MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

# Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

# Computer Science and Design

## V & VI Semester Scheme and Syllabus

(2024 Scheme)

# VISION

To empower young minds through technology, research and innovation, to produce technically competent and socially responsible professionals in higher education.

# MISSION

1. To deliver excellence in education through innovative teaching, impactful research, and continuous skill development, preparing students to meet global challenges with technical expertise and ethical responsibility.
2. To foster a transformative learning environment that integrates technology, research and practical experience, empowering students to become skilled professionals and socially conscious leaders.
3. To cultivate a culture of lifelong learning and professional excellence by encouraging creativity, research, and community engagement, equipping students with the skills to thrive in a dynamic world.
4. To provide a holistic educational experience that combines advanced technology, hands-on research, and community-focused learning, shaping students into competent, ethical professionals who contribute positively to society.

# QUALITY POLICY

Rajarajeswari College of Engineering is committed to imparting quality technical education that nurtures competent, ethical professionals with global relevance. We ensure academic excellence through a dynamic, outcome-based curriculum, experienced faculty, and cutting-edge infrastructure. Continuous improvement is driven by innovation, research and strong industry collaboration. We foster holistic development and a progressive environment that supports lifelong learning, teamwork, and professional growth.

# CORE VALUES

Academic Excellence, Integrity, Innovation, Global Competence, Continuous Improvement.

# Computer Science and Design

## DEPARTMENT VISION

To craft a new generation of innovations who merge technology with design to shape them into skilled and socially responsible professionals.

## DEPARTMENT MISSION

1. To deliver the environment to become industry ready professionals, Researchers and Entrepreneurs by offering courses on cutting edge technology and advanced practical courses for the students.
2. Impart high quality experiential learning to get expertise in modern software tools and to cater to the real time requirements of the industry.
3. Inculcate problem solving and team building skills promote lifelong learning to demonstrate with a sense of societal and ethical responsibilities.

# PROGRAM OUTCOMES (POs)

**PO1: Engineering Knowledge:** Apply knowledge of mathematics, natural science, computing, engineering fundamentals and an engineering specialization as specified in WK1 to WK4 respectively to develop to the solution of complex engineering problems.

**PO2: Problem Analysis:** Identify, formulate, review research literature and analyze complex engineering problems reaching substantiated conclusions with consideration for sustainable development. (WK1 to WK4)

**PO3: Design/Development of Solutions:** Design creative solutions for complex engineering problems and design/develop systems /components / processes to meet identified needs with consideration for the public health and safety, whole-life cost, net zero carbon, culture, society and environment as required. (WK5)

**PO4: Conduct Investigations of Complex Problems:** Conduct investigations of complex engineering problems using research-based knowledge including design of experiments, modeling, analysis & interpretation of data to provide valid conclusions. (WK8).

**PO5: Engineering Tool Usage:** Create, select and apply appropriate techniques, resources and modern engineering & IT tools, including prediction and modeling recognizing their limitations to solve complex engineering problems. (WK2 and WK6)

**PO6: The Engineer and The World:** Analyze and evaluate societal and environmental aspects while solving complex engineering problems for its impact on sustainability with reference to economy, health, safety, legal framework, culture and environment. (WK1, WK5, WK7).

**PO7: Ethics:** Apply ethical principles and commit to professional ethics, human values, diversity and inclusion; adhere to national & international laws. (WK9)

**PO8: Individual and Collaborative Team work:** Function effectively as an individual, and as a member or leader in diverse/multi-disciplinary teams.

**PO9: Communication:** Communicate effectively and inclusively within the community and society at large, such as being able to comprehend and write effective reports and design documentation, make effective presentations considering cultural, language, and learning differences

**PO10: Project Management and Finance:** Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.

**PO11: Life-Long Learning:** Recognize the need for, and have the preparation and ability for i) independent and life-long learning ii) adaptability to new and emerging technologies and iii) critical thinking in the broadest context of technological change. (WK8)

# PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

**PEO-1:** Graduates of the program will possess strong educational foundation in mathematics, science, and computer science & engineering necessary for pursuing career and/ or higher studies in computing as well as other allied professions.

**PEO-2:** Graduates with an interest in, and aptitude for lifelong learning will be engaged in learning, understanding, and applying new ideas and technologies as the field evolves to solve engineering problems, design appropriate computing systems that are technically sound economically viable and socially acceptable and be responsible engineering and computing professionals.

**PEO-3:** Graduates will be informed leaders, effective communicators who work efficiently with diverse teams, promote and practice appropriate ethical moral and codes.

# PROGRAM SPECIFIC OUTCOMES (PSOs)

**PSO-1:** Understand, apply, and demonstrate advanced technical skills in problem solving and leadership, as well as an understanding of system integration and the practical technological problems of end users.

**PSO-2:** An ability to design, implement, and evaluate a software or a software/hardware system, component, or process to meet desired needs within realistic constraints such as memory, runtime efficiency, as well as other socio-economic constraints.

# INDEX


| V Semester | | | |
|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Page No.** |
| 1. | B24CS501 | Software Engineering and Project Management | 1 |
| 2. | B24CS502 | Computer Networks | 4 |
| 3. | B24CS503 | Theory of Computation | 7 |
| 4. | B24CS504 | Artificial Intelligence | 9 |
| 5. | B24CS505L | Artificial Intelligence Lab | 11 |
| 6. | B24IS561 | System Software | 13 |
| 7. | B24CG562 | Visual Design Communication | 15 |
| 8. | B24CG563 | Computer Graphics and Design | 18 |
| 9. | B24IC564 | Big Data Analytics | 20 |
| 10. | B24CS581 | Angular JS Lab | 22 |
| 11. | B24CG582 | UI/UX Design | 24 |
| 12. | B24CG583 | R Programming | 26 |
| 13. | B24IC584 | Big Data Analytics with Python Lab | 28 |
| 14. | B24CGP511 | Mini Project | 30 |

| VI Semester | | | |
|---|---|---|---|
| **Sl. No.** | **Course Code** | **Course Title** | **Page No.** |
| 1. | B24CS601 | Machine Learning Algorithms | 32 |
| 2. | B24IS602 | Cloud Computing | 34 |
| 3. | B24CG631 | Agile Methodology | 37 |
| 4. | B24CG632 | Strategic Design Management | 40 |
| 5. | B24CG633 | Advanced Computer Networks | 42 |
| 6. | B24CG634 | CUDA | 44 |
| 7. | B24CS641 | Introduction to Data Structures | 46 |
| 8. | B24IC642 | Introduction to Cyber Security | 48 |
| 9. | B24CS643 | Fundamentals of Operating Systems | 50 |
| 10. | B24AI644 | AI for Everyone | 52 |
| 11. | B24CS605L | Machine Learning Algorithms Lab | 54 |
| 12. | B24CG681 | VR Lab | 56 |
| 13. | B24 AI682 | Generative AI | 58 |
| 14. | B24IS683 | Software Testing Automation | 60 |
| 15. | B24 CS684 | REACT | 62 |

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## DEPARTMENT OF COMPUTER SCIENCE AND DESIGN

Scheme of Teaching and Examinations -2024 Scheme

Outcome based Education (OBE) and Choice Based Credit System (CBCS) Effective from the Academic Year 2026-27

### V Semester

| S.No | Course Category and Course Code | | Course Title | TD / PSB | Teaching Hours / Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture L | Tutorial T | Practical P | Self-Learning S | CIE Marks | SEE Duration in Hrs | SEE Marks | Total Marks | |
| 1. | HSMC | B24CS501 | Software Engineering and Project Management | CG | 3 | 0 | 0 | 3 | 50 | 3 | 50 | 100 | 3 |
| 2. | IPCC | B24CS502 | Computer Networks | CG | 3 | 0 | 2 | 3 | 50 | 3 | 50 | 100 | 4 |
| 3. | PCC | B24CS503 | Theory of Computation | CG | 2 | 2 | 0 | 2 | 50 | 3 | 50 | 100 | 3 |
| 4. | PCC | B24CS504 | Artificial Intelligence | CG | 3 | 0 | 0 | 3 | 50 | 3 | 50 | 100 | 3 |
| 5. | PCCL | B24CS505L | Artificial Intelligence Lab | CG | 0 | 0 | 2 | 0 | 50 | 3 | 50 | 100 | 1 |
| 6. | PEC | B24YY56X | Professional Elective Course- I | CS & Allied | 3 | 0 | 0 | 3 | 50 | 3 | 50 | 100 | 3 |
| 7. | BSC | B24BEK507 | Biology for Engineers | CG / Che | 2 | 0 | 0 | 2 | 50 | 2 | 50 | 100 | 2 |
| 8. | AEC | B24YY58X | Ability Enhancement Course Lab - V | CS & Allied | 0 | 0 | 2 | 0 | 50 | 3 | 50 | 100 | 1 |
| 9. | NCMC | B24NCK59X | NSS / NCC / PE / Yoga / Music | HSS | 2 | 0 | 0 | 0 | 100 | - | - | 100 | PP |
| 10. | NCMC | B24ESK510 | Environmental Science and E-Waste Management | CG / CV | 2 | 0 | 0 | 0 | 100 | - | - | 100 | PP |
| 11. | SDC | B24CGP511 | Mini-Project | CG | 0 | 0 | 4 | 0 | 50 | 3 | 50 | 100 | 2 |
| | | | | | | | | TOTAL | 650 | | 450 | 1100 | 22 |

BSC: Basic Science Course, HSMC: Humanity Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, PEC: Professional Elective Course, SDC- Skill Development Course, L: Lecture, T: Tutorial, P: Practical S: Self-Learning, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: Indicates common course to all the streams of engineering, PP/NP: Pass/ Not Pass, YY: Programme Code (EC, CS, IS etc.,), X: 1/2/3/4.

| **Professional Elective Courses (PEC) - I** | | | |
|---|---|---|---|
| B24IS561 | System Software | B24CG562 | Visual Design Communication |
| B24CG563 | Computer Graphics and Design | B24IC564 | Big Data Analytics |

| **Ability Enhancement Course / Skill Enhancement Course (AEC/SEC) – V** | | | |
|---|---|---|---|
| B24CS581 | Angular JS Lab | B24CG582 | UI/UX Design |
| B24CG583 | R Programming | B24IC584 | Big Data Analytics with Python Lab |

| **Non-Credit Mandatory Courses (NCMC)** | | | |
|---|---|---|---|
| B24NCK591 | National Service Scheme | B24NCK592 | National Cadet Corps |
| B24NCK593 | Physical Education | B24NCK594 | Yoga |
| B24NCK595 | Music | | |

**National Service Scheme /National Cadet Corps/Physical Education/Yoga/Music:** All the students have to register the same course namely National Service Scheme (NSS), National Cadet Corps(NCC**),** Physical Education (PE), Yoga (YOG) and Music (MUS) during the first week of III/IV/V/VI semesters. However, the option is given to students to change the activity. He/she may opt for the change of the course in ensuing semester. If the student is opting new course in V semester first time, he/she may take the basic modules from the syllabus to complete and if they repeat the same course in ensuing semester, subsequent modules can be offered.

**These courses shall not be considered for vertical progression as well as for the calculation of SGPA and CGPA, but completion of the course is mandatory for the award of degree.**

**Professional Elective Courses (PEC):** A PEC is intended to enhance the depth and breadth of educational experience in the engineering and technology curriculum. Multidisciplinary courses that are added supplement the latest trend and advanced technology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of student's strength for offering a professional elective is 10. However, this condition shall not be applicable to cases where the admission to the programme is less than 10 students.

**HoD** **Dean-Academics** **Principal**

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### VI Semester

| S.No | Course Category and Course Code | | Course Title | TD / PSB | Teaching Hours / Week | | | | Examination | | | | Credits |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Lecture | Tutorial | Practical | Self-Learning | CIE Marks | SEE Duration Hrs | SEE Marks | Total Marks | |
| | | | | | L | T | P | S | | | | | |
| 1. | PCC | B24CS601 | Machine Learning Algorithms | CG | 2 | 2 | 0 | 2 | 50 | 3 | 50 | 100 | 3 |
| 2. | IPCC | B24IS602 | Cloud Computing | CG | 3 | 0 | 2 | 3 | 50 | 3 | 50 | 100 | 4 |
| 3. | PEC | B24YY63X | Professional Elective Course- II | CS & Allied | 3 | 0 | 0 | 3 | 50 | 3 | 50 | 100 | 3 |
| 4. | OEC | B24YY64X | Open Elective Course - I | Any Dept | 3 | 0 | 0 | 3 | 50 | 3 | 50 | 100 | 3 |
| 5. | PCCL | B24CS605L | Machine Learning Algorithms Lab | CG | 0 | 0 | 2 | 0 | 50 | 3 | 50 | 100 | 1 |
| 6. | AEC | B24RMK606 | Research Methodology and IPR | CG / IC | 1 | 0 | 0 | 1 | 50 | 1 | 50 | 100 | 1 |
| 7. | SDC | B24PRJ607 | Capstone Project work : Phase - I | CG | 0 | 0 | 4 | 0 | 100 | - | - | 100 | 2 |
| 8. | AEC | B24YY68X | Ability Enhancement Course Lab – VI | CS & Allied | 0 | 0 | 2 | 0 | 50 | 3 | 50 | 100 | 1 |
| 9. | NCMC | B24NCK69X | NSS / NCC / PE / Yoga / Music | HSS | 2 | 0 | 0 | 0 | 100 | - | - | 100 | PP |
| 10. | HSMC | B24IKK610 | Indian Knowledge System | CG | 2 | 0 | 0 | 0 | 100 | - | - | 100 | PP |
| | | | | | | | | TOTAL | 600 | | 400 | 1000 | 18 |

HSMC: Humanity Social sciences including Management courses, IPCC: Integrated Professional Core Course, PCC: Professional Core Course, PCCL: Professional Core Course laboratory, NCMC: Non-Credit Mandatory Course, AEC: Ability Enhancement Course, PEC: Professional Elective Course, OEC: Open Elective Course, SDC- Skill Development Course, L: Lecture, T: Tutorial, P: Practical S: Self-Learning, CIE: Continuous Internal Evaluation, SEE: Semester End Evaluation. K: Indicates common course to all the streams of engineering, PP/NP: Pass/ Not Pass, YY: Programme Code (EC, CS, IS etc.,), X: 1/2/3/4

| | | | |
|---|---|---|---|
| **Professional Elective Courses (PEC) - II** | | | |
| B24CG631 | Agile Methodology | B24CG632 | Strategic Design Management |
| B24CG633 | Advanced Computer Networks | B24CG634 | CUDA |
| **Open Elective Course (OEC)- I** | | | |
| B24CS641 | Introduction to Data Structures | B24IC642 | Introduction to Cyber Security |
| B24CS643 | Fundamentals of Operating Systems | B24AI644 | AI for Everyone |
| **Ability Enhancement Course (AEC) – VI** | | | |
| B24CG681 | VR Lab | B24AI682 | Generative AI |
| B24IS683 | Software Testing Automation | B2 CS684 | REACT |
| **Non Credit Mandatory Course (NCMC)** | | | |
| B24NCK691 | National Service Scheme | B24NCK692 | National Cadet Corps |
| B24NCK693 | Physical Education | B24NCK694 | Yoga |
| B24 NCK 695 | Music | | |

**PROJECT WORK**: **Phase – I:** The objective of the Project work is (i) To encourage independent learning and the innovative attitude of the students. (ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills. (iii) To impart flexibility and adaptability. (iv) To inspire team working. (v) To expand intellectual capacity, credibility, judgment and intuition. (vi) To adhere to punctuality, setting and meeting deadlines. (vii) To install responsibilities to oneself and others. (viii)To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

**CIE Procedure for Project Work:** The CIE marks shall be awarded by a committee consisting of the Head of the concerned department and two senior faculty members of the department, one of whom shall be the Guide. The CIE marks awarded for the project work shall be based on the evaluation of the **Project Work Report, Project Reviews and Viva-Voce.** The marks awarded for the project report shall be the same for all the batch mates.

**SEE procedure for Project Work**: SEE for project work will be conducted by the two examiners appointed by the Institution. The SEE marks awarded for the project work shall be based on the evaluation of **Project Demonstration, Project Presentation and Viva-Voce** in the ratio 20:60:20.

**Open Elective Courses**: Students belonging to a particular stream of Engineering are not entitled to the open electives offered by their parent department. However, they can opt for an elective offered by other departments, provided they satisfy the prerequisite condition if any. Registration to open electives shall be documented under the guidance of the Program Coordinator/ Mentor. The minimum number of students' for offering Open Elective Course is 10. However, this condition shall not be applicable to class where the admission to the program is less than 10.

**HoD** **Dean-Academics** **Principal**

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **Software Engineering and Project Management**<br>**Category: HSMC**<br>**(Common to CSE, CSD, CSE(IC), AIML, ISE)** | | | | | |
| Course Code | : | **B24CS501** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To outline software engineering principles and activities involved in building large software programs. Identify ethical and professional issues and explain why they are of concern to Software Engineers. |
| 2. | To describe the process of requirement gathering, requirement classification, requirement specification and requirements validation. |
| 3. | To recognize the importance of Project Management with its methods and methodologies. |
| 4. | To identify software quality parameters and quantify software using measurements and metrics. |
| 5. | To list software quality standards and outline the practices involved. |

| **Module – 1** | **No.of Hrs** |
|---|---|
| **Software and Software Engineering**: The nature of Software, The unique nature of WebApps,Software Engineering, The software Process, Software Engineering Practice, Software Myths.<br>**Process Models:** A generic process model, Process assessment and improvement, Prescriptive process models: Waterfall model, Incremental process models, Evolutionary process models,Concurrent models, Specialized process models. Unified Process , Personal and Team process models. | 9 |
| **Module – 2** | **No.of Hrs** |
| **Understanding Requirements**: Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements,Validating Requirements.<br>**Requirements Modeling Scenarios, Information and Analysis classes**: Requirement Analysis, Scenario based modeling, UML models that supplement the Use Case, Data modeling Concepts, Class-Based Modeling.<br>**Requirement Modeling Strategies** : Flow oriented Modeling , Behavioral Modeling. | 9 |
| **Module – 3** | **No.of Hrs** |
| **Agile Development:** What is Agility?, Agility and the cost of change. What is an agile Process?, Extreme Programming (XP), Other Agile Process Models, A tool set for Agile process .<br>**Principles that guide practice**: Software Engineering Knowledge, Core principles, Principles that guide each framework activity. | 9 |
| **Module – 4** | **No.of Hrs** |
| **Introduction to Project Management:** Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, Some ways of categorizing Software Projects, Stakeholders, Setting Objectives,Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices.<br>**Project Evaluation:** Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation. | 9 |
| **Module – 5** | **No.of Hrs** |
| **Software Quality:** Introduction, The place of software quality in project planning, Importance of software quality, Defining software quality, Software quality models, product versus process quality management.<br>**Software Project Estimation:** Observations on Estimation, Decomposition Techniques, | 9 |

| | |
|---|---|
| Empirical Estimation Models. | |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Differentiate process models to judge which process model has to be adopted for the given scenarios. |
| **CO2** | Derive both functional and nonfunctional requirements from the case study. |
| **CO3** | Analyze the importance of various software testing methods and agile methodology. |
| **CO4** | Illustrate the role of project planning and quality management in software development. |
| **CO5** | Identify appropriate techniques to enhance software quality. |

| **Text Books** | |
|---|---|
| 1. | Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill. |
| 2. | Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018. |
| **Reference Text Books** | |
| 1. | Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India. |
| 2. | "Software Engineering: Principles and Practice", Hans van Vliet, Wiley India, 3rd Edition, 2010. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://onlinecourses.nptel.ac.in/noc20_cs68/preview |
| 2. https://onlinecourses.nptel.ac.in/noc24_mg01/preview |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| CO / PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | - | - | - | - | - | - | - | 1 |
| **CO2** | 2 | 3 | 3 | 2 | - | - | - | - | 1 | - | 1 |
| **CO3** | 2 | 3 | 2 | 2 | 2 | - | - | - | - | - | 1 |
| **CO4** | 2 | 2 | 3 | - | 1 | 1 | - | 2 | 1 | 3 | 1 |
| **CO5** | 2 | 2 | 3 | 2 | 2 | 1 | 1 | - | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **Computer Networks**<br>**Category: IPCC**<br>**(Common to CSE, CSD, CSE(IC), AIML, ISE)** | | | | | |
| Course Code | : | **B24CS502** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:2:3 | SEE | : | 50 Marks |
| Total Hours | : | 45+30 | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand fundamental concepts of computer networks, including network applications, hardware, software, and reference models such as OSI and TCP/IP. |
| 2. | To explain the functions and technologies of the Physical Layer**,** including transmission media, wireless communication, PSTN, and mobile communication systems. |
| 3. | To analyze Data Link Layer mechanisms**,** covering error detection and correction, flow control, sliding window protocols, Ethernet, and wireless LAN technologies. |
| 4. | To describe Network and Transport Layer operations, including routing algorithms, congestion control, IPv4/IPv6, Quality of Service (QoS), and transport protocols like TCP and UDP. |
| 5. | To demonstrate knowledge of Application Layer protocols, such as DNS, HTTP, FTP, SMTP, SNMP, and Telnet, and understand how network services support real-world applications. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Introduction:** Network applications, network hardware, network software, reference models: OSI, TCP/IP, Internet, frame relay.<br>**The Physical Layer:** Guided transmission media, wireless transmission, the public switched telephone networks, mobile telephone system. | 9 |
| **Module – 2** | **No. of Hours** |
| **Data Link Layer:** Design issues, error detection and correction, elementary data link protocols, sliding window protocols, example data link protocols - HDLC, the data link layer in the internet. THE **Medium Access Sub layer:** multiple access protocols, Ethernet, Data Link Layer switching, Wireless LAN, Broadband Wireless, Bluetooth | 9 |
| **Module – 3** | **No. of Hours** |
| **Network Layer:** Network layer design issues, routing algorithms, Congestion control algorithms, Internetworking, the network layer in the internet (IPv4 and IPv6), Quality of Service. | 9 |
| **Module – 4** | **No. of Hours** |
| **Transport Layer:** Transport service, elements of transport protocol, Simple Transport Protocol, Internet transport layer protocols: UDP and TCP. | 9 |
| **Module – 5** | **No. of Hours** |
| **Application Layer:** Domain name system, electronic mail, World Wide Web: architectural overview, dynamic web document and http.<br>**Application Layer Protocols:** Simple Network Management Protocol, File Transfer Protocol, Simple Mail Transfer Protocol, Telnet. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Explain the fundamentals of computer networks, network models (OSI, TCP/IP), and different types of network applications. |
| CO2 | Analyze the functions of the Physical Layer, including transmission media, wireless communication, PSTN and mobile communication systems. |
| CO3 | Apply Data Link Layer concepts such as error detection and correction, flow control, sliding window protocols, and multiple access techniques. |
| CO4 | Evaluate Network Layer and Transport Layer protocols, including routing algorithms, congestion control, IPv4/IPv6, TCP, and UDP. |
| CO5 | Demonstrate the working of Application Layer services and protocols such as DNS, HTTP, FTP, SMTP, SNMP, and Telnet in real-world networking scenarios. |

