – Piezoelectric crystal method – magnetostriction effect – application of ultrasonic waves |
| **TEXT BOOKS** | 1. D.S.Mathur, 2010, Elements of Properties of Matter,   S.Chand & Co.   1. BrijLal & N. Subrahmanyam, 2003, Properties of Matter, S.Chand & Co 2. D.R.Khanna & R.S.Bedi, 1969, Textbook of Sound,   AtmaRam & sons   1. BrijLal and N.Subrahmanyam, 1995, A Text Book of Sound, Second revised edition,Vikas Publishing House. 2. R.Murugesan,2012, Properties of Matter, S.Chand& Co. |
| **REFERENCEBOOKS** | 1. C.J. Smith, 1960, General Properties of Matter, Orient Longman Publishers 2. H.R. Gulati, 1977, Fundamental of General Properties of Matter, Fifth edition,R. Chand & Co. 3. A.P French, 1973, Vibration and Waves, MIT Introductory Physics, Arnold-Heinmann India. |
| **WEBLINKS** | 1. <https://www.youtube.com/watch?v=gT8Nth9NWPM> 2. <https://www.youtube.com/watch?v=m4u-SuaSu1s&t=3s> 3. <https://www.biolinscientific.com/blog/what-are-surfactants-and-how-do-they-work> 4. <https://learningtechnologyofficial.com/category/fluid-mechanics-lab/> 5. <http://www.sound-physics.com/> 6. <http://nptel.ac.in/courses/112104026/> |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | 75 | 100 |  |

**COURSE OUTCOMES:**

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

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| **C**O**URSE OUTCOMES** | **CO1** | Relate elastic behaviour in terms of three modulii of elasticity and working of torsion pendulum. |
| **CO2** | Understand and appreciate the concept of bending of beams and analyze the expression, quantify and understand nature of materials. |
| **CO3** | Explain the surface tension and viscosity of fluid and support the interesting phenomena associated with liquid surface, soap films provide an analogue solution to many engineering problems. |
| **CO4** | Analyze simple harmonic motions mathematically and apply them. Understand the concept of resonance and use it to evaluate the frequency of vibration. |
| **CO5** | Justify the importance of constructing buildings with good acoustics after understanding the concept of acoustics.  Able to apply their knowledge of ultrasonics in real life, especially in medical field and assimilate different methods of production of ultrasonic waves |

**MAPPING WITH PROGRAM OUTCOMES:**

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO3** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO4** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO5** | **3** | **3** | **3** | **2** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **15** | **10** | **7** | **15** |

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| **COURSE** | FIRST SEMESTER – CORE |
| **COURSETITLE** | **ELECTRONICS** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To provide knowledge on the essential concepts of analog and digital electronics. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Boolean laws – De-Morgan’s theorem – basic logic gates and their truth tables - universal logic gates (NAND & NOR) –standard representation of logic functions (SOP & POS) – minimization techniques (Karnaugh map: 2, 3, 4 variables). Arithmetic circuits: Half & full Adder – half & full Subtractor – parallel binary adder. |
| **UNIT-II** | Flip-Flops: S-R Flip-flop, J-K Flip-flop, T and D type flip-flops, master-slave flip-flop, truth tables, registers: serial in serial out and parallel in and parallel out – counters asynchronous: mod-8, mod-10 - synchronous - 4-bit Ring counter – Shift counters |
| **UNIT-III** | Transistor biasing - stability factor - methods of biasing - Base resistor method - biasing with feedback resistor - voltage divider bias method - single stage transistor amplifier - load line analysis - DC and AC load lines - multistage amplifier - RC coupled, transformer coupled and direct coupled amplifiers |
| **UNIT-IV** | Negative feedback amplifier - Emitter follower. Positive feedback - LC oscillators - Hartley and Colpitt’s oscillators - RC oscillators - Phase shift oscillator - Wein’s bridge oscillator - Multivibrators - astable, bistable and monostable multivibrators  Constructional features, basic theory of operation and I-V characteristics of the following: UJT, JFET, MOSFET, PNPN diode, SCR, Triac, Tunnel diode. |
| **UNIT-V** | General memory operations, ROM, RAM (static and dynamic), PROM, EPROM, EEPROM, EAROM. IC – logic families: RTL, DTL, TTL logic, CMOS NAND & NOR Gates, CMOS Inverter, Programmable Logic Devices – Programmable Logic Array (PLA), Programmable Array Logic (PAL). |
| **TEXT BOOKS** | 1. M. Morris Mano, Digital Design, 3rd Edition, PHI, New Delhi. 2. Malvino and Leach, Digital Principles and Applications, TMG Hill Edition 3. V.K. Mehta and Rohit Mehta (2008) Principles of Electronics 11th ed. S. Chand and Co., New Delhi. 4. V. Vijayendran, 2009, Introduction to Integrated Electronics: Digital and Analog, Viswanathan, S., Printers & Publishers Pvt Ltd |
| **REFERENCE BOOKS** | 1. Herbert Taub and Donald Schilling, Digital Integrated Electronics, McGraw Hill. 1985. 2. S.K. Bose. Digital Systems, 2/e. New Age International.1992. 3. Ronald J. Tocci. Digital Systems-Principles and Applications, 6/e. PHI. New Delhi. 1999. 4. Daniel M. Kaplan, Christopher G. White, 2003, Hands-On Electronics, Cambridge University Press |
| **WEBLINKS** | 1. https://nptel.ac.in/courses/108101091 2. https://www.electronics-tutorials.ws/ |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Discuss the fundamental concepts involved with gates, standard representation of logic functions and arithmetic circuits. Apply De-Morgan’s theorem, minimization techniques to solve and design circuits |
| **CO2** | Understand the construction and working of various Flip-Flops and appreciate their application |
| **CO3** | Know the principles and applications of transistors and types of transistor biasing and amplifiers |
| **CO4** | Discuss the role of negative and positive feedback amplifiers. Explain the Constructional features, basic theory of operation and I-V characteristics of various semiconductor devices |
| **CO5** | Classify various memory devices and their functions |

**MAPPING WITH PROGRAM OUT COMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **1** | **1** | **3** |
| **CO2** | **3** | **3** | **1** | **1** | **1** | **3** |
| **CO3** | **3** | **3** | **2** | **2** | **2** | **3** |
| **CO4** | **3** | **3** | **1** | **2** | **3** | **3** |
| **CO5** | **3** | **3** | **1** | **1** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **8** | **7** | **9** | **15** |

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| **COURSE** | SECOND SEMESTER - CORE |
| **COURSETITLE** | **HEAT**, **THERMODYNAMICS AND** S**TATISTICAL PHYSICS** |
| **HOURS** | 4 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | The course focuses to relate the laws of thermodynamics, entropy in everyday life and explore the knowledge of statistical mechanics and its relation |

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| **UNITS** | **COURSEDETAILS** |
| **UNIT-I** | CALORIMETRY: specific heat capacity – specific heat capacity of gases CP & CV – Meyer’s relation – Joly’s method for determination of CV – Regnault’s method for determination of CP  LOW TEMPERATURE PHYSICS: Joule-Kelvin effect – porous plug experiment – Joule-Thomson effect –Boyle temperature – temperature of inversion – liquefaction of gas by Linde’s Process – adiabatic demagnetisation. |
| **UNIT-II** | THERMODYNAMICS-I: zeroth law and first law of thermodynamics – P-V diagram – heat engine – efficiency of heat engine – Carnot’s engine, construction, working and efficiency of petrol engine and diesel engines – comparison of engines. |
| **UNIT-III** | THERMODYNAMICS-II: second law of thermodynamics –entropy of an ideal gas – entropy change in reversible and irreversible processes – T-S diagram –thermodynamical scale of temperature – Maxwell’s thermodynamical relations – Clasius-Clapeyron’s equation (first latent heat equation) – third law of thermodynamics – unattainability of absolute zero – heat death. |
| **UNIT-IV** | HEAT TRANSFER: modes of heat transfer: conduction, convection and radiation.  CONDUCTION: thermal conductivity – determination of thermal conductivity of a good conductor by Forbe’s method – determination of thermal conductivity of a bad conductor by Lee’s disc method.  RADIATION: black body radiation (Ferry’s method) – distribution of energy in black body radiation – Wien’s law and Rayleigh Jean’s law –Planck’s law of radiation – Stefan’s law – deduction of Newton’s law of cooling from Stefan’s law. |
| **UNIT-V** | STATISTICAL MECHANICS: definition of phase-space – micro and macro states – ensembles –different types of ensembles – classical and quantum Statistics – Maxwell-Boltzmann statistics –Bose-Einstein statistics – Fermi-Dirac statistics –expression for all three distribution function – comparison of three statistics. |
| **TEXT BOOKS** | 1. Brijlal & N. Subramaniam, 2000, Heat and Thermodynamics, S.Chand& Co. 2. Narayanamoorthy & KrishnaRao, 1969, Heat, Triveni Publishers, Chennai. 3. V.R.Khanna & R.S.Bedi, 1998 1st Edition, Text book of Sound, Kedharnaath Publish & Co, Meerut 4. Brijlal and N. Subramanyam, 2001, Waves and Oscillations, Vikas Publishing House, New Delhi. 5. Ghosh, 1996, Text Book of Sound, S.Chand &Co. 6. R.Murugeshan & Kiruthiga Sivaprasath, Thermal Physics,   S.Chand& Co. |
| **REFERENCE BOOKS** | 1. J.B.Rajam & C.L.Arora, 1976, Heat and Thermodynamics,   8th edition, S.Chand& Co. Ltd. 2. D.S.Mathur, Heat and Thermodynamics, Sultan Chand & Sons. 3. Gupta, Kumar, Sharma, 2013, Statistical Mechanics, 26th Edition, S. Chand & Co. 4. Resnick, Halliday&Walker,2010, Fundamentals of Physics, 6th Edition. 5. Sears, Zemansky, Hugh D. Young, Roger A. Freedman, 2021 University Physics with Modern Physics 15th Edition, Pearson. |
| **WEBLINKS** | 1. https://youtu.be/M\_5KYncYNyc 2. <https://www.youtube.com/watch?v=4M72kQulGKk&vl=en> |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Outline the physical laws and principles in heat, thermodynamics and statistical Physics, identify the relationship between heat capacity, specific heat capacity and understand cryogenics, superconductivity, superfluidity and low temperature physics |
| **CO2** | Explain the theories and experiments in statistical physics and thermodynamical applications and discuss the implications of the laws of Thermodynamics in diesel and petrol engines |
| **CO3** | Analyze performance of thermodynamic systems viz efficiency by problems |
| **CO4** | Apply the process of thermal conductivity to good and bad conductors. Quantify different parameters related to heat, relate them with various physical parameters and analyse them |
| **CO5** | Interpret classical statistics concepts such as phase space, ensemble, Maxwell-Boltzmann distribution law. Develop the statistical interpretation of Bose-Einstein and Fermi-Dirac statistics |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CO4** | **3** | **3** | **3** | **1** | **2** | **3** |
| **CO5** | **3** | **3** | **2** | **2** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **14** | **10** | **8** | **15** |

