`

**BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT**

(Autonomous Institute affiliated to VTU, Belagavi, Approved by AICTE New Delhi)

Yelahanka, Bengaluru 560064

# Bachelor of Engineering

# Department of Information Science and Engineering

## V Semester Scheme and Syllabus 2022 Scheme

## Effective from the AY 2024-25

**Approved in the BoS meeting held on 26/07/2024**

`

# Vision and Mission of the Department

## Vision

Emerge as center of learning in the field of Information Science & Engineering with technical competency to serve the society.

## Mission

To provide excellent learning environment through balanced curriculum, best teaching methods, innovation, mentoring and industry institute interaction.

`

# Program Educational Objectives (PEOs)

| PEOs | |
|---|---|
| **PEO 1** | Successful professional career in Information Science & Technology. |
| **PEO 2** | Pursue higher studies and research for advancement of knowledge in IT industry. |
| **PEO 3** | Exhibit professionalism and team work with social concern |

# Program Specific Outcomes (PSOs)

| PSOs | |
|---|---|
| **PSO-1** | Apply the knowledge of information technology to develop software solutions. |
| **PSO-2** | Design and develop hardware systems, manage and monitor resources in the product life cycle |

ಬಿ.ಎಂ.ಎಸ್. ತಾಂತ್ರಿಕ ಮತ್ತು ವ್ಯವಸ್ಥಾಪನಾ ಮಹಾವಿದ್ಯಾಲಯ
**BMS Institute of Technology and Management**
(An Autonomous Institution, Affiliated to VTU Belagavi)
Avalahalli, Doddaballapur Main Road, Bengaluru, Karnataka – 560064

**Ref.:** BMSIT&M/Exam/2023-24/ 104 **Date:** 21.09.2024

## CONTINUOUS INTERNAL EVALUATION (CIE) AND SEMESTER END EXAMINATION (SEE) PATTERN

(Applicable to UG students admitted from the 2022 batch, effective from the Academic year 2024-25 onwards)

The UG students admitted from the 2022 batch onwards are hereby informed to note the following regarding Continuous Internal Evaluation and Semester End Examination pattern:

- The Weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examination (SEE) is 50%.
- The Minimum passing mark for the CIE is 40% of the Maximum marks (i.e. 20 marks out of 50) and for the SEE minimum passing mark is 35% of the Maximum marks (i.e. 18 out of 50 marks).
- A student will be declared to have passed the course if they secure a minimum of 40% (i.e. 40 marks out of 100) in the combined total of the CIE and SEE.

The following tables summarize the CIE and SEE Patterns for the courses of various credits:

| INTEGRATED PROFESSIONAL COMPETENCE COURSE (IPCC) COURSES **4 OR 3 CREDITS** | | | | | | |
|---|---|---|---|---|---|---|
| **Evaluation Type** | | **Internal Assessments (IAs)** | **Test/ Exam Marks Conducted for** | **Marks to be scaled down to** | **Min. Marks to be Scored** | **Evaluation Details** |
| Theory Component | CIE - Internal Assessment (IA) Tests | CIE – Test 1 (1.5 hr) | 40 | 20 | - | The sum of the two internal assessment tests will be **80 Marks** and the same shall be scaled down to **20 Marks**. |
| | | CIE – Test 2 (1.5 hr) | 40 | | | |
| | CIE – CCA (Comprehensive Continuous Assessment) | CCA | 10 | 10 | - | Any one assessment method can be used from the list appended below. |
| | **Total CIE Theory** | | | **30** | **12** | |
| Practical Component | CIE - Practical | | 30 | 10 | - | Each laboratory experiment is to be |

| | | | | | |
|---|---|---|---|---|---|
| | | | | | assessed for **30 Marks** using appropriate rubrics. |
| | CIE Practical Test | 20 | 10 | - | One test after all experiments to be conducted for **20 Marks** |
| | **Total CIE Practical** | | **20** | **08** | |
| **Total CIE Theory + Practical** | | | **50** | **20** | |
| **SEE** | | 100 | 50 | 18 | SEE exam is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.** |
| **CIE + SEE** | | | **100** | **40** | |
| **Note:** The assessment of the laboratory component for the IPCC courses shall be restricted to CIE only. | | | | | |

| **PROFESSIONAL CORE COURSES (PCC) / ENGINEERING SCIENCE COURSES (ESC) 03 OR 02 CREDITS** | | | | | | |
|---|---|---|---|---|---|---|
| **Evaluation Type** | | **Internal Assessments (IAs)** | **Test/ Exam Marks Conducted for** | **Marks to be scaled down to** | **Min. Marks to be Scored** | **Evaluation Details** |
| Theory Component | CIE – IA Tests | CIE – Test 1 (1.5 hr) | 40 | 30 | - | The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**. |
| | | CIE – Test 2 (1.5 hr) | 40 | | | |
| | CIE - CCAs | CCA | 20 | 20 | - | Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given. |
| | **Total CIE Theory** | | | **50** | **20** | |
| **SEE** | | | 100 | 50 | 18 | SEE is a theory exam, conducted for **100 Marks**, scored marks are scaled down to **50 Marks.** |
| **CIE + SEE** | | | | **100** | **40** | |

| NON-IPCC COURSES<br>**01 CREDIT – MULTIPLE CHOICE QUESTION TYPE** | | | | | | |
|---|---|---|---|---|---|---|
| **Evaluation Type** | | **Internal Assessments (IAs)** | **Test/ Exam Marks Conducted for** | **Marks to be scaled down to** | **Min. Marks to be Scored** | **Evaluation Details** |
| Continuous Internal Evaluation Component | CIE – IA Tests (MCQs) | CIE – Test 1 (1 hr) | 40 | 40 | - | The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).**<br>The questions with 2 Marks can be framed based on a higher Bloom's level.<br>The sum of the two internal assessment tests will be **80 Marks**, and the same will be scaled down to **40 Marks**. |
| | | CIE – Test 2 (1 hr) | 40 | | | |
| | CIE - CCAs | CCA | 10 | 10 | - | Any One Assessment method can be used from the list provided below. |
| | **Total CIE** | | | **50** | **20** | |
| **SEE (MCQ Type)** | | | | 50 | 18 | The question paper pattern for this course shall be an **MCQ** of **1 or 2 Marks (s).**<br>The questions with 2 Marks can be framed based on higher Bloom's level.<br>MCQ-type question papers of 50 questions with each question of a **01 Mark**, the examination duration is 01 hour. |
| **CIE + SEE** | | | | **100** | **40** | |

| PROFESSIONAL CORE COURSE LABORATORY (PCCL) /ABILITY ENHANCEMENT COURSE LABORATORY (AEC)<br>**01 CREDIT** | | | | | |
|---|---|---|---|---|---|
| **Evaluation Type** | **Internal Assessments (IAs)** | **Test/ Exam Marks Conducted for** | **Marks to be scaled down to** | **Min. Marks to be Scored** | **Evaluation Details** |
| Continuous Internal Evaluation | CIE - Practical | 30 | 30 | | Each laboratory experiment is to be evaluated for **30 Marks** using appropriate rubrics. |
| | CIE - Practical Test | 50 | 20 | | One test after all experiments is to be conducted for **50 Marks** and to be scaled down to **20 Marks**. |
| | **Total CIE** | - | **50** | **20** | |
| Semester End Examination | | 100 | 50 | 18 | SEE to be conducted for **100 Marks**. |
| **CIE+SEE** | | **100** | | **40** | |