## LABORATORY

**Practical Component of IPCC (10 Experiments)**

| Sl. No | List Of Experiments |
|---|---|
| 1. | Write a program to implement CRC (Cyclic Redundancy Check) for error detection. |
| 2. | Write a program to implement Hamming Code for error detection and correction. |
| 3. | Write a program to simulate Flow Control using Stop-and-Wait Protocol. |
| 4. | Write a program to simulate Sliding Window Protocol. |
| 5. | Write a program to implement Leaky Bucket Algorithm for traffic shaping |
| 6. | Write a program to implement Token Bucket Algorithm. |
| 7. | Write a program to Create a TCP server and client to exchange messages. |
| 8. | Write a program to Implement connectionless communication between client and server. |
| 9. | Write a program to Implement error detection using CRC. |
| 10. | Write a program to Detect and correct single-bit errors |
| 11. | Write a program to Basic error detection technique. |
| 12. | Write a program to Control data transmission rate. |

| **Text Books** |
|---|

| **Reference Text Books** | |
|---|---|
| 1. | Behrouz A. Forouzan (2006), Data communication and Networking, 4th Edition, Mc Graw-Hill, India |
| 2. | Kurose, Ross (2010), Computer Networking: A top down approach, Pearson Education, India |
| 1. | 1. A. S. Tanenbaum (2003), Computer Networks, 4th edition, Pearson Education/ PHI, New Delhi, |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| Component | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30** (Average of Best Two Assessments) | **50/2 = 25** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | Any One Assessments as per regulations | **20** | **20** | |
| **Laboratory** | **Lab conduction & Record** | Evaluating each expt. for 10 marks. | **05** | **25** |
| | **Lab Internal Test** | **50** | **20** | |
| **Continuous Internal Evaluation (CIE)** | | | | **50** |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.
8. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | - | - | - | - | - | - | - | 1 |
| CO2 | 3 | 2 | 2 | 1 | | - | - | - | - | - | 1 |
| CO3 | 2 | 3 | 2 | 1 | 1 | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 2 | 2 | | - | - | - | - | - | 1 |
| CO5 | 2 | 2 | 3 | 1 | 2 | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **Theory of Computation**<br>**Category: PCC**<br>**(Common to CSE, CSE(IC), CSD, ISE)** | | | | | |
| Course Code | : | **B24CS503** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 2:2:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To explain the concepts of Deterministic and Non-Deterministic Finite Automata. |
| 2. | To demonstrate the use of Regular Expressions for constructing DFA and NFA |
| 3. | To illustrate the construction of Context-Free Grammar for a given language. |
| 4. | To narrate advanced computing Machines such as PDA and Turing Machine |

| **Module – 1** | **No. of Hours** |
|---|---|
| Finite Automata (FA): Introduction, Alphabets; Languages; strings; Deterministic Finite Automata (DFA) -Formal definition, simpler notations (state transition diagram, transition table), language of a DFA. Nondeterministic Finite Automata (NFA) - Definition of NFA, language of an NFA, Equivalence of Deterministic | 9 |
| **Module – 2** | **No. of Hours** |
| Non-deterministic Finite Automata, Applications of Finite Automata, Finite Automata with Epsilon Transitions, Eliminating Epsilon transitions,.<br>Regular Expressions (RE): Minimization of Deterministic Finite Automata, Introduction to Regular Expression, Identities of Regular Expressions, Finite Automata and Regular Expressions- Converting from DFA's to Regular Expressions, | 9 |
| **Module – 3** | **No. of Hours** |
| Converting Regular Expressions to Automata, Applications of Regular Expressions. Equivalence of finite automata and regular expressions; pumping lemma for regular languages;<br>Regular Grammars, Context Free Grammars and Normal Forms: Definition, regular grammars and FA, FA for regular grammar, Regular grammar for FA. | 9 |
| **Module – 4** | **No. of Hours** |
| Context Free Grammars; Derivation Trees, Sentential Forms, Rightmost and Leftmost derivations of Strings. Ambiguity in CFG's; Normal forms-CNF and GNF. | 9 |
| **Module – 5** | **No. of Hours** |
| Push Down Automata (PDA): Definition, Model, Acceptance of CFL, Acceptance by Final State and Acceptance by Empty stack and its Equivalence, Equivalence of CFG and PDA. Turing Machines (TM): Formal definition and behavior, Languages of a TM, Problems. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Construct the Finite State Machine by applying the concepts of DFA, NFA and Epsilon-NFA. |
| CO2 | Identify ambiguity in Grammar and Construct CFG for the given language in Normal Forms. |
| CO3 | Apply the concepts of Push down Automata and Turing machine for a given Language. |
| CO4 | Classify a problem for different models of Computation. |
| CO5 | Recognize skills in formal reasoning and reduction of a problem to a formal model. |

| **Text Books** | |
|---|---|
| 1. | John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, Introduction to Automata Theory, Languages and Computation, 3rd Edition, Pearson Education, 2009. |
| 2. | Peter Linz, An Introduction to formal Languages and Automata, 4th Edition, Jones and Bartlett Publishers, 2006. |

| **Reference Text Books** | |
|---|---|
| 1. | Kamala Krithivasan, Rama R, Introduction to Formal Languages, Automata Theory and Computation, Pearson, 2009. |
| 2. | B N Srinivasa Murthy, Formal Languages and Automata Theory, Sanguine Publishers, 2006. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |
| CO2 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |
| CO3 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |
| CO4 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |
| CO5 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |
| CO6 | 2 | 2 | 3 | 3 | 3 | - | - | - | 2 | - | 3 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **Artificial Intelligence**<br>**Category: PCC**<br>**(Common to CSE, CSD, ISE)** | | | | | |
| Course Code | : | **B24CS504** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To study about uninformed and Heuristic search techniques. |
| 2. | To learn techniques for reasoning under uncertainty. |
| 3. | To introduce Machine Learning and supervised learning algorithms. |
| 4. | To study about ensembling and unsupervised learning algorithms. |
| 5. | To learn the basics of deep learning using neural networks. |

| **Module – 1** | **No.of Hrs** |
|---|---|
| **Introduction:** What is AI? Foundations and History of AI Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. | 9 |
| **Module – 2** | **No.of Hrs** |
| **Problem-solving:** Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies: Breadth First search, Depth First Search, Iterative deepening depth first search. | 9 |
| **Module – 3** | **No.of Hrs** |
| **Informed Search Strategies:** Heuristic functions, Greedy best first search, A*search. Heuristic Functions Logical Agents: Knowledge–based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic. | 9 |
| **Module – 4** | **No.of Hrs** |
| **First Order Logic:** Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic. Inference in First Order Logic :Propositional Versus First Order Inference, Unification, Forward Chaining, Backward Chaining, Resolution | 9 |
| **Module – 5** | **No.of Hrs** |
| **Uncertain Knowledge and Reasoning:** Quantifying Uncertainty: Acting under Uncertainty, Basic Probability Notation, Inference using Full Joint Distributions, Independence, Baye's Rule and its use. Wumpus World Revisited Expert Systems: Representing and using domain knowledge, ES shells. Explanation, knowledge acquisition. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Apply knowledge of agent architecture, searching and reasoning techniques for different applications. |
| **CO2** | Compare various Searching and Inferencing Techniques. |
| **CO3** | Develop knowledge base sentences using propositional logic and first order logic. |
| **CO4** | Describe the concepts of quantifying uncertainty. |
| **CO5** | Use the concepts of Expert Systems to build applications. |

| **Text Books** | |
|---|---|
| 1. | Stuart J. Russell and Peter Norvig , Artificial Intelligence, 3rd Edition, Pearson,2015. |
| 2. | Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition,Tata McGraw Hill,2013. |
| **Reference Text Books** | |
| 1. | George F Lugar, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011. |
| 2. | Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980. |
| 3. | Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html |
| 2. https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409 |
| 3. https://nptel.ac.in/courses/106/105/106105077 |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 3 | 3 | - | - | - | - | 1 | 3 | 3 |
| CO2 | 1 | 1 | 1 | 3 | 1 | - | - | - | 1 | 2 | 1 |
| CO3 | 2 | 1 | 2 | 1 | 1 | - | - | - | 2 | 1 | 1 |
| CO4 | 3 | 1 | 3 | 1 | - | - | - | 2 | 1 | 2 | 1 |
| CO5 | 2 | 1 | 2 | 2 | 1 | - | - | - | 2 | 2 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **Artificial Intelligence Lab**<br>**Category: PCCL**<br>**(Common to CSE, CSD, ISE)** | | | | | |
| Course Code | : | **B24CS505L** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To implement fundamental Artificial Intelligence and Machine Learning algorithms. |
| 2. | To apply supervised and unsupervised learning techniques on real-world datasets. |
| 3. | To design and evaluate classification, regression, and clustering models. |
| 4. | To analyze the performance of AI and ML algorithms. |
| 5. | To develop problem-solving skills using AI and ML tools and techniques. |

| Sl. No | List of Experiments |
|---|---|
| 1. | Implement and Demonstrate Depth First Search Algorithm on Water Jug Problem. |
| 2. | Implement and Demonstrate Best First Search Algorithm on Missionaries-Cannibals Problems using Python. |
| 3. | Implement A* Search algorithm. |
| 4. | Implement AO* Search algorithm. |
| 5. | Solve 8-Queens Problem with suitable assumptions. |
| 6. | Implementation of TSP using heuristic approach. |
| 7. | Implementation of the problem- solving strategies: either using Forward Chaining or Backward Chaining. |
| 8. | Implement resolution principle on FOPL related problems. |
| 9. | Implement Tic-Tac-Toe game using Python. |
| 10. | Build a bot which provides all the information related to text in search box. |
| 11. | Implement any Game and demonstrate the Game playing strategies. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Implement and demonstrate AI and ML algorithms |
| **CO2** | Evaluate different algorithms |
| **CO3** | Build supervised learning models |
| **CO4** | Build ensembling and unsupervised models |
| **CO5** | Build deep learning neural network models |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Laboratory | Lab Conduction & Record | Evaluating each expt. for 10 marks | 20 | 50 |
| | Laboratory Test -1 | 50 | 15 | |
| | Laboratory Test -2 | 50 | 15 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hour

**CO-PO Mapping**

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 3 | - | - | 1 | - | - | 1 |
| CO2 | 2 | 3 | 1 | 2 | 2 | - | - | - | 1 | - | 2 |
| CO3 | 3 | 2 | 3 | 2 | 3 | - | - | 1 | - | - | 1 |
| CO4 | 3 | 3 | 2 | 2 | 3 | - | - | 1 | - | - | 2 |
| CO5 | 3 | 2 | 3 | 2 | 3 | 1 | - | 1 | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **System Software**<br>**Category: PEC-I** | | | | | |
| Course Code | : | **B24IS561** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To create awareness about the low-level codes which are very close to the hardware and about the environment where programs can be developed and executed. |
| 2. | To understand the machine dependent system software features. |
| 3. | To understand the machine independent system software features. |
| 4. | To design/implement system software like assembler, loader, linker, macro processor and device drivers. |
| 5. | To study of system software develops ability to design interfaces between software applications and computer hardware. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **System Software v/s Application Software-** Different System Software– Assembler, Linker, Loader, Macro Processor, Text Editor, Debugger, Device Driver, Compiler, Interpreter, Operating System (Basic Concepts only). SIC & SIC/XE Architecture, Addressing modes, SIC & SIC/XE Instruction set , Assembler Directives. | 9 |
| **Module – 2** | **No. of Hours** |
| **SIC/XE Programming,** Basic Functions of Assembler, Assembler Output Format – Header, Text and End Records. Assembler Data Structures, Two Pass Assembler Algorithm, Hand Assembly of SIC/XE Programs. | 9 |
| **Module – 3** | **No. of Hours** |
| **Machine Dependent Assembler Features**-Instruction Format and Addressing Modes, Program Relocation. Machine Independent Assembler Features –Literals, Symbol Defining Statements, Expressions, Program Blocks, Control Sections and Program Linking. Assembler Design Options- One Pass Assembler, Multi Pass Assembler. Implementation Example-MASM Assembler. | 9 |
| **Module – 4** | **No. of Hours** |
| **Basic Loader Functions** - Design of Absolute Loader, Simple Bootstrap Loader. Machine Dependent Loader Features- Relocation, Program Linking, Algorithm and Data Structures of Two Pass Linking Loader. Machine Independent Loader Features -Automatic Library Search, Loader Options. Loader Design Options | 9 |
| **Module – 5** | **No. of Hours** |
| **Macro Preprocessor** - Macro Instruction Definition and Expansion, One pass Macro processor Algorithm and data structures, Machine Independent Macro Processor Features, Macro processor design options. Device drivers - Anatomy of a device driver, Character and block device drivers, General design of device drivers. Text Editors- Overview of Editing, User Interface, Editor Structure. Debuggers - Debugging Functions and Capabilities, Relationship with other parts of the system, Debugging Methods- By Induction, Deduction and Backtracking. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Distinguish softwares into system and application software categories |
| CO2 | Identify standard and extended architectural features of machines. |
| CO3 | Identify machine dependent features of system software |
| CO4 | Identify machine independent features of system software. |
| CO5 | Design algorithms for system softwares and analyze the effect of data structures. Understand the features of device drivers and editing & debugging tools. |

| **Text Books** | |
|---|---|
| 1. | Leland L. Beck, System Software: An Introduction to Systems Programming, 3/E, Pearson Education Asia |
| 2. | D.M. Dhamdhere, Systems Programming and Operating Systems, Second Revised Edition, Tata McGraw Hill. |

| **Reference Text Books** | |
|---|---|
| 1. | John J. Donovan, Systems Programming, Tata McGraw Hill Edition 1991. |
| 2. | George Pajari, Writing UNIX Device Drivers, Addison Wesley Publications (Ebook : http://tocs.ulb.tu-darmstadt.de/197262074.pdf ). |
| 3. | Peter Abel, IBM PC Assembly Language and Programming, Third Edition, Prentice Hall of India. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

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**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | - | 2 | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | 3 | 2 | - | - | - | - | - | - | 1 |
| CO3 | 2 | 2 | 3 | 2 | - | - | - | - | - | - | 1 |
| CO4 | 2 | 2 | - | 2 | - | - | - | - | - | - | 1 |
| CO5 | 2 | 2 | 3 | 2 | - | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **Visual Design Communication**<br>**Category: PEC-I** | | | | | |
| Course Code | : | **B24CG562** | CIE | : | 50 Marks |
| Teaching Hours L : T : P : S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand the basics concepts and fundamental principles of visual design. |
| 2. | To explain the rules for making visually appealing and aesthetical design. |
| 3. | To develop visual thinking. |
| 4. | To familiarize the students with visual design software programs such as Adobe Illustrator. |
| 5. | To expose to wider application of design in media, advertisement and entertainment industry. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Elements, Principles and Theories of Design:** Introduction to design and visual communication, Meaning and Purpose of design, Design thinking processes, Multi-dimensional approach to finding a meaningful solution to a problem. Element of Design, Gestalt Principles – Semiotics – Color etc,. Critical evaluation of designs - Composition: Focus, leading lines, juxtaposition, white space, Rule of thirds, the Golden ratio., Typography: Evolution, principle, typeface & font, structure of letter (Baseline, meanline, ascender, descender, etc.), Serif & Sans-serif font, use in news media, illustrated magazines, ads, signs, logos, brochures, movie posters, digital platforms, etc. | 9 |
| **Module – 2** | **No. of Hours** |
| **Aspects of Designing:** Design processes: Discuss the problem, developing creative brief, concept building, visualization, development, etc., Stages of campaign planning, Steps involved in designing Press ad, Magazine ad, Hoardings, Kiosks, Interior & Exterior Signage, Danglers and Banners etc., Focusing on the composition and balancing the different element of design, Choice and use of images and colors Tagline, Visuals, Copy, Spot colors, Process colors, Color Management for images, Understanding the in-house style guide | 9 |
| **Module – 3** | **No. of Hours** |
| **Layouts and Design**: Elements of an effective layout, Book design: stages of book/e-book design. Periodicals: magazine and newsletters functions. Editorial planning, design planning, design approach, Newspaper makeup: using photographs, communicating with type and color, Poster design: strengths and limitations of poster designing, its steps and poster production, Creative brief, research, brainstorming, conceptualization, refinement, client presentation, development, etc. | 9 |
| **Module – 4** | **No. of Hours** |
| **Understanding Designing Software and its Usages :** Illustrator, in design : Understanding the basic architecture of and differences between vector and raster graphic software and their wider usages in media industry, Designing Logotype, Processes of logo design: Principles of logo design, Letterhead design, Business Card, Envelop, Catalogues, Brochures, Digital Posters, etc., Using the standardized style sheets on software, Basics of Adobe Illustrator: Document types and templates, Configuring the user interface, Creating various shapes, Fill and stroke, Transformation techniques, Selection tools, Grouping the objects, Alignment & distribution, Handling the appearance of objects, Drawing, Use of Various Brushes, Working with images (tracing), Typing options, Saving &exporting for print and the web, Basics of Adobe InDesign: Document type, Managing the workspace, working with templates, Bleed and slug, Importing docs and text, Various tools: Selection, type, line, pen, etc. Grouping, ungrouping and rotating, Layer, Color & swatches, Working with lines and frames, Master page, Guide-columns- grids etc., Using text and image: Basic formatting, Inserting symbols, Header and footer, Character & Paragraph style, Working with multiple pages and magazine spread, Creation and usages of table, Cheat sheets and shortcuts, Exporting options. | 9 |
| **Module – 5** | **No. of Hours** |
| **Visual Design for the Digital Platforms:** Understanding user experience for the Web, Static vs. dynamic design, Issues of file size and load time, Type of typography for the Web, Making GIF animation, User-friendly designs, Compression techniques: Lossy and Lossless, Color choices. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Practice the sketching and drawing in the visual design |
| CO2 | Demonstrate the basics concepts and principles of visual design. |
| CO3 | Apply the rules for making visually appealing and aesthetic design. |
| CO4 | Use visual design software programs such as Adobe Illustrator, InDesign and Photoshop. |
| CO5 | Design wider application of design in media, advertisement and entertainment industry |

| **Text Books** | |
|---|---|
| 1. | Ambrose, G., & Harris, P. (2009). The fundamentals of graphic design. Bloomsbury Publishing. |
| 2. | Bringhurst, R. (2004). The elements of typographic style. Point Roberts, WA: Hartley & Marks |
| 3. | Cross, N. (2011). Design thinking: Understanding how designers think and work. Berg. |

| **Reference Text Books** | |
|---|---|
| 1. | Dabner, D., Stewart, S., &Vickress, A. (2017). Graphic design school: the principles and practice of graphic design. John Wiley & Sons. |
| 2. | Fahmy, S., Bock, M., &Wanta, W. (2014). Visual communication theory and research: A mass communication perspective. Springer. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 1 | 3 | 2 | 1 | - | - | - | - | - | 1 |
| CO2 | 2 | 1 | 3 | 2 | 1 | - | - | - | - | - | 1 |
| CO3 | 2 | 1 | 3 | 2 | 1 | - | - | - | - | - | 1 |
| CO4 | 2 | 1 | 3 | 2 | 1 | - | - | - | - | - | 1 |
| CO5 | 2 | 1 | 3 | 2 | 1 | - | - | 3 | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester - V** | | | | | |
|---|---|---|---|---|---|
| **Computer Graphics and Design**<br>**Category: PEC-I** | | | | | |
| Course Code | : | **B24CG563** | CIE | : | 50 Marks |
| Teaching Hours L : T : P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To grasp the fundamental knowledge of implementing Computer Graphics in 2D |
| 2. | To get familiar with 3D Graphics |
| 3. | To learn the process of implementation of Computer Graphics through Vulkan API |
| 4. | To get familiarity with basic to advanced rendering techniques |
| 5. | To acquaint oneself with common data structures and procedural graphics |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Introduction:** Application areas of Computer Graphics, overview of graphics systems, video display devices, raster-scan systems, random scan systems, graphics monitors and work stations and input devices Output primitives: Points and lines, line drawing algorithms, mid-point circle and ellipse algorithms. Filled area primitives: Scan line polygon fill algorithm, boundary-fill and flood-fill algorithms. | 9 |
| **Module – 2** | **No. of Hours** |
| **2-D geometrical transforms:** Translation, scaling, rotation, reflection and shear transformations, matrix representations and homogeneous coordinates, composite transforms, transformations between coordinate systems 2-D viewing : The viewing pipeline, viewing coordinate reference frame, window to view-port coordinate transformation, viewing functions, Cohen-Sutherland and Cyrus-beck line clipping algorithms, Sutherland –Hodgeman polygon clipping algorithm. | 9 |
| **Module – 3** | **No. of Hours** |
| **3-D object representation:** Polygon surfaces, quadric surfaces, spline representation, Hermite curve, Bezier curve and B-Spline curves, Bezier and B-Spline surfaces. Basic illumination models, polygon rendering methods. 3-D Geometric transformations: Translation, rotation, scaling, reflection and shear transformations, composite transformations.3-D viewing: Viewing pipeline, viewing coordinates, view volume and general projection transforms and clipping. | 9 |
| **Module – 4** | **No. of Hours** |
| **Visible surface detection methods:** Classification, back-face detection, depth-buffer, scan-line, depth sorting, BSP-tree methods, area sub-division and octree methods. | 9 |
| **Module – 5** | **No. of Hours** |
| **Computer animation:** Design of animation sequence, general computer animation functions, raster animation, computer animation languages, key frame systems, motion specifications. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Implement 2D transformations and algorithms for generating primitives and attributes |
| CO2 | Solve problems in 3D transformations and viewing |
| CO3 | Implement and Render graphics using open source Vulkan API |
| CO4 | Implement rendering techniques and Use GPU based rendering |
| CO5 | Experiment with different procedural graphics and common data structures |