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| **COURSE** | SECOND SEMESTER – CORE |
| **COURSETITLE** | **PHYSICS CORE PRACTICAL – I** |
| **HOURS** | 3 + 3 (Two labs/week) |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | Apply various physics concepts to understand Properties of Matter, set up experimentation to verify theories, quantify and analyse, able to do error analysis and correlate results. To perform basic experiments on characteristics of electronic devices and then get into the applications such as amplifiers, oscillators, counters, multivibrators. |
| **Properties of Matter (Any 9 experiments can be done)** | |
| 1. Determination of rigidity modulus without mass using Torsional pendulum. 2. Determination of rigidity modulus with masses using Torsional pendulum. 3. Determination of moment of inertia of an irregular body. 4. Verification of parallel axes theorem on moment of inertia. 5. Verification of perpendicular axes theorem on moment of inertia. 6. Determination of moment of inertia and g using Bifilar pendulum. 7. Determination of Young’s modulus by stretching of wire with known masses. 8. Verification of Hook’s law by stretching of wire method. 9. Determination of Young’s modulus by uniform bending – load depression graph. 10. Determination of Young’s modulus by non-uniform bending – scale & telescope. 11. Determination of Young’s modulus by cantilever – load depression graph. 12. Determination of Young’s modulus by cantilever – oscillation method 13. Determination of Young’s modulus by Koenig’s method – (or unknown load) 14. Determination of rigidity modulus by static torsion. 15. Determination of Y, n and K by Searle’s double bar method. 16. Determination of surface tension & interfacial surface tension by drop weight method. 17. Determination of co-efficient of viscosity by Stokes’ method – terminal velocity. 18. Determination of critical pressure for streamline flow. 19. Determination of Poisson’s ratio of rubber tube. 20. Determination of viscosity by Poiseullie’s flow method. 21. Determination of radius of capillary tube by mercury pellet method. 22. Determination of g using compound pendulum. | |
| **Electronics (Any 9 experiments can be done)** | |
| 1. Zener diode – voltage regulations 2. Bride rectifier using diodes 3. Clipping and clamping circuits using diodes. 4. Characteristics of a transistor – (CE mode) 5. Characteristics of a transistor – (CB mode). 6. RC coupled CE transistor amplifier - single stage. 7. Transistor Emitter follower. 8. Colpitt’s oscillator -transistor. 9. Hartley oscillator - transistor. 10. Astable multivibrator - transistor. 11. Bistable multivibrator - transistor. 12. FET - characteristics. 13. FET - amplifier (common drain) 14. UJT - characteristics 15. 5V, IC Regulated power supply. 16. Construction of seven segment display. 17. Study of gate ICs – NOT,OR,AND, NOR,NAND, XOR, XNOR 18. Verification of De Morgan's theorem using ICs 19. NAND as universal building block. 20. NOR as universal building block. 21. Half adder / Half subtractor using basic logic gate ICs 22. Full adder / Full subtractor using basic logic gate ICs | |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

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| **COURSE** | THIRD SEMESTER - CORE |
| **COURSETITLE** | **GENERAL MECHANICS AND CLASSICAL MECHANICS** |
| **HOURS** | 5 Theory + 1 Tutorial |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To have a basic understanding of the laws and principles of mechanics. To apply the concepts of forces existing in the system. To understand the forces of physics in everyday life. To visualize conservation laws. To apply Lagrangian equation to solve complex problems. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **LAWS OF MOTION:** Newton’s Laws– forces – equations of motion – frictional force – motion of a particle in a uniform gravitational field – types of everyday forces in Physics.  *Gravitation*: Classical theory of gravitation**–**Kepler’s laws, Newton’s law of gravitation – Determination of G by Boy’s method – Earth-moon system – weightlessness – earth satellites – parking orbit – earth density – mass of the Sun – gravitational potential – velocity of escape – satellite potential and kinetic energy –Einstein’s theory of gravitation – introduction –principle of equivalence – experimental tests of general theory of relativity – gravitational red shift – bending of light – perihelion of mercury. |
| **UNIT-II** | **CONSERVATION LAWS OF LINEAR AND ANGULAR MOMENTUM: c**onservation of linear and angular momentum – Internal forces and momentum conservation – center of mass – examples – general elastic collision of particles of different masses – system with variable mass – examples – conservation of angular momentum – torque due to internal forces – torque due to gravity – angular momentum about center of mass – proton scattering by heavy nucleus. |
| **UNIT-III** | **CONSERVATION LAWS OF ENERGY:** Introduction – significance of conservation laws – law of conservation of energy concepts of work- power – energy – conservative forces – potential energy and conservation of energy in gravitational and electric field – examples –non-conservative forces – general law of conservation of energy. |
| **UNIT-IV** | **RIGID BODY DYNAMICS:** Translational and rotational motion – angular momentum – moment of inertia – general theorems of moment of inertia – examples – rotation about fixed axis – kinetic energy of rotation – examples – body rolling along a plane surface – body rolling down an inclined plane – gyroscopic precision – gyrostatic applications. |
| **UNIT-V** | **LAGRANGIAN MECHANICS:** Generalized coordinates –degrees of freedom – constraints - principle of virtual work and D’ Alembert’s Principle –Lagrange’s equation from D’ Alembert’s principle – application –simple pendulum – Atwood’s machine. |
| **TEXT BOOKS** | 1. J.C.Upadhyaya, 2019, Classical Mechanics, Himalaya Publishing house, Mumbai.  2. P.Durai Pandian, Laxmi Durai Pandian, Muthamizh Jayapragasam,2005, Mechanics, 6th revised edition,  S.Chand & Co.  3. [D. S. Mathur](https://www.schandpublishing.com/author-details/d-s-mathur) & [P. S. Hemne](https://www.schandpublishing.com/author-details/p-s-hemne), 2000, Mechanics, Revised Edition, S.Chand& Co.  4.  Narayanamurthi, M.&Nagarathnam. N, 1998, Dynamics. The National Publishing,Chennai.  5.  Narayanamurthi, M. and Nagarathnam, N, 1982, Statics, Hydrostatics and Hydrodynamics, The National Publishers, Chennai. |
| **REFER ENCE BOOKS** | 1.  Goldstein Herbert, 1980, Classical Mechanics. U.S.A: Addison and Wesely.  2.  Halliday, David & Robert, Resnick, 1995, Physics Vol.I. New Age, International, Chennai.  3.  Halliday, David Robert Resnick and Walker Jearl, 2001, Fundamentals of Physics, John Wiley, New Delhi |
| **WEB LINKS** | 1. <https://youtu.be/X4_K-XLUIB4> 2. <https://nptel.ac.in/courses/115103115> 3. https://www.youtube.com/watch?v=p075LPq3Eas 4. <https://www.youtube.com/watch?v=mH_pS6fruyg> 5. <https://onlinecourses.nptel.ac.in/noc22_me96/preview> 6. <https://www.youtube.com/watch?v=tdkFc88Fw-M> 7. https://onlinecourses.nptel.ac.in/noc21\_me70/preview |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Understand the Newton’s Law of motion, general theory of relativity, Kepler’s laws and realize the basic principles behind planetary motion |
| **CO2** | Acquire the knowledge on the conservation laws |
| **CO3** | Apply conservation law and calculate energy of various systems. Understand and differentiate conservative and non-conservative forces |
| **CO4** | Gain knowledge on rigid body dynamics and solve problems based on this concept |
| **CO5** | Understand the importance of Lagrangian system of mechanics |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **1** | **3** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CO4** | **3** | **3** | **3** | **1** | **2** | **3** |
| **CO5** | **3** | **3** | **2** | **2** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **14** | **10** | **8** | **15** |

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| **COURSE** | THIRD SEMESTER - CORE |
| **COURSETITLE** | **PHYSICS CORE PRACTICAL - II** |
| **HOURS** | 4 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | Apply the knowledge gained in the concepts of heat and sound waves, resonance, calculate frequency of ac mains, verify theories, quantify and analyse, do error analysis and correlate results |
| **HEAT, OSCILLATIONS, WAVES & SOUND (Any 9 experiments can be done)** | |
| 1. Determination of specific heat by cooling – graphical method. 2. Determination of thermal conductivity of good conductor by Searle’s method. 3. Determination of thermal conductivity of bad conductor by Lee’s disc method. 4. Determination of thermal conductivity of bad conductor by Charlaton’s method. 5. Determination of specific heat capacity of solid. 6. Determination of specific heat of liquid by Joule’s electrical heating method (applying radiation correction by Barton’s correction/graphical method), 7. Determination of Latent heat of a vaporization of a liquid. 8. Determination of Stefan’s constant for Black body radiation. 9. Verification of Stefan’s-Boltzmans law. 10. Determination of thermal conductivity of rubber tube. 11. Helmholtz resonator. 12. Velocity of sound through a wire using Sonometer. 13. Determination of velocity of sound using Kunds tube. 14. Determination of frequency of an electrically maintained tuning fork 15. To verify the laws of transverse vibration using sonometer. 16. To verify the laws of transverse vibration using Melde’s apparatus. 17. To compare the mass per unit length of two strings using Melde’s apparatus. 18. Frequency of AC by using sonometer. | |

**METHOD OF EVALUATION:**

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| **Continuous InternalAssessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