| NON-IPCC / ABILITY ENHANCEMENT COURSE (AEC)<br>**01 CREDIT – DESCRIPTIVE TYPE** | | | | | | |
|---|---|---|---|---|---|---|
| **Evaluation Type** | | **Internal Assessments (IAs)** | **Test/ Exam Marks Conducted for** | **Marks to be scaled down to** | **Min. Marks to be Scored** | **Evaluation Details** |
| Theory Component | CIE – IA Tests | CIE – Test 1 (1.5 hr) | 40 | 30 | - | The sum of the two internal assessment tests will be **80 Marks** and the same will be scaled down to **30 Marks**. |
| | | CIE – Test 2 (1.5 hr) | 40 | | | |
| | CIE - CCAs | CCA | 20 | 20 | - | Any Two assessment methods can be used from the list. If it is project-based, one CCA shall be given. |
| | **Total CIE Theory** | | | **50** | **20** | |

| | | | | |
|---|---|---|---|---|
| **SEE** | 100 | 50 | 18 | SEE is a theory exam, conducted for **100 Marks for 02 Hours duration**, scored marks are scaled down to **50 Marks.** |
| **CIE + SEE** | | **100** | **40** | |

**COMPUTER AIDED ENGINEERING DRAWING (BCEDK103/BCEDK203)**
**3 CREDIT**

| Evaluation Type | | Topics/ Modules | Computer Printout | Preparatory Sketch | Max Marks | Total Marks | Marks to be Scaled Down to | Min Marks to Pass |
|---|---|---|---|---|---|---|---|---|
| CIE | **Sketch Book and CAD Modelling** | Projection of Points | 10 | 05 | 15 | 200 | 20 | - |
| | | Projection of Lines | 10 | 10 | 20 | | | |
| | | Projection of Planes | 20 | 15 | 35 | | | |
| | | Projection of Solids | 40 | 20 | 60 | | | |
| | | Isometric Projections | 20 | 15 | 35 | | | |
| | | Development of lateral surfaces | 20 | 15 | 35 | | | |
| | **Test 1** | Module 1 & 2 | 24 | 06 | 30 | 70 | 20 | - |
| | | Module 3 | 32 | 08 | 40 | | | |
| | **Test 2** | Module 3 | 32 | 08 | 40 | 70 | | |
| | | Module 4 | 24 | 06 | 30 | | | |
| | **CCA 1** | Module 5 | 08 | 02 | 10 | 10 | 10 | - |
| | **CCA 2** | Module 5 | 08 | 02 | 10 | | | |
| **CIE Total** | | | | | | | **50** | **20** |
| **SEE** | | Module 1 & 2 | 24 | 06 | 30 | 100 | **50** | **18** |
| | | Module 3 | 32 | 08 | 40 | | | |
| | | Module 4 | 24 | 06 | 30 | | | |
| **CIE + SEE** | | | | | | | **100** | **40** |

| COMPUTER AIDED MODELLING FOR MANUFACTURING (BME305)<br>**1 CREDIT** | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| **Evaluation Type** | | **Topics/ Modules** | **Computer Printout** | **Preparatory Calculations / Sketch** | **Max Marks** | **Total Marks** | **Marks to be Scaled Down to** | **Min Marks to Pass** |
| **CIE** | **Sketch Book and CAD Modelling** | Module 1 | 60 | 30 | 90 | 200 | 20 | |
| | | Module 2 | 40 | 20 | 60 | | | |
| | | Module 3 | 40 | 10 | 50 | | | |
| | **Test 1** | Module 1 | 20 | 10 | 30 | 60 | 20 | - |
| | | Module 2 | 20 | 10 | 30 | | | |
| | **Test 2** | Module 1 | 20 | 10 | 30 | 60 | | |
| | | Module 3 | 20 | 10 | 30 | | | |
| | **CCA** | Module 1 | 30 | 10 | 40 | 40 | 10 | - |
| **CIE Total** | | | | | | | **50** | **20** |
| **SEE** | | Module 1 | 30 | 10 | 40 | 100 | **50** | **18** |
| | | Module 2 | 20 | 10 | 30 | | | |
| | | Module 3 | 20 | 10 | 30 | | | |
| **CIE + SEE** | | | | | | | **100** | **40** |

**Learning Activities for CCAs:**

A faculty member may choose the following CCAs based on the needs of the course:

1. Course project
2. Literature review
3. MOOC
4. Case studies
5. Tool exploration
6. GATE-based aptitude test
7. Open book tests
8. Industry integrated learning
9. Analysis of Industry / Technical / Business reports
10. Programming assignments with higher Bloom level
11. Group discussions
12. Industrial / Social / Rural projects

**CoE** 21/09/2024

**Dean - AA** 21/09/24

21/9/2024

**Principal**

**Copy To:**

1. The Vice-Principal, Deans, HoDs, and Associate HoDs
2. All faculty members and students of 2022, 2023, and 2024 batch.
3. Examination Section

# Scheme of V Semester

**BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT**
**(Autonomous Institute affiliated to VTU)**
**Scheme of Teaching and Examination: Effective from AY 2024 – 25**
**Choice Based Credit System (CBCS)**
**Common to CSE/ISE**

**UG PROGRAM: B.E. Information Science and Engineering (ISE)** — **Semester: V**

| Sl. No | Course Category | Course Code | Course Title | Teaching Department (TD)and Question Paper Setting Board (PSB) | Teaching Hours /Week Credits | | | | Examination | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | Theory Lecture L | Tutorial T | Practical / Drawing P | SDA S | Duration | CIE Marks | SEE Marks | Total Marks | Credits |
| 1 | HSMC | BCS501 | Software Engineering and Project Management | TD: ISE PSB: CSE/ISE | 3 | 0 | 0 | | 03 | 50 | 50 | 100 | 3 |
| 2 | IPCC | BCS502 | Computer Networks | | 3 | 0 | 1 | | 05 | 50 | 50 | 100 | 4 |
| 3 | PCC | BCS503 | Theory of Computation | | 4 | 0 | 0 | | 04 | 50 | 50 | 100 | 4 |
| 4 | PCCL | BCSL504 | Web Technology Lab | | 0 | 0 | 2 | | 02 | 50 | 50 | 100 | 1 |
| 5 | PEC | BCS505X | Professional Elective Course I | | 3 | 0 | 0 | | 03 | 50 | 50 | 100 | 3 |
| 6 | PW | BCS506 | Mini Project | | 0 | 0 | 3 | | 06 | 50 | 50 | 100 | 3 |
| 7 | AEC | BRMK507 | Research Methodology and IPR | Any Department | 2 | 0 | 0 | | 02 | 50 | 50 | 100 | 2 |
| 8 | MC | BESK 508 | Environmental Studies | TD: CV PSB: CV | 1 | 0 | 0 | | 01 | 50 | 50 | 100 | 1 |
| 9 | NCMC | BNSK509 | National Service Scheme (NSS) | NSS Coordinator | 0 | 0 | 0 | | 02 | 100 | - | 100 | 0 |
| | | BPEK509 | Physical Education (Sports and Athletics) | Physical Education Director | | | | | | | | | |
| | | BYOK509 | Yoga | Yoga Teacher | | | | | | | | | |
| | | BNCK509 | National Cadet Corps (NCC) | NCC officer | | | | | | | | | |
| | | BMUK509 | Music | Music Teacher | | | | | | | | | |
| **Total** | | | | | | | | | | **500** | **400** | **900** | **21** |