| **Text Books** | |
|---|---|
| 1. | "Computer Graphics C version", Donald Hearn and M.Pauline Baker, Pearson Education |
| 2. | "Computer Graphics Principles & practice", second edition in C, Foley, VanDam, Feiner and Hughes, Pearson Education. |
| **Reference Text Books** | |
| 1. | Computer Graphics", second Edition, Donald Hearn and M.Pauline Baker, PHI/Pearson Education. |
| 2. | Computer Graphics Second edition", Zhigandxiang, Roy Plastock, Schaum's outlines, Tata Mc-Graw hill edition. |
| 3. | Procedural elements for Computer Graphics, David F Rogers, Tata Mc Graw hill, 2nd edition |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 |
| CO3 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 |
| CO4 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 |
| CO5 | 2 | 2 | 2 | 2 | 2 | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **Big Data Analytics**<br>**Category: PEC - I** | | | | | |
| Course Code | : | **B24IC564** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To implement MapReduce programs for processing big data. |
| 2. | To realize storage and processing of big data using MongoDB, Pig, Hive and Spark. |
| 3. | To analyze big data using machine learning techniques. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Introduction:** Dawn of the Big Data Era, Definition and Features of Big Data, Big Data Value, The Development of Big Data, Challenges of Big Data. RELATED TECHNOLOGIES: Cloud Computing - Cloud Computing Preliminaries, Relationship Between Cloud Computing and Big Data, IoT - IoT Preliminaries, Relationship Between IoT and Big Data, Data Center, Hadoop - Hadoop Preliminaries, Relationship between Hadoop and Big Data. | 9 |
| **Module – 2** | **No. of Hours** |
| **Big Data Generation And Acquisition:** Big Data Generation-Enterprise Data, IoT Data, Internet Data, Bio IT medical Data, Data Generation from Other Fields, Big Data Acquisition - Data Collection, Data Transportation, Data Pre-processing. | 9 |
| **Module – 3** | **No. of Hours** |
| **Big Data Storage:** Storage System for Massive Data, Distributed Storage System, Storage Mechanism for Big Data - Database Technology, Design Factors, Database Programming Model.<br>**Hadoop & Map Reduce:** Data Storage and Analysis, Comparison with Other Systems, A Brief History of Hadoop , Apache Hadoop and the Hadoop Ecosystem, A Weather Dataset, Analyzing the Data with Unix Tools, Analyzing the Data with Hadoop (Map and Reduce, Java MapReduce), Scaling Out, Hadoop Streaming, Hadoop Pipes. | 9 |
| **Module – 4** | **No. of Hours** |
| **Big Data Analysis**: Traditional Data Analysis, Big Data Analytic Methods, Architecture for Big Data Analysis - Real-Time vs. Offline Analysis, Analysis at Different Levels, Analysis with Different Complexity, Tools for Big Data Mining and Analysis. | 9 |
| **Module – 5** | **No. of Hours** |
| **Big Data Applications**: Application Evolution, Big Data Analysis Fields - Structured Data Analysis, Text Data Analysis, Web Data Analysis, Multimedia Data Analysis, Network Data Analysis, Mobile Traffic Analysis, Key Applications - Application of Big Data in Enterprises, Application of IoT Based Big Data, Application of Online Social Network-Oriented Big Data, Applications of Healthcare and Medical Big Data, Collective Intelligence, Smart Grid. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand big data analytics as the next wave for businesses looking for competitive advantage |
| CO2 | Understand the financial value of big data analytics |
| CO3 | Explore tools and practices for working with big data |
| CO4 | Understand how big data analytics can leverage into a key component |
| CO5 | Learn about stream computing |

| **Text Books** | |
|---|---|
| 1. | Min Chen, Shiwen Mao, Yin Zhang,Victor C.M. Leung, “Big Data: Related Technologies, Challenges and Future Prospects”, Springer; 2014 edition. |

| **Reference Text Books** | |
|---|---|
| 1. | Tom White, “Hadoop- The Definitive Guide”, O’reilly, 2nd Edition |
| 2. | VigneshPrajapati,”Big Data Analytics with R and Hadoop”, PACKT Publishing, November 2013. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO2 | 3 | - | - | - | - | - | - | - | - | - | - |
| CO3 | 3 | 3 | - | - | 3 | - | - | - | - | - | 3 |
| CO4 | 3 | 2 | - | - | 2 | - | - | - | - | - | 2 |
| CO5 | 3 | 2 | - | - | 2 | - | - | - | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **Angular JS Lab** | | | | | |
| **Category: AEC - V** | | | | | |
| Course Code | : | **B24CS581** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To learn the basics of Angular JS framework. |
| 2. | To understand the Angular JS Modules, Forms, inputs, expression, data bindings and Filters |
| 3. | To gain experience of modern tool usage (VS Code, Atom or any other] in developing Web applications |

| Sl. No | Name of the Programs / List of the experiments |
|---|---|
| 1. | Develop Angular JS program that allows user to input their first name and last name and display their full name. Note: The default values for first name and last name may be included in the program. |
| 2. | Develop an Angular JS application that displays a list of shopping items. Allow users to add and remove items from the list using directives and controllers. Note: The default values of items may be included in the program |
| 3. | Develop a simple Angular JS calculator application that can perform basic mathematical operations (addition, subtraction, multiplication, division) based on user input. |
| 4. | Write an Angular JS application that can calculate factorial and compute square based on given user input |
| 5. | Develop AngularJS application that displays a details of students and their CGPA. Allow users to read the number of students and display the count. Note: Student details may be included in the program |
| 6. | Develop an AngularJS program to create a simple to-do list application. Allow users to add, edit, and delete tasks.Note: The default values for tasks may be included in the program |
| 7. | Write an AngularJS program to create a simple CRUD application (Create, Read, Update, and Delete) for managing users. |
| 8. | Develop AngularJS program to create a login form, with validation for the username and password fields |
| 9. | Create an AngularJS application that displays a list of employees and their salaries. Allow users to search for employees by name and salary. Note: Employee details may be included in the program |
| 10. | Create AngularJS application that allows users to maintain a collection of items. The application should display the current total number of items, and this count should automatically update as items are added or removed. Users should be able to add items to the collection and remove them as needed. Note: The default values for items may be included in the program |
| 11. | Create AngularJS application to convert student details to Uppercase using angular filters. Note: The default details of students may be included in the program |
| 12. | Create an Angular JS application that displays the date by using date filter parameters |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Develop Angular JS programs using basic features |
| CO2 | Develop dynamic Web applications using Angular JS modules |
| CO3 | Make use of form validations and controls for interactive applications |
| CO4 | Consume RESTful APIs and integrate with backend services. |
| CO5 | Use Angular JS best practices for performance optimization and testing. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Laboratory | Lab Conduction & Record | Evaluating each expt. for 10 marks | 20 | 50 |
| | Laboratory Test -1 | 50 | 15 | |
| | Laboratory Test -2 | 50 | 15 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 3 hour.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | - | 3 | - | - | - | - | - | - |
| CO2 | 2 | 3 | 3 | - | 3 | - | - | - | - | 1 | - |
| CO3 | 1 | 2 | 3 | - | 3 | - | - | - | - | 2 | - |
| CO4 | 2 | 1 | 1 | - | - | - | - | - | - | - | - |
| CO5 | 2 | 1 | - | - | - | - | - | - | - | - | - |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **UI/UX Design** | | | | | |
| **Category: AEC - V** | | | | | |
| Course Code | : | **B24CG582** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective** | |
|---|---|
| 1. | To explore and understand the nuances of User Experience and User Interface |
| 2. | To gain mastery over the usage of Figma for designing and prototyping UI/UX |
| 3. | To understand user requirement and translate it into UI/UX protype |
| 4. | To analyse apps and websites and understand how they can be continually improved |
| 5. | To understand the UI components and interactions being used in different apps and websites |

| **Sl. No.** | **Title of the program / list of the experiment** |
|---|---|
| 1. | Chat App Redesign: Create a Wireframe and redesign any popular chat app. |
| 2. | Food App: Create a wireframe, Design and Prototype the UI Pages for the food application |
| 3. | Social Media App: Create a wireframe, Design and Prototype social media photo sharing app. |
| 4. | Product Website: Design and prototype a product website page. Create web pages and rollovers for the web pages |
| 5. | Travel Agency Website: Create a wireframe, Design and prototype the UI for the website including design for Home Page with search bar, Activities page, Client Testimonial Page, Image Gallery |
| 6. | UI/UX Designer Portfolio Design: Create a wireframe, Design and prototype a UI for a portfolio including design for About page, Work showcase page, Blog page, contact page |
| 7. | Dashboard Design: Create a wireframe, Design and Prototype Dashboard UI page, add some Dashboard details, statistics and graphs, Add dropdown options for some dashboard details |
| 8. | E-Commerce Website: Create a wireframe, Design and prototype Web pages including product category pages (example: mobiles, gaming consoles, Speakers), product pages in each category, buynow page, add to cart page |
| 9. | Educational Website: Create a wireframe, Design and Prototype the UI for an educational website – Include a Homepage with footer, About Us Page, Programs page, Instructors page, Pricing page, Payments |
| 10. | Music Player App: Create a wireframe, Design and prototype the pages with a background and a Rollover button, and Song selection Page with a Home Rollover button. The third page may include animated play and pause button, play music animation, timer animation. |
| 11. | Hospital/Healthcare Appointment App: Create a wireframe, Design and Prototype the UI for a healthcare appointment booking app – include a Doctor listing page with filters, Doctor profile page, Appointment booking calendar page, and Payment confirmation page with animated success screen. |
| 12. | Online Banking App: Create a wireframe, Design and Prototype the UI for a banking/wallet app – include a Login/OTP verification page, Account dashboard with balance and transaction graph, Fund transfer page with dropdown for beneficiaries, and a transaction success/failure animated screen. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Apply the basics of wire framing in designing apps and Websites. |
| CO2 | Make use of Figma for designing and prototyping UI/UX for different types of apps and Websites. |
| CO3 | Analyse user requirements and translate the requirements to design prototypes. |
| CO4 | Demonstrate the UI/UX concepts applied when designing the prototype of apps and Websites. |
| CO5 | Demonstrate the UI/UX concepts applied when designing the prototype of apps and Websites. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Laboratory | Lab Conduction & Record | Evaluating each expt. for 10 marks | 20 | 50 |
| | Laboratory Test -1 | 50 | 15 | |
| | Laboratory Test -2 | 50 | 15 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 1 | 3 | 1 | - | - | - | - | - | 1 |
| CO2 | 2 | 3 | 1 | 3 | 1 | - | - | - | - | - | 1 |
| CO3 | 2 | 3 | 3 | 3 | 1 | - | - | - | - | - | 1 |
| CO4 | 1 | 2 | 3 | 3 | 1 | - | - | - | - | - | 1 |
| CO5 | 1 | 2 | 3 | 3 | 1 | - | - | - | - | - | 1 |

Level 3 – High, Level 2 – Moderate, Level 1 -Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **R Programming**<br>**Category: AEC - V** | | | | | |
| Course Code | : | **B24CG583** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand and implement basic programming concepts such as data types (vectors, lists, data frames, matrices), variables, operators, and control structures (loops, conditional statements) |
| 2. | To learn how to download, install, and use the R programming environment and an Integrated Development Environment (IDE) like RStudio. |
| 3. | To acquire skills in reading data from various sources (e.g., CSV, Excel, databases), cleaning, transforming, and manipulating data efficiently using packages like dplyr and tidyr |
| 4. | To enable students to perform and interpret various statistical analyses, including descriptive statistics (mean, median, mode, standard deviation), hypothesis testing, correlation, and regression analysis. |
| 5. | To educate students on creating high-quality, impactful visualizations using base graphics and specialized packages like ggplot2 to communicate data insights effectively. |

| **Sl. No.** | **Title of the program / list of the experiment** |
|---|---|
| 1. | Download and install R-Programming environment and install basic packages using install. Packages () command in R. |
| 2. | Learn all the basics of R-Programming (Data types, Variables, Operators etc.) |
| 3. | Implement R-Loops with different examples. |
| 4. | Learn the basics of functions in R and implement with examples. |
| 5. | Implement data frames in R. Write a program to join columns and rows in a data frame using c bind () and r bind () in R. |
| 6. | Implement different String Manipulation functions in R. |
| 7. | Implement different data structures in R(Vectors ,Lists ,Data Frames) |
| 8. | Write a program to read acsv file and analyze the data in the file in R |
| 9. | Create pie charts and bar charts using R. |
| 10. | Create a data set and do statistical analysis on the data using R. |
| 11. | Write R program to find Correlation and Covariance |
| 12. | Write R program for Regression Modeling |
| 13. | Write R program to build classification model using KNN algorithm |
| 14. | Write R program to build clustering model using K-mean algorithm |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Show the installation of R Programming Environment |
| CO2 | Utilize and R Data types for developing programs. |
| CO3 | Make use of different R Data Structures. |
| CO4 | Develop programming logic using R Packages. |
| CO5 | Analyze the data sets using R programming capabilities. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Laboratory** | **Lab Conduction & Record** | **Evaluating each expt. for 10 marks** | **20** | **50** |
| | **Laboratory Test -1** | **50** | **15** | |
| | **Laboratory Test -2** | **50** | **15** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO2 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO3 | 2 | 2 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO5 | 1 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 |

Level 3 – High, Level 2 – Moderate, Level 1 - Low

| **Semester-V** | | | | | |
|---|---|---|---|---|---|
| **Big Data Analytics with Python Lab** **Category: AEC - V** | | | | | |
| Course Code | : | **B24IC584** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To implement MapReduce programs for processing big data. |
| 2. | To realize storage of big data using MongoDB |
| 3. | To analyze big data using machine learning techniques such as Decision tree |

| Sl. No | Name of the Programs / List of the experiments |
|---|---|
| 1. | Install, configure and run python, numPy and Pandas. |
| 2. | Install, configure and run Hadoop and HDFS. |
| 3. | Visualize data using basic plotting techniques in Python |
| 4. | Implement No SQL Database Operations: CRUD operations, Arrays using MongoDB. |
| 5. | Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB. |
| 6. | Implement word count / frequency programs using MapReduce. |
| 7 | Implement a MapReduce program that processes a dataset. |
| 8 | Implement clustering techniques using SPARK. |
| 9 | Implement an application that stores big data in MongoDB / Pig using Hadoop / R. |
| 10. | Develop a Map Reduce Programme to find the grades of students. |
| 11. | Develop a Map Reduce Programme to implement matrix multiplication. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Learn to install & configuration |
| CO2 | Learn to plot the graphs |
| CO3 | Learn the database method like MongoDB |
| CO4 | Learn to clustering and mapreduce |
| CO5 | Learn to implement the real time applications |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Laboratory** | **Lab Conduction & Record** | **Evaluating each expt. for 10 marks** | **20** | **50** |
| | **Laboratory Test -1** | **50** | **15** | |
| | **Laboratory Test -2** | **50** | **15** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hour.

**CO-PO Mapping:**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | 1 | - | - | - | - | 2 | 2 | 2 |
| CO2 | 3 | 3 | 3 | 1 | - | - | - | - | 2 | 2 | 2 |
| CO3 | 3 | 3 | 2 | 2 | - | - | - | - | 1 | 3 | 3 |
| CO4 | 3 | 2 | 2 | 2 | - | - | - | - | 1 | 3 | 3 |
| CO5 | 3 | 2 | 2 | 1 | - | - | - | - | 1 | 3 | 3 |

Level 3 - High, Level 2 – Moderate, Level 1 - Low

| **Semester -V** | | | | | |
|---|---|---|---|---|---|
| **Mini - Project**<br>**Category: SDC** | | | | | |
| Course Code | : | **B24CGP511** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:4:0 | SEE | : | 50 Marks |
| Total Hours | : | 60 | Total | : | 100 Marks |
| Credits | : | 2 | SEE Duration | : | 3 Hrs |

## Mini-Project Work Evaluation:

Mini Project is a hands on course that will provide a platform to students to enhance their practical knowledge and skills by the development of small applications etc. Based on the ability/abilities of the student/s and recommendations of the supervisor, a single discipline or a multidisciplinary Mini- project can be assigned to an individual student or to a group having not more than 4 students.

**CIE procedure for Mini-project:** (i) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two faculty members of the Department, one of them being the Guide. The CIE marks awarded for the Mini-project work shall be based on the evaluation of the **Project Reviews, Project report and Viva-Voce in the ratio of 60:20:20**. The marks awarded for the project report shall be the same for all the batches mates.
(ii) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all the guides of the project.

**CIE Evaluation:** The CIE marks awarded for the Mini-project, shall be based on the evaluation of the **Project Reviews, Project report and Viva-Voce in the ratio of 60:20:20**. The marks awarded for the project report shall be the same for all the batches mates.

**SEE Evaluation**: SEE for project work will be conducted by the two examiners appointed by the Principal / CoE. The SEE marks awarded for the project work shall be based on the evaluation of **Write-up, Presentation Skills, Project Demonstration and Viva-Voce** in the ratio of 20:60:20

## Rubrics for Mini-Project

| **Sl. No** | **Criteria** | **Scale of Assessment** | | |
|---|---|---|---|---|
| | | **Satisfactory (0-5)** | **Good (6-8)** | **Excellent (9-10)** |
| 1 | Objective, Existing method with proposed method | Incomplete justification to the objectives proposed;<br><br>Steps are mentioned but unclear; without justification to objectives | Good justification to the objectives; Methodology to be followed is specified but detailing is not done | All objectives of the proposed work are well defined.<br><br>Steps to be followed to solve the defined problem are clearly specified. |
| 2 | Analysis/Description of the project | Incomplete explanation of the key concepts and in-sufficient description of the technical requirements of the project | Complete explanation of the key concepts but in-sufficient description of the technical requirements of the project | Complete explanation of the key concepts and strong description of the technical requirements of the project |

| | | | | |
|---|---|---|---|---|
| 3 | Result Analysis | • All defined objectives are achieved.<br>• Modules are working well in isolation and properly demonstrated<br>• Modules of project are not properly integrated. | • All defined objectives are achieved.<br>• Each module working well and properly demonstrated.<br>• Integration of all modules not done and system working is not very satisfactory. | • All defined objectives are achieved.<br>• Each module working well and properly demonstrated<br>• All modules of project are well integrated and system working is accurate |
| 4 | Project Report | • Project report is according to the specified format but some mistakes.<br>• In-sufficient references | • 1. Project report is according to the specified format.<br>• References are appropriate but not mentioned well. | • Project report is according to the specified Format.<br>• References are appropriate and well mentioned |
| 5 | Queries | Lacks sufficient knowledge and awareness | Fair knowledge and awareness related to the project. | Extensive knowledge and awareness related to the project |

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Machine Learning Algorithms**<br>**Category: PCC** | | | | | |
| Course Code | : | **B24CS601** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 2:2:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 55 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To Study about uninformed and Heuristic search techniques. |
| 2. | To Learn techniques for reasoning under uncertainty. |
| 3. | To Introduce Machine Learning and supervised learning algorithms. |
| 4. | To Study about ensembling and unsupervised learning algorithms. |
| 5. | To Learn the basics of deep learning using neural networks. |

| **Module – 1** | **No.of Hrs** |
|---|---|
| **Problem Solving:** Introduction to AI - AI Applications - Problem solving agents – search algorithms – uninformed search strategies – Heuristic search strategies – Local search and optimization problems – adversarial search – constraint satisfaction problems (CSP) | 11 |
| **Module – 2** | **No.of Hrs** |
| **Probabilistic Reasoning:** Acting under uncertainty – Bayesian inference – naïve bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks. | 11 |
| **Module – 3** | **No.of Hrs** |
| **Supervised Learning:** Introduction to machine learning – Linear Regression Models: Least squares, single & multiple variables, Bayesian linear regression, gradient descent, Linear Classification Models: Discriminant function – Probabilistic discriminative model - Logistic regression, Probabilistic generative model – Naive Bayes, Maximum margin classifier – Support vector machine, Decision Tree, Random forests. | 11 |
| **Module – 4** | **No.of Hrs** |
| **Ensemble Techniques and Unsupervised Learning:** Combining multiple learners: Model combination schemes, Voting, Ensemble Learning - bagging, boosting, stacking, Unsupervised learning: K-means, Instance Based Learning: KNN, Gaussian mixture models and Expectation maximization. | 11 |
| **Module – 5** | **No.of Hrs** |
| **Neural Networks:** Perceptron - Multilayer perceptron, activation functions, network training – gradient descent optimization – stochastic gradient descent, error backpropagation, from shallow networks to deep networks –Unit saturation (aka the vanishing gradient problem) – ReLU, hyperparameter tuning, batch normalization, regularization, dropout. | 11 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Use appropriate search algorithms for problem solving. |
| **CO2** | Apply reasoning under uncertainty. |
| **CO3** | Build supervised learning models . |
| **CO4** | Build ensembling and unsupervised models. |
| **CO5** | Build ensembling and unsupervised models. |

| **Text Books** | |
|---|---|
| 1 | Stuart Russell and Peter Norvig, “Artificial Intelligence – A Modern Approach”, Fourth Edition, Pearson Education, 2021. |
| 2 | Ethem Alpaydin, “Introduction to Machine Learning”, MIT Press, Fourth Edition, 2020. |
| **Reference Text Books** | |
| 1 | Dan W. Patterson, “Introduction to Artificial Intelligence and Expert Systems”, Pearson Education,2007. |
| 2 | Kevin Night, Elaine Rich, and Nair B., “Artificial Intelligence”, McGraw Hill, 2008. |
| 3 | Patrick H. Winston, "Artificial Intelligence", Third Edition, Pearson Education, 2006. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/) |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 3 | 3 | - | - | - | - | 1 | 3 | 3 |
| **CO2** | 1 | 1 | 1 | 3 | 1 | - | - | - | 1 | 2 | 1 |
| **CO3** | 2 | 1 | 2 | 1 | 1 | - | - | - | 2 | 1 | 1 |
| **CO4** | 3 | 1 | 3 | 1 | - | - | - | 2 | 1 | 2 | 1 |
| **CO5** | 2 | 1 | 2 | 2 | 1 | - | - | - | 2 | 2 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Cloud Computing**<br>**Category: IPCC** | | | | | |
| Course Code | : | **B24IS602** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:2:3 | SEE | : | 50 Marks |
| Total Hours | : | 45+30 | Total | : | 100 Marks |
| Credits | : | 4 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To introduce the rationale behind the cloud computing revolution and the business drivers. |
| 2. | To understand various models, types and challenges of cloud computing. |
| 3. | To understand the design of cloud native applications, the necessary tools and the design tradeoffs. |
| 4. | To realize the importance of Cloud Virtualization, Abstraction`s, Enabling Technologies and cloud security. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Distributed System Models and Enabling Technologies:** Scalable Computing Over the Internet, Technologies for Network Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency. | 9 |
| **Module – 2** | **No. of Hours** |
| **Virtual Machines and Virtualization of Clusters and Data Centers:** Implementation Levels of Virtualization, Virtualization Structure/Tools and Mechanisms, Virtualization of CPU/Memory and I/O devices, Virtual Clusters and Resource Management, Virtualization for Data Center Automation. | 9 |
| **Module – 3** | **No. of Hours** |
| **Cloud Platform Architecture over Virtualized Datacenters:** Cloud Computing and Service Models, Data Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and Azure, Inter-Cloud Resource Management. | 9 |
| **Module – 4** | **No. of Hours** |
| **Cloud Security:** Top concern for cloud users, Risks, Privacy Impact Assessment, Cloud Data Encryption, Security of Database Services, OS security, VM Security, Security Risks Posed by Shared Images and Management OS, XOAR, A Trusted Hypervisor, Mobile Devices and Cloud Security.<br>**Cloud Security and Trust Management:** Cloud Security Defense Strategies, Distributed Intrusion/Anomaly Detection, Data and Software Protection Techniques, Reputation-Guided Protection of Data Centers. | 9 |
| **Module – 5** | **No. of Hours** |
| **Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms, Parallel and Distributed Computing Paradigms, Programming Support for Google App Engine, Programming on Amazon AWS and Microsoft, Emerging Cloud Software Environments. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Describe various cloud computing platforms and service providers. |
| CO2 | Illustrate the significance of various types of virtualization. |
| CO3 | Identify the architecture, delivery models and industrial platforms for cloud computing based applications. |
| CO4 | Analyze the role of security aspects in cloud computing. |
| CO5 | Demonstrate cloud applications in various fields using suitable cloud platforms. |

