Software Engineering & Project Management		Semester	V
Course Code	**BCS501**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	4:0:0:0	SEE Marks	50
Total Hours of Pedagogy	52 hours	Total Marks	100
Credits	04	Exam Hours	03
Examination nature (SEE)	**Theory**		

Course objectives:

This course will enable students 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.
- Describe the process of requirement gathering, requirement classification, requirement specification and requirements validation.
- Recognize the importance of Project Management with its methods and methodologies.
- Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based-Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

MODULE-1 **10 hours**

Software and Software Engineering: The nature of Software, The unique nature of WebApps, Software Engineering, The software Process, Software Engineering Practice, Software Myths.

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

Textbook 1: Chapter 1: 1.1 to 1.6, Chapter 2: 2.1 to 2.5

MODULE-2 **12 hours**

Understanding Requirements: Requirements Engineering, Establishing the ground work, Eliciting Requirements, Developing use cases, Building the requirements model, Negotiating Requirements, Validating Requirements.

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.

Requirement Modeling Strategies : Flow oriented Modeling , Behavioral Modeling.

Textbook 1: Chapter 5: 5.1 to 5.7, Chapter 6: 6.1 to 6.5, Chapter 7: 7.1 to 7.3

MODULE-3 **10 hours**

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 .
Principles that guide practice: Software Engineering Knowledge, Core principles, Principles that guide each framework activity.

Textbook 1: Chapter 3: 3.1 to 3.6, Chapter 4: 4.1 to 4.3

MODULE-4	10 hours

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.
Project Evaluation: Evaluation of Individual projects, Cost–benefit Evaluation Techniques, Risk Evaluation
Textbook 2: Chapter 1: 1.1 to 1.17 , Chapter 2: 2.4 to 2.6

MODULE-5	10 hours

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.
Software Project Estimation: Observations on Estimation, Decomposition Techniques, Empirical Estimation Models.

Textbook 2: Chapter 13: 13.1 to 13.5, 13.7, 13.8, Text Book 1: Chapter 26: 26.5 to 26.7

Course Outcomes

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

- **Differentiate** process models to judge which process model has to be adopted for the given scenarios.
- **Derive** both functional and nonfunctional requirements from the case study.
- **Analyze** the importance of various software testing methods and agile methodology.
- **Illustrate** the role of project planning and quality management in software development.
- **Identify** appropriate techniques to enhance software quality.

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at

the end of the semester if two assignments are planned.

- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

Marks scored shall be proportionally reduced to 50 marks. .

Suggested Learning Resources:

Textbooks

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 Book:

3. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India.
4. "Software Engineering: Principles and Practice", Hans van Vliet, Wiley India, 3rd Edition, 2010.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc20_cs68/preview
- https://onlinecourses.nptel.ac.in/noc24_mg01/preview

Activity Based Learning (Suggested Activities in Class)/Practical-Based Learning

- Demonstration of Agile tool: The students are expected to learn any of the popular agile tool. (10 marks)
- Field Survey (In Team): The students' team may of the size of 2 or 4. Students are expected to visit their library and understand the Library Automation Software. **OR** they have to understand the working of ERP or any inventory management, and then they have to prepare a report and then to be submitted to the concerned staff. Prepare a document/report which includes all the phases of SDLC and to be submitted accordingly (15 marks)

DATA COMMUNICATION		Semester	IV
Course Code	**BCM502**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	3:0:2:0	SEE Marks	50
Total Hours of Pedagogy	40 hours Theory + 8-10 Lab slots	Total Marks	100
Credits	04	Exam Hours	3 Hrs.
Examination nature (SEE)	Theory/practical		

Course objectives:

- To understand the transmission technique of digital data between the computers and a computer network that allows computers to exchange data.
- To learn the basics of data communication and various types of computer networks.
- To study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable and noisy channels.
- To explore wireless and wired LANs along with IP version.

Teaching-Learning Process (General Instructions)

These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters student's Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.