`

**HSMC**: Humanities, Social Sciences and Management Course**, IPCC**: Integrated Professional Core Course**, PCC**: Professional Core Courses, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **PW**: Project Work, **AEC**: Ability Enhancement Course, **MC**: Mandatory Course**, NCMC**: Non-Credit Mandatory Course, **L**: Lecture, **T**: Tutorial, **P**: Practical, **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation. **K**: This letter in the course code indicates common to all the stream of engineering

| **Professional Elective Course I (Note- Student should opt for the course which should not be similar to the course opted in 1st Year)** | | | |
|---|---|---|---|
| BCS505A | Computer Vision | BCS505B | Artificial Intelligence |
| BIS505C | Embedded Systems | BCS505D | Big Data Analytics |

I**ntegrated Professional Core Course (IPCC):** Refers to Professional Core Course Theory Integrated with practical's of the same course. Credit for IPCC can be 04 and its Teaching– Learning hours (L: T: P) can be considered as (3: 0: 2) or (2: 2: 2). The theory part of the IPCC shall be evaluated both by CIE and SEE. The practical part shall be evaluated by only CIE (no SEE). However, questions from the practical part of IPCC shall be included in the SEE question paper.

**National Service Scheme /Physical Education/Yoga/Music/National Credit Corps:** All students have to register for any one of the courses namely National Service Scheme (NSS), Physical Education (PE)(Sports and Athletics), Yoga(YOG), Music and National Credit Corps (NCC) with the concerned coordinator of the course during the first week of III semesters. Activities shall be carried out between III semester to the VI semester (for 4 semesters). Successful completion of the registered course and requisite CIE score is mandatory for the award of the degree. The events shall be appropriately scheduled by the colleges and the same shall be reflected in the calendar prepared for the NSS, PE, Yoga, Music and NCC activities. 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 professional elective (PEC) course 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 tech nology in the selected stream of engineering. Each group will provide an option to select one course. The minimum number of students' strengths for offering a professional elective is 10. However, this conditional shall not be applicable to cases where the admission to the program is less than 10.

**Mini Project:** The Mini Project Work is a part of the curriculum in the pre-final year. Mini Project is a course which will provide a platform to students to enhance their practical knowledge and skills by the development of small systems/applications. Based on the ability/abilities of the student/s and recommendations of the mentor, a Mini- project can be assigned to a group having not more than 4 students. A comprehensive report is to be prepared after completion of the project work.

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**
**Choice Based Credit System (CBCS) applicable for 2022 Scheme**
**SEMESTER – V**

**Software Engineering and Project Management** (3:0:0) 3
(Effective from the academic year 2024-25)

| | | | |
|---|---|---|---|
| Course Code | BCS501 | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P:S) | 3:0:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 hours Theory | Exam Hours | 3 Hours |

**Course Objectives:**

This course aims to prepare the students to:

1. Outline software engineering principles and activities involved in building software programs.
2. Describe the process of requirement gathering, classification, specification and validation.
3. Discuss various types of software testing practices and software evolution process.
4. Recognize the importance Project Management and Planning.

**Preamble:** Software Engineering refers to the systematic application of engineering approaches to the development of software. This course emphasizes essential principles, methodologies and practices of Software Engineering, requirement analysis to project management. Students will gain a comprehensive understanding of the software development life cycle and project management strategies.

**Module-1**

**Introduction:** Need for Software Engineering. Professional Software Development, Software Engineering Ethics. Case Studies.

**Software Processes:** Software Process models: Waterfall Model, Incremental Development, Spiral Model, Process activities.

Textbook 1: 1.1, 1,2, 1.3, 2.1, 2.2 **(8 Hours)**

**Module-2**

**Requirements Engineering:** Functional and Non-functional requirements, Requirements Engineering Processes. Requirements Elicitation and Analysis, Requirements Specification, Requirements validation, Requirements change.

Textbook 1: Chapter 4 **(8 hours)**

**Module-3**

**Design and Implementation**: Object-Oriented design using UML, Design pattern, Implementation issues. Open-source development.

Textbook 1: Chapter 7 **(8 hours)**

`

| Module-4 |
| --- |
| **Software Testing:** Development testing, Test-driven development, Release testing, User testing. Test Automation.<br>Textbook 1: Chapter 8 **(8 hours)** |
| **Module-5** |
| **Project management:** Risk management, Managing people, Teamwork<br>**Project planning**: Software pricing. Plan-driven development, Project scheduling.<br>Textbook 1: Chapter 22 and 23.1, 23.2, 23.3 **(8 hours)** |
| **Course outcomes:**<br>The students will be able to:<br>CO1: Understand the activities involved in software engineering and process models<br>CO2: Describe requirements Engineering to build various software models<br>CO3: Apply design principles in real-time applications<br>CO4: Analyze the different software testing processes and project management practices in software development. |
| **Textbook:**<br>1. **Ian Sommerville:** Software Engineering, 10th Edition, Pearson Education, 2016.<br><br>**References:**<br>1. **Paul C. Jorgensen**: Software Testing, A Craftsman"s Approach, 3rd Edition, Auerbach Publications, 2008.<br>2. **Mauro Pezze, Michal Young**: Software Testing and Analysis - Process, Principles and Techniques, Wiley India, 2009.) |
| **Alternate Assessment Tools (AATs) suggested:**<br>**Role play:** Demonstrating the Software Development Life Cycle (SDLC) through team activities, where students take on different roles such as developers, testers, and managers to illustrate the practical application of software engineering concepts and project management. |
| **Web links and Video Lectures (e-Resources):**<br>1. https://onlinecourses.nptel.ac.in/noc20 cs68/preview<br>2. https://www.youtube.com/watch?v=WxkP5KR_Emk&list=PLrjkTql3jnm9b5nrggx 7Pt1G 4UAHeFlJ<br>3. http://elearning.vtu.ac.in/econtent/CSE.php<br>4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html<br>5. https://nptel.ac.in/courses/128/106/12816012/ |

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**

Choice Based Credit System (CBCS) applicable for 2022 Scheme

**SEMESTER – V**

**COMPUTER NETWORKS** (3:0:2) 4

(Effective from the academic year 2024 -25)

| | | | |
|---|---|---|---|
| Course Code | BCS502 | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P:S) | 3:0:2 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 hours Theory + 12 hours practical's | Exam Hours | 3 Hours |
| Examination nature (SEE) | Theory | | |

**Course Objectives:**

This course will enable students to:

1. Understand fundamentals of data communication networks
2. Explain routers, IP and Routing Algorithms in network layer
3. Discuss transport layer services and understand UDP and TCP protocols
4. Demonstration of application layer protocols.

**Preamble:** This course provides an outline of network functions by introducing data communication and network concepts such as characteristics, functions, benefits, metrics, and attributes that describe network features and performance. In broad sense, Computer Networks are bringing fundamental transformation in our society from an industry economy to an information economy. Data Communications and Networking is an integral part of contemporary technologies and hence gained significance in engineering education. With constant upgrade in knowledge and skills Computer networking can lead to an exciting and rewarding career including the potential job opportunities such as Network Specialists, Network Technicians, Network administrators, Network analysts and Network solution Architects.