## LABORATORY

***Practical Component of IPCC***

| **Sl. No** | **Name of the experiments** |
|---|---|
| 1. | Creating a Virtual Machine: Configure and deploy a virtual machine with specific CPU and memory requirements in Google Cloud.<br>OR |

| | |
|---|---|
| | Exploring AWS CloudShell and the AWS Cloud9 IDE |
| 2. | Getting Started with Cloud Shell and gcloud: Discover the use of gcloud commands to manage Google Cloud resources from Cloud Shell.<br>OR<br>Working with Amazon S3Orchestrating Serverless Functions with AWS Step Functions |
| 3. | **Cloud Functions**: Create and deploy a Cloud Function to automate a specific task based on a Cloud Storage event.<br>OR<br>Working with Amazon DynamoDB |
| 4. | **App Engine**: Deploy a web application on App Engine with automatic scaling enabled. OR<br>Developing REST APIs with Amazon API Gateway |
| 5. | **Cloud Storage: Qwikstart: Google** Cloud Storage provides scalable and secure object storage for managing data, accessible via the Cloud Console or gsutil CLI.<br>OR<br>Creating Lambda Functions Using the AWS SDK for Python |
| 6. | Cloud SQL for MySQL: Discover how Google Cloud SQL for MySQL provide automated management and high availability for MySQL databases?<br>OR<br>Migrating a Web Application to Docker Containers |
| 7. | **Cloud Pub/Sub:** Experiment how Google Cloud Pub/Sub facilitate real-time messaging and communication between distributed applications.<br>OR<br>Caching Application Data with ElastiCache, Caching with Amazon CloudFronT, Caching Strategies |
| 8. | **Multiple VPC Networks:** Explore benefits of using multiple VPC networks in Google Cloud for organizing and isolating resources.<br>OR<br>Implementing CloudFront for Caching and Application Security |
| 9. | **Cloud Monitoring:** Discover how Cloud Monitoring help in tracking and analyzing the performance and health of cloud resources?<br>OR<br>Orchestrating Serverless Functions with AWS Step Functions |
| 10. | Kubernetes Engine: Qwik Start: Deploy a containerized application to a Kubernetes Engine cluster.<br>OR<br>Automating Application Deployment Using a CI/CD Pipeline |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30** (Average of Best Two Assessments) | **50/2 = 25** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | Any One Assessments as per regulations | **20** | **20** | |
| **Laboratory** | **Lab conduction & Record** | Evaluating each expt. for 10 marks. | **05** | **25** |
| | **Internal Test** | **50** | **20** | |
| **Total Marks** | | | | **50** |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice. Students should answer five full questions, selecting one full question from each module.
5. Students have to answer for 100 marks and marks scored out of 100 shall be proportionally reduced to 50 marks.
6. The maximum marks from the practical component to be included in the SEE question paper is **16 marks.**
7. Question papers to be set as per the Blooms Taxonomy levels.
8. The laboratory component of the **integrated course** shall be CIE only. However, in SEE, the questions from the practical component shall be included.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | 2 | 1 | - | - | 1 | - | 1 | 2 |
| CO2 | 2 | 2 | - | 2 | 1 | - | - | 1 | - | 2 | 2 |
| CO3 | 1 | 1 | - | 2 | 1 | - | - | - | - | 2 | 1 |
| CO4 | 1 | 1 | - | 2 | 1 | - | - | - | - | 1 | 1 |
| CO5 | 1 | 1 | - | 2 | 1 | - | - | - | - | 1 | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -VI** | | | | | |
|---|---|---|---|---|---|
| **Agile Methodology**<br>**Category: PEC-II** | | | | | |
| Course Code | : | **B24CG631** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand fundamentals of Agile methodology. |
| 2. | To study agile principles. |
| 3. | To learn Scrum principles. |
| 4. | To practices of XP and Incremental design. |
| 5. | To develop methods to eliminate waste. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Learning Agile:** Getting Agile into Your Brain, Understanding Agile Values, No Silver Bullet, Agile to the Rescue, Adding Agile Makes a Difference. A Fractured Perspective, How a Fractured Perspective Causes Project Problems. The Agile Manifesto, Purpose Behind Each Practice. Individuals and Interactions Over Processes and Tools, Working Software Over Comprehensive Documentation, Customer Collaboration Over Contract Negotiation, Responding to Change Over Following a Plan, Principles Over Practices. Understanding the Elephant, Methodologies Help You Get It All in Place at Once, Where to Start with a New Methodology. | 9 |
| **Module – 2** | **No. of Hours** |
| **Agile Principles:** The 12 Principles of Agile Software, The Customer Is Always Right...Right? , "Do As I Say, Not As I Said". Delivering the Project, Better Project Delivery for the Ebook Reader Project. Communicating and Working Together, Better Communication for the Ebook Reader Project. Project Execution—Moving the Project Along, A Better Working Environment for the Ebook Reader Project Team. Constantly Improving the Project and the Team. The Agile Project: Bringing All the Principles Together | 9 |
| **Module – 3** | **No. of Hours** |
| **Scrum and Self-Organizing Teams:** The Rules of Scrum, Act I: I Can Haz Scrum?, Everyone on a Scrum Team Owns the Project, The Scrum Master Guides the Team's Decisions, The Product Owner Helps the Team Understand the Value of the Software, Everyone Owns the Project, Scrum Has Its Own Set of Values ,Status Updates Are for Social Networks!, The Whole Team Uses the Daily Scrum, Feedback and the Visibility-Inspection-Adaptation Cycle, The Last Responsible Moment, How to Hold an Effective Daily Scrum. Sprinting into a Wall, Sprints, Planning, and Retrospectives, Iterative or Incremental?, The Product Owner Makes or Breaks the Sprint, Visibility and Value, How to Plan and Run an Effective Scrum Sprint.<br>**Scrum Planning and Collective Commitment:** Not Quite Expecting the Unexpected, User Stories, Velocity, and Generally Accepted Scrum Practices, Make Your Software Useful, User Stories Help Build Features Your Users Will Use, Conditions of Satisfaction, Story Points and Velocity, Burndown Charts, Planning and Running a Sprint Using Stories, Points, Tasks, and a Task Board. Victory Lap, Scrum Values Revisited, Practices Do Work Without the Values (Just Don't Call It Scrum), Is Your Company's Culture Compatible with Scrum Values? | 9 |
| **Module – 4** | **No. of Hours** |
| **XP and Embracing Change:** Going into Overtime, The Primary Practices of XP, Programming Practices, Integration Practices, Planning Practices, Team Practices, Why Teams Resist Changes, and How the Practices Help. The Game Plan Changed, but We're Still Losing, The XP Values Help the Team Change Their Mindset, XP Helps Developers Learn to Work with Users, Practices Only "Stick" When the Team Truly Believes in Them, An Effective Mindset Starts with the XP Values, The XP Values, Paved with Good Intentions. The Momentum Shifts, Understanding the XP Principles Helps You Embrace Change, The Principles of XP, XP Principles Help You Understand Planning, XP Principles Help You Understand Practices—and Vice Versa, Feedback Loops.<br>**XP, Simplicity, and Incremental Design:** Code and Design, Code Smells and Antipatterns (or, How to Tell If You're Being Too Clever), XP Teams Look for Code Smells and Fix Them, Hooks, Edge Cases, and Code That Does Too Much. Make Code and Design Decisions at the Last Responsible Moment, Fix Technical Debt by Refactoring Mercilessly, Use Continuous Integration to Find Design | 9 |

| | |
|---|---|
| Problems, Avoid Monolithic Design, Incremental Design and the Holistic XP Practices. Teams Work Best When They Feel Like They Have Time to Think, Team Members Trust Each Other and Make Decisions Together. The XP Design, Planning, Team, and Holistic Practices Form an Ecosystem Incremental Design Versus Designing for Reuse, When Units Interact in a Simple Way, the System Can Grow Incrementally, Great Design Emerges from Simple Interactions, Final Score. | |
| **Module – 5** | **No. of Hours** |
| Options Thinking, and Set-Based Development, Creating Heroes and Magical Thinking. Eliminate Waste, Use a Value Stream Map to Help See Waste Clearly, Gain a Deeper Understanding of the Product, See the Whole, Find the Root Cause of Problems That You Discover. Deliver As Fast As Possible; Use an Area Chart to Visualize Work in Progress, Control Bottlenecks by Limiting Work in Progress.<br>**Kanban, Flow, and Constantly Improving:** The Principles of Kanban, Find a Starting Point and Evolve Experimentally from There. Stories Go into the System; Code Comes Out, Improving Your Process with Kanban, Visualize the Workflow, Limit Work in Progress. Measure and Manage Flow, Managing Flow with WIP Limits Naturally Creates Slack. Make Process Policies Explicit So Everyone Is on the Same Page. Emergent Behavior with Kanban.<br>**The Agile Coach:** Coaches Understand Why People Don't Always Want to Change. The Principles of Coaching. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Describe agile methodology AND explain the purpose of each practice in Agile. |
| CO2 | Apply principles of Agile software and explain the purpose of effective communication in Agile. |
| CO3 | Describe Scrum and organizing Teams and explain the Sprints. |
| CO4 | Illustrate the primary practices of XP and identify and find Design problems. |
| CO5 | Make use of an area chart to visualize work in progress and explain the principles of Kanban. |

| **Text Books** | |
|---|---|
| 1. | Andrew Stellman, Jill Alison Hart, Learning Agile, O'Reilly, 2015. |

| **Reference Text Books** | |
|---|---|
| 1. | Andrew stellman, Jennifer Green, Head first Agile, O'Reilly, 2017. Rubin K , Essential Scrum : A practical guide to the most popular Agile process, Addison-Wesley, 2013. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | - | - | - | - | - | 1 |
| CO2 | 2 | 2 | 2 | 1 | 3 | 1 | - | - | - | - | 1 |
| CO3 | 2 | 2 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO4 | 1 | 3 | 2 | 3 | 2 | - | - | - | - | - | 1 |
| CO5 | 2 | 2 | 2 | 3 | 3 | 1 | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -VI** | | | | | |
|---|---|---|---|---|---|
| **Strategic Design Management**<br>**Category: PEC-II** | | | | | |
| Course Code | : | **B24CG632** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To Learn the overview of strategic management |
| 2. | To Understand the functionality of external and internal assessment. |
| 3. | To Study about varies types of strategies and their analysis. |
| 4. | To Know implementation steps in strategy and its problems |
| 5. | To Learn the steps in implementing strategy and its development issues |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Overview of Strategic Management:** The nature of strategic management: strategic management, key terms in strategic management, strategic management model, benefits of strategic management model, pitfalls in strategic management, guidelines for effective strategic management, comparing business and military strategy, Strategy Formation: Business vision and mission, importance of vision and mission statement, characteristics, writing and evaluating mission statements. | 9 |
| **Module – 2** | **No. of Hours** |
| **External and Internal Assessment:** The nature of external audit, Industrial organization view, Economic, social, cultural, demographic, natural environment, political, government, legal technological, and competitive forces, sources of external information, forecasting tools and techniques, competitive profile matrix (CPM) – assurance of learning exercises. Internal Assessment: nature of internal audit, resource-based view, integrated strategy and culture, management, marketing, finance, production, research and development, MIS, value chain analysis (VAC), Internal Factor Evaluation (IFE) matrix. | 9 |
| **Module – 3** | **No. of Hours** |
| **SWOT Analysis:** The critical theory – where to look for factors – how to create strategic responses to a plan – how to approach a swot assignment – avoiding. Usual mistakes – how to implement swot analysis in financial planning. | 9 |
| **Module – 4** | **No. of Hours** |
| **Strategy Implementation:** Implementing strategies: nature of strategy implementation, annual objectives, policies, resource allocation, managing conflict, matching structure with strategy, restructuring, reengineering, E-engineering, human resource concerns when implementing strategies, nature of strategic implementation, current marketing and finance issues, research & development issues, MIS issues. | 9 |
| **Module – 5** | **No. of Hours** |
| **Strategy Evaluation and Control:** Strategy Review, Evaluation and Control: Nature of strategy evaluation, strategy-evaluation framework, balanced scorecard, published sources of strategy-evaluation information, characteristics of an effective evaluation system, contingency planning, auditing, Global Issues: multinational organization, advantages and disadvantages of international operations, global challenge, worldwide tax rates, joint ventures in India. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand the various functions of strategic management. |
| CO2 | Evaluate external and internal assessment and value chain analysis |
| CO3 | Apply strategic action and its analysis in real world scenarios. |
| CO4 | Apply strategy implementation in real life systems. |
| CO5 | Learn and execute strategy evaluation and control in global scenarios. |
| **Text Books** | |
| 1. | Fred R. David, Strategic Management, Pearson Education, Limited, 15th Student Manual/Study Guide Edition 2015. |
| 2. | Thomas L Wheelen, J.David Hunger Strategic Management and Business Policy: Toward Global Sustainability, 13th Edition, Prentice Hall, 2011 |

| **Reference Text Books** | |
|---|---|
| 1. | AzharKazmi, Business Policy and Strategic Management, Tata McGraw Hill, 3rd Edition |
| 2. | R. Srinivasan, Strategic Management – The Indian context, Prentice Hall of India, 2012. |
| 3. | Wheelen, Hunger, Kansal, Strategic Management and Business Policy, Pearson Education, 15th Edition. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | - | 1 | 2 | - | - | - | - | 1 |
| CO2 | 2 | 3 | 3 | 2 | 2 | 2 | - | - | - | - | 1 |
| CO3 | 2 | 3 | 2 | 3 | 1 | 1 | - | - | - | - | 1 |
| CO4 | 3 | 2 | 3 | 2 | 2 | 2 | - | - | - | - | 1 |
| CO5 | 1 | 2 | 2 | 1 | - | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester–VI** | | | | | |
|---|---|---|---|---|---|
| **Advanced Computer Networks**<br>**Category: PEC-II** | | | | | |
| Course Code | : | **B24CG633** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand the concept of layering in networks. |
| 2. | Explain the architecture, components and standards of NGN, including All-IP networks and layered network design. |
| 3. | To visualize the end-to-end flow of information. |
| 4. | To describe network convergence concepts, including voice, data and multimedia services over IP networks. |
| 5. | To learn the functions of network layer and the various routing protocols. |

| **Module–1** | **No. of Hours** |
|---|---|
| **Introduction And Application Layer:** Data Communication – Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Introduction to Sockets – Application Layer protocols: HTTP – FTP – Email protocols (SMTP – POP3 – IMAP – MIME) – DNS – SNMP | 9 |
| **Module–2:** | **No. of Hours** |
| **NGN Architecture** & Protocols, All-IP network design, NGN architecture elements, Control and signaling protocols (eg.SIP), Addressing and Naming schemes. | 9 |
| **Module–3:** | **No. of Hours** |
| **Switching:** Packet Switching – Internet protocol – IPV4 – IP Addressing – Subnetting – IPV6, ARP, RARP, ICMP, DHCP | 9 |
| **Module–4:** | **No. of Hours** |
| **IMS and Converged Services**, IP Multimedia Subsystem (IMS) architecture, IMS Services (VOLTE), VoIP, Push - to- Talk), FMC (Fixed-Mobile Convergence) | 9 |
| **Module–5:** | **No. of Hours** |
| **Routing**: Routing and protocols: Unicast routing – Distance Vector Routing – RIP – Link State Routing – OSPF – Path-vector routing – BGP – Multicast Routing: DVMRP – PIM. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Explain the basic layers and its functions in computer networks |
| CO2 | Describe the architecture and functional components of NGN and All-IP NETWORKS. |
| CO3 | Understand the basics of how data flows from one node to another. |
| CO4 | Demonstrate understanding of network convergences and IP Multimedia Subsystem (IMS) for multimedia services. |
| CO5 | Analyze routing algorithms |

| **Text Books** | |
|---|---|
| 1. | James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Eighth Edition, Pearson Education, 2021 |
| 2. | Behrouz A. Forouzan, Data Communications and Networking with TCP/IP Protocol Suite, Sixth Edition TMH, 202 |
| 3. | Jingming Li Salina & Pascal Salina- covers NGN technologies, architecture , services, transport, standards and future directions. |

| **Reference Text Books** | |
|---|---|
| 1. | Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012. |
| 2. | William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013. |
| 3. | Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014. |
| 4. | Ying-Dar Lin, Ren-Hung Hwang, Fred Baker, “Computer Networks: An Open Source Approach”, McGraw Hill, 2012. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | - | - | - | 3 | 1 | - | - | 1 | 2 |
| CO2 | 2 | 2 | - | - | - | 2 | 1 | - | - | 2 | 2 |
| CO3 | 1 | 1 | - | - | - | 1 | 2 | - | - | 2 | 1 |
| CO4 | 1 | 1 | - | - | - | 1 | 2 | - | - | 1 | 1 |
| CO5 | 1 | 1 | - | - | - | 1 | 2 | - | - | 1 | 1 |

Level3-High, Level2-Moderate, Level1-Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **CUDA**<br>**Category: PEC-II** | | | | | |
| Course Code | : | **B24CG634** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To learn the differences between CPU and GPU architectures, including streaming multiprocessors and high-bandwidth memory. |
| 2. | To learn to write, compile (using nvcc), and execute parallel kernels using CUDA C/C++. |
| 3. | Gain proficiency in managing memory transfers between the CPU (host) and GPU (device) to maximize efficiency. |
| 4. | To learn techniques to optimize thread utilization, avoid race conditions, and use profiling tools (e.g., nvprof) to analyze performance. |
| 5. | To apply Parallel Programming patterns to scientific computing, data processing, and machine learning tasks. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **A Short History of Supercomputing:** Von Neumann Architecture, Cray, multimode computing, nvidia and cuda, alternatives to cuda, types of parallelism. | 9 |
| **Module – 2** | **No. of Hours** |
| **GPUs History of GPU Computing:** FLYNN'S TAXONOMY, some common parallel patterns, Reduced Instruction Set Computers, Multiple Core Processors, Vector Processors, Limits to parallelizability, Amdahl's law on Parallelism. | 9 |
| **Module – 3** | **No. of Hours** |
| **Introduction:** GPUs as Parallel Computers, Architecture of a Model GPU, Why More Speed or Parallelism? GPU Computing. Introduction to CUDA: Data Parallelism, CUDA Program Structure, A Vector Addition Kernel, Device Global Memory and Data Transfer, Kernel Functions and Threading. | 9 |
| **Module – 4** | **No. of Hours** |
| **CUDA Threads:** CUDA Thread Organization, Mapping Threads To Multidimensional Data, Synchronization and Transparent Scalability, Assigning Resources to Blocks, Thread Scheduling and Latency Tolerance. | 9 |
| **Module – 5** | **No. of Hours** |
| **Implementation of algorithms in CUDA:** A Matrix-Matrix Multiplication, Program to implement sorting using CUDA, Program to Histogram calculation using CUDA, Program to create threads using default stream in CUDA, CUDA for Deep Learning - A Case Study. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand the technologies and architectures used for parallel computing. |
| CO2 | Demonstrate an understanding of GPUs and their architecture. |
| CO3 | Analyze the features of GPUs, their functionalities and CUDA Programming Structure. |
| CO4 | Understand the features of CUDA threads and scheduling. |
| CO5 | Develop multi-threaded applications using CUDA. |

| **Text Book:** | |
|---|---|
| 1. | Introduction to parallel computing by Ananth Grama. |
| 2. | CUDA Programming: A Developer's Guide to Parallel Computing with GPUs. |
| **Reference:** | |
| 1. | GPU parallel program development using CUDA by Tolga Soyata. CRC Press 2018. |

| **Web links and Video lectures (e-Resources):** |
|---|
| • Links:https://onlinecourses.nptel.ac.in/noc20_cs92/preview |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

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**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 1 | - | - | - | - | - | 1 |
| CO2 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 |
| CO3 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 2 | 3 | 3 | - | - | - | - | - | 1 |
| CO5 | 3 | 3 | 3 | 2 | 3 | - | - | - | - | - | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester –VI** | | | | | |
|---|---|---|---|---|---|
| **Introduction to Data Structures**<br>**Category: OEC-I** | | | | | |
| Course Code | : | **B24CS641** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To introduce primitive and non-primitive data structures |
| 2. | To understand the various types of data structure along their operations |
| 3. | To study various searching and sorting algorithms |
| 4. | To assess appropriate data structures during program development / problem solving |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Arrays:** Introduction, One-Dimensional Arrays, Two-Dimensional Arrays, Initializing Two Dimensional Arrays, Multidimensional arrays.<br>**Pointers:** Introduction, Pointer Concepts, Accessing Variables through Pointers, Pointer Applications, Dynamic Memory Allocation Functions.<br>**Structures and Unions:** Introduction, Declaring Structures, Giving Values to Members, Structure Initialization, Comparison of Structure Variables, Arrays of Structures, Arrays within Structures, Nested Structures, Unions, Size of Structures. | 9 |
| **Module – 2** | **No. of Hours** |
| **Stacks:** Introduction, Stack Operations, Stack Implementation using Arrays, Applications of Stacks.<br>**Queues:** Introduction, Queue Operations, Queue Implementation using Arrays, Different Types of Queues: Circular Queues, Double-Ended Queues, Priority Queues, Applications of Queues. | 9 |
| **Module – 3** | **No. of Hours** |
| **Linked Lists**: Introduction, Singly Linked List, Self-Referential Structures, Operations on Singly Linked Lists: Insert-Delete-Display, Implementation of Stacks and Queues using Linked List, Concatenate two Lists, Reverse a List without Creating a New Node, Static Allocation Vs Linked Allocation. Circular Singly Linked List: Introduction, Operations: Insert-Delete-Display. | 9 |
| **Module – 4** | **No. of Hours** |
| **Trees:** Introduction, Basic Concepts, Representation of Binary Trees, Operations on Binary Trees: Insertion-Traversals-Searching-Copying a Tree, Binary Search Trees, Operations on Binary Search Trees: Insertion-Searching-Find Maximum and Minimum Value-Count Nodes, Expression Trees. | 9 |
| **Module – 5** | **No. of Hours** |
| **Sorting:** Introduction, Bubble Sort, Selection Sort, Insertion Sort. Searching: Introduction, Linear Search, Binary Search. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Develop C programs utilizing fundamental concepts such as arrays, pointers and structures. |
| CO2 | Apply data structures like stacks and queues to solve problems. |
| CO3 | Develop C programs using linked lists and their various types. |
| CO4 | Explain the fundamental concepts of trees and their practical applications. |
| CO5 | Demonstrate different sorting and searching algorithms and determine their algorithmic complexities. |

| **Text Books** | |
|---|---|
| 1. | E Balagurusamy, “C Programming and Data Structures”, 4th Edition, McGraw-Hill, 2007. |
| 2. | A M Padma Reddy, “Systematic Approach to Data Structures using C”, 9th Revised Edition, Sri Nandi Publications, 2009. |