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| **COURSE** | THIRD SEMESTER – ELECTIVE |
| **COURSETITLE** | **PROGRAMMING TECHNIQUES USING C** |
| **HOURS** | 3 Theory 1 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To familiarize the students with the understanding of code organization and to improve the programming skills by learning the basic programming constructs. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **Introduction:** Characteristics of Computers - Evolution of Computers - Computer Generations - Basic Computer Organization -Computer Languages- **Problem Solving Concepts:** Problem Solving in Everyday life - Types of Problems - Problem solving with computers - Difficulties with Problem Solving  **Practical Programs**  1. Simple C Programs |
| **UNIT-II** | **Problem solving concepts for the computer:** Constant -Variables - Data Types - Functions - Operators - Expressions and Equations. Organizing the Solution-Algorithm - Flowchart - Pseudo code- **Programming Structure**: Structuring a solution - Modules and their function - Cohesion and Coupling - Local and Global variables - Parameters - Return values.  **Practical Programs**  2. Operators |
| **UNIT-III** | **Sequential Logic Structure** - Problem solving with Decision - Problem Solving with Loops- **Overview of C:** History of C- Importance of C- Basic Structure of C Programs-Executing a simple C Program.  **Practical Programs**  3. Expressions |
| **UNIT-IV** | Operators and Expressions in C - Managing Input and Output Operations. Decision Making and Branching: Decision Making and Looping  **Practical Programs**  4. Decision Making  5. Looping |
| **UNIT-V** | **User Defined Functions:** Elements of User Defined Functions- Definition of Functions- Return Values and their Types- Function Call- Function Declaration- Categories of Functions- Nesting of Functions-Recursion.  **Practical Programs**  6. Function  7. Recursion |
| **TEXT BOOKS** | 1. Pradeep K.Sinha and Priti Sinha, (2004)  “Computer Fundamentals”, Sixth Edition, BPB Publications. (Unit I : Chapter 1 ,2 & 12) 2. Maureen Sprankle and Jim Hubbard, (2009) “Problem Solving and Programming Concepts”, Ninth Edition, Prentice Hall. (Unit I: Chapter 1,Unit II: Chapter 2,3&4, Unit III: Chapter 5 & 6) 3. E. Balaguruswamy, (2010), “Programming in ANSI C”, Fifth Edition, Tata McGraw Hall Publications (Unit III,Unit IV,Unit V) |
| **REFER ENCE BOOKS** | 1. Pradip Dey, Manas Ghosh, “Fundamentals of Computing and Programming in C”, First Edition, Oxford University Press, 2009. 2. Problem Solving with C, M.T. Somashekara, D S Guru and K.S. Manjunatha, PHI Learning, 2nd Edition, 2017 |
| **WEB LINKS** | 1. http://www.tutorialspoint.com/cprogramming  2. http://www.cprogramming.com  3. http://www.programmingsimplified.com/c-program-examples  4. http://www.programiz.com/c-programming  5. http://www.tutorialspoint.com/computer\_fundamentals  6. https://www.programiz.com/article/flowchart-programming |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Outline the fundamental concepts of computers, programming languages and Problem-solving Techniques using C. |  |
| **CO2** | Demonstrate the programming methodology |  |
| **CO3** | Identify suitable programming constructs for problem solving. |  |
| **CO4** | Select the appropriate data representation, control structures, functions and concepts based on the problem requirement |  |
| **CO5** | Solve simple, mathematical and logical problems in ‘C’. |  |

**MAPPING WITH PROGRAM OUTCOMES:**

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| --- | --- | --- | --- | --- | --- | --- |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |

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| **COURSE** | FOURTH SEMESTER - CORE |
| **COURSETITLE** | **OPTICS AND SPECTROSCOPY** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To provide an in-depth understanding of the basics of various phenomena in geometrical and wave optics. To explain the behaviour of light in different mediums. To understand the differences in the important phenomena namely interference, diffraction and Polarization and apply the knowledge in everyday life. To solve problems in optics by selecting the appropriate equations and performing numerical or analytical calculations. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **LENS AND PRISMS:** Fermat’s principle of least time – postulates of geometrical optics – thick and thin lenses – focal length, critical thickness, power and cardinal points of a thick lens – narrow angled prisms.  *Lens*: lens makers formula – aberrations: spherical aberration, chromatic aberrations, coma, and astigmatism – chromatic aberrations methods.  *Prism*: dispersion, deviation, aberrations - applications rainbows and halos, constant deviation spectroscope.  *Eyepieces*: advantage of an eyepiece over a simple lens – Huygen’s and Ramsden’s eyepieces, construction and working –merits and demerits of the eyepiece.  *Resolving power*: Rayleigh’s criterion for resolution – limit of resolution for the eye – resolving power of, (i) Prism (ii) grating (iii) telescope |
| **UNIT-II** | **INTERFERENCE:** Division of wave front, Fresnel’s biprism – fringes with white light – division of amplitude: interference in thin films due to, (i) reflected light, (ii) transmitted light – colours of thin films applications – air wedge – Newton’s rings.  *Interferometers*: Michelson’s interferometer – applications, (i) determination of the wavelength of a monochromatic source of light, (ii) determination of the wavelength and separation D1 and D2 lines of sodium light, (iii) determination of a thickness of a mica sheet. |
| **UNIT-III** | **DIFFRACTION:** Fresnel’s assumptions – zone plate – action of zone plate for an incident spherical wave front – differences between a zone plate and a convex lens –Fresnel type of diffraction – diffraction pattern due to a straight edge – positions of maximum and minimum intensities – diffraction due to a narrow slit – Fraunhofer type of diffraction – Fraunhofer diffraction at a single slit – plane diffraction grating– experiment to determine wavelengths – width of principal maxima. |
| **UNIT-IV** | **POLARISATION:** optical activity – optically active crystals –polarizer and analyser–double refraction – optic axis, principal plane – Huygens’s explanation of double refraction in uniaxial crystals – polaroids and applications – circularly and elliptically polarized light –quarter wave plate – half wave plate – production and detection of circularly and elliptically polarized lights – Fresnel’s explanation – specific rotation – Laurent half shade polarimeter – experiment to determine specific rotatory power. |
| **UNIT-V** | **SPECTROSCOPY:** infra-red spectroscopy near infra-red and far infra-red – properties –origin of IR spectra – IR spectrophotometer – applications interpretation of IR spectra – CH, CO, CN bending and stretching vibrational modes only – scattering of light – Raman effect –classical theory –quantum theory –mutual exclusion principle – Raman spectrometer- characteristics of Raman lines –applications – ultraviolet and visible spectroscopy –properties – spectrophotometer. |
| **TEXT BOOKS** | 1. Subramaniam. N & Brijlal, 2014, Optics, 25th edition,S.Chand &Co. 2. S.L.Gupta,V.Kumar & R.C.Sharma,1997,Elements of Spectroscopy, 13th Edition, Pragati Prakashan, Meerut. 3. G.Aruldhass,2000,Molecular Structure and Spectroscopy,II edition.PHIPvt Ltd, New Delhi. 4. P.R.Sasikumar, 2012, Photonics, PHIPvt Ltd, New Delhi. 5. K.Rajagopal, 2008, Engineering Physics, PHIPvt Ltd, New Delhi. 6. V.Rajendran, 2012, Engineering Physics, Tata McGraw Hill. |
| **REFER ENCE BOOKS** | 1.Agarwal B.S, 2011,Optics, KedernathRamnath Publishers, Meerut.  2.Sathyaprakash, 1990,Optics,VII edition, RatanPrakashanMandhir, New Delhi.  3.C.N.Banewell, 2006, Introduction to Molecular Spectroscopy,IV edition,TMH Publishing Co,New Delhi.  4. AjoyGhatak, 2009,Optics, 4thedition, PHIPvt Ltd, New Delhi.  5.Singh &Agarwal,2002,Optics and Atomic Physics, 9thedition, PragatiPrakashan Meerut.  6.D.Halliday,R.Resnick and J. Walker, 2001, Fundamentals of Physics,6th edition, Willey, New York.  7.JenkinsA.Francis & White, 2011, Fundamentals of Optics, 4th edition, McGraw Hill Inc., NewDelhi. |
| **WEB LINKS** | 1. <https://science.nasa.gov/ems/> 2. <https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472> 3. <https://science.nasa.gov/ems/> 4. <https://www.youtube.com/watch?v=tL3rNc1G0qQ&list=RDCMUCzwo7UlGkb-8Pr6svxWo-LA&start_radio=1&t=2472> 5. <https://imagine.gsfc.nasa.gov/educators/gammaraybursts/imagine/index.html> 6. <http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/> 7. <http://www.thephysicsmill.com/2014/03/23/sky-blue-lord-rayleigh-sir-raman-scattering/> |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

|  |  |  |
| --- | --- | --- |
| **COURSE OUTCOMES** | **CO1** | Outline the basics of optics and concepts associated with lenses, prisms, eyepieces. Differentiate the resolving power of different optical instruments, and articulate their technological applications |
| **CO2** | Discuss the principle of superposition of waves, use these ideas to understand the wave nature of light through working of interferometer |
| **CO3** | Extend the knowledge about nature of light through diffraction techniques, apply mathematical principles to analyse the optical instruments |
| **CO4** | Interpret basic formulation of polarization and gain knowledge about polarimeter, appraise its usage in industries |
| **CO5** | Relate the principles of optics to various fields of IR, Raman and UV spectroscopy and understand their instrumentation and application in industries |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | | **PSO 5** | | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | | **3** | | **3** |
| **CO2** | **3** | **3** | **3** | **3** | | **3** | | **3** |
| **CO3** | **3** | **3** | **3** | **3** | | **3** | | **3** |
| **CO4** | **3** | **3** | **3** | **2** | | **2** | | **3** |
| **CO5** | **3** | **3** | **2** | **3** | | **3** | | **3** |
| **Weightage of course contributed  to each PSO** | **15** | **15** | **14** | | **14** | | **14** | **15** |