**Module – 1**

**Data Communications**: Data Communications Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Physical Layer: Data and Signals, Digital Signals, Transmission Impairment, Digital Transmission: Digital to digital conversion (Only Line coding: Polar, Bipolar and Manchester coding), PCM

**Text book 1:** Chapter:1,2,3 **(08 Hours)**

**Module – 2**

**Data Link Layer:** Error Detection and Correction: Introduction, Block coding, Cyclic codes, Checksum, Data link layer protocols, Stop and Wait, Go-Back-N, Selective repeat, Point to Point protocol (Framing, Transition phases only). Media Access control: Random Access, Controlled Access and Channelization

**Text book 1:** Chapter: 9,10,11 **(08 Hours)**

**Module – 3**

**IPV4 Addresses, Internet Protocols:** IPv4 and IPv6, Routing Algorithms: The Link-State (LS) Routing Algorithm, The Distance-Vector (DV) Routing Algorithm

**Text book 1:** Chapter: 18.4,18.4.l,18.4.2,18.4.3,19.1,19.1.1

**Text book 1:** Chapter: 4.4.4,4.5,4.5.1,4.5.2 **(08 Hours)**

`

**Module – 4**

**Introduction to Transport layer services, Connectionless Transport**: UDP, UDP Segment Structure, UDP Checksum, Connection-Oriented Transport TCP: TCP Segment Structure, Round-Trip Time Estimation and Timeout, TCP Connection Management

**Text book 2**: 3.1,3.3,3.5.2,3.5.3,3.5.6 **(08 Hours)**

**Module – 5**

**Application Layer: Principles of Network Applications**: Network Application Architectures, Processes Communicating, Application-Layer Protocols. The Web and HTTP: Overview of HTTP, Non-persistent and Persistent Connections, HTTP Message Format, File Transfer: FTP Commands & Replies, Electronic Mail in the Internet: SMTP, Mail Message Format, Mail Access Protocols, DNS; The Internet's Directory Service: Services Provided by DNS, Overview of How DNS Works, DNS Records and Messages, Socket Programming

**Text book 2**: 2.1.1,2.1.2,2.1.5,2.2.1-,2.2.3, 2.3.1,2.4.12.4.3,2.4.4, 2.5.1-2.5.3,2.7 **(08 Hours)**

**PRACTICAL COMPONENT OF IPCC**

| SL. No. | Experiments |
|---|---|
| 1 | Implementation of Cyclic Redundancy Check for error correction and detection. |
| 2 | Write a program for congestion control using leaky bucket algorithm |
| 3 | Write a program to find the shortest path between vertices using bellman-ford algorithm |
| 4 | Implement a client Server program using TCP and UDP |
| 5 | Implement three nodes point - to - point network with duplex links between them. Set the queue size, vary the bandwidth and find the number of packets dropped |
| 6 | Simulate a four-node point-to-point network with the links connected as follows: n0 - n2, nl - n2 and n2 - n3. Apply TCP agent between n0-n3 and UDP between nl-113. Apply relevant applications over TCP and UDP agents, changing the parameter and determine the number of packets sent by TCP I UDP |
| 7 | Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination |
| 8 | Implement simple ESS and with transmitting nodes in wire-less LAN by simulation and determine the performance with respect to transmission of packets. |

**Course outcomes (Course Skill Set):**

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

CO1: Apply Computer networking concepts to perform data communication between different entities.

CO2: Analyse different layer services and protocols

CO3: Analyse the algorithms to provide congestion control, routing and processes communication.

CO4: Demonstrate algorithms for different concepts of computer networks

`

**Suggested Learning Resources:**

**Textbooks:**

1. Behrouz A Forouzan, Data and Communications and Networking, Fifth Edition, McGraw Hill
2. James F Kurose and Keith W Ross, Computer Networking, A Top-Down Approach, Sixth Edition, Pearson,2017 .

**References:**

1. Alberto Leon-Garcia and Indra Widjaja: Communication Networks - Fundamental Concepts
2. Larry L. Peterson and Bruce S. Davie: Computer Networks - A Systems Approach, 6th Edition, Elsevier, 2007.

**Alternate Assessment Tools (AATs) suggested:**

Demonstration and Survey on network architecture of various organizations

**Web links and Video Lectures (e-Resources):**

1. Computer Networks and Internet Protocol - Course (nptel.ac.in)

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**

Choice Based Credit System (CBCS) applicable for 2022 Scheme

**SEMESTER – V**

**Theory of Computation** (4:0:0) 4

(Effective from the academic year 2024 -25)

| | | | |
|---|---|---|---|
| Course Code | BCS503 | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P:S) | 4:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 50 hours Theory | Exam Hours | 3 Hours |
| Examination Nature | Theory | | |

**Course Objectives:**

This course will enable students to:

1. Apply the core concepts in Automata and Theory of Computation
2. Design Grammars for context free languages
3. Prove theorems in automata theory using suitable properties
4. Design PDA and Turing machines for suitable languages

**Preamble**

In this course, we delve into the elegant theories and intricate models that define what is computationally possible and impossible. From finite automata to Turing machines, from regular languages to undecidability, we explore the boundaries and capabilities of computation itself.

**Module – 1**

**Introduction to Finite Automata:**

Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. Finite automata with Epsilon-transitions.

**Text book : 1.5, 2.2, 2.3, 2.5** **(10 hours)**

**Module – 2**

**Regular expressions, Properties of Regular Languages:** Finite Automata and Regular Expressions; Applications of Regular Expressions. Kleene's theorem. Regular languages: Proving languages not to be regular languages; Closure properties of regular languages; Equivalence and minimization of automata.

**Text Book : 3.1, 3.2, 3.3, 4.1, 4.2, 4.4** **(10 hours)**

**Module – 3**

**Context-Free Grammars and Languages:** Context–free grammars; Writing a grammar, Leftmost derivation, rightmost derivation, Parse Trees; Applications; Ambiguity in grammars and Languages.

**Text Book: 5.1, 5.2, 5.3, 5.4** **(10 hours)**

`

| Module – 4 |
|---|
| **Properties of Context-Free Languages:** Normal forms for CFGs. Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata.<br><br>**Text Book: 7.1, 6.1, 6.2, 6.3, 6.4** **(10 hours)** |
| **Module – 5** |
| **Introduction to Turing Machine:** Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.<br>**Recap:** Summary of the Course<br><br>**Text Book: 8.1, 8.2, 8.3, 8.4, 8.6** **(10 hours)** |
| **Course Outcomes:**<br>The students will be able to:<br>CO1: Understand the concept of abstract machines and their power to recognize the languages.<br>CO2:Apply the regular expressions/finite state machines to solve the computing problems<br>CO3: Design grammars, PDA, and Turing machines for formal languages.<br>CO4: Analyze the relationship of language classes, grammar and automata. |

**Textbooks:**

1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman ,Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd Edition, 2007

**Reference Books:**

1. Peter Linz, An Introduction to Formal Languages and Automata, 3rd Edition, Narosa Publishers, 1998.
2. K.L.P. Mishra, Theory of Computer Science, Automata, Languages, and Computation, PHI Learning, 3rd Edition, 2009.
3. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education, 2012/2013.
4. John C Martin, Introduction to Languages and Automata Theory, Tata McGraw- Hill, 3rd Edition, 2007.