| **Reference Text Books** | |
|---|---|
| 1. | Ellis Horowitz and Sartaj Sahni, “Fundamentals of Data Structures in C”, 2nd Edition, Universities Press, 2014. |
| 2. | Seymour Lipschutz, “Data Structures Schaum’s Outlines”, Revised 1st Edition, McGraw-Hill, 2014. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | - | 1 | - | 1 | - | - | - | - |
| CO2 | 3 | 1 | | - | - | - | - | - | - | - | - |
| CO3 | 1 | 3 | 2 | - | - | - | - | 1 | - | - | - |
| CO4 | 2 | | | - | - | - | - | - | - | - | - |
| CO5 | 1 | 2 | 3 | - | - | - | - | - | - | - | - |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester -VI** | | | | | |
|---|---|---|---|---|---|
| **Introduction to Cybersecurity**<br>**Category: OEC-I** | | | | | |
| Course Code | : | **B24IC642** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand the cybercrime terminologies and perspectives. |
| 2. | To understand Cyber Offenses and Botnets. |
| 3. | To gain knowledge on tools and methods used in cybercrimes. |
| 4. | To understand phishing and computer forensics. |

| **Module - 1** | **No. of Hours** |
|---|---|
| **Introduction to Cybercrime:** Cybercrime: Definition and Origins of the Word, Cybercrime and Information Security, Who are Cybercriminals? Classifications of Cybercrimes, An Indian Perspective, Hacking and Indian Laws, Global Perspectives. | 9 |
| **Module - 2** | **No. of Hours** |
| **Cyber Offenses:** How Criminals Plan Them-Introduction, How criminals plan the attacks, Social Engineering, Cyber Stalking, Cybercafé & cybercrimes.<br>**Botnets:** The fuel for cybercrime, Attack Vector. | 9 |
| **Module - 3** | **No. of Hours** |
| **Tools and Methods used in Cybercrime:** Introduction, Proxy Servers, Anonymizers, Phishing, Password Cracking, Key Loggers and Spy ways, Virus and Worms, Trozen Horses and Backdoors, Steganography, DoS and DDOS Attacks, Attacks on Wireless networks. | 9 |
| **Module - 4** | **No. of Hours** |
| **Phishing and Identity Theft:** Introduction, methods of phishing, phishing, phishing techniques, spear phishing, types of phishing scams, phishing toolkits and spy phishing, counter measures, Identity Theft. | 9 |
| **Module - 5** | **No. of Hours** |
| **Understanding Computer Forensics:** Introduction, Historical Background of Cyber forensics, Digital Forensics Science, Need for Computer Forensics, Cyber Forensics and Digital Evidence, Digital Forensic Life cycle, Chain of Custody Concepts, network forensics. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understanding the concepts of cybercrime terminologies. |
| CO2 | Understanding the Cyber offenses and Botnets. |
| CO3 | Illustrate Tools and Methods used on Cybercrime. |
| CO4 | Explain Phishing and Identity Theft. |
| CO5 | Justify the need of computer forensics. |

| **Text Books** | |
|---|---|
| 1. | Sunit Belapure and Nina Godbole, "Cyber Security: Understanding Cyber Crimes, Computer Forensics And Legal Perspectives", Wiley India Pvt Ltd, ISBN: 978-81- 265-21791, 2011, First Edition (Reprinted 2018) |

| **Web links and Video lectures (e-Resources)** |
|---|
| https://www.youtube.com/watch?v=yC_hFm0BX28&list=<br>PLxApjaSnQGi6Jm7LLSxvmNQjS_rt9swsu<br>https://www.youtube.com/watch?v=nzZkKoREEGo&list=<br>PL9ooVrP1hQOGPQVeapGsJCktzIO4DtI4_<br>https://www.youtube.com/watch?v=6wi5DI6du-4&list=PL_uaeekrhGzJlB8XQBxU3z hDwT95xlk<br>https://www.youtube.com/watch?v=KqSqyKwVuA8 |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 2 | 2 | 1 | - | 2 | - | - | - | - | 2 | - |
| CO2 | 2 | 2 | 2 | - | 2 | - | - | - | - | 2 | - |
| CO3 | 2 | 2 | 2 | - | 2 | - | - | - | - | 2 | - |
| CO4 | 2 | 2 | 2 | - | 2 | 1 | - | - | - | 2 | - |
| CO5 | 2 | 2 | 2 | 1 | 2 | 1 | - | 1 | - | 2 | - |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Fundamentals of Operating Systems**<br>**Category: OEC- I** | | | | | |
| Course Code | : | **B24CS643** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1 | To explain the need and different types of OS |
| 2 | To discuss suitable techniques for management of different resources. |
| 3 | To analyze different memory, storage, and file system management strategies. |
| 4 | To understand the concept of deadlocks and analyse the Memory Management Techniques. |
| 5 | To nderstand and familiar with virtual memory management and files. |

| **Module - 1** | **No. of Hrs** |
|---|---|
| **Introduction**: What operating systems do; Computer System organization; Computer System Organization, Computer System architecture; Operating System operations; Resource Management Operating System Structures: Operating System Services, User and Operating System interface; System calls, Application Program Interface, Types of system calls. | 9 |
| **Module - 2** | **No. of Hrs** |
| **Process Management:** Process concept; Process scheduling; Operations on processes; Inter process Communication Multi-threaded Programming: Overview; Multithreading models, Thread Libraries. | 9 |
| **Module - 3** | **No. of Hrs** |
| **CPU Scheduling:** Basic Concepts, Scheduling criteria, Scheduling algorithms, Thread Scheduling, Process Synchronization: Synchronization: The critical section problem; Peterson's solution; Semaphores; Classical problems of synchronization. | 9 |
| **Module - 4** | **No. of Hrs** |
| **Deadlocks:** System model; Deadlock characterization; Methods for handling deadlocks; Deadlock prevention; Deadlock avoidance; Deadlock detection and recovery from deadlock. Memory Management: Background; Contiguous memory allocation; Paging; Structure of page table. | 9 |
| **Module - 5** | **No. of Hrs** |
| **Virtual Memory Management:** Background; Demand paging; Copy-on-write; Page replacement; File System Interface: File concept; Access methods; Directory Structure, Protection, File System Implementation: File System Structure, File System Operations, File System Internals: File Systems, File System Mounting; Partition and Mounting, File sharing. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Explain the fundamentals of operating systems. |
| **CO2** | Apply appropriate CPU scheduling algorithm for the given scenarios. |
| **CO3** | Analyze the various techniques for process synchronization and deadlock handling. |
| **CO4** | Apply the various techniques for memory management. |
| **CO5** | Analyze the importance of File System Mounting and File Sharing. |

| **Text Books** | |
|---|---|
| 1 | Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts" II, 10th Edition, John Wiley and Sons Inc., 2018. |
| 2 | Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 5th Edition, 2022 New Delhi. |
| **Reference Text Books** | |
| 1 | RamazElmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010. |
| 2 | William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018. |
| 3 | T V Geetha, "Understanding Natural Language Processing – Machine Learning and Deep Learning Perspectives", Pearson, 2024. |

| **Web links and Video lectures (e-Resources)** |
|---|
| 1. https://archive.nptel.ac.in/courses/106/105/106105214/ |
| 2. https://archive.nptel.ac.in/courses/106/102/106102132/ |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

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**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and it carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping:**

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | – | 1 | – | – | – | 1 | – | 1 |
| CO2 | 3 | 3 | 2 | 2 | 2 | – | – | – | – | – | 1 |
| CO3 | 3 | 3 | 2 | 2 | 2 | 1 | – | – | – | – | 1 |
| CO4 | 3 | 3 | 2 | 2 | 3 | 1 | – | – | – | – | 1 |
| CO5 | 2 | 3 | 2 | 1 | 2 | 2 | 1 | – | 1 | – | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **AI for Everyone**<br>**Category: OEC -1** | | | | | |
| Course Code | : | **B24AI644** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 3:0:0:3 | SEE | : | 50 Marks |
| Total Hours | : | 45 | Total | : | 100 Marks |
| Credits | : | 3 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand fundamental AI concepts in a non-technical, interdisciplinary context. |
| 2. | To analyze the impact of AI on industries, business processes, and society. |
| 3. | To understand the lifecycle and workflow of AI-driven projects. |
| 4. | To examine ethical, legal, and societal challenges in AI systems. |
| 5. | To identify practical AI applications across diverse domains. |

| **Module –1** | **No. of Hours** |
|---|---|
| **Foundations of Artificial Intelligence**: Overview of artificial intelligence, historical evolution, types of AI, including narrow and general AI, key concepts such as machine learning, deep learning, and data science, comparison between AI-driven systems and traditional programming, and broad applications of AI across industries. | 9 |
| **Module –2** | **No. of Hours** |
| **AI in Business and Industry:** Role of AI in digital transformation, applications in healthcare, finance, retail, manufacturing, and smart services, automation and workforce transformation, AI-enabled decision-making, introduction to data-driven organizations, and case studies illustrating successful AI adoption. | 9 |
| **Module –3** | **No. of Hours** |
| **AI Project Lifecycle and Workflow**: Problem identification and formulation for AI solutions, data collection and labeling, data preparation and feature understanding, model selection and evaluation, deployment considerations, interaction between technical and non-technical stakeholders, and an overview of commonly used AI tools and platforms. | 9 |
| **Module –4** | **No. of Hours** |
| **Ethics, Bias, and Governance in AI**: Ethical principles in AI, sources of bias in datasets and models, fairness and accountability, transparency and explain ability, privacy and data protection, regulatory considerations, responsible AI development, and governance frameworks. | 9 |
| **Module –5** | **No. of Hours** |
| **AI Applications and Future Trends**: Applications of AI in natural language processing, computer vision, robotics, and recommendation systems. Introduction to generative AI, AI for sustainability and smart systems, emerging trends in AI, challenges, risks, and opportunities in widespread AI adoption. | 9 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Explain fundamental concepts and types of artificial intelligence. |
| CO2 | Analyze the impact of AI on business processes and societal transformation. |
| CO3 | Understand and describe the workflow of AI projects and data-driven problem solving |
| CO4 | Evaluate ethical, legal, and social implications of AI technologies. |
| CO5 | Identify and assess opportunities for applying AI in real-world scenarios. |

| **Text Books** | |
|---|---|
| 1. | Andrew Ng, *AI for Everyone*, DeepLearning.AI, 2019. |
| 2. | Ajay Agrawal, Joshua Gans, and Avi Goldfarb, *Prediction Machines: The Simple Economics of Artificial Intelligence*, Harvard Business Review Press, 2018. |
| **Reference Text Books** | |
| 1. | Melanie Mitchell, *Artificial Intelligence: A Guide for Thinking Humans*, Farrar, Straus and Giroux, 2019. |
| 2. | Stuart Russell and Peter Norvig, *Artificial Intelligence: A Modern Approach*, 4th Edition, Pearson Education, 2020. |
| 3. | Kai-Fu Lee, *AI Superpowers: China, Silicon Valley, and the New World Order*, Houghton Mifflin Harcourt. 2018. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of continuous Internal Evaluation (CIE) is 50% and for the Semester End Examination (SEE) is 50%. The minimum passing mark for the CIE is 40% of maximum marks (20 marks out of 50). The minimum passing mark for SEE is 35% of maximum marks (18 marks out of 50). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course. Student has to secure a minimum 40% (40 marks out of 100) in the total of the CIE and SEE together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. The question paper shall be set for 100 marks and duration of SEE is 3 hours.
2. The question paper will have two parts: Part-A and Part-B.
3. **Part-A** should contain minimum **Two or Four** quiz questions from each module of 02 marks/ 01 marks each. **Part-A is Compulsory** and carries 20 Marks.
4. **Part-B** contains total 10 questions.
5. Two questions of 16 marks (with minimum of 3 sub questions) from each module with internal choice.
6. Students should answer five full questions, selecting one full question from each module.
7. Question papers to be set as per the Blooms Taxonomy levels.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 1 | - | 1 | - | 1 | - | 1 |
| CO2 | 2 | 3 | 2 | 2 | 2 | 2 | 1 | 1 | 2 | 1 | 1 |
| CO3 | 2 | 3 | 3 | 2 | 2 | - | 1 | 1 | 2 | 1 | 1 |
| CO4 | 1 | 3 | 2 | 3 | 3 | 2 | 2 | 1 | 2 | 1 | 2 |
| CO5 | 1 | 2 | 2 | 2 | 3 | 2 | 3 | 1 | 2 | 1 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Machine Learning Algorithms Lab** **Category: PCCL** | | | | | |
| Course Code | : | **B24CS605L** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0 : 0 : 2: 0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective** | |
|---|---|
| 1. | To implement fundamental Artificial Intelligence and Machine Learning algorithms. |
| 2. | To apply supervised and unsupervised learning techniques on real-world datasets. |
| 3. | To design and evaluate classification, regression, and clustering models. |
| 4. | To analyze the performance of AI and ML algorithms. |
| 5. | To develop problem-solving skills using AI and ML tools and techniques. |

| **Sl. No** | **List of Experiments** |
|---|---|
| 1. | Implement A* Search algorithm. |
| 2. | Implement AO* Search algorithm |
| 3. | For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithmto output a description of the set of all hypotheses consistent with the training examples. |
| 4. | Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge toclassify a new sample. |
| 5. | Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets. |
| 6. | Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets |
| 7. | Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program. |
| 8. | Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem. |
| 9. | Implement the non-parametric Locally Weighted Regressionalgorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Implement and demonstrate AI and ML algorithms |
| **CO2** | Evaluate different algorithms |
| **CO3** | Build supervised learning models |
| **CO4** | Build ensembling and unsupervised models |
| **CO5** | Build deep learning neural network models |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Laboratory | Lab Conduction & Record | Evaluating each expt. for 10 marks | 20 | 50 |
| | Laboratory Test -1 | 50 | 15 | |
| | Laboratory Test -2 | 50 | 15 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| CO \ PO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 2 | 1 | 3 | - | - | 1 | - | - | 1 |
| CO2 | 2 | 3 | 1 | 2 | 2 | - | - | - | 1 | - | 2 |
| CO3 | 3 | 2 | 3 | 2 | 3 | - | - | 1 | - | - | 1 |
| CO4 | 3 | 3 | 2 | 2 | 3 | - | - | 1 | - | - | 2 |
| CO5 | 3 | 2 | 3 | 2 | 3 | 1 | - | 1 | - | - | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **VR LAB** | | | | | |
| **Category: AEC-VI** | | | | | |
| Course Code | : | **B24CG681** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To make the students understand graphics programming. |
| 2. | To perform 2D and 3D transformation. |
| 3. | To create 2D animations. |
| 4. | To create a 3D scenes. |
| 5. | To create VR architecture using mobile and Web VR/XR. |

| **Sl. No.** | **Title of the program / list of the experiment** |
|---|---|
| 1. | Implementation of Algorithms for drawing 2D Primitives – Line using DDA and Bresenham's algorithm. |
| 2. | Implementation of midpoint circle generating algorithm |
| 3. | 2D Geometric transformations – Translation, Rotation, Scaling, Reflection, Shear |
| 4. | Implementation of Line Clipping Algorithm |
| 5. | 3D Transformations - Translation, Rotation, Scaling |
| 6. | Creating 3D Scenes |
| 7. | 2D Animation – To create Interactive animation using any authoring tool |
| 8. | Hand held VR mobile app development using unity |
| 9. | 3D modelling for VR |
| 10. | VR walkthrough (mobile app & WebVR /XR) |
| 11. | VR Game development (using unity/Blender) |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Understand graphics programming. |
| CO2 | Design two and three dimensional graphics and apply transformations. |
| CO3 | Apply clipping techniques to graphics and To create 2D animations and 3D scenes. |
| CO4 | To create VR architecture using mobile and Web VR/XR. |
| CO5 | To create simple VR Game. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Laboratory** | **Lab Conduction & Record** | **Evaluating each expt. for 10 marks** | **20** | **50** |
| | **Laboratory Test -1** | **50** | **15** | |
| | **Laboratory Test -2** | **50** | **15** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 1 | 2 | 2 | - | - | - | - | - | - | 1 |
| CO2 | 2 | 1 | 3 | 3 | 2 | - | - | - | - | - | 1 |
| CO3 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 1 |
| CO4 | 2 | 3 | 3 | 3 | 3 | - | - | - | - | - | 1 |
| CO5 | 3 | 3 | 3 | 3 | 3 | - | - | - | - | - | 1 |

Level 3 – High, Level 2 – Moderate, Level 1 -Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Generative AI**<br>**Category: AEC-VI** | | | | | |
| Course Code | : | **B24AI682** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0:0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand the principles and concepts behind generative AI models |
| 2. | To explain the knowledge gained to implement generative models using Prompt design frameworks. |
| 3. | To apply various Generative AI applications for increasing productivity. |
| 4. | To develop Large Language Model-based Apps. |

| Sl. No. | Title of the program / list of the experiment |
|---|---|
| 1. | Explore pre-trained word vectors. Explore word relationships using vector arithmetic. Perform arithmetic operations and analyze results. |
| 2. | Use dimensionality reduction (e.g., PCA or t-SNE) to visualize word embeddings for Q 1. Select 10 words from a specific domain (e.g., sports, technology) and visualize their embeddings. Analyze clusters and relationships. Generate contextually rich outputs using embeddings. Write a program to generate 5 semantically similar words for a given input. |
| 3. | Train a custom Word2Vec model on a small dataset. Train embeddings on a domain-specific corpus (e.g., legal, medical) and analyze how embeddings capture domain-specific semantics. |
| 4. | Use word embeddings to improve prompts for Generative AI model. Retrieve similar words using word embeddings. Use the similar words to enrich a Gen AI prompt. Use the AI model to generate responses for the original and enriched prompts. Compare the outputs in terms of detail and relevance. |
| 5. | Use word embeddings to create meaningful sentences for creative tasks. Retrieve similar words for a seed word. Create a sentence or story using these words as a starting point. Write a program that: Takes a seed word. Generates similar words. Constructs a short paragraph using these words. |
| 6. | Use a pre-trained Hugging Face model to analyze sentiment in text. Assume a real-world application, Load the sentiment analysis pipeline. Analyze the sentiment by giving sentences to input. |
| 7. | Summarize long texts using a pre-trained summarization model using Hugging face model. Load the summarization pipeline. Take a passage as input and obtain the summarized text. |
| 8. | Install langchain, cohere (for key), langchain-community. Get the api key( By logging into Cohere and obtaining the cohere key). Load a text document from your google drive . Create a prompt template to display the output in a particular manner. |
| 9. | Take the Institution name as input. Use Pydantic to define the schema for the desired output and create a custom output parser. Invoke the Chain and Fetch Results. Extract the below Institution related details from Wikipedia: The founder of the Institution. When it was founded. The current branches in the institution . How many employees are working in it. A brief 4-line summary of the institution. |
| 10. | Build a chatbot for the Indian Penal Code. We'll start by downloading the official Indian Penal Code document, and then we'll create a chatbot that can interact with it. Users will be able to ask questions about the Indian Penal Code and have a conversation with it. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Develop the ability to explore and analyze word embeddings, perform vector arithmetic to investigate word relationships, visualize embeddings using dimensionality reduction techniques |
| CO2 | Apply prompt engineering skills to real-world scenarios, such as information retrieval, text generation. |
| CO3 | Utilize pre-trained Hugging Face models for real-world applications, including sentiment analysis and text summarization. |
| CO4 | Apply different architectures used in large language models, such as transformers, and understand their advantages and limitations. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Laboratory | Lab Conduction & Record | Evaluating each expt. for 10 marks | 20 | 50 |
| | Laboratory Test -1 | 50 | 15 | |
| | Laboratory Test -2 | 50 | 15 | |
| SEE | Semester End Examination | 100 | 50 | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 3 | 3 | - | - | - | - | 2 | 2 | - | - |
| CO2 | 3 | 3 | 3 | - | - | - | - | 2 | 2 | - | - |
| CO3 | 3 | 2 | 2 | - | - | - | - | 2 | 2 | - | - |
| CO4 | 3 | 3 | 3 | - | - | - | - | 2 | 2 | - | - |

Level 3 – High, Level 2 – Moderate, Level 1 -Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **Software Testing Automation**<br>**Category: AEC -VI** | | | | | |
| Course Code | : | **B24IS683** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0 :0:2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To introduce the features, components and benefits of the Katalon and Selenium Studio. |
| 2. | To understand the Test Case Design, Test Execution and Test Data Management. |
| 3. | To understand the Concept of Test Automation |
| 4. | To understand the Test Scenario Development |

| Sl. No. | List of Experiments |
|---|---|
| 1. | **Installation of Katalon Studio:** Installation and Setup, Web Locators & Techniques, Selectors Huband browsers devtools Installation of Katalon Studio: Installation and Setup, Web Locators &Techniques, Selectors Huband browsers devtools. |
| 2. | **Automation Modes in Katalon Studio:** Katalon Studio record mode, Katalon Studio manualmode, Katalon Studio keywords and Katalon Studio script mode. |
| 3. | **Exploring Katalon Recorder Tool:** Recorder Tool Chrome Browser, Firefox, Explorer, Play test cases in Recorder |
| 4. | **Exploring Web Spy & Web Object Repository:** Web Spy & Object Repository, Spy on web object in a browser, Object locators and strategies. |
| 5. | **Exploring the Predefined pre –Defined Web UI Keywords:** browser Keywords, windows Keywords, checkbox Keywords, combo box, file upload, screenshot, scroll down and scroll up button related, alerts frames, mouse hover, drag, and drop and keystroke Keywords. |
| 6. | **Installation of Selenium:** Setting up Selenium RC & Selenium Web Driver. |
| 7. | **Designing Test cases:** Test Case design and Conversion of Mapping and Templates using Selenium tool and manual test cases mapping with Selenium test cases. |
| 8. | **Using Selenium IDE:** Develop a test suite containing minimum 4 test cases. |
| 9. | **Test Suite:** Conduct a test suite for any two website. |
| 10. | **Test Scripts:** Develop and test a program to login a specific web page using Selenium test scripts. |
| 11. | **Test Scripts:** Develop and test a program to provide total number of objects present available on the page using Selenium test scripts. |
| 12. | **Practical Exercise and Wrap-Up:** Build Test suite with suitable applications and complete end-to-end automation process. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Demonstrate Katalon studio and Selenium Architecture and key features of Katalon studio and Selenium Automation Tool. |
| CO2 | Develop test scenarios that can be run automatically. |
| CO3 | Develop test cases and modules in automation tool. |
| CO4 | Develop selenium to build test cases and run test cases in different browsers. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Laboratory** | **Lab Conduction & Record** | **Evaluating each expt. for 10 marks** | **20** | **50** |
| | **Laboratory Test -1** | **50** | **15** | |
| | **Laboratory Test -2** | **50** | **15** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | 1 | 1 | 3 | 1 | – | 2 | 2 | 2 | 1 |
| CO2 | 2 | 3 | 3 | 2 | 3 | 1 | – | 2 | 3 | 2 | 2 |
| CO3 | 2 | 2 | 3 | 2 | 3 | 1 | – | 2 | 3 | 3 | 2 |
| CO4 | 2 | 2 | 3 | 2 | 3 | 1 | – | 1 | 3 | 3 | 2 |