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| **COURSE** | FOURTH SEMESTER - CORE |
| **COURSE TITLE** | **PHYSICS CORE PRACTICAL - III** |
| **HOURS** | 4 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | Demonstrate various optical phenomena, discover the working of optical instruments, apply and interpret the results. |
| **LIGHT (Any 9 experiments can be done)** | |
| 1. Determination of refractive index of prism using spectrometer. 2. Determination of refractive index of liquid using hollow prism and spectrometer 3. Determination of dispersive power of a prism. 4. Determination of radius of curvature of lens by forming Newton’s rings. 5. Determination of thickness of a wire using air wedge. 6. Determination of Cauchy’s Constants. 7. Determination of resolving power of grating 8. Determination of resolving power of telescope 9. Comparison of intensities using Lummer Brodhum Photometer. 10. Determination of range of motion using Searle’s goniometer. 11. Verification of Newton’s formula for a lens separated by a distance. 12. Determination of refractive index of a given liquid by forming liquid lens 13. Determination of refractive index using Laser. 14. Determination of wavelengths, particle size using Laser/Monochromatic source. 15. Determination of resolving power of Diffraction grating using Laser   Determination of wire using Laser. | |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

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| --- | --- |
| **COURSE** | FOURTH SEMESTER – ELECTIVE |
| **COURSETITLE** | **JAVA PROGRAMMING** |
| **HOURS** | 3 Theory 1 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To provide knowledge on fundamentals of object-oriented programming and to have the ability to use the SDK environment to create, debug and run Java programs. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Fundamentals of Object- Oriented Programming: Introduction – Object Oriented Paradigm – Concepts of Object – Oriented Programming – Benefits of OOP –Overview of Java Language: Java Program- Structure – Tokens – Java Statements – Java Virtual Machine – Command Line Arguments - Constants, Variables and Data Types – Operators and Expressions – Decision making and Branching – Looping  **Exercise Programs:**  1.       Basic Programs |
| **UNIT-II** | Arrays - Strings – Collection Interfaces and classes -  **Exercise Programs:**  2.       Arrays  3.       Strings |
| **UNIT-III** | Classes objects and methods: Introduction – Defining a class – Method Declaration – Constructors - Method Overloading – Static Members – Nesting of methods  **Exercise Programs:**  4.       Classes and Objects  5.       Method Overloading |
| **UNIT-IV** | Inheritance – Overriding – Final variables and methods – Abstract methods and classes  **Exercise Programs**:  6.     Inheritance |
| **UNIT-V** | Multiple Inheritance: Defining Interfaces – Extending Interfaces – Implementing Interfaces –Managing Errors and Exceptions  **Exercise Programs:**  7.       Interfaces  8.       Exception Handling |
| **TEXT BOOKS** | 1.   E Balagurusamy(2010), “Programming with Java”, Tata McGraw Hill Edition India Private Ltd, 4th   Edition  2.   C Xavier,”Java Programming – A Practical Approach”, Tata McGraw Hill Edition Private Ltd |
| **REFERENCE BOOKS** | 1. P.Naughton and H.Schildt (1999), “Java 2 The Complete Reference”, TMH, 3rd Edition  2.Jaison Hunder & William Crawford (2002),”Java Servlet Programming”, O'Reilly  3.Jim Keogh (2002), “J2EE: The Complete Reference”, Tata McGraw Hill Edition. |
| **WEB LINKS** | 1. <http://javabeginnerstutorial.com/core-java/>  2. <http://www.tutorialspoint.com/java/>  3. <http://beginnersbook.com/java-tutorial-for-beginners-with-examples/>  4. <http://www.homeandlearn.co.uk/java/java.html> |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Outline   the   basic   terminologies   of   OOP,  programming   language techniques |
| **CO2** | Solve problems using basic constructs, mechanisms, techniques and technologies of Java |
| **CO3** | Analyse and explain the behavior of simple programs involving different techniques such as Inheritance, Interfaces and Exception Handling |
| **CO4** | Assess various problem-solving strategies involved in Java. |
| **CO5** | Design Java programs using suitable OOP concepts and techniques for any given concept. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |

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| **COURSE** | FIFTH SEMESTER - CORE |
| **COURSE TITLE** | **ATOMIC PHYSICS AND LASERS** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To study about electric charges, their properties, gain knowledge on photoelectric effect, solve problems based on Einstein’s photoelectric equation. Make students understand the development of atom models, quantum numbers, coupling schemes and analysis of magnetic moments of an electrons. To gain knowledge on excitation and ionization potentials, splitting of spectral lines in magnetic and electric fields. To understand the principle, production and applications of lasers. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **THE ELECTRON AND POSITIVE RAYS:** e/m of electron by Dunnington's method –charge of electron by Millikan’s oil drop method – properties of positive rays –e/m of positive rays by Thomson's parabola method (*problems calculation of e/m ratio of positive rays*)–mass spectrographs and uses– Bainbridge and Dempster’s mass spectrographs |
| **UNIT-II** | **PHOTOELECTRIC EFFECT:** photoelectric emission – Leonard's experiment – Richardson and Compton experiment –laws of photoelectric emission – Einstein's photoelectric equation (*problems using Einstein's photoelectric equation*) –experimental verification by Millikan’s method –photoelectric cell– photo emissive cell –photovoltaic cell – photo conducting cell – applications of photoelectric cells –photomultiplier. |
| **UNIT-III** | **ATOMIC STRUCTURE:** Sommerfield’s relativistic atom model –vector atom model –various quantum numbers – L-S and J-J coupling – Pauli's exclusion principle –magnetic dipole moment of an electron due to orbital and spin motion – Bohr magneton - Stern and Gerlach experiment – Lande ‘g’ factor. |
| **UNIT-IV** | **SPLITTING OF SPECTRAL LINES:** excitation, ionisation and critical potentials – Davis and Goucher’s method – optical spectra – spectral notation and selection rules – fine structure of sodium D-line – Zeeman effect – experimental arrangement and classical theory of normal Zeeman effect – Larmor's theorem –quantum theory of normal Zeeman effect –anomalous Zeeman effect –explanation of splitting of D1 and D2lines of sodium – Paschen Back effect - Stark effect (Qualitative only). |
| **UNIT-V** | **LASERS:** General principles of lasers – properties of lasers action – spontaneous and stimulated emission – population inversion – optical pumping – conditions for coherence - time and space coherence - Einstein’s coefficients - He-Ne laser (principle and working) – semiconductor laser – gas laser - solid state laser - laser applications–holography. |
| **TEXT**  **BOOKS** | 1. R. Murugesan, Modern Physics, S. Chand & Co**.** 2. Brijlal & N. Subrahmanyam, Atomic & Nuclear Physics, S. Chand & Co. (All units) 3. J. B. Rajam, Modern Physics, S. Chand & Co. 4. Sehgal&Chopra, Modern Physics, Sultan Chand, New Delhi 5. Avadhahnulu, An Introduction to Lasers - Theory and Applications, M.N., S.Chand& Co., New Delhi, 2001. |
| **REFER ENCE BOOKS** | 1. Perspective of Modern Physics, Arthur Beiser, McGraw Hill. 2. Modern Physics, S. Ramamoorthy, National Publishing & Co. 3. Laser and Non-Linear Optics by B.B.Laud, Wiley Easter Ltd.,New York,1985. |
| **WEBLINKS** | 1. <http://hyperphysics.phy-astr.gsu.edu/hbase/hframe.html> 2. <https://makingphysicsfun.files.wordpress.com/2015/01/photoelectric-effect.pptx> 3. <https://www.khanacademy.org/science/physics/quantum-physics/in-in-nuclei/v/types-of-decay> 4. <https://www.khanacademy.org/science/in-in-class-12th-physics-india/nuclei> |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | List the properties of electrons and positive rays, define specific charge of positive rays, know different mass spectrographs. |
| **CO2** | Outline photoelectric effect and the terms related to it, state laws of photoelectric emission, explain experiments and applications of photo electric effect, solve problems based on photoelectric equation. |
| **CO3** | Explain different atom models, describe different quantum numbers and different coupling schemes. |
| **CO4** | Differentiate excitation and ionization potentials, explain Davis and Goucher’s experiment, apply selection rule, analyse Paschen-Back effect, compare Zeeman and Stark effect. |
| **CO5** | Understand the condition for production of laser, appreciate various properties and applications of lasers. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO5** | **3** | **3** | **2** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **14** | **14** | **14** | **15** |