**Alternate Assessment Tools (AATs) suggested:**

- Application of JFLAP Tool to solve sample problems.
- Assignment questions on decidability and undecidability.

**Web links and Video Lectures (e-Resources):**

1. https://www.geeksforgeeks.org/theory-of-computation-automata-tutorials/
2. https://brilliant.org/wiki/finite-state-machines/

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**
Choice Based Credit System (CBCS) applicable for 2022 Scheme
**SEMESTER – V**

**Web Technology Lab** (0:0:2) 1
(Effective from the academic year 2024 -25)

| | | | |
|---|---|---|---|
| Course Code | BCSL504 | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 0:0:2 | SEE Marks | 50 |
| Total Number of Contact Hours | 15 | Exam Hours | 1 |

**Course Objectives:**
This course will enable students to:
1. Illustrate the Semantic Structure of HTML and CSS
2. Compose forms and tables using HTML and CSS
3. Design Client-Side programs using JavaScript and Server-Side programs using PHP
4. Infer Object Oriented Programming capabilities of PHP.

**Preamble:** This course is intended to teach the basics involved in publishing content on the World Wide Web. This includes the fundamentals of how the Internet and the web function, and a general grounding introduction to more advanced topics such as programming and scripting. This will also expose students to the basic tools and applications used in Web technologies.

**List Of Experiments**

| SI.No | Experiments |
|---|---|
| **1** | Write a JavaScript to design a simple calculator to perform the following operations: sum, product, difference and quotient. |
| **2** | Write a JavaScript code that displays text "TEXT-GROWING" with increasing font size in the interval of 100ms in RED COLOR, when the font size reaches S0pt it displays "TEXTSHRINKING" in BLUE color. Then the font size decreases to Spt. |
| **3** | Develop and demonstrate a HTMLS file that includes JavaScript script that uses functions for the following problems:<br>a. Parameter: A string<br>b. Output: The position in the string of the left-most vowel<br>c. Parameter: A number<br>d. Output: The number with its digits in the reverse order |
| **4** | Design an XML document to store information about a student in an engineering college affiliated to VTU. The information must include USN, Name, and Name of the College, Programme, Year of Joining, and email id. Make up sample data for 3 students. Create a CSS style sheet and use it to display the document. |
| **5** | Write a PHP program to keep track of the number of visitors visiting the web page and to display this count of visitors, with proper headings. |
| **6** | Write a PHP program to display a digital clock which displays the current time of the server. |
| **7** | Write the PHP programs to do the following: |

`

| | |
|---|---|
| | a. Implement simple calculator operations.<br>b. Find the transpose of a matrix.<br>c. Multiplication of two matrices.<br>d. Addition of two matrices. |
| **8** | Write a PHP program named states.py that declares a variable states with value "Mississippi Alabama Texas Massachusetts Kansas". write a PHP program that does the following:<br>a. Search for a word in variable states that ends in xas. Store this word in element O of a list named states List.<br>b. Search for a word in states that begins with k and ends in s. Perform a case-insensitive comparison. [Note: Passing re.las a second parameter to method compile performs a case-insensitive comparison.] Store this word in elementl of states List.<br>c. Search for a word in states that begins with M and ends in s. Store this word in element 2 of the list.<br>Search for a word in states that ends in a. Store this word in element 3 of the list |
| **9** | Write a PHP program to sort the student records which are stored in the database using selection Output: The position in the string of the left-most vowel sort. |

**Course Outcomes:**

The students will be able to:

CO1: Apply the concepts of mark-up languages CSS and JavaScript in developing dynamic web pages.
CO2: Compare the concepts of client-side and server-side, and demonstrate how server-side concepts can be used to create dynamic web pages using PHP.
CO3: Develop a web application project using HTML, CSS, JavaScript, PHP and database.

**Textbooks:**


1. Randy Connolly, Ricardo Hoar, "Fundamentals of Web Development", 1st Edition, Pearson Education India. (ISBN:978-9332575271).
2. Robert W. Sebesta: Programming the World Wide Web, 4th Edition, Pearson Education, 2008. (Listed topics only from Chapters 1 to 9, 11 to 15).


**Alternate Assessment Tools (AATs) suggested:**

1. Mini project using appropriate framework.

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**
Choice Based Credit System (CBCS) applicable for 2022 Scheme
**SEMESTER – V**

**COMPUTER VISION** (3:0:0) 3
(Effective from the academic year 2024-25)

| | | | |
|---|---|---|---|
| Course Code | BCS505A | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P:S) | 0:0:2:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 | Exam Hours | 03 |

**Course Objectives:**

This course enables students to:

1. Be familiar with both the theoretical and practical aspects of computing with images.
2. Have described the foundation of image formation, measurement, and analysis.
3. Understand the geometric relationships between 2D images and the 3D world.
4. Explore the principles of state-of-the-art deep neural networks.

**Preamble:**

Computer vision is an important applied research area encompassing aspects from geometry, machine learning, probabilistic models, optimization etc. The course consists of various important aspects of computer vision namely geometry, motion, image features, and low-level and high-level image labelling. The course is designed such that some fundamental frameworks as well as some contemporary methods are covered

**Module – 1**

**Introduction:** What is computer vision? Image formation: Geometric primitives and transformations Photometric image formation, digital camera
**Image processing:** Point operators, Linear filtering, Non-linear filtering

**Text book-1:** Chapter 1.1, Chapter 2, Chapter 3.1, 3.2, 3.3.1 **(8 Hours)**

**Module – 2**

**Model fitting and optimization:** Scattered data interpolation, Variation methods and regularization, Markov random fields.
**Deep learning:** Deep neural networks, Convolutional networks

**Text book-1:** Chapter 4.1, ,4.2, 4.3, 5.3,5.4 **(8 Hours)**

**Module – 3**

**Recognition:** Instance recognition , Image classification , Object detection, Semantic segmentation
**Feature detection and matching:** Contour tracking , Lines and vanishing points, Segmentation

**Text book-1:** 6.1,6.2, 6.3, 6.4,7.3, 7.4, 7.5 **(8 Hours)**

**Module – 4**

**Computational photography:** Image matting and compositing , Texture analysis and synthesis
**Structure from motion and SLAM:** Two-frame structure from motion, Multi-frame structure from motion, Simultaneous localization and mapping (SLAM)