Level3 -High, Level2- Moderate, Level1 - Low

| **Semester-VI** | | | | | |
|---|---|---|---|---|---|
| **REACT**<br>**Category: AEC- VI** | | | | | |
| Course Code | : | **B24CS684** | CIE | : | 50 Marks |
| Teaching Hours L:T:P:S | : | 0 : 0 : 2:0 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 3 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To enable students to develop React applications utilizing functional and class-based components, effectivelymanaging state with hooks and lifecycle methods . |
| 2. | To introduce, how to pass data dynamically between parent and child components using props, ensuring modularand reusable component design. |
| 3. | To create dynamic and responsive applications, integrating forms, validation, task management systems, and styledcomponents. |
| 4. | To use React Router for navigation, external API integration for dynamic data handling, and CSS styling techniquesfor modern UI/UX design. |

| **Sl. No** | **List of Experiments** |
|---|---|
| 1 | Use create-react-app to set up a new project. Edit the App.js file to include a stateful component with useState.Add an input field and a <h1> element that displays text based on the input. Dynamically update the <h1> contentas the user types. |
| 2 | Develop a React application that demonstrates the use of props to pass data from a parent component to childcomponents. The application should include the parent component named App that serves as the central containerfor the application. Create two separate child components, Header: Displays the application title or heading. Footer:Displays additional information, such as copyright details or a tagline. Pass data (e.g., title, tagline, or copyrightinformation) from the App component to the Header and Footer components using props. Ensure that the contentdisplayed in the Header and Footer components is dynamically updated based on the data received from the parentcomponent. |
| 3 | Create a Counter Application using React that demonstrates state management with the useState hook. Display thecurrent value of the counter prominently on the screen. Add buttons to increase and decrease the counter value.Ensure the counter updates dynamically when the buttons are clicked. Use the useState hook to manage thecounter's state within the component. Prevent the counter from going below a specified minimum value (e.g., 0).Add a "Reset" button to set the counter back to its initial value. Include functionality to specify a custom incrementor decrement step value. |
| 4 | Develop a To-Do List Application using React functional components that demonstrates the use of the useStatehook for state management. Create a functional component named ToDoFunction to manage and display the to-do list. Maintain a list of tasks using state. Provide an input field for users to add new tasks. Dynamically renderthe list of tasks below the input field. Ensure each task is displayed in a user-friendly manner. Allow users todelete tasks from the list. Mark tasks as completed or pending, and visually differentiate them. |
| 5 | Develop a React application that demonstrates component composition and the use of props to pass data. Createtwo components: FigureList: A parent component responsible for rendering multiple child components.BasicFigure: A child component designed to display an image and its associated caption. Use the FigureListcomponent to dynamically render multiple BasicFigure components. Pass image URLs and captions as props fromthe FigureList component to each BasicFigure component. Style the BasicFigure components to display the imageand caption in an aesthetically pleasing manner. Arrange the BasicFigure components within the FigureList in agrid or list format. Allow users to add or remove images dynamically. Add hover effects or animations to theimages for an interactive experience. |
| 6 | Design and implement a React Form that collects user input for name, email, and password. Form Fields areName, Email, Password. Ensure all fields are filled before allowing form submission.Validate the email field to ensure it follows the correct email format (e.g., example@domain.com). Optionally enforce a minimum passwordlength or complexity. Display error messages for invalid or missing inputs. Provide visual cues (e.g., red borders)to highlight invalid fields. Prevent form submission until all fields pass validation. Log or display the entered dataupon successful submission (optional). Add a "Show Password" toggle for the password field. Implement client-side sanitization to ensure clean input. |
| 7 | Develop a React Application featuring a ProfileCard component to display a user's profile information, |

| | |
|---|---|
| | includingtheir name, profile picture, and bio. The component should demonstrate flexibility by utilizing both external CSSand inline styling for its design. Display the following information: Profile picture, User's name, A short bio ordescription Use an external CSS file for overall structure and primary styles, such as layout, colors, and typography.Apply inline styles for dynamic or specific styling elements, such as background colors or alignment. Design theProfileCard to be visually appealing and responsive. Ensure the profile picture is displayed as a circle, and thename and bio are appropriately styled. Add hover effects or animations to enhance interactivity. Allow thebackground color of the card to change dynamically based on a prop or state. |
| 8 | Develop a Reminder Application that allows users to efficiently manage their tasks. The application should includethe following functionalities: Provide a form where users can add tasks along with due dates. The form includestask name,Due date,An optional description. Display a list of tasks dynamically as they are added. Show relevantdetails like task name, due date, and completion status. Include a filter option to allow users to view all Tasks andDisplay all tasks regardless of status. Show only tasks marked as completed. Show only tasks that are not yetcompleted. |
| 9 | Design a React application that demonstrates the implementation of routing using the react-router-domlibrary. The application should include the Navigation Menu: Create a navigation bar with links to threedistinct pages, Home, About, Contact. Develop separate components for each page (Home, About, andContact) with appropriate content to differentiate them. Configure routes using react-router-dom to renderthe corresponding page component based on the selected link. Use BrowserRouter and Route componentsfor routing. Highlight the active link in the navigation menu to indicate the current page |
| 10 | Design and develop a React application using a class-based component to demonstrate the use of lifecycle methods with external API integration. The application should fetch data from a public REST API and display it in a structured table or card format. Use the componentDidMount() method to retrieve initial data when the component is first rendered. Implement search, filter, and refresh options for user interaction. Use the componentDidUpdate() method to detect changes in state or props and trigger updated API requests accordingly. Include proper error handling for network failures and empty responses, and display appropriate messages to the user. Ensure that all updates are reflected dynamically without reloading the page. |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Illustrate React fundamentals including components and state management. |
| CO2 | Develop React applications using component composition and data passing through props. |
| CO3 | Apply dynamic state updates, event handling, and custom logic for incrementing, decrementing, and resetting values. |
| CO4 | Implement React forms to collect, validate, and manage user input. |
| CO5 | Demonstrate interaction with external APIs for dynamic content generation and real-time state management. |

**ASSESSMENT DETAILS BOTH (CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks).

A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (CIE)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Laboratory** | **Lab Conduction & Record** | **Evaluating each expt. for 10 marks** | **20** | **50** |
| | **Laboratory Test -1** | **50** | **15** | |
| | **Laboratory Test -2** | **50** | **15** | |
| **SEE** | **Semester End Examination** | **100** | **50** | **50** |
| **Total Marks** | | | | **100** |

**SEMESTER END EXAMINATION (SEE)**

1. SEE marks for the practical course are 50 Marks. Practical examinations are to be conducted between the schedules mentioned in the academic calendar of the Institution.
2. All laboratory experiments are to be included for practical examination.
3. Evaluation of test write-up, conduction procedure, result and viva will be conducted jointly by examiners.
4. Rubrics suggested for SEE, writeup-20%, Conduction procedure and result in -60%, Viva-voce 20% of maximum marks. SEE for practical shall be evaluated for 100 marks and scored marks shall be scaled down to 50 marks.
5. Change of experiment is allowed only once and 15% of Marks allotted to the Conduction procedure part are to be made zero. The minimum duration of SEE is 03 hours.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | 2 | 1 | 2 | – | – | 2 | 2 | 2 | – | 2 |
| **CO2** | 2 | 3 | 3 | 2 | 2 | – | – | 2 | 2 | 2 | 2 | 2 |
| **CO3** | 2 | 3 | 3 | 2 | 3 | – | – | 2 | 2 | 2 | 2 | 2 |
| **CO4** | 2 | 2 | 3 | 3 | 2 | – | – | 2 | 2 | 2 | 2 | 2 |
| **CO5** | 2 | 3 | 3 | 3 | 3 | – | – | 2 | 2 | 2 | 3 | 3 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

MOOGAMBIGAI CHARITABLE AND EDUCATIONAL TRUST

# Rajarajeswari College of Engineering

(An Autonomous Institution under Visvesvaraya Technological University, Belagavi)
#14, Ramohalli Cross, Kumbalagodu, Mysore Road, Bengaluru–560074

# Common Courses

## V & VI Semester

## UG – B.E (2024 Scheme)

# INDEX


| Sl. No. | Course Code | Course Title | Page No. |
|---|---|---|---|
| 1. | B24BEK507 | Biology for Engineers | 1 |
| 2. | B24ESK510 | Environmental Science and E-Waste Management | 3 |
| 3. | B24RMK606 | Research Methodology and IPR | 5 |
| 4. | B24PRJ607 | Capstone Project work: Phase I | 7 |
| 5. | B24IKK610 | Indian Knowledge System | 12 |
| 6. | B24NCK591/691 | National Service Scheme (NSS) | 14 |
| 7. | B24NCK592/692 | National Cadet Corps (NCC) | 16 |
| 8. | B24NCK593/693 | Physical Education (PE) | 17 |
| 9. | B24NCK594/694 | Yoga | 24 |
| 10. | B24NCK595/695 | Music | 32 |

| Semester-V | | | | | |
|---|---|---|---|---|---|
| **Biology for Engineers**<br>**Category: BSC**<br>**(Common to All)** | | | | | |
| Course Code | : | **B24BEK507** | CIE | : | 50 Marks |
| Teaching Hours L : T : P : S | : | 2:0:0:2 | SEE | : | 50 Marks |
| Total Hours | : | 30 | Total | : | 100 Marks |
| Credits | : | 2 | SEE Duration | : | 2 Hrs |

| **Course Learning Objective is** | |
|---|---|
| 1. | To familiarize the students with the basic biological concepts and their engineering applications. |
| 2. | To enable the students with an understanding of biodesign principles to create novel devices and structures. |
| 3. | To provide the students an appreciation of how biological systems can be re-designed as substitute products for natural systems. |
| 4. | To motivate the students to develop interdisciplinary vision of biological engineering. |

| **Module– 1** | **No. of Hours** |
|---|---|
| **Introduction to Biology:** The cell: the basic unit of life, Structure and functions of a cell. The Plant Cell and animal cell, Prokaryotic and Eukaryotic cell, Stem cells and their application.<br>**Biomolecules:** Properties and functions of Carbohydrates, Nucleic acids, proteins, lipids. Importance of special biomolecules; Enzymes (Classification (with one example each), Properties and functions), vitamins and hormones. | 6 |
| **Module– 2** | **No. of Hours** |
| **Application of Biomolecules:** Carbohydrates in cellulose-based water filters production, PHA and PLA in bio plastics production, Nucleic acids in vaccines and diagnosis, Proteins in food production. | 6 |
| **Module– 3** | **No. of Hours** |
| **Adaptation of Anatomical Principles for Bioengineering Design:** Brain as a CPU system. Robotic arms for prosthetics. Engineering solutions for Parkinson's disease. Eye as a Camera system, bionic eye. Heart as a pump system, pace makers, defibrillators. Lungs as purification system, Heart-lung machine. Kidney as a filtration system, dialysis systems. | 6 |
| **Module– 4** | **No. of Hours** |
| **Nature-Bioinspired Materials and Mechanisms:** Echolocation, Photosynthesis. Bird flying, Lotus leaf effect, Shark skin, Kingfisher beak. Human Blood substitutes - hemoglobin-based oxygen carriers (HBOCs) and perflourocarbons (PFCs). | 6 |
| **Module– 5** | **No. of Hours** |
| **Trends in Bioengineering:** DNA origami and Biocomputing, Bioprinting techniques and materials. Bioimaging and Artificial Intelligence for disease diagnosis. Bioconcrete. Biomining. | 6 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Elucidate the basic biological concepts via relevant industrial applications and case studies. |
| CO2 | Evaluate the principles of design and development, for exploring novel bioengineering projects. |
| CO3 | Corroborate the concepts of biomimetics for specific requirements. |
| CO4 | Think critically towards exploring innovative biobased solutions for socially relevant problems. |

| **Text Books** | |
|---|---|
| 1. | Biology for Engineers, Rajendra Singh C and Rathnakar Rao N, Rajendra Singh C and Rathnakar Rao N Publishing, Bengaluru, 2023. |
| 2. | Human Physiology, Stuart Fox, Krista Rompolski, McGraw-Hill eBook. 16th Edition, 2022 |

**Web links and Video Lectures (E-Resources)**

- https://nptel.ac.in/courses/121106008
- https://freevideolectures.com/course/4877/nptel-biology-engineers-other-non-biologists
  https://ocw.mit.edu/courses/20-020-introduction-to-biological-engineering-design-spring-2009

| | |
|---|---|
| • https://ocw.mit.edu/courses/20-010j-introduction-to-bioengineering-be-010j-spring-2006<br>• https://www.coursera.org/courses?query=biology | |
| **Activity Based Learning (Suggested Activities in Class)/ Practical Based learning** | |
| 1. | Group Discussion of Case studies. |
| 2. | Model Making and seminar/poster presentations. |
| 3. | Design of novel device/equipment like Cellulose-based water filters, Filtration system. |

**ASSESSMENT DETAILS (BOTH CIE AND SEE)**

The assessment in each course is divided equally between Continuous Internal Evaluation (CIE) and the Semester End Examination (SEE), with each carrying 50% weightage. To qualify and become eligible to appear for SEE, in the CIE, a student must score at least 40% of 50 marks, i.e., 20 marks. To pass the SEE, a student must score at least 35% of 50 marks, i.e., 18 marks. Notwithstanding the above, a student is considered to have passed the course, provided the combined total of CIE and SEE is at least 40 out of 100 marks.

## CONTINUOUS INTERNAL EVALUATION (CIE):

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment1** | **50** | **30 (Average of Best two Assessments)** | **50** |
| | **Internal Assessment2** | **50** | | |
| | **Internal Assessment3** | **50** | | |
| **AAT** | **Any Two Assessments as per Regulations** | **20** | **20** | |
| **SEE** | **Semester End Examination** | **50** | **50** | **50** |
| **Total Marks** | | | | **100** |

## SEMESTER END EXAMINATION (SEE):

1. The Question paper shall be set for 50 marks and duration of SEE is 2 Hours.
2. Two questions of 10 marks ( with minimum two sub questions) from each module with internal choice.
3. Students should answer five full questions, selecting one full question from each module.
4. Mention COs, POs, Bloom's Taxonomy levels in the question paper.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO8 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | - | - | - | - | 1 | 1 | - | 1 | 1 | 1 |
| CO2 | 1 | - | - | - | - | 1 | - | 1 | - | 1 | 1 |
| CO3 | 1 | - | - | - | - | 1 | - | 1 | - | 1 | 1 |
| CO4 | 1 | - | - | - | - | 1 | 2 | - | 2 | 1 | 1 |
| CO5 | 1 | - | - | - | - | 1 | 2 | 2 | 1 | 2 | 1 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| Semester-V | | | | | |
|---|---|---|---|---|---|
| **Environmental Science and E-Waste Management**<br>**Category: NCMC**<br>**(Common to All)** | | | | | |
| Course Code | : | **B24ESK510** | CIE | : | 100 Marks |
| Teaching Hours L : T : P : S | : | 2:0:0:0 | SEE | : | - |
| Total Hours/Semester | : | 30 | Total | : | 100 Marks |
| Credits | : | PP | SEE Duration | : | - |

| **Course Learning Objective is** | |
|---|---|
| 1. | To identify the major challenges of environment issues. |
| 2. | To develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection. |
| 3. | To analyze the impact of issues w. r. t. waste management. |

| **Module– 1** | **No. of Hours** |
|---|---|
| **Ecosystem and Sustainability:** Ecosystems: Structure of Ecosystem, Types: Forest, Desert, Wetlands, Riverine, Oceanic ecosystems.<br>**Sustainability:** 17SDG targets and possible actions. | 6 |
| **Module– 2** | **No. of Hours** |
| **Natural Resources and Energy:** Natural Resources: Water resources-Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water.<br>**Energy:** Different types of energy, Conventional sources & Non-Conventional sources of energy, solar energy. Wind energy, Hydrogen as an alternative energy. | 6 |
| **Module– 3** | **No. of Hours** |
| **Environmental Pollution:** Water Pollution, Noise pollution, Air pollution (Sources, Impacts, Preventive measures and public Health Aspects.<br>**Global Environmental Concerns (Concept, policies and case-studies):** Ground water depletion/recharging, Climate Change; Acid Rain; Ozone Depletion; Radon and Fluoride problem in drinking water; Resettlement and rehabilitation of people, Environmental Toxicology. | 6 |
| **Module– 4** | **No. of Hours** |
| **Waste management:** Solid Waste Management, types and sources, functional elements of SWM, Biomedical Waste Management-Sources, Characteristics.<br>**Environmental Legislation:** Solid Waste Management Rules, 2016, Biomedical Waste Management Rules, 2016. | 6 |
| **Module– 5** | **No. of Hours** |
| **E-Waste Management:** E-waste; composition and generation. Global context in e-waste; E-Waste pollutants, E-waste hazardous properties, Effects of pollutant (E-waste) on human health and surrounding environment, domestic e-waste disposal, Basic principles of E waste management, Component of E Waste management.<br>E-waste (Management and Handling) Rules, 2011; and E-waste (Management) Rules, 2022-Salient Features and its implications. | 6 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Comprehend the principles of ecology and environmental issues pertaining to air, land and water on a global scale. |
| CO2 | Acquire observation skills for solving problems related to the environment. |
| CO3 | Conduct survey to describe the realities of waste management system. |

| **Text Books** | |
|---|---|
| 1. | S M Prakash, "Environmental Studies" 3rd Edition, Elite Publishing House, Mangalore, 2018. |
| 2. | Hester R.E., and Harrison R.M, Electronic Waste Management. Science, 2009. |

| **Reference Text Books** | |
|---|---|
| 1. | Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited. |
| 2. | Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi. |

| **Web links and Video Lectures (e-Resources):** | |
|---|---|
| 1. | https://www.youtube.com/playlist?list=PLXTQoJ3yDR1Tp9O8R7RZGmm_GdheHqM2w |
| 3. | https://sdgs.un.org/goals |
| 4. | https://kspcb.karnataka.gov.in/waste-management/biomedical-waste |
| 5. | E Waste (Management) Rules, 2022: https://kspcb.karnataka.gov.in/sites/default/files/inlinefiles/ E%20Waste%20%28Management%29%20Rules%2C%202022.pdf |

**ASSESSMENT DETAILS (CIE only)**

The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (40 marks out of 100).

**CONTINUOUS INTERNAL EVALUATION (MCQs)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| **Theory** | **Internal Assessment-1** | **50** | **50 (Average of Best two Assessments)** | **100** |
| | **Internal Assessment-2** | **50** | | |
| | **Internal Assessment-3** | **50** | | |
| **AAT** | **Two Assessments as per Regulations** | **50** | **50** | |
| **Total Marks** | | | | **100** |

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 0 |
| CO2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| CO3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| Semester-V | | | | | |
|---|---|---|---|---|---|
| **Research Methodology & IPR (RMIPR)**<br>**Category: AEC** | | | | | |
| Course Code | : | **B24RMK606** | CIE | : | 50 Marks |
| Teaching Hours L:T: P : S | : | 1 : 0 : 0 : 3 | SEE | : | 50 Marks |
| Total Hours/Semester | : | 15 | Total | : | 100 Marks |
| Credits | : | 1 | SEE Duration | : | 1 Hours |

| **Course Learning Objective is** | |
|---|---|
| 1. | To understand the fundamentals of research, types of research methodologies, and ethical practices involved in engineering research. |
| 2. | To develop the ability to conduct effective literature review, technical reading, and identify research gaps for problem formulation. |
| 3. | To design research methodologies, apply appropriate sampling techniques, and perform data collection and hypothesis testing. |
| 4. | To analyze, interpret, and present research findings through structured technical reports and research papers using standard tools and formats. |
| 5. | To understand Intellectual Property Rights (IPR), patenting processes, and their role in innovation, society, and sustainable development. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Introduction to Research & Research Methodology:** Meaning, Objectives of Engg. Research & Characteristics of good research, Research Methods v/s Research Methodology, Types of engineering research, Descriptive v/s Analytical, Applied v/s Fundamental, Quantitative v/s Qualitative, Conceptual v/s Empirical, Research, Criteria of good research, Developing a research plan, Ethics & plagiarism in Engineering Research with Research Practice for different types of Research Misconducts, Case Study and Practice Sessions | 3 |
| **Module – 2** | **No. of Hours** |
| **Literature Review and Technical Reading:** What is literature review or survey, New & Existing Knowledge, Bibliographic Databases, Search Engines, Google & Google Scholar, Effective Search, Conceptualizing Research Reviews, Gaps in research, Critical and Creative Reading, Taking Notes While Reading, Defining research problems, Datasheets, Importance of literature review in defining a problem, Primary and secondary sources of info - Review articles, treatise, monographs, papers from conferences & journals, case-studies, reports, patents, web and net searching ; Identifying gap areas from literature review, Citations, Acknowledgments, Case Studies and Practice sessions. | 3 |
| **Module – 3** | **No. of Hours** |
| **Research Design and Methods:** Research design, Basic Principles, Need for research design, Features of good design, Development of Models, Developing a research plan, Exploration, Description, Diagnosis, Simulation and Experimentations, Determining experimental and sample designs, Sampling design, Steps in sampling design, Characteristics of a good sample design, Types of sample designs, Measurement and scaling techniques, Methods of data collection, Collection of primary & secondary data, Data collection instruments, Hypothesis - Basic Concepts, Testing of hypotheses, flow diagram for hypotheses testing, Case Study and Practice Sessions. | 3 |
| **Module – 4** | **No. of Hours** |
| **Technical Report & Paper Writing:** Interpretation and report writing, Techniques of interpretations, Structure and components of scientific reports, Different steps in the report preparation – Layout, organization, structure and language of the report, Illustrations and tables with result analysis (simulation or experimentation), Types of reports, technical reports, project reports (mini & major) and research thesis, Research tools for writing, Conclusions, Future works, Flow of a research article, Research paper writing for conference & journals, text-books, Case Study and Practice Sessions. | 3 |
| **Module – 5** | **No. of Hours** |
| **IPRs & Copyrights:** Intellectual Property, what are patents & copyrights in IP? Role of IP in the Economic and Cultural Development of the Society, IP Governance, Invention and Creativity, Importance and Protection of Intellectual Property Rights (IPRs), A brief summary of - Patents, Monographs, Copyrights ©, Registered Firms ®, Trademarks ™, Industrial Designs (Design Patent, | 3 |

| | |
|---|---|
| Utility Patent, Granted Patent, Commercialized Patent) – Indian &Foreign Patents, Steps in Patenting — Application and Procedures with Searches, Case Study and Practice Sessions. | |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| **CO1** | Explain research fundamentals, methodologies, and ethical practices in engineering research. |
| **CO2** | Perform literature review, identify research gaps, and formulate research problems. |
| **CO3** | Design research experiments, collect data, and apply hypothesis testing methods. |
| **CO4** | Analyze results and prepare technical reports and research papers. |
| **CO5** | Apply IPR concepts including patents, copyrights, and trademarks in research and innovation. |

**Research Papers & Technical References (Web-links & Video Resources)**

- IEEE Xplore – https://ieeexplore.ieee.org
- Scopus – https://www.scopus.com
- Science Direct – https://www.sciencedirect.com
- Google Scholar – https://scholar.google.com
- Research Gate – https://www.researchgate.net

**ASSESSMENT DETAILS (BOTH CIE AND SEE)**

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for the SEE minimum passing mark is 35% of the maximum marks (18 out of 50 marks). A student shall be deemed to have satisfied the academic requirements and earned the credits allotted to each subject/ course if the student secures a minimum of 40% (40 marks out of 100) in the sum total of the CIE (Continuous Internal Evaluation) and SEE (Semester End Examination) taken together.