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| **COURSE** | FIFTH SEMESTER – CORE |
| **COURSETITLE** | **RELATIVITY AND QUANTUM MECHANICS** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To understand the theory of relativity, its postulates and the consequences. To learn the importance of transformation equations and also to differentiate between special and general theory of relativity. To interpret the wave theory of matter with various theoretical and experimental evidences. To derive and use Schrodinger’s wave equation and also learn about various operators. To solve Schrodinger’s wave equation for simple problems and analyse to understand the solutions. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **SPECIAL THEORY OF RELATIVITY:** Michelson-Morley experiment**–**frames of reference – Galilean Relativity – postulates of special theory of relativity – Lorentz transformation – consequences – time dilation–concept of simultaneity – Doppler effect – length contraction–variation of mass with velocity – Einstein’s mass-energy relation– relativistic momentum – energy relation |
| **UNIT-II** | **TRANSFORMATION RELATIONS:** Transformation of velocity, mass, energy and momentum – four vector – invariance under transformation – Lorentz transformation and velocity addition equations in terms of hyperbolic functions.  **GENERAL THEORY OF RELATIVITY:** Inertial and Gravitational mass – Principle of equivalence – Experimental evidences for General theory of Relativity |
| **UNIT-III** | **PHOTONS AND MATTER WAVES:** Difficulties of classical physics and origin of quantum theory –black body radiation – Planck’s law – Einstein’s photoelectric equation –Compton effect –pair production – De Broglie waves – phase velocity and group velocity– Davisson and Germer’s experiment –uncertainty principle – consequences –illustration of Gamma ray microscope. |
| **UNIT-IV** | **OPERATORS AND SCHRÖDINGER EQUATION:** Postulates of quantum mechanics – Wave function and its interpretation – Schrödinger’s equation – linear operators – Eigenvalue – Hermitian operator – properties of Hermitian operator– observable – operators for position, linear Momentum, angular momentum components –commutator algebra –commutator between these operators –expectation values of position and momentum – Ehrenfest theorem. |
| **UNIT-V** | **SOLVING SCHRÖDINGER EQUATION FOR SIMPLE PROBLEMS:** *one-dimensional problems*: (i) particle in a box, (ii) barrier penetration problem – quantum mechanical tunneling, (iii) linear harmonic oscillator.  *higher dimensional problems*: (i) Rigid rotator (qualitative), (ii) Hydrogen atom (qualitative). |
| **TEXT BOOKS** | 1. Special Theory of Relativity, S. P. Puri*,* Pearson Education, India, 2013. 2. Concepts of Modern Physics, A.Beiser, 6th Ed., McGraw-Hill, 2003. 3. Modern Physics, R. Murugeshan, Kiruthiga Sivaprasath,S. Chand & Co.,17th Revised Edition, 2014. 4. Quantum Mechanics, S.P.Singh, M.K.Bagde, S.Chand& Co., New Delhi, 2000. 5. Modern Physics, R. Murugesan, S.Chand& Co., New Delhi. **(**Quantum Mechanics, Gupta, Kumar and Sharma. Jai Prakash Nath & Co Meerut) 6. Quantum mechanics – Satyaprakash and Swati Saluja. KedarNath Ram Nath& Co. |
| **REFER ENCE BOOKS** | 1. Fundamentals of Modern Physics, Peter J. Nolan, 1stEdition, 2014, by Physics 2. Quantum Mechanics, V.Murugan, Pearson Education, India, 2014. 3. Quantum Mechanics, Alastair I. M. Rae and Jim Napolitano, 6th Edition, CRC Press: Taylor& Francis, 2010. 4. Quantum Physics: A Fundamental Approach to Modern Physics, John S. Townsend, University Science Books, Sausalito, California, 2010. 5. Quantum Mechanics: Theory and Applications, AjoyGhatak and S. Lokanathan, Springer ScienceBusiness Media, Dordrecht, Netherlands, 2004. 6. Quantum Mechanics, V.Devanathan, Narosa Pub. House, Chennai, 2005. 7. A Text Book of Quantum Mechanics, Mathews &Venkatesan, Tata McGraw Hill, New Delhi. 8. Quantum Mechanics, Ghatak & Loganathan, Macmillan Publications. 9. Quantum Mechanics, Gupta, Kumar and Sharma. Jai Prakash Nath & Co Meerut |
| **WEBLINKS** | 1. <http://hyperphysics.phy-astr.gsu.edu/hbase/qapp.html> 2. <https://swayam.gov.in/nd2_arp19_ap83/preview> 3. <https://swayam.gov.in/nd1_noc20_ph05/preview> 4. <https://www.khanacademy.org/science/physics/special-relativity/minkowski-spacetime/v/introduction-to-special-relativity-and-minkowski-spacetime-diagrams> |

**METHOD OF EVALUATION:**

|  |  |  |  |
| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

|  |  |  |
| --- | --- | --- |
| **COURSE OUTCOMES** | **CO1** | Understand various postulates of special theory of relativity. |
| **CO2** | Appreciate the importance of transformation equations and also the general theory of relativity. |
| **CO3** | Realize the wave nature of matter and understand its importance |
| **CO4** | Derive Schrodinger equation and also realize the use of operators. |
| **CO5** | Apply Schrödinger equation to simple problems. |

**MAPPING WITH PROGRAM OUTCOMES:**

|  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **3** | **3** |
| **CO3** | **3** | **3** | **3** | **2** | **3** | **3** |
| **CO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **14** | **13** | **13** | **15** |

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| **COURSE** | FIFTH SEMESTER – CORE |
| **COURSETITLE** | **SOLID STATE PHYSICS** |
| **HOURS** | 5 |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To understand constituents, properties and models of nucleus.  To give reason for radioactivity and study their properties. To learn about the principles of various particle detectors and accelerators.  To acquire knowledge on different types of nuclear reactions and their applications. To know the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **BONDING IN SOLIDS, CRYSTAL STRUCTURE:** types of bonding –ionic bonding – bond energy of NaCl molecule –covalent bonding – metallic bonding – hydrogen bonding – Van-der-Waals bonding – crystal lattice – lattice translational vectors – lattice with basis – unit cell – Bravais’ lattices – Miller indices – procedure for finding them –packing of BCC and FCC structures – structures of NaCl and diamond crystals –reciprocal lattice – reciprocal lattice vectors – properties – reciprocal lattices to SC, BCC and FCC structures – Brillouin zones – X-rays – Bragg's law(simple problems) – experimental methods: Laue method, powder method and  rotating crystal method |
| **UNIT-II** | **ELEMENTARY LATTICE DYNAMICS:** lattice vibrations and phonons: linear monoatomic and diatomic chains. acoustical and optical phonons –qualitative description of the phonon spectrum in solids – Dulong and Petit’s Law – Einstein and Debye theories of specific heat of solids – T3 law –properties of metals – classical free electron theory of metals (Drude-Lorentz) – Ohm’s law – electrical and thermal conductivities – Weidemann-Franz’ law –Sommerfeld’s quantum free electron theory (qualitative only) – Einstein’s theory of specific heat capacity. |
| **UNIT-III** | **MAGNETIC PROPERTIES OF SOLIDS:** permeability, susceptibility, relation between them – classification of magnetic materials – properties of dia, para, ferro, ferri and antiferromagnetism – Langevin’s theory of diamagnetism – Langevin’s theory of paramagnetism – Curie-Weiss law – Weiss theory of ferromagnetism (qualitative only) – Heisenberg’s quantum theory of ferromagnetism – domains – discussion of B-H curve –hysteresis and energy loss – soft and hard magnets – magnetic alloys. |
| **UNIT-IV** | **DIELECTRIC PROPERTIES OF MATERIALS:** polarization and electric susceptibility –local electric field of an atom – dielectric constant and polarisability – polarization processes: electronic polarization– calculation of polarisability – ionic, orientational and space charge polarization –internal field – Clausius-Mosotti relation –frequency dependence of dielectric constant –dielectric loss – effect of temperature on dielectric constant – dielectric breakdown and its types – classical theory of electric polarisability –normal and anomalous dispersion – Cauchy and Sellmeir relations – Langevin-Debye equation – complex dielectric constant -optical phenomena. Application – plasma oscillations – plasma frequency –plasmons, |
| **UNIT-V** | **FERROELECTRIC & SUPERCONDUCTING PROPERTIES OF MATERIALS:** *ferroelectric effect*: Curie-Weiss Law – ferroelectric domains, P-E hysteresis loop – *elementary band theory:* Kronig-Penny model – band gap (no derivation) – conductor, semiconductor (P and N type) and insulator –conductivity of semiconductor – mobility – Hall effect – measurement of conductivity (four probe method) - Hall coefficient.  *Superconductivity:* experimental results –critical temperature –critical magnetic field – Meissner effect –type-I and type-II superconductors – London’s equation and penetration depth – isotope effect – idea of BCS theory (no derivation) |
| **TEXT BOOKS** | 1. Introduction to Solid State Physics, Kittel, Willey Eastern Ltd (2003). 2. Solid state Physics, Rita John,1st edition, Tata McGraw Hill publishers (2014). 3. Solid State Physics, R L Singhal, Kedarnath Ram Nath& Co., Meerut (2003) 4. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India 5. Solid-state Physics, H. Ibach and H. Luth, 2009, Springer 6. Elementary Solid State Physics, 1/e M. Ali Omar, 1999, Pearson India 7. Solid State Physics, M.A. Wahab, 2011, Narosa Publishing House, ND |
| **REFERENCE BOOKS** | 1. Puri&Babber – Solid State Physics – S.Chand&Co. New Delhi. 2. Kittel - Introduction to solid state physics, Wiley and Sons, 7th edition. 3. Raghavan - Materials science and Engineering, PHI 4. Azaroff - Introduction to solids, TMH 5. S. O.  Pillai - Solid State Physics, Narosa publication 6. A.J. Dekker - Solid State Physics, McMillan India Ltd. 7. Elements of Solid State Physics, J.P. Srivastava, 2nd Edition, 2006, Prentice-Hall of India |
| **WEBLINKS** | 1. <https://nptel.ac.in/courses/115105099/> 2. <https://nptel.ac.in/courses/115106061/> |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Classify the bonding & crystal structure also learn about the crystal structure analysis using X ray diffraction. |
| **CO2** | Understand the lattice dynamics and thus learn the electrical and thermal properties of materials. |
| **CO3** | Give reason for classifying magnetic material on the basis of their behaviour. |
| **CO4** | Comprehend the dielectric behavior of materials. |
| **CO5** | Appreciate the ferroelectric and super conducting properties of materials. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **2** | **3** |
| **CO2** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **2** | **3** | **3** |
| **CO5** | **3** | **3** | **2** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **11** | **14** | **14** | **15** |