**Text book-1:** Chapter 10.4, 10.5, 11.3, 11.4, 11.5. **(8 Hours)**

`

| Module – 5 |
| --- |
| **Depth estimation:** Epipolar geometry, Sparse correspondence, Dense correspondence, Local methods, Global optimization, Multi-view stereo, Monocular depth estimation<br>**3D reconstruction:** Model-based reconstruction, Recovering texture maps and albedos.<br><br>**Text book-1:** Chapter 12 (except 12.6, 12.9), 13.6.13.7 **(8 Hours)** |
| **Course Outcomes:**<br>The student should be able to:<br>CO1: Understand the fundamental concepts, terminology, theories in computer vision<br>CO2: Apply various methods of computer vision related to multi-scale representation, edge detection and detection of other primitives, stereo, motion and object recognition.<br>CO3: Design innovative computer vision applications or systems<br>CO4: Evaluate performance of computer vision algorithms in diverse applications like, biomedical, automobile etc., |
| **Textbooks:**<br>Richard Szeliski, "Computer Vision: Algorithms and Applications", Texts in Computer Science, 2nd edition, Springer Cham, published in 2022,<br>**Reference Books:**<br>1. Olivier Faugeras, "Three-Dimensional Computer Vision", Artificial Intelligence series, The MIT PresslISBN: 9780262061582.<br>2. D.Forsyth and J.Ponce , "Computer Vision - A modern approach", Prentice Hall Robot Vision, by 8. K. P. Horn, McGraw-Hill |
| **Alternate Assessment Tools (AATs) suggested:**<br>Submission of literature review report on recent tools used in computational photography |
| **Web links and Video Lectures (e-Resources):**<br><br>1. https://mitpress.mit.edu/9780262061582/three-dimensional-computer-vision<br>2. https://www.sas.com/en in/insights/analytics/computer-vision.html<br>3. https://aws.amazon.com/computer-vision. |

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**

Choice Based Credit System (CBCS) applicable for 2022 Scheme

**SEMESTER – V**

**Artificial Intelligence** (3:0:0) 3

(Effective from the academic year 2024-25)

| | | | |
|---|---|---|---|
| Course Code | BCS505B | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P: S) | 3:0:0 | SEE Marks | 50 |
| Total Hours of Pedagogy | 40 Hours of Theory | Total Marks | 100 |
| Credits | 03 | Exam Hours | 03 |
| Examination type (SEE) | Theory | | |

**Course Objectives:**

This course enables students to:

1. Gain a historical perspective of AI and its foundations.
2. Become familiar with basic principles of AI toward problem solving.
3. Get to know approaches of inference, perception, knowledge representation, and learning

**Preamble:** Artificial Intelligence (Al) is a field with a rich history and solid foundations that have evolved over decades. Originating from early computational theories and the quest to create machines capable of mimicking human thought, AI has grown into a multifaceted discipline. To understand AI comprehensively, it is essential to gain a historical perspective, tracing its development from the pioneering work of Alan Turing and John McCarthy to the sophisticated systems of today. Familiarity with the basic principles of AI is crucial for addressing a wide range of problem-solving scenarios. These principles include algorithms, data structures, and computational complexity, which together form the backbone of Al applications. By applying these principles, AI systems can analyze data, recognize patterns, and make decisions with minimal human intervention.

**Module – 1**

**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.

**Text book 1:** Chapter 1- 1.1, 1.2, 1.3 Chapter 2- 2.1, 2.2, 2.3, 2.4 **(8 hours)**

**Module – 2**

**Problem-solving**: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search

**Strategies:** Breadth First search, Depth First Search, Iterative deepening depth first search;

**Text book 1:** Chapter 3- 3.1, 3.2, 3.3, 3.4 **(8 hours)**

**Module – 3**

**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

**Text book 1:** Chapter 3-3.5,3.6 Chapter 4-4.1, 4.2 Chapter 7- 7.1, 7.2, 7.3, 7.4, 7.5 **(8 hours)**

**B.E. INFORMATION SCIENCE AND ENGINEERING**

Choice Based Credit System (CBCS) applicable for 2022 Scheme

**SEMESTER – V**

**EMBEDDED SYSTEMS** (3:0:0) 3

(Effective from the academic year 2024-25)

| | | | |
|---|---|---|---|
| Course Code | BIS505C | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P:S) | 3:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 | Exam Hours | 02 |
| Examination Type | Theory | | |

**Course Objectives:**

This course enables students to:

1. Understand Embedded System Hardware, System-on-Chip, Design Process and Examples.
2. Familiarize the basic architecture/programming of 8051/ARM microcontroller, Memory Organization etc.
3. Interface microcontroller to external memory and I/O devices using its I/O ports.
4. Appreciate RTOS Concepts like files, devices, task scheduling, performance metrics, and security issues.

**Preamble:** This course attempts to make the students familiar with modern embedded system involved by understanding microcontroller and Soc. The course begins with an introduction to 8051 processor. Design methodologies, Real time operating systems and the networks needed for embedded systems are also discussed. At the end of the course, the learner will be able to develop real time applications.

**Module – 1**

**Introduction to Embedded Systems:** Processor Embedded into a System, Embedded Hardware Units and Devicesin a System, Software in a System and an Overview of Programming Languages, Introduction to Embedded-system design, Architecture, Model, Classification of Embedded Systems, Skills required for an Embedded-system Designer, Examples.

**Text Book: Chapter-1: 1.1 to 1.10** **(8 Hours)**

**Module – 2**

**Embedded Systems Design and Development Process:** Embedded System-On-Chip (SoC) and Use of VLSI Circuit Design Technology, Complex Systems Design and Processors, Build Process, Design Process in Embedded System, Design Challenges, Challenges in Embedded-System Design: Optimising the Design Metrics, Challenges and Issues Related to Embedded-Software Development, Hardware-Software Co-Design in an Embedded System, Embedded-System Design Technologies, Formalism of System Design, Design Process and Design Examples.

**Text Book: Chapter-2: 2.1 to 2.11** **8 Hours**

**Module – 3**

**8051, AVR and ARM Microcontrollers, Real-World Interfacing the Inputs and Outputs Using Buses:** Introduction to Microcontrollers and Microprocessors, Embedded Versus External Memory Devices, Example of a Microcontroller - 8051 Architecture, ATMEL AVR Microcontrollers, ARM Microcontrollers, Computer-System Buses, Real-World Interfacing, I/O Performance, I/O Buses, Network-Oriented Bus Arbitration, Buses, Multilevel Buses

**Text Book: Chapter-3: 3.1 to 3.12** **8 Hours**

**Module – 4**

**I/O Devices, Communication Buses and Distributed Networked Embedded Architectures:** IO Types and Examples, Serial Communication Devices, Parallel Device Ports, Sophisticated Interfacing Features in Device Ports, Wireless Devices, Timer and Counting Devices, Distributed Network Embedded Systems Architecture, Serial Bus Communication Protocols, Parallel Bus Device Protocols-Parallel Communication, Network Using the ISA, PCI, PCI-X and Advanced Buses, Internet Enabled Systems Network Protocols, Wireless and Mobile System Protocols.

**Text Book: Chapter-5: 5.1 to 5.1** **8 Hours**

**Module – 5**

**Real Time Operating Systems-Basic Functions of OS and RTOS:** Operating System Services, Process Management, Timer Functions, Event Functions, Memory Management, Device, File, and IO Subsystems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt- Source Calls, Introduction to Real-Time Operating Systems, Basic Design Using a Real-Time Operating System, RTOS Task-Scheduling Models, OS Security Issues, Performance Metrics, OS Standards: POSIX, RTOS Interrupt Latency and Response Times of the Tasks as Performance Metrics, OS Performance Guidelines, Middleware: Meaning and Examples, Application-layer Software: Meanings and Examples

**Text Book: Chapter-10: 10.1 to 10.1** **8 Hours**

**Course Outcomes:**

The student should be able to:

| | |
|---|---|
| CO1: | Understand the concept of embedded system, microcontroller, and different components of microcontroller, Interfaces to external devices and RTOS. |
| CO2: | Write Program for 8051/ARM microcontroller to perform various tasks. |
| CO3: | Demonstrate usage of internal components of microcontroller like Registers/Memory through ALP to develop embedded solutions. |
| CO4: | Analyse the key concepts of embedded systems such as I/O, timers, interrupts and interaction with peripheral devices. |

**Textbooks**

1. Embedded Systems – Architecture, Programming and Design, Raj Kamal, The McGraw-Hill Companies, Second Edition.

**References:**


1. "The 8051 Microcontroller Based Embedded Systems", Manish K Patel, McGraw Hill, 2014, ISBN: 978-93-329-0125-4.
2. "The 8051 Microcontroller and Embedded Systems – using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay; PHI, 2006 / Pearson, 2006.
3. "The 8051 Microcontroller", Kenneth J. Ayala, 3rd Edition, Thomson/Cengage Learning.