MODULE-1

Introduction: Data Communications, Networks, Network Types
Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model,
Introduction to Physical Layer-1: Data and Signals**,** Digital Signals, Transmission Impairment, Data Rate limits, Performance. Internet History, Standards and Administration
Textbook 1: Ch. 1.1 - 1.5, Ch. 2.1 - 2.3, Ch. 3.1, 3.3 - 3.6

MODULE-2

Digital Transmission: Digital to digital conversion: Line coding: Polar, Bipolar, Manchester coding, AMI , Pseudo ternary.
Physical Layer-2: Analog to digital conversion, Pulse Code Modulation, Delta Modulation, Transmission Modes **Analog Transmission**: Digital to analog conversion.
Bandwidth Utilization: Multiplexing
Textbook 1: Ch. 4.1.1 - 4.1.2, Ch. 4.2 - 4.3, Ch. 5.1, Ch. 6.1

MODULE-3

Transmission Media: Introduction, Guided Media: Twisted Pair Cable, Coaxial Cable, Fiber Optics Cable ;
Switching: Introduction, Circuit Switched Networks and Packet switching
Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Code, Checksum
Textbook 1: Ch. 7.1-7.2, Ch. 8.1 - 8.3, Ch. 10.1 - 10.4

MODULE-4

Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, High Level Data Link Control (HDLC), Media Access control: Random Access, Controlled Access, Channelization **Textbook 1 Ch. 11.1 – 11.3, Ch. 12.1 - 12.3**
MODULE-5
Wired LANs Ethernet: Ethernet Protocol, Standard Ethernet, Fast Ethernet, Gigabit Ethernet and 10 Gigabit Ethernet, Wireless LANs: Introduction, IEEE 802.11 Project, Bluetooth, WiMAX, Cellular Telephony. **Textbook 1: Ch. 13.1 - 13.5, Ch. 15.1-15.3, Ch. 16.1 – 16.2**

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	Study and discussion on various Computer network commands such as Ping, Netstat, Tracert, ARP, Nbtstat, Netsh and execution of the commands.
2	Installation and Setup of Packet Tracer Tool. Study and execution of basic commands of Packet Tracer such as Traceroute, ifconfig, Telnet and others.
3	Initialization and Setting up a Router with Encryption in Packet Tracer.
4	Designing and Implementing LAN using subnetting.
5	Create two subnets and implement it with calculated subnet masking.
6	Simulation and study of networks using routers.
7	Setting a local server for access of files.
8	Data Transmission through wired and wireless communication without any outside support.

Course outcomes (Course Skill Set):

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

- **Explain** the fundamentals of data communication.
- **Illustrate** the techniques for digital transmission and bandwidth utilization using various transmission media.
- **Analyze** the principles of protocol layering in modern communication systems.
- **Demonstrate** the working of physical and data link layer services using simulation tools.

Note: For the Simulation experiments modify the topology and parameters set for the experiment and take multiple rounds of reading and analyse the results available in log files. Plot necessary graphs and conclude using any open-source simulation tool such as CISCO Packet Tracer. Installation procedure of the required software must be demonstrated, carried out in groups, and documented in the report. Non simulation programs can be implemented using Java.

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.

CIE for the theory component of the IPCC (maximum marks 50)

- IPCC means practical portion integrated with the theory of the course.
- CIE marks for the theory component are **25 marks** and that for the practical component is **25 marks**.
- 25 marks for the theory component are split into **15 marks** for two Internal Assessment Tests (Two Tests, each of 15 Marks with 01-hour duration, are to be conducted) and **10 marks** for other assessment methods mentioned in 22OB4.2. The first test at the end of 40-50% coverage of the syllabus and the second test after covering 85-90% of the syllabus.
- Scaled-down marks of the sum of two tests and other assessment methods will be CIE marks for the theory component of IPCC (that is for **25 marks)**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the theory component of IPCC.

CIE for the practical component of the IPCC

- **15 marks** for the conduction of the experiment and preparation of laboratory record, and **10 marks** for the test to be conducted after the completion of all the laboratory sessions.
- On completion of every experiment/program in the laboratory, the students shall be evaluated including viva-voce and marks shall be awarded on the same day.
- The CIE marks awarded in the case of the Practical component shall be based on the continuous evaluation of the laboratory report. Each experiment report can be evaluated for 10 marks. Marks of all experiments' write-ups are added and scaled down to **15 marks**.
- The laboratory test **(duration 02/03 hours)** after completion of all the experiments shall be conducted for 50 marks and scaled down to **10 marks.**
- Scaled-down marks of write-up evaluations and tests added will be CIE marks for the laboratory component of IPCC for **25 marks**.
- The student has to secure 40% of 25 marks to qualify in the CIE of the practical component of the IPCC.

SEE for IPCC

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours**)

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scoredby the student shall be proportionally scaled down to 50 Marks

The theory portion of the IPCC shall be for both CIE and SEE, whereas the practical portion will have a CIE component only. Questions mentioned in the SEE paper may include questions from the practical component.