**CONTINUOUS INTERNAL EVALUATION (MCQs)**

| CIE | Type of Assessment | Max. Marks | Max. Marks Scaling Down to | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 30 (Average of Best two Assessments) | 50 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| AAT | Two Assessments as per regulations | 20 | 20 | |
| SEE | Semester End Examination | 50 | | 50 |
| Total Marks | | | | 100 |

**SEMESTER END EXAMINATION (SEE)**

SEE paper shall be set for 50 questions, each of the 01 marks. The pattern of the question paper is MCQ (multiple choice questions). The time allotted for SEE is 01 hour. The student has to secure a minimum of 35% of the maximum marks meant for SEE.

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **CO1** | 3 | 2 | - | 1 | - | - | 2 | - | - | - | 2 |
| **CO2** | 3 | 3 | - | 2 | 1 | - | 1 | 1 | 1 | - | 2 |
| **CO3** | 2 | 3 | 3 | 3 | 2 | - | 1 | 2 | - | - | 2 |
| **CO4** | 2 | 2 | 3 | 3 | 3 | - | 1 | 2 | 3 | 1 | 2 |
| **CO5** | 1 | 1 | - | - | 1 | 3 | 3 | 1 | 2 | 2 | 2 |

L = Low (**1**), M = Medium (**2**), H = High (**3**) - Blank = No significant mapping correlation levels

| Semester - VI | | | | | |
|---|---|---|---|---|---|
| **Capstone Project Work: Phase - I**<br>**Category: SDC** | | | | | |
| Course Code | : | **B24PRJ607** | CIE | : | 100 Marks |
| Teaching Hours L:T:P:S | : | 0:0:4:0 | SEE | : | - |
| Total Hours | : | 60 | Total | : | 100 Marks |
| Credits | : | 2 | SEE Duration | : | - |

## Capstone Project: Phase -I and Phase - II

The Capstone project is a comprehensive, year-long project carried out in two phases during **6th and 7th** semesters of the undergraduate program. It integrates knowledge and skills acquired from multiple courses and disciplines to address a complex, real-world problem.

This project provides students with an opportunity to apply scientific principles, engineering methodologies, and technological tools to conceive, design, implement and evaluate an engineering solution.

It serves as a culminating academic experience to demonstrate program outcomes, including problem-solving ability, teamwork, communication skills, and practical application of engineering principles. Students can take up project individually or in a group not exceeding 4 students. The group may have students from the same discipline and drawn from different disciplines.

**Types of Capstone Projects**: Capstone projects undertaken for one year may fall into one or more of the following categories:

a) Research-Oriented Projects :
   • Focus on investigating new concepts, theories, or technologies.
   • Aim to generate new knowledge or contribute to academic research.
b) Experimental/Analytical Projects
   • Based on laboratory or field experiments to validate a hypothesis or study a phenomenon.
   Simulation/ Modelling Projects
   • Including detailed data collection, analysis, and interpretation.
   • Use computational tools to model, simulate, and predict system behavior.
   • Reduce the need for physical prototyping in the initial stages.
c) Industrial/Industry-Sponsored Projects
   • Carried out in collaboration with an industry partner.
   • Address real-world engineering problems faced by the organization.
d) Interdisciplinary/Multidisciplinary Projects
   • Combine knowledge and techniques from multiple engineering domains or other fields such as management, medicine, or environmental sciences.
e) Entrepreneurial/Innovation Projects
   • Focus on product or service innovation with potential for commercialization.

- Phase I Evaluation: Capstone Project Phase-I shall have only Continuous Internal Evaluation (CIE).
- In case disciplinary capstone project, the CIE shall be conducted by the Departmental Project Review Committee, which consists of a Senior Professor, the Project Guide, and one additional faculty member appointed by the principal for projects within the parent discipline.
- For Interdisciplinary Projects, the Project Review Committee will consist of one Senior Professor, the department and interdepartmental Project Guides and one faculty member from a department related to the interdisciplinary project. The committee members are appointed by the principal of the college.
- Phase I evaluation shall be based on rubrics designed to measure graduate attributes defined by NBA. Successful completion of Phase-I allows the student to proceed to Phase-II.
- Phase II Evaluation: CIE of Phase shall be evaluated as indicated with phase -I evaluation. The SEE shall be conducted by two examiners. The assessment shall be based on rubrics designed to measure graduate attributes.

| **Review #** | **Agenda** | **Assessment** | **Review Assessment Weightage** |
|---|---|---|---|
| **Review1** | Project Synopsis / Proposal Evaluation | Rubric R1 | 15 |
| **Review2** | Mid-Term Project Evaluation | Rubric R2 | 30 |
| **Review3** | End Semester Project Evaluation | Rubric R3 | 30 |
| **Review4** | Project Report Evaluation | Rubric R4 | 15 |
| **Review5** | Evaluation by Guide | Rubric R5 | 10 |
| **Continuous Internal Evaluation (CIE)** | | | 100 |
| **Total Marks** | | | 100 |

## Rubric #R1: Project Synopsis / Proposal Evaluation Maximum Marks: 15

| | | Excellent (5 Marks) | Good (4 Marks) | Average (3 Marks) | Acceptable (2 Marks) | Unacceptable (1 Marks) |
|---|---|---|---|---|---|---|
| a | **Identification of Problem Domain and Detailed Analysis** | Detailed and extensive explanation of the purpose and need of the project | Good explanation of the purpose and need of the project | Average explanation of the purpose and need of the project | Moderate explanation of the purpose and need of the project | Minimal explanation of the purpose and need of the project |
| b | **Study of the Existing Systems and Feasibility of Project Proposal** | Detailed and extensive explanation of the specifications and the limitations of the existing systems | Collects a great deal of information and good study of the existing systems | Moderate study of the existing systems; collects some basic information | Explanation of the specifications and the limitations of the existing systems not very satisfactory; limited information | Minimal explanation of the specifications and the limitations of the existing systems; incomplete information |
| c | **Objectives and Methodology of the Proposed Work** | All objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are clearly specified | Good justification to the objectives; Methodology to be followed is specified but detailing is not done | Incomplete justification to the objectives proposed; Steps are mentioned but unclear; without justification to objectives | Only Some objectives of the proposed work are well defined; Steps to be followed to solve the defined problem are not specified properly | Objectives of the proposed work are either not identified or not well defined; Incomplete and improper specification |

## Rubric #R2: Mid-term Project Evaluation Maximum Marks: 30

| Level of Achievement | | | | | | |
|---|---|---|---|---|---|---|
| | | **Excellent(10)** | **Good (8)** | **Average(6)** | **Acceptable(4)** | **Unacceptable (2)** |
| a | **Design Methodology** | • Division of problem in to modules and good selection of computing framework.<br>• Appropriate design methodology and properly justification. | • Division of problem into modules and good selection of computing frame work.<br>• Design methodology not properly justified. | • Division of problem into modules but in appropriate selection of computing framework.<br>• Design methodology not defined properly. | • Partial division of problem into modules and inappropriate selection of computing framework.<br>• Design methodology not defined properly. | • Modular approach not adopted.<br>• Design methodology not defined. |
| b | **Planning of Project Work and Team Structure** | • Time frame properly specified and being followed.<br>• Appropriate distribution of project work. | • Time frame properly specified and being followed.<br>• Distribution of project work inappropriate. | • Time frame properly specified, but not being followed.<br>• Distribution of project work un-even. | • Time frame properly specified, but not being followed.<br>• Un-even distribution of Project work and no synchronization. | • Time frame not properly specified.<br>• In-appropriate distribution of project work. |

| | | | | | | |
|---|---|---|---|---|---|---|
| c | **Demonstration and Presentation** | • Objectives achieved as per time frame.<br>• Contents of presentations are appropriate and well arranged.<br>• Proper eye contact with audience and clear voice with good spoken language. | • Objectives achieved as per time frame<br>• Contents of presentations are appropriate but not well arranged Satisfactory demonstration, clear voice with good spoken language but eye contact not proper | • Objectives achieved as per time frame.<br>• Contents of presentations are appropriate but not well arranged.<br>• Presentation not satisfactory and average demonstration | • Objectives not achieved as per time frame.<br>• Contents of presentations are not appropriate.<br>• Eye contact with few people and unclear voice. | • No objectives achieved.<br>• Contents of Presentations are not appropriate and not well delivered.<br>• Poor delivery of presentation. |

## Rubric #R3: End Semester Internal Project Evaluation Maximum Marks: 30

| | | Excellent(10) | Good (8) | Average(6) | Acceptable(4) | Unacceptable (2) |
|---|---|---|---|---|---|---|
| a | **Incorporation of Suggestions** | Changes are made as per modifications suggested during midterm evaluation and new innovations added | Changes are made as per modifications suggested during mid-term evaluation and good justification | All major changes are made as per modifications suggested during midterm evaluation | Few changes are made as per modifications suggested during midterm evaluation | Suggestions during mid-term evaluation are not incorporated |
| b | **Project Demonstration** | • All defined objectives are achieved.<br>• Each module working well and properly demonstrated.<br>• All modules of project are well integrated and system working is accurate. | • All defined objectives are achieved.<br>• Each module working well and properly demonstrated.<br>• Integration of all modules not done and system working is not very satisfactory. | • All defined objectives are achieved.<br>• Modules are working well in isolation and properly demonstrated.<br>• Modules of project are not properly integrated. | • Some of the defined objectives are achieved.<br>• Modules are working well in isolation and properly demonstrated<br>• Modules of project are not properly integrated. | • Defined objectives are not achieved.<br>• Modules are not in proper working form that further leads to failure of integrated system. |
| c | **Presentation** | • Contents of presentations are appropriate and well delivered.<br>• Proper eye contact with audience and clear voice with good spoken language | • Contents of presentations are appropriate and well delivered.<br>• Clear voice with good spoken language but less eye contact with audience | • Contents of presentations are appropriate but not well delivered .<br>• Eye contact with few people and unclear voice | • Contents of presentations are not appropriate.<br>• Eye contact with few people and unclear voice | • Contents of presentations are not appropriate and not well delivered .<br>• Poor delivery of presentation |

## Rubric #R4: Project Report Evaluation Maximum Marks: 15

| Level of Achievement | | | | | | |
|---|---|---|---|---|---|---|
| | | **Excellent(5)** | **Good (4)** | **Average(3)** | **Acceptable(2)** | **Unacceptable (1)** |
| **a** | **Project Report** | • Project report is according to the specified format.<br>• References and citations are appropriate and well mentioned. | • Project report is according to the specified format.<br>• References and citations are appropriate but not mentioned well. | • Project report is according to the specified format but some mistakes.<br>• In-sufficient references and citations. | • Project report is not fully according to the specified format.<br>• In-sufficient references and citations | • Project report not prepared according to the specified format.<br>• References and citations are not appropriate |
| **b** | **Description of Concepts and Technical Details** | • Complete explanation of the key concepts.<br>• Strong description of the technical requirements of the project. | • Complete explanation of the key concepts.<br>• In-sufficient description of the technical requirements of the project. | • Complete explanation of the key concepts but little relevance to literature.<br>• In-sufficient description of the technical requirements of the project. | • All key concepts are not explained and very little relevant to literature.<br>• In-sufficient description of the technical requirements of the Project. | • Inappropriate explanation of the key concepts.<br>• Poor description of the technical requirements of the project. |
| **c** | **Conclusion and Discussion** | • Results are presented in very appropriate manner<br>• Project work is well summarized and concluded.<br>• Future extensions in the project are well specified. | • Results are presented in good manner.<br>• Project work summary and conclusion not very appropriate.<br>• Future extensions in the project are specified. | • Results presented are not much Satisfactory.<br>• Project work summary and conclusion not very appropriate.<br>• Future extensions in the project are specified. | • Results presented are not much satisfactory.<br>• Project work summary and conclusion not very appropriate.<br>• Future extensions in the project are not specified. | • Results are not presented properly.<br>• Project work is not summarized and concluded.<br>• Future extensions in the project are not specified. |

## Rubric #R5: Evaluation by Guide Maximum Marks: 10

| Level of Achievement | | | | |
|---|---|---|---|---|
| | | **Excellent (5)** | **Satisfactory(3)** | **Unsatisfactory(2)** |
| **a** | **Self-Motivation, Determination and Regularity** | • Approaches the project with self-motivation and follows it through to completion.<br>• Reports to the guide regularly and consistent in work. | • Completes the project but sometimes lacks self-motivation.<br>• Reports to the guide but lacks consistency | • Lacks self-motivation and determination.<br>• Irregular in attendance and in consistent in work. |
| **b** | **Working with in a Team & Technical Knowledge and Awareness related to the Project** | • Collaborates and communicates in a group situation and integrates the views of others.<br>• Extensive knowledge related to the project. | • Exchanges some views but requires guidance to collaborate with others.<br>• Fair knowledge related to the project | • Makes little or no attempt to collaborate in a group situation.<br>• Lack sufficient knowledge. |

| Semester-VI | | | | | |
|---|---|---|---|---|---|
| **Indian Knowledge Systems**<br>**Category: HSMC**<br>**(Common to All)** | | | | | |
| Course Code | : | **B24IKK610** | CIE | : | 100 Marks |
| Teaching Hours L:T:P:S | : | 1:0:0:0 | SEE | : | - |
| Total Hours/Semester | : | 15 | Total | : | 100 Marks |
| Credits | : | PP | SEE Duration | : | - |

| **Course Learning Objective is** | |
|---|---|
| 1. | To facilitate the students with the concepts of Indian traditional knowledge and to make them understand the Importance of roots of knowledge system. |
| 2. | To make the students understand the traditional knowledge and analyse it and apply it to their day-to-day life. |

| **Module– 1** | **No. of Hours** |
|---|---|
| **Introduction to Indian Knowledge Systems (IKS):** Overview, Vedic Corpus, Philosophy, Character scope and importance, traditional knowledge vis-a-vis indigenous knowledge, traditional knowledge vs. western knowledge. | 5 |
| **Module– 2** | **No. of Hours** |
| **Traditional Knowledge in Humanities and Sciences:** Lingistics, Number and measurements-Mathematics, Chemistry, Physics, Art, Astronomy, Astrology, Crafts and Trade in India and Engineering and Technology. | 5 |
| **Module– 3** | **No. of Hours** |
| **Traditional Knowledge in Professional domain:** Town planning and architecture-Construction, Health, wellness and Psychology-Medicine, Agriculture, Governance and public administration, United Nations Sustainable development goals. | 5 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Provide an overview of the concept of the Indian Knowledge System and its importance. |
| CO2 | Appreciate the need and importance of protecting traditional knowledge. |
| CO3 | Recognize the relevance of Traditional knowledge in different domains. |
| CO4 | Establish the significance of Indian Knowledge systems in the contemporary world. |

| **Text Books** | |
|---|---|
| 1. | Introduction to Indian Knowledge System- concepts and applications, B Mahadevan, Vinayak Rajat Bhat, Nagendra Pavana R N, 2022, PHI Learning Private Ltd, ISBN-978-93- 91818-21-0 |
| 2. | Traditional Knowledge System in India, Amit Jha, 2009, Atlantic Publishers and Distributors (P) Ltd., ISBN-13: 978-8126912230, |
| 3 | Knowledge Traditions and Practices of India, Kapil Kapoor, Avadesh Kumar Singh, Vol. 1, 2005, DK Print World (P) Ltd., ISBN 81-246-0334, |

**ASSESSMENT DETAILS (CIE only)**
The weightage of Continuous Internal Evaluation (CIE) is 100%. The minimum passing mark for the CIE is 40% of the maximum marks (40 marks out of 100).

**CONTINUOUS INTERNAL EVALUATION (MCQs)**

| CIE | Type of Assessment | Max. Marks | Max. Marks | Total Marks |
|---|---|---|---|---|
| Theory | Internal Assessment-1 | 50 | 100<br>(Sum of Best two Assessments) | 100 |
| | Internal Assessment-2 | 50 | | |
| | Internal Assessment-3 | 50 | | |
| **Total Marks** | | | | **100** |

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 1 | 0 | 0 | 0 | 0 | 3 | 2 | 0 | 0 | 0 | 0 |
| CO2 | 0 | 0 | 0 | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 1 |
| CO3 | 0 | 0 | 0 | 0 | 0 | 2 | 2 | 0 | 0 | 0 | 2 |

Level 3 - High, Level 2 - Moderate, Level 1 - Low

| SEMESTER-V & VI | | | | | |
|---|---|---|---|---|---|
| **NATIONAL SERVICE SCHEME (NSS)**<br>**Category: NCMC** | | | | | |
| Course Code | : | B24NCK591/691 | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | --- |
| Total Hours | : | 50 | Total | : | 100 Marks |
| Credits | : | -- | SEE Duration | : | -- |

| **Course Objectives** | |
|---|---|
| 1. | Understand the community in which they work |
| 2. | Identify the needs and problems of the community and involve the min problem-solving |
| 3. | Develop among themselves a sense of social & civic responsibility & utilize their knowledge in finding practical solutions to individual and community problems |
| 4. | Develop competence required for group-living and sharing of responsibilities & gain skills in mobilizing community participation to acquire leadership qualities and democratic attitudes |
| 5. | Develop capacity to meet emergencies and natural disasters & practice national integration and social harmony |

| **CONTENT** | **No. of Hours** |
|---|---|
| 1. Organic farming, Indian Agriculture (Past, Present and Future) Connectivity for marketing.<br>2. Waste management–Public, Private and Govt. organization.<br>3. Setting of the information imparting club for women leading to contribution in social and economic issues.<br>4. Water conservation techniques–Role of different take holders–Implementation.<br>5. Preparing an actionable business proposal for enhancing the village income and approach for implementation.<br>6. Helping local schools to achieve good results and enhance their enrolment in Higher/ technical/ vocational education.<br>7. Developing Sustainable Water management system for rural areas and implementation approaches.<br>8. Contribution to any national level initiative of Government of India.Digital India, Skill India, Swachh Bharat, Atmanirbhar Bharath, Make in India, Mudra scheme, Skill development programs etc.<br>9. Spreading public awareness under rural outreach programs.(minimum 5 programs).<br>10. Social connect and responsibilities.<br>11. Plantation and adoption of plants. Know your plants.<br>12. Organize National integration and social harmony events/ workshops / seminars. (Minimum 02 programs).<br>13. Govt. school Rejuvenation and helping them to achieve good infrastructure.<br><br>**NOTE:**<br><br>Students have to take up any one activity on the above said topics and have to prepare content for awareness and technical contents for implementation of the projects and have to present strategies for implementation of the same. Compulsorily students have to attend one camp.<br><br>CIE will be evaluated based on their presentation, approach and implementation strategies. | 50 |

| **Course Outcomes:** After completing the course, the students will be able to | |
|---|---|
| CO1 | Understand the importance of his/her responsibilities towards society. |
| CO2 | Analyze the environmental and societal problems/issues and will be able to design solutions for the same. |
| CO3 | Evaluate the existing system and to propose practical solutions for the same for sustainable development. |
| CO4 | Implement government or self-driven projects effectively in the field. |

**CO-PO Mapping**

| PO / CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | 3 | 2 | - | - | 3 | - | - | - | - | - | - |
| CO2 | 3 | 2 | - | - | 3 | - | - | - | - | - | - |
| CO3 | 3 | 2 | - | - | 3 | - | - | - | - | - | - |
| CO4 | 3 | 2 | - | - | 3 | - | - | - | - | - | - |

Level 3- Highly Mapped, Level 2-Moderately Mapped, Level 1-Low Mapped, Level 0- Not Mapped

| SEMESTER-V & VI | | | | | |
|---|---|---|---|---|---|
| **NATIONAL CADET CORPS (NCC)**<br>**Category: NCMC** | | | | | |
| Course Code | : | B24NCK592/692 | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | -- |
| Total Hours | : | 50 | Total | : | 100 Marks |
| Credits | : | -- | SEE Duration | : | -- |

| Course Objectives | |
|---|---|
| 1. | To develop character, camaraderie, discipline, secular outlook, the spirit of adventure, sportsman spirit, and ideals of selfless service amongst cadets by working in teams, honing qualities such as self-discipline, self-confidence, self-reliance, and dignity of labour in the cadets. |
| 2. | To create a pool of organized, trained, and motivated youth with leadership qualities from all walks of life, who will serve the Nation regardless of which career they choose |
| 3. | To provide a conducive environment to motivate young Indians to choose the Armed Forces as a career |

| Content | No. of Hours |
|---|---|
| **Unit 1. Personality Development:** Group Discussions - Change your Mindset, Public Speaking.<br><br>**Unit 2.LeadershipDevelopment:** Case Studies– APJ Abdul Kalam, DeepaMalik, Maharana Pratap, N Narayan Murthy etc.<br><br>**Unit 3. Disaster management:** Disaster Management Capsule, Organization, Types of Disasters, Essential Services, Assistance, Civil Defense Organization.<br><br>**Unit 4.Adventure:**AdventureActivities<br><br>**Unit 5. Border & Coastal Areas:** History, Geography &Topography of Border/ Coastal Areas.<br><br>**Unit 6. Drill:** Arm Drill, Rifle ke saath Savdhan, Vishram aur Aram se, Rifle ke saath Parade Paraur Saj, Riflekesaath Visarjan, LineTod, Bhumi Shastra aur Uthao Shastra, BagalShastra aur Baju Shastra.<br><br>**Unit 7.WeaponTraining**: Short Range firing.<br><br>**Unit 8.MapReading:**SettingofMap,FindingsNorthandOwnPosition<br><br>**Unit 9.Field Craft & Battle Craft:** Observation, Camouflage, Concealment.<br><br>**Unit 10. Obstacle Training:** Obstacle training - Introduction, Safety-measures, Benefits. Obstacle Course- Straight balance, Clear Jump, Gate Vault, Zig- Zag Balance, High Wall | 50 |

| SEMESTER-V & VI | | | | | |
|---|---|---|---|---|---|
| **PHYSICAL EDUCATION(PE)**<br>**Category: NCMC** | | | | | |
| Course Code | : | B24NCK593/693 | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | -- |
| Total Hours | : | -- | Total | : | 100 Marks |
| Credits | : | -- | SEE Duration | : | -- |

| Semester | Course |
|---|---|
| III | Fitness Components<br>Kabaddi / KhoKho |
| IV | Athletics<br>Volleyball<br>Throw ball |
| V | Athletics<br>Football / Hockey |
| V | Athletics<br>Cricket / Base ball |
| VI | Athletics<br>Netball / Basketball |
| VI | Individual Games<br>Handball / Badminton |

**Notes:**

- One Hour of Lecture is equal to 1 Credit
- One Hour of Tutorial is equal to1 Credit (Except Languages)
- Two Hours of Practical is equal to 1 Credit
- SEE: Semester End Examination
- CIE: Continuous Internal Examination
- L+T+P: Lecture + Tutorial + Practical