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| **COURSE** | FIFTH SEMESTER CORE |
| **COURSE TITLE** | **MICROPROCESSOR 8085 AND MICROCONTROLLER** |
| **HOURS** | 5 (3 THEORY + 2 PRACTICAL) |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To get the knowledge on fundamentals of 8085 architecture, instruction sets and interfaces. To enable students to apply programming techniques with the knowledge of the instruction set, memory system and various interfacing devices, develop assembly language programs and test them practically. To provide basic knowledge on 8051 microcontroller. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | 8085 Microprocessor: introduction to microprocessor – INTEL 8085 architecture – register organization –pin configuration of 8085, interrupts and its priority – Program Status Word (PSW) – Addressing modes of 8085 – system clock - instruction format-instruction fetch and execution - sequence and timing.  Instruction set of 8085 – Data transfer group - arithmetic/logic group-branch group - stack and I/O control instruction. |
| **UNIT-II** | Programming: Addition- subtraction – multiplication - division of single  byte and double byte numbers- square and square root  of Hex numbers   and BCD numbers- code conversion- BCD to BINARY conversion - binary TO BCD conversion – BCD to ASCII and ASCII to BCD - Sorting-Bubble sort method - ascending, descending order - searching an array for a given byte and appending a byte - block move - time delay. |
| **UNIT-III** | I/O Interfaces: serial communication interface (8251-USART) – programmable peripheral interface (8255-PPI) – Mapped I/O - Memory Map – keyboard and display (8279), DMA controller (8237) - interfacing digital to analog converters (DAC) - Analog to digital converters (ADC).  Memory interfacing – interfacing 2kx8 ROM and RAM |
| **UNIT-IV** | 8051MICROCONTROLLER HARDWARE:  The 8051 Architecture- Hardware- Oscillator and clock-program counter - data pointer-registers-stack and stack pointer-special function registers- memory organization-program memory-data memory -Input / Output Ports - External data memory and program memory. |
| **UNIT-V** | MICROPROCESSOR 8085 – PRACTICALS:   1. Addition, subtraction, multiplication, division of single byte numbers. 2. Multibyte addition and BCD addition 3. Square of a single byte Hex number and two-digit BCD number. 4. Sorting and Searching 5. Code conversion - BCD to Binary conversion 6. Code conversion - Binary TO BCD conversion 7. Ring and shift counter using 8255 I/O Interface 8. Wave form generator using DAC 0808 Interface. 9. ADC interface to microprocessor. |
| **TEXT BOOKS** | 1. R.S.Gaonkar (1997) Microprocessor Architecture, Programming and Applications with the 8085 – Penram International Publishing, Mumbai 2. B. Ram (1993). Fundamentals of Microprocessors and Microcomputers (4th edn). Dhanpat RAI Publication 3. V. Vijayendran (2003). Fundamental of Microprocessor 8085. S. Viswanathan Publishers, Chennai, 4. Douglas.V. Hall (1991) Microprocessor Interfacing, Programming and Hardware, Tata McGraw Hill Publishing Co. Ltd, New Delhi 5. Kenneth Ayala (2007) The 8051 Microcontroller, 3rd ed. Delmar/Cengage Learning Publishers |
| **REFER ENCE BOOKS** | 1. Senthil Kumar Saravanan, Jeevananthan (2010). Microprocessors and Microcontrollers (2nd edn). Oxford Univ Press, 2. Dougles V. Hall (1983). Microprocessor and Digital System (2nd edn), McGraw Hill Company. 3. Microcomputer Systems the 8086/8088 family – YU-Cheng Liu and GlenSA 4. Malvino and Leach. Digital Principles and Applications, TMG Hill Edition |
| **WEB LINKS** | 1. https://www.elprocus.com/8051-microcontroller-architecture-and-applications/ 2. <https://www.edgefx.in/8051-microcontroller-architecture/> |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Understand the architecture & organization of microprocessor 8085 and familiarize the instruction set of microprocessors 8085 |
| **CO2** | Apply the software instructions to write efficient assembly language programs |
| **CO3** | Illustrate the interfacing of peripheral devices with 8085 microprocessors |
| **CO4** | Acquire basic knowledge on the hardware of 8051 microcontroller |
| **CO5** | Execute assembly language programs through practical work |

**MAPPING WITH PROGRAM OUTCOMES:**

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| --- | --- | --- | --- | --- | --- | --- |
| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **1** | **1** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **1** | **2** | **2** | **3** |
| **CO4** | **3** | **3** | **1** | **1** | **2** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **9** | **10** | **13** | **15** |

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| **COURSE** | FIFTH SEMESTER - ELECTIVE |
| **COURSETITLE** | **PYTHON PROGRAMMING** |
| **HOURS** | 2 Theory 2 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To provide knowledge on fundamentals of object-oriented programming and to have the ability to use the SDK environment to create, debug and run Java programs. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Introduction: Python programming language - Data and Expressions:  Literals - Variables and Identifiers - Operators - Expressions and Data types - Control Structures: Boolean Expressions - Selection Control - Iterative Control - Lists: List Structures - Lists in Python - Iterating over lists in Python  **Exercises :**   1. Python Basic programs 2. Control Structures 3. Lists |
| **UNIT-II** | Tuples - Functions: Program routines - More on Functions - Recursion: Recursive Functions. Modular Design: Modules - Top-Down Design - Python Modules.  **Exercises :**   1. Tuples 2. Functions and Recursions 3. Modules |
| **UNIT-III** | String Processing - Dictionaries and Sets: Dictionary type in Python - Set Data type - Object Oriented Programming.  **Exercises :**   1. String Processing 2. Dictionaries & Sets 3. Classes and Objects |
| **UNIT-IV** | Encapsulation - Inheritance – Polymorphism - Exception Handling: try and except statement – try with else clause – Finally keyword in python – raising exception.  **Exercises :**   1. Polymorphism 2. Inheritance 3. Exception Handling |
| **UNIT-V** | Getting Started with Pandas: Introduction to Pandas Data Structure – Essential Functionality - Plotting and Visualization: A Brief matplotlib API Primer - Plotting functions in Pandas - Python Visualization.  **Exercises :**   1. Plotting functions in pandas 2. Visualization |
| **TEXT BOOKS** | 1. Charles Dierbach, (2015), “Introduction to Computer Science using Python - A computational Problem solving Focus”, Wiley India Edition. 2. Wes Mckinney, (2013), “Python for Data Analysis,” O’reilly Media. (Unit - V - Chapters – (5,8) |
| **REFERENCE BOOKS** | 1. Mark Lutz, (2013), “Learning Python Powerful Object Oriented Programming”, O’reilly Media, 5 th Edition. 2. Timothy A. Budd, (2011), “Exploring Python”, Tata MCGraw Hill Education Private Limited, First Edition. 3. Allen Downey, Jeffrey Elkner, Chris Meyers, (2012), “How to think like a computer scientist: learning with Python” |
| **WEBLINKS** | 1. http://docs.python.org/3/tutorial/index.html 2. http://interactivepython.org/courselib/static/pythonds 3. http://www.ibiblio.org/g2swap/byteofpython/read/ 4. http://www.diveintopython3.net/ 5. http://greenteapress.com/wp/think-python-2e/ |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Understand the fundamental concepts in python. |
| **CO2** | Acquire programming skills in python. |
| **CO3** | Apply the different data types available in python |
| **CO4** | Analyze and select proper concepts to execute python script. |
| **CO5** | To develop python script to solve the given problems. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |

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| **COURSE** | FIFTH SEMESTER - ELECTIVE |
| **COURSETITLE** | **RELATIONAL DATABASE MANAGEMENT SYSTEM** |
| **HOURS** | 3 Theory 1 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To understand the basic DBMS models and architecture. To design, normalize and query the data base. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Introduction to Databases: Introduction – Characteristics of the Database Approach– Advantages of using DBMS Approach. Overview of database and Architectures: Data Models, Schemas, and Instances - Three Schema Architecture - Data Independence - Client Server Architecture for DBMS   **Exercises :**   1. DDL Commands 2. DML Commands |
| **UNIT-II** | Basic Relational Model: Relational Model Concepts – Relational Model Constraints - Relational Database Schemas – Formal Relational Languages: Unary Relational Operations –Relational Algebra operations from Set Theory - Binary Relational Operations: Join and Division  **Exercises :**   1. DCL Commands 2. SQL Built-in functions |
| **UNIT-III** | Conceptual Data Modeling using the Entities and Relationships: A Sample Database Application – Entity Types, Entity Sets, Attributes, and Keys. Relationship Types, Relationship Sets, Roles, and Structural Constraints – Weak Entity Types.  **Exercises :**   1. SQL Built-in functions 2. Group By query |
| **UNIT-IV** | Introduction to Normalization using Functional and Multivalued Dependencies: Informal Design Guidelines for Relation Schemas - Functional Dependencies –– Normal Forms based on Primary Keys – Boyce-Codd Normal Form - Fourth Normal Form – Fifth Normal Form.  **Exercises :**   1. Sub Queries |
| **UNIT-V** | SQL: Basic Queries in SQL –Data Constraints – Views in SQL – Built-in Functions- Joins – Group By  PL/SQL: Introduction to PL/SQL – Error Handling in PL/SQL – Oracle’s Named Exception Handlers  **Exercises :**  **PL/SQL:**   1. Simple programs using PL/SQL 2. Exception Handling |
| **TEXT BOOKS** | 1. Ramez Elmasri, Shamkant B. Navathe (2014), “Database Systems”, Sixth edition, Pearson Education, New Delhi. 2. Ivan Bayross (2003 Reprint), SQL, PL/SQL-The Programming Language of Oracle, Second Revised Edition, BPB Publications, New Delhi |
| **REFERENCE BOOKS** | Abraham Silberschatz, Henry F.Korth, S.Sudarshan, Database System Concepts, Tata McGraw Hill Publication, 4th Edition |
| **WEBLINKS** | 1. <https://learning.shine.com/talenteconomy/career-prospects/advantages-of-database-management-system/> 2. <https://www.scaler.com/topics/dbms/relational-model-in-dbms/> 3. <https://www.youtube.com/watch?v=FrWd8_u1aFc> 4. <https://www.javatpoint.com/dbms-normalization> 5. <https://www.geeksforgeeks.org/sql-ddl-dql-dml-dcl-tcl-commands/> |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Understand the model, architecture and Schema of RDBMS. |
| **CO2** | Outline the fundamental RDBMS concepts and PL/SQL. |
| **CO3** | Apply database operations, normalization, SQL and PL/SQL. |
| **CO4** | Analyze the requirements to implement relational database concepts |
| **CO5** | Evaluate the database based on various models and normalization. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |

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| **COURSE** | SIXTH SEMESTER – CORE |
| **COURSETITLE** | **NUCLEAR AND PARTICLE PHYSICS** |
| **HOURS** | 5 Theory + 1 Tutorial |
| **CREDITS** | 5 |
| **COURSE**  **OBJECTIVES** | * To understand constituents, properties and models of nucleus. To give reason for radioactivity and study their properties. To learn about the principles of various particle detectors and accelerators. * To acquire knowledge on different types of nuclear reactions and their applications. To know the reason for cosmic rays and their effect on the surface of earth and also understand the classification of elementary particles. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | **PROPERTIES OF NUCLEUS:** constituents of nucleus – isotopes, isobars, isotones – nuclear size, mass, density, charge, spin, angular momentum, magnetic dipole moment, electric quadrupole moment (qualitative) – binding energy – mass defect – packing fraction – nuclear stability – binding energy per nucleon graph – properties of nuclear force – meson theory of nuclear forces – Yukawa potential.  **NUCLEAR MODELS:** liquid drop model –Weizacker’s semi-empirical mass formula – shell model – magic numbers. |
| **UNIT-II** | **RADIO ACTIVITY:** radio activity – laws of radioactivity – radioactive disintegration, decay constant, half-life, mean-life (only final formulae) **–** units of radioactivity**–**successive disintegration – transient and secular equilibrium– properties of alpha, beta and gamma rays – Geiger-Nuttal law –α-ray spectra –Gammow's theory of α-decay (qualitative) –β-ray spectrum – neutrino theory of β-decay – nuclear isomerism – K-shell capture – internal conversion – non-conservation of parity in weak interactions. |
| **UNIT-III** | **PARTICLE DETECTORS AND ACCELERATORS**  **DETECTORS:** Gas detectors –ionization chamber – G-M counter – scintillation counter – photo multiplier tube (PMT) – semiconductor detectors – neutron detector.  **ACCELERATORS:** linear accelerators – cyclotron – synchrotron – betatron– electron synchrotron – proton synchrotron (bevatron) |
| **UNIT-IV** | **NUCLEAR REACTIONS:** types of nuclear reactions –conservation laws in nuclear reaction – Q-value– threshold energy – nuclear fission – energy released in fission – chain reaction – critical mass – nuclear reactor – nuclear fusion – sources of stellar energy – proton-proton cycle – Carbon-Nitrogen cycle – thermonuclear reactions – controlled thermonuclear reactions. |
| **UNIT-V** | **COSMIC RAYS AND ELEMENTARY PARTICLES**  **COSMIC RAYS:** Discovery of cosmic rays – primary and secondary cosmic rays – cascade theory of cosmic ray showers – altitude and latitude effects –discovery of positron – pair production – annihilation of matter – Van-Allen radiation belts – big-bang theory – future of the Universe (elementary ideas only).\  **ELEMENTARY PARTICLES:** Particles and antiparticles – classification of elementary particles – types of fundamental interactions – quantum numbers of elementary particles – conservation laws and symmetry – quarks and types – quark model (elementary ideas only). |
| **TEXT BOOKS** | 1. R Murugeshan & Kiruthiga Sivaprasath, Modern Physics, S. Chand & Co. (2013) 2. Brijlal& N. Subramaniyan, Atomic and Nuclear Physics S.Chand& Co 3. J.B. Rajam, Modern Physics, S Chand &Co.Publishing Co. 4. D.C. Tayal, Nuclear Physics, Himalayan Publishing House 5. Atomic and Nuclear Physics, Brijlal& N. Subramaniyan, S.Chand& Co |
| **REFER ENCE BOOKS** | 1. Basic ideas and concepts in Nuclear Physics, K.Heyde, 3rd Edn., Institute of Physics Pub. 2. Introductory nuclear Physics by Kenneth S. Krane (Wiley India Pvt. Ltd., 2008) 3. Concepts of nuclear physics by Bernard L. Cohen. (Tata Mcgraw Hill, 1998). 4. Introduction to the physics of nuclei & particles, R.A. Dunlap. (Thomson Asia, 2004). 5. Introduction to High Energy Physics, D.H. Perkins, Cambridge Univ. Press 6. Introduction to Elementary Particles, D. Griffith, John Wiley & Son 7. Quarks and Leptons, F. Halzen and A.D. Martin, Wiley India, New Delhi 8. Radiation detection and measurement, G.F. Knoll (John Wiley & Sons, 2000). 9. Theoretical Nuclear Physics, J.M. Blatt &V.F.Weisskopf (Dover Pub.Inc., 1991) 10. Physics and Engineering of Radiation Detection, Syed Naeem Ahmed (AcademicPress, Elsevier, 2007).   11.  Nuclear Physics, S. N. Ghoshal, S Chand & Co. Edition 2003  15. Elements of Nuclear Physics, M. L.Pandya& R. P. S.Yadav, KedarNath& Ram Nath |
| **WEB LINKS** | 1. <http://hyperphysics.phy-astr.gsu.edu/hbase/nuccon.html> 2. <https://www.kent.edu/physics/nuclear-physics-links> 3. <https://www2.lbl.gov/abc/links.html> |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| **25** | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Describe various models that explain about the nuclear structures |
| **CO2** | Give reason for various kinds of radioactivity and also know laws governing them |
| **CO3** | Know the principles and applications of various particle detectors and accelerators. |
| **CO4** | Discuss the concepts used in nuclear reaction. |
| **CO5** | Classify various elementary particles and study the effect of cosmic rays. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **1** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **1** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **2** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **1** | **3** | **3** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **7** | **15** | **15** | **15** |

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| **COURSE** | SIXTH SEMESTER – CORE |
| **COURSETITLE** | **ELECTRICITY AND Electromagnetism** |
| **HOURS** | 5 Theory + 1 Tutorial |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | To explain the fundamental processes of Electricity and Magnetism and, solve related numerical problems and apply these concepts to understand the working of electrical instruments. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Coulomb’s law - superposition principle - Electric field - due to a point charge - due to an electric dipole at any point - potential energy of a dipole in a uniform electric field - lines of force.  Flux of the electric field - Gauss’ Law - differential form - application of Gauss’ law - insulated conductor - uniformly charged sphere - line of charge - cylinder of charge - sheet of charge - two parallel sheets of charge - Coulomb’s theorem - energy stored. |
| **UNIT-II** | Principle of a capacitor, capacitance of a spherical Capacitor - cylindrical capacitor - parallel plate capacitor (with and without dielectric) energy stored in a charged capacitor - introduction of a dielectric medium - Polarization of matter - electric susceptibility - permittivity and the dielectric constant - electric displacement **D** - energy stored in a dielectric medium. |
| **UNIT-III** | Potential difference - field and potential - potential due to a point charge - uniformly charged conducting sphere - uniformly charged non-conducting solid sphere - dipole - potential energy - Poisson’s and Laplace’sequations.  EMF induced in a coil rotating in a magnetic field - AC circuit containing resistance, Inductance and capacitance in series and parallel **-** resonance in series and parallel circuits - power in AC circuits. |
| **UNIT-IV** | Force on a current carrying conductor in a magnetic field - force between two parallel current carrying conductors - definition of ampere - force on charged particles - torque on a current loop in a uniform magnetic field - moving coil ballistic galvanometer - current and voltage sensitivities - measurement of charge sensitiveness (figure of merit) - Ampere circuital law - curl and divergence of magnetic field vector B**.**  Faraday’s Laws of electromagnetic induction - self-induction - mutual induction - coefficient of coupling - transformers. |
| **UNIT-V** | Magnetization - relation between the three magnetic vectors **B**, **M** and **H** - magnetic susceptibility and permeability - properties of dia, para and ferromagnetic materials - the Electron theory of magnetism - experiment to draw B-H curve. Hysteresis - energy loss.  Displacement current - Maxwell’s Equations - electromagnetic waves - velocity of electromagnetic waves - electromagnetic waves in matter - transverse nature of plane waves - Poynting Vector and its significance. |
| **TEXT BOOKS** | 1. R. Murugeshan (2017) Electricity and Magnetism 10th ed. S. Chand and Co, New Delhi. 2. Arthur Kip (1969) Fundamentals of Electricity and Magnetism International student edition, Tata McGraw Hill, Kogakusha, Japan. 3. N. Narayanamurthi and N. Nagaratnam (1997) Electricity and Magnetism 3rd ed.    National Publishing, Chennai**.** |
| **REFERENCE BOOKS** | 1. David Griffiths (1993) Introduction to Electrodynamics 2nd ed. Prentice Hall, New Delhi. 2. Young, Hugh D., and Roger A. Freedman. University Physics with modern Physics. San Francisco, CA: Addison-Wesley, 2003. 3. Resnick, Robert, David Halliday, and Kenneth S. Krane. Physics. Vol. 2. New York, NY: Wiley, 2001. |
| **WEBLINKS** | 1. http://hyperphysics.phy-astr.gsu.edu/hbase/index.html 2. https://www.youtube.com/watch?v=HZwhDf74c6o |

**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Describe the concept of electric charges and electric fields. Explain Gauss’ Law, its differential form and application |
| **CO2** | Understand the basics of capacitors and dielectrics and solve relevant problems |
| **CO3** | Differentiate electric field and potential and solve problems. Explain Poisson’s and Laplace’sequations. Discuss the AC circuits containing resistance, Inductance and capacitance |
| **CO4** | Discuss the magnetic effect of electric current and its application |
| **CO5** | Interpret the magnetic properties of materials. Derive Maxwell’s equations and discuss the nature of electromagnetic waves |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **MAPPING TABLE** | | | | | | |
| **CO/PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO2** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO3** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO4** | **3** | **3** | **3** | **2** | **2** | **3** |
| **CO5** | **3** | **3** | **3** | **2** | **2** | **3** |
| **Weightage of course contributed to each PSO** | **15** | **15** | **15** | **10** | **10** | **15** |