Suggested Learning Resources:

Textbook:

1. Behrouz A. Forouzan, Data Communications and Networking, 5th Edition, Tata McGraw-Hill,2013.

Reference Books:

1. Larry L. Peterson and Bruce S. Davie: Computer Networks – A Systems Approach, 4th Edition, Elsevier, 2019.
2. Nader F. Mir: Computer and Communication Networks, 2nd Edition, Pearson Education, 2015.
3. William Stallings, Data and Computer Communication 10th Edition, Pearson Education, Inc., 2014.

Web links and Video Lectures (e-Resources):

1. https://www.digimat.in/nptel/courses/video/106105183/L01.html
2. http://www.digimat.in/nptel/courses/video/106105081/L25.html
3. https://nptel.ac.in/courses/10610

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning
Students will be informed to give presentation/demo on any of the topic given below. (10 marks)

- To study about different physical equipment's used for networking.
- To study different internetworking devices in a computer network.
- To assign IP address to the PC connected to the internet.
- Creating a Network topology using CISCO packet tracer software.

	THEORY OF COMPUTATION		Semester	V
	Course Code	**BCS503**	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	(3:2:0:0)	SEE Marks	50
	Total Hours of Pedagogy	50	Total Marks	100
	Credits	04	Exam Hours	3
	Examination type (SEE)	Theory		

Course objectives:

- Introduce core concepts in Automata and Theory of Computation.
- Identify different Formal Language Classes and their Relationships.
- Learn concepts of Grammars and Recognizers for different formal languages.
- Prove or disprove theorems in automata theory using their properties.
- Determine the decidability and intractability of Computational problems.

Teaching-Learning Process (General Instructions)

These are sample Strategies which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different approaches and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1	**10 Hours**

Introduction to Finite Automata, Structural Representations, Automata and Complexity. The Central Concepts of Automata Theory. Deterministic Finite Automata, Nondeterministic Finite Automata, An Application: Text Search, Finite Automata with Epsilon-Transitions.

TEXT BOOK: Sections 1.1, 1.5, 2.2,2.3,2.4,2.5

Module-2	**10 Hours**

Regular Expressions, Finite Automata and Regular Expressions, Proving Languages not to be Regular. Closure Properties of Regular Languages, Equivalence and Minimization of Automata, Applications of Regular Expressions

TEXT BOOK: Sections 3.1, 3.2 (Except 3.2.1), 3.3, 4.1, 4.2, 4.4

Module-3	**10 Hours**

	Context-Free Grammars, Parse Trees, Ambiguity in Grammars and Languages, Ambiguity in Grammars and Languages, Definition of the Pushdown Automaton, The Languages of a PDA, Equivalence of PDA's and CFG's, Deterministic Pushdown Automata. **TEXT BOOK: Sections 5.1, 5.2, 5.4, 6.1,6.2,6.3.1,6.4**
	Module-4 **10 Hours**
	Normal Forms for Context-Free Grammars, The Pumping Lemma for Context-Free Languages, Closure Properties of Context-Free Languages. **TEXT BOOK: Sections 7.1, 7.2, 7.3**
	Module-5 **10 Hours**
	Introduction to Turing Machines: Problems That Computers Cannot Solve, The Turing Machine, Programming Techniques for Turing Machines, Extensions to the Basic Turing Machine, Undecidability: A Language That Is Not Recursively Enumerable. **TEXT BOOK: Sections 8.1,8.2, 8.3,8.4, 9.1, 9.2**

Course outcome (Course Skill Set)

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

1. Apply the fundamentals of automata theory to write DFA, NFA, Epsilon-NFA and conversion between them.
2. Prove the properties of regular languages using regular expressions.
3. Design context-free grammars (CFGs) and pushdown automata (PDAs) for formal languages.
4. Design Turing machines to solve the computational problems.
5. Explain the concepts of decidability and undecidability.

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

The Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks.

Suggested Learning Resources:

Books

1. John E Hopcroft, Rajeev Motwani, Jeffrey D. Ullman," Introduction to Automata Theory, Languages and Computation", Second Edition, Pearson.

Reference:

1. Elain Rich, "Automata,Computability and complexity", 1st Edition, Pearson Education,2018.
2. K.L.P Mishra, N Chandrashekaran , 3rd Edition , 'Theory of Computer Science",PHI,2012.
3. Peter Linz, "An introduction to Formal Languages and Automata ", 3rd Edition, Narosa Publishers,1998.
4. Michael Sipser : Introduction to the Theory of Computation, 3rd edition, Cengage learning,2013.
5. John C Martin, Introduction to Languages and The Theory of Computation, 3rd Edition, Tata McGraw –Hill Publishing Company Limited, 2013.