**Guideline for Athletic and Sports**

| Semester & Course Code | Course Title | Content | No. of Hours |
|---|---|---|---|
| 3rd Semester<br><br>B24NCK393 | **Fitness Components** | Meaning and Importance, Fit India Movement, Definition of fitness, Components of fitness, Benefits of fitness, Types of fitness and Fitness tips.<br>***Practical Components: Speed, Strength, Endurance, Flexibility, and Agility***<br>**KABADDI**<br>**A. Fundamental skills**<br>➢ Skills in Raiding: Touching with hands, Use of leg-toe touch, squat leg thrust, side kick, mule kick, arrow fly kick, crossing of baulk line. Crossing of Bonus line.<br>➢ Skills of holding the raider: Various formations, catching from particular position, different catches, catching formation and techniques.<br>➢ Additional skills in raiding: Escaping from various holds, techniques of escaping from chain formation, offense and defense.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretations and duties of the officials.** | Total-32 hours<br>2 hours / week |
| | Speed<br>Strength<br>Endurance<br>Agility<br>Flexibility | | |
| | Kho kho | **A. Fundamental skills**<br>➢ Skills in Chasing: Sit on the box (Parallel & Bullet toe method), Get up from the box (Proximal & Distal foot method), Give Kho (Simple, Early, Late & Judgment), Pole Turn, Pole Dive, Tapping, Hammering, Rectification of foul.<br>➢ Skills in running: Chain Play, Ring play and Chain & Ring mixed play.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretations and duties of the officials.** | |
| | Kabaddi | **A. Fundamental skills**<br>1. Skills in Raiding: Touching with hands, Use of leg-toe touch, squat leg thrust, side kick, mule kick, arrow fly kick, crossing of baulk line. Crossing of Bonus line.<br>2. Skills of holding the raider: Various formations, catching from particular position, different catches, catching formation and techniques.<br>3. Additional skills in raiding: Escaping from various holds, techniques of escaping from chain formation, offense and defense.<br>4. Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretations and duties of the officials** | |

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| **4th Semester**<br><br>**B24NCK493** | **Athletics**<br>**Track-**Sprints<br>**Jumps-**Long Jump<br>**Throws-**Shot Put | **Track Events**<br>➢ Starting Techniques: Standing start and Crouch start (its variations) use of Starting Block.<br>➢ Acceleration with proper running techniques.<br>➢ Finishing technique: Run Through, Forward Lunging and Shoulder Shrug.<br>**Long Jump**: Approach Run, Take-off, Flight in the air (Hang Style / Hitch Kick) and Landing<br>**Shot put:** Holding the Shot, Placement, Initial Stance, Glide, Delivery Stance and Recovery (Perry O'Brien Technique) | Total-32 hours<br>2 hours / week |
| | Volleyball | **A. Fundamental skills**<br>Service: Under arm service, Side arm service, Tennis service, Floating service.<br>Pass: Under arm pass, Over head pass.<br>Spiking and Blocking.<br>Game practice with application of Rules and Regulations<br>**B. Rules and their interpretation and duties of officials.** | |
| | Throw ball | **A. Fundamental skills**<br>Overhand service, Side arm service, two hand catching, one hand overhead return, side arm return.<br>**B. Rules and their interpretations and duties of officials** | |

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| **5th Semester**<br><br>**B24NCK593** | **<u>Athletics</u>**<br>**Track-11**0&400 Meters Hurdles<br>**Jumps-**High Jump<br>**Throws-**Discuss Throw | **110 Meters and 400 Meters:**<br>Hurdling Technique: Lead leg Technique, Trail leg Technique, Side Hurdling, Over the Hurdles<br>Crouch start (its variations) use of Starting Block.<br>Approach to First Hurdles, In Between Hurdles, Last Hurdles to Finishing.<br>**High jump**: Approach Run, Take-off, Bar Clearance (Straddle) and Landing.<br>**Discus Throw**: Holding the Discus, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle). | |

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| **5th Semester**<br><br>**B24NCK593** | Football | **A. Fundamental Skills**<br>➢ Kicking: Kicking the ball with inside of the foot, Kicking the ball with Full Instep of the foot, Kicking the ball with Inner Instep of the foot, Kicking the ball with Outer Instep of the foot and Lofted Kick.<br>➢ Trapping: Trapping-the Rolling ball, and the Bouncing ball with sole of the foot.<br>➢ Dribbling: Dribbling the ball with Instep of the foot, Dribbling the ball with Inner and Outer Instep of the foot.<br>➢ Heading: In standing, running and jumping condition.<br>➢ Throw-in: Standing throw-in and Running throw-in.<br>➢ Feinting: With the lower limb and upper part of the body.<br>➢ Tackling: Simple Tackling, Slide Tackling.<br>➢ Goal Keeping: Collection of Ball, Ballclearance-kicking, throwing and deflecting.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | Total-32 hours<br>2 hours / week |
| | Hockey | **A. Fundamental Skills**<br>➢ Passing: Short pass, Long pass, push pass, hit<br>➢ Trapping.<br>➢ Dribbling and Dozing.<br>➢ Penalty stroke practice.<br>➢ Penalty corner practice.<br>➢ Tackling: Simple Tackling, Slide Tackling.<br>➢ Goal Keeping, Ball clearance-kicking, and deflecting.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |
| | **Athletics**<br>**Track**-Relays<br>**Jumps**-Triple Jump<br>**Throws**-Javelin Throw | **Relay Race**: Starting, Baton Holding / Carrying, Baton Exchange in between zone, and Finishing.<br>**Triple Jump**: Approach Run, Take-off, Flight in the Hop, Step, Jump and Landing.<br>**Javelin Throw**: Grip, Carry, and Recovery (3/5 Impulse stride).<br>Release. | Total-32 hours<br>2 hours / week |
| | **CRICKET** | **A. Fundamental Skills**<br>➢ Batting-Forward Defense Stroke, Backward Defense Stroke, Off Drive, On Drive, Straight Drive, Cover Drive, Square Cut.<br>➢ Bowling-Out-swing, In-swing, Off Break, Leg Break and Googly.<br>➢ Fielding: Catching - The High Catch, The Skim Catch, The Close Catch and throwing at the stumps from different angles. Long Barrier and Throw, Short Throw, Long Throw, Throwing on the Turn.<br>➢ Wicket Keeping<br>**B. Rules and their interpretation and duties of officials.** | |

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| | **BASEBALL** | **A. Fundamental Skills**<br>Player Stances–walking, extending walking, L stance, cat stance.<br>Grip – standard grip, choke grip.<br>Batting – swing and bunt.<br>Pitching.<br>Baseball: Slider, fast pitch, curve ball, drop ball, rise ball, change up, knuckle ball, screw ball.<br>**B. Rules and their interpretation and duties of officials.** | |

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| **6th Semester**<br><br>**B24NCK693** | **Athletics**<br>Combined Events-Heptathlon & Decathlon<br>**Jumps**- Pole Vault<br>**Throws**-Hammer Throw | Combined Events: Heptathlon all the7 events<br>Decathlon: All10Events<br>**Pole Vault**: Approach Run, Planting the Pole, Take-off, Bar Clearance and Landing.<br>**Hammer Throw**: Holding the Hammer, Initial Stance Primary Swing, Turn, Release and Recovery (Rotation in the circle). | Total-32 hours<br>2 hours / week |
| | **Basketball** | **A. Fundamental Skills**<br>➢ Passing: Two hands Chest Pass, Two hands Bounce Pass, One hand Base ball Pass, Side arm Pass, Overhead Pass, Hook Pass.<br>➢ Receiving: Two hand receiving, one hand receiving, Receiving in stationary position, receiving while jumping and Receiving while Running.<br>➢ Dribbling: How to start dribble, drop dribble, High Dribble, Low Dribble, Reverse Dribble, Rolling Dribble.<br>➢ Shooting: Lay-up shot and its variations, one hand set shot, two hands jump shot, Hook shot, Free Throw.<br>➢ Rebounding: Defensive rebound and Offensive rebound.<br>➢ Individual Defence: Guarding the player with the ball and without the ball, pivoting.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |
| | **Netball** | **A. Fundamental skills**<br>➢ Catching: one handed, two handed, with feet grounded and in flight.<br>➢ Throwing (Different passes and their uses): One hand passes (shoulder, high shoulder, underarm, bounce, lob), two hand passes (Push, overhead and bounce).<br>➢ Footwork: Landing on one foot, landing on two feet, Pivot, Running pass.<br>➢ Shooting: One hand, forward step shot, and back ward step shot. | |

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| | | ➢ Techniques of free dodge and sprint, sudden sprint, sprint and stop, sprinting with change at speed.<br>➢ Defending: Marking the player, marking the ball, blocking, inside the circle, outside the circle. Defending the circle edge against the passing.<br>➢ Intercepting: Pass and shot.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |
| | **Individual games**<br><br>Shuttle Badminton | **A. Fundamental skills**<br>➢ Basic Knowledge: Various parts of the Racket and Grip.<br>➢ Service: Short service, Long service, Long-high service.<br>➢ Shots: Over head shot, Defensive clear shot, Attacking clear shot, Drop shot, Net shot, Smash.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | Total-32 hours<br>2 hours / week |
| | Table Tennis | **A. Fundamental skills**<br>➢ Basic Knowledge: Various parts of the Racket and Grip (Shake Hand & Pen Hold Grip).<br>➢ Stance: Alternate & Parallel.<br>➢ Push and Service: Backhand & Forehand.<br>➢ Chop: Backhand & Forehand.<br>➢ Receive: Push and Chop with both Backhand & Forehand.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |
| | Hand ball | **A. Fundamental skills**<br>➢ Catching, Throwing and Ball control,<br>➢ Goal Throws: Jump shot, Center shot, Dive shot, Reverse shot.<br>➢ Dribbling: High and low.<br>➢ Attack and counter attack, simple counter attack, counter attack from two wings and center.<br>➢ Blocking, Goal Keeping and Defensive skills.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |
| | Ball Badminton | **A. Fundamental skills**<br>➢ Basic Knowledge: Various parts of the Racket and Grip.<br>➢ Service: Short service, Long service, Long-high service.<br>➢ Shots: Over head shot, Defensive clear shot, Attacking clear shot, Drop shot, Net shot, Smash.<br>➢ Game practice with application of Rules and Regulations.<br>**B. Rules and their interpretation and duties of officials.** | |

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2. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata.
3. Petipus, et al. Athlete's Guide to Career Planning, Human Kinetics.
4. Dharma, P. N. Fundamentals of Track and Field, Khel Sahitya Kendra, New Delhi.
5. Jain, R. Play and Learn Cricket, Khel Sahitya Kendra, New Delhi.
6. Vivek Thani, Coaching Cricket, Khel Sahitya Kendra, New Delhi.
7. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
8. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata
9. Naveen Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
10. Dubey, H. C. Basketball, Discovery Publishing House, New Delhi.
11. Rachana Jain, Teach Yourself Basketball, Sports Publication.
12. Jack Nagle, Power Pattern Of fences for winning basketball, Parker Publishing Co., New York. 13 Renu Jain, Play and Learn Basketball, Khel Sahitya Kendra, New Delhi.
13. Sally Kus, Coaching Volleyball Successfully, Human Kinetics.
14. Saha, A. K. Sarir Siksher Ritiniti, Rana Publishing House, Kalyani.
15. Bandopadhyay, K. Sarir Siksha Parichay, Classic Publishers, Kolkata

| SEMESTER-V & VI | | | | | |
|---|---|---|---|---|---|
| **YOGA**<br>**Category: NCMC** | | | | | |
| Course Code | : | B24NCK594/694 | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | -- |
| Total Hours | : | -- | Total | : | 100 Marks |
| Credits | : | -- | SEE Duration | : | -- |

| Semester | Course |
|---|---|
| III Semester | 1) Introduction of Yoga, Aim and Objectives of yoga, Prayer<br>2) Brief introduction of yogic practices for common man<br>3) Rules and regulations<br>4) Misconceptions of yoga<br>5) Suryanamaskara<br>6) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Prone line<br>d. Supine line |
| IV Semester | 1) Patanjali's Ashtanga Yoga<br>2) Suryanamaskara<br>3) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Prone line<br>d. Supine line<br>4) Kapalbhati<br>5) Pranayama |
| V Semester | 1) Patanjali's Ashtanga Yoga<br>2) Surya namaskara<br>3) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Proneline<br>d. Supineline<br>4) Kapalbhati<br>5) Pranayama |

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|---|---|
| | 1) Patanjali's Ashtanga Yoga<br>2) Suryanamaskara<br>3) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Prone line<br>d. Supine line<br>4) Kapalbhati<br>5) Pranayama |
| VI Semester | 1) Patanjali's Ashtanga Yoga<br>2) Suryanamaskara<br>3) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Prone line<br>d. Supine line<br>4) Kapalbhati<br>5) Pranayama |
| | 1) Patanjali's AshtangaYoga<br>2) Suryanamaskara<br>3) Different types of Asanas<br>a. Sitting<br>b. Standing<br>c. Prone line<br>d. Supine line<br>4) Kapalbhati<br>5) Pranayama<br>6) Shat Kriyas |

**Notes:**

- One Hour of Lectureisequalto1Credit
- One Hour of Tutorial is equal to 1Credit (Except Languages)
- Two Hours of Practical is equal to 1Credit
- SEE: Semester End Examination
- CIE: Continuous Internal Examination
- L+T+P: Lecture + Tutorial + Practical

**Guidelines for Yoga Syllabus**

| Semester & Course Code | Course Title | Content | No. of Hours |
|---|---|---|---|
| 3rd Semester<br><br>B24NCK394 | Introduction of Yoga, Aim and Objectives of yoga, Prayer | Yoga, its origin, history and development. Yoga, its meaning, definitions.<br>Different schools of yoga, importance of prayer | Total-32 hours<br>2 hours / week |
| | Brief introduction of yogic practices for common man | Yogic practices for common man to promote positive health | |
| | Rules and regulations | Rules to be followed during yogic practices by practitioner | |
| | Misconceptions of yoga | Yoga its misconceptions,<br>Difference between yogic and non yogic practices. | |
| | Suryanamaskara | Suryanamaskar prayer and its meaning, Need, importance and benefits of Suryanamaskar12 count, 2 rounds | |
| | Different types of Asanas<br>Sitting<br>➢ Padmasana<br>➢ Vajrasana<br>Standing<br>➢ Vrikshana<br>➢ Trikonasana<br>Prone line<br>➢ Bhujangasana<br>➢ Shalabhasana<br>Supine line<br>➢ Utthitadvipadasana<br>➢ Ardhahalasana | Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana. | |

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| **4th Semester**<br><br>**B24NCK494** | Patanjali's Ashtanga Yoga<br>➢ Yama<br>➢ Niyama | Patanjali's Ashtanga Yoga its need and importance.<br><u>Yama:</u> Ahimsa, satya, asteya, brahmacarya, aparigraha.<br><u>Niyama:</u> shoucha, santosh, tapa, svaadhyaya, Eshvara pranidhan | Total-32 hours<br>2 hours / week |
| | Suryanamaskara | Suryanamaskar 12 count, 4 rounds | |
| | Different types of Asanas<br>Sitting<br>➢ Sukhasana<br>➢ Paschimottanasana<br>Standing<br>➢ Ardhakati Chakrasana<br>➢ Parshva Chakrasana<br>Prone line<br>➢ Dhanurasana<br>Supine line<br>➢ Halasana<br>➢ Karna Peedasana | Asana, Need, importance of Asana. Different types of asana. Asana its meaning by name, technique, precautionary measures and benefits of each asana. | |
| | Kapalabhati | Meaning, importance and benefits of Kapalabhati.<br>40 strokes/min, 3 rounds | |
| | Pranayama<br>➢ Suryanuloma–Viloma<br>➢ Chandranuloma-Viloma<br>➢ Suryabhedana<br>➢ ChandraBhedana<br>➢ Nadishodhana | Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama | |

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| **5th Semester**<br><br>**B24NCK594** | Ashtanga Yoga<br>➢ Asana<br>➢ Pranayama | Patanjali's Ashtanga Yoga its need and importance. | Total-32 hours<br>2 hours / week |
| | Suryanamaskara | Suryanamaskar 12 count, 6 rounds | |
| | Different types of Asanas<br>Sitting<br>➢ Ardha Ushtrasana<br>➢ Vakrasana<br>Standing<br>➢ Urdhva Hastothanasana<br>➢ Hastapadasana<br>Prone line<br>➢ Padangushtha Dhanurasana<br>Supine line<br>➢ Sarvangasana<br>➢ Chakraasana | Asana, Need, importance of Asana. Different types. Asana its meaning by name, technique, precautionary measures and benefits of each asana. | |
| | Kapalabhati | Revision of practice 50 strokes/min, 3 rounds | |
| | Pranayama<br>➢ Surya Bhedana<br>➢ Ujjayi | Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, Precautionary measures and benefits of each Pranayama. | |
| | Ashtanga Yoga<br>➢ Pratyahara<br>➢ Dharana | Patanjali's Ashtanga Yoga its need and importance. | Total-32 hours<br>2 hours / week |
| | Suryanamaskara | Revisionofpractice12count, 8 rounds | |
| | Different types of Asanas<br>Sitting<br>➢ AakarnaDhanurasana<br>➢ YogamudrainPadmasana<br>Standing<br>➢ ParivrittaTrikonasana<br>➢ Utkatasana<br>Prone line<br>➢ PoornaBhujangasana/ | Asana, Need, importance of Asana.<br>Different types, Asana by name, technique, precautionary measures and benefits of each asana. | |

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| | Rajakapotasana<br>Supine line<br>➢ Navasana/Noukasana<br>➢ Pavanamuktasana | | |
| | Kapalabhati | Revision of practice 60 strokes/min, 3 rounds | |
| | Pranayama<br>➢ Sheetali<br>➢ Sheektari | Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, precautionary measures and benefits of each Pranayama | |

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| **6th Semester**<br><br>**B24NCK694** | Ashtanga Yoga<br>➢ Dhyana (Meditation)<br>➢ Samadhi | Patanjali's Ashtanga Yoga its need and importance. | Total-32 hours<br>2 hours / week |
| | Suryanamaskara | Revision of practice 12count, 10rounds. | |
| | Different types of Asanas<br>Sitting<br>➢ Vibhakta Paschimottanasana<br>➢ Yogamudra inVajrasana<br>Standing<br>➢ Parshvakonasana<br>➢ Ekapadbaddhapadmottanasana<br>Prone line balancing<br>➢ Mayurasana<br>Supine line<br>➢ Sarvangasana<br>➢ Setubandhasana<br>➢ Shavasanaa (Relaxation poisture) | Asana, Need, Importance of Asana.<br>Different types, Asana by name, technique, precautionary measures and benefits of each asana. | |
| | Kapalabhati | Revision of practice 80 strokes/min, 3 rounds | |

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| | Pranayama<br>➢ Bhastrika<br>➢ Bhramari | Meaning, Need, importance of Pranayama. Different types. Meaning by name, technique, Precautionary measures and benefits of each Pranayama. | |
| | Suryanamaskara | Revision of practice 12count, 12 rounds. | Total-32 hours<br>2 hours / week |
| | Different types of Asanas<br>Sitting<br>➢ Bakasana<br>➢ Hanumanasana<br>➢ Ekapada Rajakapotasana<br>Standing<br>➢ Vatayanasana<br>➢ Garudasana<br>➢ Natarajasana<br>Balancing<br>➢ Sheershasana<br>Supine line<br>➢ 1.Setubandha Sarvangasana<br>➢ Shavasanaa (Relaxation poisture) | Asana, Need, importance of Asana.<br>Different types, Asana by name, technique, precautionary measures and benefits of each asana. | |
| | Kapalabhati | Revision of practice 100 strokes/min, 3 rounds. | |
| | Pranayama<br>➢ Nadishodhana<br>➢ Ujjai<br>➢ Bhramari | Revision of practices | |
| | ShatKriyas<br>➢ Jalaneti & sutraneti<br>➢ Nouli (only for men)<br>➢ Sheetkarma Kapalabhati | Meaning, Need, importance of Shatkriya. Different types. Meaning by name, technique, precautionary measures and benefits of each Kriya | |

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- Tiruka: Shatkriyegalu (Kannada)
- Iyengar B K S: Yoga Pradipika (Kannada)
- Iyengar B K S: Light on Yoga (English)

| SEMESTER-V & VI | | | | | |
|---|---|---|---|---|---|
| **MUSIC**<br>**Category: NCMC** | | | | | |
| Course Code | : | B24NCK595/695 | CIE | : | 100 Marks |
| Teaching Hours L : T : P | : | 1:0:0 | SEE | : | -- |
| Total Hours | : | -- | Total | : | 100 Marks |
| Credits | : | -- | SEE Duration | : | -- |

| **Course Objectives** | |
|---|---|
| 1. | Identify the major traditions of Indian music, both through notations and aurally. |
| 2. | Analyze the compositions with respect to musical and lyrical content |
| 3. | Demonstrate an ability to use music technology appropriately in a variety of setting. |

| **Module – 1** | **No. of Hours** |
|---|---|
| **Preamble:** Contents of the curriculum intend to promote music as language to develop an analytical, Creative, and intuitive Understanding. For this the student must experience music through study and direct participation in improvisation and composition. Origin of the Indian Music: Evolution of the Indian music system, Understanding of Shruthi, Nada, Swara, Laya, Raga Tala, Mela. | 3 |
| **Module – 2** | **No. of Hours** |
| **Compositions:** Introduction to the types of composition in Carnatic Music- Geethe, Jath i, Swara, Swarajathi, Varna, Krithi, and Thillana, Notation System. | 3 |
| **Module – 3** | **No. of Hours** |
| **Composers:** Biography and contributions of Purandaradasa, Thyagaraja, Mysoro Vasudevacharya. | 3 |
| **Module – 4** | **No. of Hours** |
| **Music Instruments:** Classification and construction of string instruments, wind instrurments, percussion instruments, Idiophones (Ghana Vaadya), Examples of each class of Instrum ents | 3 |
| **Module – 5** | **No. of Hours** |
| **Abhyasa Gana:** Singing the swara exercises (Sarale Varase Only), Botation writing for Sarale Varase and Suladi Saptha Tala (Only in Mayamalavagowla Raga), Singing 4 Geethe in M alahari, and one jathi Swara, One Krithi in a Mela raga | 14 |

| **Course Outcomes**: At the end of the course, the students will be able to | |
|---|---|
| CO1 | Discuss the Indian system of music and relate it to other genres (Cognitive DOmain) |
| CO2 | Experience the emotions of composer and develop empathy (Affective Domain) |
| CO3 | Respond to queries on various patterns in a composition (Psycho Motor Domain) |

| **Text Books** | |
|---|---|
| 1. | Vidushi Vasantha Madhavi, "Theory of Music", Prism Publication, 2007. |
| 2. | T Sachidevi and T Sharadha (Thirumalai Sisters), Karnataka Sangeetha Dharpana- Vol. 1 (English), Shreenivaas Prakaashana, 2018. |

| **Reference Text Books** | |
|---|---|
| 1. | Lakshminarayana Subramaniam, Viji Subramanaim, "Classical Music of India: A Practical Guige", Tranqueber 2018. |
| 2. | R. Rangaramanuja Ayyangar, "History of South Indian (Carnatic) Music", Vipanci Charitable Trust; Third edition, 2019. |
| 3. | Ethel Rosenthal, "The Story of Indian Music and Its Istruments: A Study of the Present and a Record of the Past", Pilgrims Publishing, 2007. |
| 4. | Carnatic Music, National Institute of Open Schooling, 2019. |