**Alternate Assessment Tools (AATs) suggested:**

- Case study of Microcontroller/RTOS/Embedded Application
- Assembly Language Programming assignments

**Web links / e – resources:**

- https://www.tutorialspoint.com/microprocessor/microcontrollers_overview.htm
- https://www.arm.com/zh-TW/products/silicon-ip-cpu
- https://www.eng.auburn.edu/~dbeale/MECH4240-50/Introduction%20to%20Microcontrollers%20and%20Embedded%20Systems.pdf

`

**B.E. INFORMATION SCIENCE AND ENGINEERING**

Choice Based Credit System (CBCS) applicable for 2022 Scheme

**SEMESTER – V**

**BIG DATA ANALYTICS** (3:0:0) 3

(Effective from the academic year 2024 -25)

| | | | |
|---|---|---|---|
| Course Code | BCS505D | CIE Marks | 50 |
| Teaching Hours/Week (L: T:P:S) | 3:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 40 Hours Theory | Exam Hours | 3 Hours |
| Examination Type | Theory | | |

**Course Objectives:**

This course will enable students to:

1. Understand fundamentals of Big Data analytics
2. Explore the Hadoop framework and Hadoop Distributed File system
3. Illustrate the concepts ofNoSQL using MongoDB and Cassandra for Big Data
4. Employ MapReduce programming model to process the big data
5. Use Spark and SparkStreaming for Real time data processing.

**Preamble**

Big Data Analytics is required to deal with the problems faced by industry today. The techniques and tools are used to solve problems from a wide variety of Industries/Society such as manufacturing, services, retail, banking and finance, sports, pharmaceuticals, and aerospace etc.

**Module – 1**

**Introduction to Big Data Analytics:** Big Data, Scalability and Parallel Processing, Designing Data Architecture, Data Sources, Quality, Pre-Processing and Storing, Data Storage and Analysis, Big Data Analytics Applications and Case Studies.

**Text book 1:** Chapter 1: 1.2 -1.7 **(8 hours)**

**Module – 2**

**Introduction to Hadoop:** Introduction, Hadoop and its Ecosystem, Hadoop Distributed File System, MapReduce Framework and Programming Model, Hadoop Yam, Hadoop Ecosystem Tools. **Hadoop Distributed File System Basics:** HDFS Design Features, Components, HDFS User Commands. Essential Hadoop Tools: Using Apache Pig, Hive, Sqoop, Flume, Oozie, HBase.

**Text book 1:** Chapter 2 :2.1-2.6 **(8 hours)**

**Module – 3**

NoSQL Big Data Management, MongoDB and Cassandra: Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks, MongoDB, Databases, Cassandra Databases.

**Text book 1:** Chapter 3: 3.1-3.7 **(8 hours)**

**Module – 4**

MapReduce, Hive and Pig: Introduction, MapReduce Map Tasks, Reduce Tasks and MapReduce Execution, Composing MapReduce for Calculations and Algorithms, Hive, HiveQL, Pig.

**Text book 1:** Chapter 4: 4.1-4.6 **(8 hours)**

**Module – 5**

**Spark:** Introduction to Data Analysis with Spark, Programming using RDDs and MLIB, Data ETL, Information Reporting, Data visualization.
**SparkStreaming:** Data Stream Concepts and Data Stream Management, Stream Computing Aspects, Real Time Analytics Platforms.

**Text book 1:** Chapter 5 and 7: 5.2, 5.3,5.5,5.6, 7.2, 7.3,7.5 **(8 hours)**

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

CO1: Apply the fundamental concepts of Big Data analytics.
CO2: Analyze the concepts ofNoSQL and Mapreduce programming concepts for Big Data Applications.
CO3: Design solutions for different case studies/problem statements.
CO4: Demonstrate big data tools to solve real time problems.

**Textbooks:**

1. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning", McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966

**References:**

1. Tom White, "Hadoop: The Definitive Guide", 4th Edition, O"Reilly Media, 2015.ISBN-13: 978-9352130672
2. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", lstEdition, Wrox Press, 2014ISBN-13: 978-8126551071
3. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators",lstEdition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
4. Arshdeep Bahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

**Alternate Assessment Tools (AATs) suggested:**

- Presentation on any case study implementation using Big Data Tools.
- MOOCS.

**Web links and Video Lectures (e-Resources):**

- https://cdac.in/index.aspx?id=DAC&courseid=65
- https://spark.apache.org/docs/latest/rdd-programming-guide.html
- https://nptel.ac.in/courses/106104189

## BMS Institute of Technology and Management, Bengaluru 64

Choice Based Credit System (CBCS)

SEMESTER – V

## Research Methodology and IPR (2:0:0)2

Common to all Branches

(Effective from the academic year 2024-25 for 2022 Scheme)

| | | | |
|---|---|---|---|
| Course Code | BRMK507 | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 2:0:0 | SEE Marks | 50 |
| Total Number of Contact Hours | 26 | Exam Hours | 03 |

**Course Objectives:**

This course will enable students to:

1. Explain research process and research problem.
2. Gain knowledge on research design, sampling survey and data collection.
3. Familiarized with Interpretation and report writing.
4. Understand the concept of IP, patent and copy right.
5. Enhance their knowledge on trademarks, industrial and IC layout design.

**Module – 1**

**Research Methodology:** Meaning of Research, Objectives of research, types of research, research approaches, Significance of research, Research Process: Formulating research problem, Research methods verses methodology, Research and scientific method. Criteria of good research.

**Defining the Research Problem:** What is a Research Problem? Selecting the Research Problem, Necessity of Defining the Problem, Techniques Involved in Defining a problem.

(06 Hours)

**Module – 2**

**Research Design:** Meaning of Research Design, Need for Research design, Feature of a Good Design. Research Design in case of exploratory research studies, descriptive and diagnostic research studies. Basic Principles of Experimental Designs.

**Design of sampling survey:** Sample Design: Objective, size of sample, parameter of interest, selection of proper sample design. Sampling errors, non-sampling errors.

**Data Collection:** Experiments and Surveys, collection of primary data: observation method. Collection of secondary data. Selection of appropriate method for data collection.

(05 Hours)

**Module – 3**

**Interpretation and Report writing:** Meaning of Interpretation, Techniques of Interpretation, Precautions in interpretation, Significance of report writing, Different steps in report writing, layout of the research report, Types of reports, Oral presentation, Mechanics of writing research report, Precautions for writing a research reports.