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/106/105/106105196/
- https://archive.nptel.ac.in/courses/106/106/106106049/
- https://nptelvideos.com/course.php?id=717

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Open source tools (like JFLAP) to make teaching and learning more interactive [https://www.jflap.org/] (10 Marks)
- Assignments at RBTL-4 (15 marks)

Embedded C Lab		Semester	5
Course Code	**BCOL504**	CIE Marks	50
Teaching Hours/Week (L:T:P: S)	0:0:2:0	SEE Marks	50
Credits	01	Exam Hours	100
Examination type (SEE)	Practical		

Course objectives:

- Learn embedded C programming.
- Simulation of capture/compare units and flash memory.
- Use of embedded C to simulate signal converters.
- Simulate I/O ports and communication protocols using embedded C.

Sl.NO	Experiments
1	Develop a program that reads the status of simulated push-button switches connected to I/O ports and controls the state of LEDs connected to other I/O ports based on the button presses. Use the I/O Port Simulation dialog to interact with the virtual hardware.
2	Develop a program to simulate the reading of an analog voltage signal using the A/D Converter. The program should display the converted digital value on a virtual serial terminal. Experiment with different analog inputs using the simulation settings and observe the corresponding digital outputs
3	Develop a program that generates a digital waveform (e.g., a sine wave, triangle wave, or square wave) and converts it to an analog signal using the D/A Converter. Use the simulator to monitor the output waveform and verify its characteristics.
4	Write a program to configure a timer to generate an interrupt every 1 second, toggling an LED each time the interrupt occurs. Use the Timer/Counter Simulation feature to monitor the timer's operation and adjust its settings.
5	Develop a program that periodically resets the Watchdog Timer during normal operation. Simulate a situation where the program gets stuck in an infinite loop, and observe the Watchdog Timer reset the system. Use the simulation to determine the appropriate reset interval.
6	Develop a program that uses the capture/compare unit to measure the duration of an input pulse signal. Use the simulator to generate various pulse widths and observe how the capture/compare unit measures them accurately.
7	Develop a program that sends and receives data over UART. Use the Serial Communications Simulation window to send data to the microcontroller and receive responses. Experiment with different baud rates and message formats.
8	Develop a program where the microcontroller acts as an I^2C master, communicating with a simulated I^2C slave device. Use the I^2C Communications Simulation window to monitor the communication and observe how data is exchanged.
9	Develop a program that configures the microcontroller as an SPI master and communicates with a simulated SPI slave device. Use the SPI Communications Simulation feature to observe the data exchange and verify timing and synchronization.
10	Develop a program that writes data to and reads data from the on-chip FLASH memory. Use the FLASH Memory Simulation to monitor memory contents in real-time and simulate various read/write operations.

Course outcomes (Course Skill Set):

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

- Design the experiments to simulate signal converters, capture/compare unit and flash memory.
- Develop Embedded C programs to simulate I/O ports and communication protocols.
- Analyze the results and produce substantial written documentation.

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 (CIE):

CIE marks for the practical course are **50 Marks**.

The split-up of CIE marks for record/ journal and test are in the ratio **60:40**.

- Each experiment is to be evaluated for conduction with an observation sheet and record write-up. Rubrics for the evaluation of the journal/write-up for hardware/software experiments are designed by the faculty who is handling the laboratory session and are made known to students at the beginning of the practical session.
- Record should contain all the specified experiments in the syllabus and each experiment write-up will be evaluated for 10 marks.
- Total marks scored by the students are scaled down to **30 marks** (60% of maximum marks).
- Weightage to be given for neatness and submission of record/write-up on time.
- Department shall conduct a test of 100 marks after the completion of all the experiments listed in the syllabus.
- In a test, test write-up, conduction of experiment, acceptable result, and procedural knowledge will carry a weightage of 60% and the rest 40% for viva-voce.
- The suitable rubrics can be designed to evaluate each student's performance and learning ability.
- The marks scored shall be scaled down to **20 marks** (40% of the maximum marks).

The Sum of scaled-down marks scored in the report write-up/journal and marks of a test is the total CIE marks scored by the student.