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| **COURSE** | SIXTH SEMESTER – CORE |
| **COURSE TITLE** | **PHYSICS CORE PRACTICAL - IV** |
| **HOURS** | 3 + 3 (Two labs/week) |
| **CREDITS** | 4 |
| **COURSE**  **OBJECTIVES** | Construct circuits to learn about the concept of electricity, current, resistance in the path of current, different parameters that affect a circuit. Demonstrate various optical phenomena principles, working, apply with various materials and interpret the results. Set up experiments, observe, analyse and assimilate the concept. |
| **ELECTRICITY AND OTHERS (Any 9 + 9 experiments can be done)** | |
| 1. Calibration of low range and high range voltmeter using potentiometer 2. Calibration of ammeter using potentiometer. 3. Measurement of low resistances using potentiometer. 4. Determination of field along the axis of a current carrying circular coil. 5. Determination of earth’s magnetic field using field along axis of current carrying coil. 6. Determination of specific resistance of the material of the wire using PO box. 7. Determination of resistance and specific resistance using Carey Foster’s bridge. 8. Determination of internal resistance of a cell using potentiometer. 9. Determination of specific conductance of an electrolyte. 10. Determination of e.m.f of thermocouple using potentiometer 11. Determination of capacitance using Desauty’s bridge and B.G./Spot galvanometer 12. Determination of figure of merit of BG or spot galvanometer. 13. Comparison of EMF of two cells using BG. 14. Comparison of capacitance using BG. | |
| 1. Diffraction grating Normal incidence. 2. Diffraction grating minimum deviation. 3. Diffraction at a wire. 4. Specific rotation of sugar solution. 5. Bi-prism – Determination of µ. 6. Thickness of a thin film of Bi-prism 7. Brewster’s law – polarization 8. Double refraction (µe and µo) 9. Y – by Corlus method. 10. Dispersive power of plane diffraction grating. 11. Diffraction a straight edge. 12. Kundt’s tube – Velocity of sound, Adiabatic Young’s modulus of the material of the rod. 13. Forbe’s method – Thermal conductivity of a metal rod. 14. Spectrometer– Grating - Normal incidence - Wave length of Mercury spectral lines. 15. Spectrometer – Grating - Minimum deviation - Wave length of Mercury spectral lines. 16. Spectrometer – (i-d) curve. 17. Spectrometer – (i-i׳) curve. 18. Spectrometer – Narrow angled prism. 19. Rydberg’s constant 20. e/m Thomson method 21. h by photocell 22. Spectral response of photo conductor (LDR). 23. Potentiometer –Resistance and Specific resistance of the coil. 24. Potentiometer – E.M.F of a thermocouple. 25. Carey Foster’s bridge - Temperature coefficient of resistance of the coil. 26. Deflection Magnetometer – Determination of Magnetic moment of a bar magnet and BHusing circular coil carrying current. 27. Vibration magnetometer - Determination of BH using circular coil carrying current– Tan B position. 28. B.G – Figure of Merit – Charge Sensitivity | |
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**METHOD OF EVALUATION:**

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| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

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| **MAPPING TABLE** | | | | | | |
| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO2** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO3** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO4** | **3** | **3** | **3** | **3** | **3** | **3** |
| **CO5** | **3** | **3** | **3** | **3** | **3** | **3** |
| **Weightage of course**  **contributed to each PSO** | **15** | **15** | **15** | **15** | **15** | **15** |

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| **COURSE** | SIXTH SEMESTER - ELECTIVE |
| **COURSETITLE** | **MOBILE APPLICATION DEVELOPMENT LAB** |
| **HOURS** | 2 Theory 3 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To provide the students with the basics of Android Software Development tools and development of software on mobile platform. |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Introduction to Android Operating System – Configuration of Android Environment- Create the First Android Application. Layout: Vertical, Vertical Scroll, horizontal, horizontal Scroll, Table Layout arrangement. **Designing User Interface:** Label Text - TextView – Password Text Box - Button –ImageButton – CheckBox  – Image - RadioButton – Slider – Autocomplete text View.  **Exercises:**   1. Building different Layout Arrangements (Vertical, vertical Scroll, Horizontal, horizontal Scroll) 2. Table Arrangements 3. Check Box 4. Image 5. Radio Button 6. Slider 7. Autocomplete Text view |
| **UNIT-II** | **User Interface:** Spinner – Switch – Side Bar- ListView - List Picker - Image Picker -  Notifier - Time and Date Picker - Web Viewer  **Exercises:**   1. Switch 2. Spinner 3. List view & List Picker 4. Side Bar 5. Image Picker 6. Date and Time Picker 7. Web Viewer |
| **UNIT-III** | **Media:** Camcorder - Camera – Player – Speech Recognizer – Text to Speech – Video Player - Canvas  **Exercises:**   1. Camcorder & Camera 2. Audio Player & Video Player 3. Speech Recognizer & Text to Speech 4. Canvas |
| **UNIT-IV** | **Maps:** Maps - Sensor: Location Sensor – Barcode Scanner - **Social components:** Contact Picker – Email Picker – Phone Number Picker – Phone Call - Social: Texting  **Exercises:**   1. Map & Location Tracker 2. Barcode Scanner 3. Email Picker 4. Contact app 5. SMS Messaging |
| **UNIT-V** | **Storage:** Cloud DB – Tiny DB – Experimental – Fire DB  **Exercises:**   1. Working with Firebase Database 2. Working with Tiny DB |
| **TEXT BOOKS** | 1. Karen Lang and Selim Tezel, (2022), Become an App Inventor The official guide from MIT App Inventor, Miteen Press, Walker Books Limited. |
| **REFERENCE BOOKS** | 1. Wei – Meng Lee, (2012), Beginning Android 4 Application Development, Wiley India Edition. 2. Deital, Android for Programmers-An App-Driven Approach,Second Edition. 3. OnurCinar,(2012), Android Apps with Eclipse, Apress, Springer(India) Private Limited. 4. James C. Sheusi , Android application development for java programmers, Cengage Learning, 2013. |
| **WEBLINKS** | 1. http://ai2.appinventor.mit.edu/reference/ 2. http://appinventor.mit.edu/explore/paint-pot-extended-camera 3. http://appinventor.mit.edu/explore/ai2/cup-game 4. http://appinventor.mit.edu/explore/ai2/android-wheres-my-car 5. http://appinventor.mit.edu/explore/library 6. http://appinventor.mit.edu/explore/resources 7. http://appinventor.mit.edu/explore/ai2/location-sensor |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Chart the requirements needed for developing android application |
| **CO2** | Apply proper interface setup, styles & themes, storing and management |
| **CO3** | techniques for the application activities |
| **CO4** | Analyze the problem and add necessary user interface components, graphics and multimedia components into the application. |
| **CO5** | Evaluate the results by implementing the concept behind the problem with proper code. |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |

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| **COURSE** | SIXTH SEMESTER - ELECTIVE |
| **COURSETITLE** | **INTERNET OF THINGS** |
| **HOURS** | 4 Theory 1 Practical |
| **CREDITS** | 3 |
| **COURSE**  **OBJECTIVES** | To impart the knowledge on IoT Architecture, Protocol, various technologies and the sensors relating to IoT implementations |

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| **UNITS** | **COURSE DETAILS** |
| **UNIT-I** | Introduction to IoT - Introduction to Internet of Things: Introduction- Physical Design of IoT- Logical Design of IoT- IoT Enabling Technologies - IoT Levels & Deployment Templates  **Practical Implementation of IoT Sensors:**  1.Humidity sensor |
| **UNIT-II** | Domain Specific IoT: Introduction-Home Automation-Cities-Environment-Energy-Retail-Logistics-Agriculture-Industry-Health & Lifestyle.IoT and M2M: Introduction-M2M-Difference between IoT and M2M- SDN and NFV for IoT.  **Practical Implementation of IoT Sensors:**  2.Light sensor |
| **UNIT-III** | IoT System Management with NETCONF-YANG: Need for IoT Management-Simple Network Management Protocol-Network Operator Requirements-NETCONF-YANG-IoT Systems Management with NETCONF-YANG-IoT Platforms Design Methodology: Introduction-IoT Design Methodology  **Practical Implementation of IoT Sensors:**  3.Heat sensor |
| **UNIT-IV** | Smart Objects: The “Things in IOT”-Sensors, Actuators and smart objects, Sensor Networks. Connecting Smart Objects: Communications Criteria  **Practical Implementation of IoT Sensors:**  4.LPG Sensor |
| **UNIT-V** | IoT in Industry: Smart and Connected cities-An IoT strategy for smarter Cities-Smart city IoT Architecture-Smart city security Architecture-Smart City Use case examples.  **Practical Implementation of IoT Sensors:**  4.LPG Sensor |
| **TEXT BOOKS** | 1. ArshdeepBahga, Vijay Madisetti, ―Internet of Things – A hands-on approach, Universities Press, 2015 (Unit I, II and III) 2. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, ―IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017(Unit IV and V) |
| **REFERENCE BOOKS** | 1. Jan Ho¨ ller, VlasiosTsiatsis , Catherine Mulligan, Stamatis , Karnouskos, Stefan Avesand. David Boyle, “From Machine-to-Machine to the Internet of Things – Introduction to a New Age of Intelligence”, Elsevier, 2014. 2. Olivier Hersent, David Boswarthick, Omar Elloumi , ―The Internet of Things – Key applications and Protocols, Wiley, 2012 3. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), ―Architecting the Internet of Things, Springer, 2011. |
| **WEBLINKS** | 1. https://www.tutorialspoint.com/internet\_of\_things/ 2. https://www.geeksforgeeks.org/introduction-to-internet-of-things-iot-set-1/ 3. https://www.edureka.co/blog/what-is-iot/ 4. https://www.slideshare.net/khusuma/domain-specific-iot(Unit-II) 5. https://www.coursehero.com/file/18189259/Chapter-4-1/(Unit-III) 6. https://github.com/connectIOT/iottoolkit 7. https://www.arduino.cc/ |

**METHOD OF EVALUATION:**

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| --- | --- | --- | --- |
| **Continuous Internal Assessment** | **End Semester Examination** | **Total** | **Grade** |
| 25 | **75** | **100** |  |

**COURSE OUTCOMES:**

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

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| **COURSE OUTCOMES** | **CO1** | Understand the fundamentals of IoT. |
| **CO2** | Outline the fundamentals and Architectural Overview of IoT. |
| **CO3** | Apply the sensors effectively for IoT application. |
| **CO4** | Analyze the challenges faced by IoT smart devices. |
| **CO5** | Design IoT applications using the technology available |

**MAPPING WITH PROGRAM OUTCOMES:**

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| **CO/ PSO** | **PSO 1** | **PSO 2** | **PSO 3** | **PSO 4** | **PSO 5** | **PSO 6** |
| **CO1** | **3** | **2** | **3** | **3** | **2** | **2** |
| **CO2** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO3** | **3** | **3** | **3** | **3** | **2** | **2** |
| **CO4** | **3** | **3** | **2** | **3** | **2** | **2** |
| **CO5** | **3** | **3** | **2** | **3** | **2** | **2** |
| **Weightage of course contributed to each PSO** | **15** | **14** | **13** | **15** | **10** | **10** |