(05 Hours)

**Module – 4**

**Introduction to IP:** Various forms of IP, Importance of intellectual property, Trade policy reviews, Agreement on trips.

**Patent**: What is patent, condition for grant of patent, Temporal and spatial aspects of patent, right of patentee, Patent office and register of patent.

**Copyright:** Copyright and classes of work, meaning of publication, ownership of copyright, license of copyright, term of copyright, Internet and copyright issues.

(05 Hours)

**Module – 5**

**Trademarks:** Introduction to trademark, term of trademark, collective marks, certification trademarks.

**Industrial Design:** Registration of Design: Non-registrable designs under The Design Act 2000, Condition for registration of Industrial Designs. Term of Industrial Designs.

**IC Layout Design:** Integrated Circuits Layout Design, Grant of registration of IC Layout Design. (05 Hours)

**Course Outcomes:**

The students will be able to:

CO1: Illustrate research process and research problem.
CO2: Describe research design, sampling survey and data collection.
CO3: Explain the techniques of Interpretation and report writing.
CO4: Summarize the concept of IP, patent and copy right.
CO5: Discuss trademarks, industrial and IC layout design.

**TEXTBOOKS:**


1. CR Kothari and Gaurav Garg, Research Methodology, New Age International Publishers, 2020.
2. Neeraj Pandey, Khushdeep Dharni, "Intellectual Property Rights", PHI Learning, 2014.


**REFERENCES:**


1. Dinakar Deb, rajdeep Dey, Valentina, Engineering Research Methodology, Springer, 2019.
2. David V. Thiel, Research method for engineers, Cambridge University Press, 2014.
3. Prabhuddha Ganguli, "Intellectual Property Rights", Tata Mc-Graw –Hill, 2017.


**ASSESSMENT METHODS**

**CIE Components** (50 Marks)

Two Unit Tests each of 40 Marks. Sum of the two Internal Assessments Tests Marks will be out of 80 Marks and scaled down to 25 Marks.

CCA 1 : 25 Marks
CCA 2 : 25 Marks

Sum of the CCA's will be out of 50 Marks and scaled down to 25 Marks.

| | |
|---|---|
| Internal Assessments Tests | : 25 Marks |
| CCA | : 25 Marks |
| Total CIE Marks | : 50 Marks |

**SEE Component** (50 Marks)

- SEE examination is conducted for 100 Marks and scaled down to 50 Marks.
- The question paper will have ten full questions carrying equal marks.
- Each full question will be for 20 marks.
- There will be two full questions (with a maximum of three sub- questions) from each module.

**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).
- The minimum passing mark for the SEE is 35% of the 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 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.

# BMS Institute of Technology and Management, Bengaluru 560064

**Choice Based Credit System (CBCS)**

**SEMESTER - V**

## Environmental Studies (1:0:0) 1

**Common to all Branches**

(Effective from the academic year 2024-25 for 2022 Scheme)

| | | | |
|---|---|---|---|
| Course Code | BESK508 | CIE Marks | 50 |
| Teaching Hours/Week (L:T:P) | 1:0:0 | SEE Marks | 50 |
| Total Number of Lecture Hours | 15 | Exam Hours | 01 |

**CREDITS: 01**

**Course objectives:**

This course will enable students to

1. Recognize the ecological basis for regional and global Environmental issues, and lead by example as an environmental steward.
2. Apply systems concepts and methodologies to analyze and understand interactions between social and environmental processes.
3. Analyze the trans-national character of environmental problems and ways of addressing them, including interactions across local to global scales.
4. Demonstrate proficiency in quantitative methods, qualitative analysis, critical thinking, and written and oral communication needed to conduct high-level work as environmentalists.

### Module – 1

**Biodiversity:** Types, Value, Hot spots and Threats. **(3 Hours)**

***Field work:** Visit to a local area to document environmental assets: River / Forest / Grassland / Hill

### Module – 2

**Environmental Pollution & Abatement & Relevant Acts:** Water, Soil and Air Pollution. **(3 Hours)**

***Field work:** Visit to a local polluted Site-Urban/Rural/Industrial/Agricultural, followed by observation and documentation of environmental pollution and recommendation of remedial measures.

### Module – 3

**Waste Management & Public Health Aspects & Relevant Acts:** E-waste, Bio-medical & Hazardous wastes. **(3 Hours)**

***Field work:** Visit to a Resource Management Facility or Waste Treatment Facility, followed by understanding of process and its brief documentation.

### Module – 4

**Global Environmental Concerns:** Ground water depletion, Climate Change and Carbon Trading. **(3 Hours)**

*Field work: Visit to a Green Building, followed by understanding of process and its brief documentation.

### Module – 5

**Latest Developments in Environmental Pollution Mitigation:** E.I.A., E.M.S., SDG. **(3 Hours)**

*Field work: Visit to Environmental NGOs, followed by brief documentation.

**Self-Study/**Discussion on Case Studies**:** Environmental Stewardship

*** Any one Field Work is to be successfully accomplished. The same will be assessed for AAT.**

**Course outcomes:**
The students will be able to:

CO 1: Appraise the significance of ecological systems under the ambit of environment.
CO 2: Analyze for the consequences owing from anthropogenic interactions on the environmental processes.
CO 3: Recommend solutions in the Anthropocene Epoch, with an in-depth understanding of the interdisciplinary facets of environmental issues.
CO 4: Elucidate the trans-national character of environmental problems and ways of addressing them.
CO 5: Appraise latest developments, concerns and ethical challenges associated with Environmental Protection.

**Text Book:**


1. Rajesh Gopinath and N. Balasubramanya, "Environmental science and Engineering", 1st Edition, Cengage Learning India Private Limited, 2018.
2. J. S. Singh, S. P. Singh and S. R. Gupta, "Ecology, Environmental Science and Conservation", India, S. Chand Publishing, 2017.


**References:**


1. M. Gadgil and R. Guha, "This Fissured Land: An Ecological History of India", Univ. of California Press, 1993.
2. E. P. Odum and H. T. Odum, "Fundamentals of Ecology", Philadelphia: Saunders Publisher, 1971.
3. M. L. Mckinney, "Environmental Science systems & Solutions", Web enhanced Edition, City of Publisher, R. M. Publisher, 1996.


**ASSESSMENT METHODS:**

**CIE Components** (50 Marks)
The pattern of the CIE question paper is MCQ.
Two Unit Tests each of 40 Marks, MCQ type (duration 01 hour). Average of the two Internal Assessments Tests Marks will be out of 40 Marks, which is further scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Two Assignment / AATs : 25 Marks [each]
Sum of the Assignment and AATs will be out of 50 Marks and scaled down to 25 Marks. (Student should score a minimum of 10 marks to be eligible.)

Internal Assessments Tests : 25 Marks
Assignment and AAT : 25 Marks
Total CIE Marks : 50 Marks (Student should score a minimum of 20 marks to be eligible.)

**SEE Components** (50 Marks)

- The pattern of the SEE question paper is MCQ.
- SEE question paper will be set for 50 questions of each of 01 marks. (Student should score a minimum of 20 marks to be eligible.)

**Assessment Details** (both CIE and SEE):

- The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Exam (SEE) is 100%.
- The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50).
- The minimum passing mark for the SEE is 35% of the 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 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.