Semester End Evaluation (SEE):

- SEE marks for the practical course are 50 Marks.
- SEE shall be conducted jointly by the two examiners of the same institute, examiners are appointed by the Head of the Institute.
- The examination schedule and names of examiners are informed to the university before the conduction of the examination. These practical examinations are to be conducted between the schedule mentioned in the academic calendar of the University.

- All laboratory experiments are to be included for practical examination.
- (Rubrics) Breakup of marks and the instructions printed on the cover page of the answer script to be strictly adhered to by the examiners. **OR** based on the course requirement evaluation rubrics shall be decided jointly by examiners.
- Students can pick one question (experiment) from the questions lot prepared by the examiners jointly.
- Evaluation of test write-up/ conduction procedure and result/viva will be conducted jointly by examiners.

General rubrics suggested for SEE are mentioned here, 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 (however, based on course type, rubrics shall be decided by the examiners)
Change of experiment is allowed only once and 15% of Marks allotted to the procedure part are to be made zero.
The minimum duration of SEE is 02 hours

Suggested Learning Resources:

- Embedded systems - https://ebooks.inflibnet.ac.in/csp13/front-matter/introduction/
- Programming Embedded Systems in C - https://ebooks.inflibnet.ac.in/csp13/chapter/programming-embedded-systems-in-c/
- https://www.geeksforgeeks.org/embedded-c/

	COMPUTER VISION		Semester	5
	Course Code	**BAI151A**	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	3
	Examination type (SEE)	**Theory**		

Course objectives:

CLO1: To understand the fundamentals of computer vision and digital image processing

CLO2: To introduce the processes involved image enhancement and restoration.

CLO3: To facilitate the students to gain understanding color image processing and morphology.

CLO5: To impart the knowledge of image segmentation and object recognition techniques.

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Use animations/videos to help the students to understand the concepts.
7. Demonstrate the concepts using a suitable programming language.

Module-1

Introduction: What is computer vision? A brief history. **Image Formation:** Photometric image formation, The digital camera. **Image processing**: Point operators, Linear filtering.

Textbook-1: Chap-1 (1.1, 1.2), Chap-2 (2.2, 2.3), Chap-3 (3.1, 3.2)

Module-2

Image processing: More neighborhood operators, Fourier transforms, Pyramids and wavelets, and Geometric transformations.

Textbook-1: Chap- 3 (3.3 - 3.6)

Module-3

Image Restoration and Reconstruction: A model of Image degradation/restoration process, restoration in the presence of noise only, periodic noise reduction by frequency domain filtering.

Image Segmentation: Fundamentals, Point, Line and edge detection, thresholding (Foundation & Basic global thresholding only), Segmentation by region growing & region splitting & merging.

Textbook-2: Chap-5 (5.1 to 5.4), Chap-10 (10.1 to 10.3.2, 10.4)

Module-4

Color Image Processing: Color fundamentals, color models, Pseudocolor image processing, full color image processing, color transformations, color image smoothing and sharpening, Using color in image segmentation, Noise in color images.

Textbook-2: Chap-6 (6.1-6.8)

Module-5

Morphological Image Processing: Preliminaries, Erosion and Dilation, opening and closing, Hit-or-miss transform, some basic morphological algorithms.

Feature Extraction: Background, Boundary preprocessing (Boundary following & Chain codes only).

Image pattern Classification: Background, Patterns and classes, Pattern classification by prototype matching (Minimum distance classifier only).

Textbook-2: Chap -9 (9.1-9.5), Chap-11(11.1-11.2.2), Chap-12 (12.1-12.3.1)

Course outcome (Course Skill Set)

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

1. Explain the fundamentals of computer vision and its applications.
2. Apply the image enhancement techniques for smoothing and sharpening of images.
3. Compare the different image restoration and segmentation techniques.
4. Demonstrate the smoothing and sharpening techniques for color images.
5. Explain morphological, feature extraction, and pattern classification techniques for object recognition.

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assessment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned. Implementation of Image processing and video processing techniques in Java/Python/Matlab is recommended.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.

4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbooks

1. Richard Szeliski, Computer Vision: Algorithms and Applications (Texts in Computer Science), 2nd Edition, 2022, Springer.
2. Rafael C G., Woods R E. and Eddins S L, Digital Image Processing, Pearson, 4th edition, 2019.

Reference books

1. David Forsyth and Jean Ponce, Computer Vision: A Modern Approach, 2nd Edition, Pearson, 2015.
2. Reinhard Klette, Concise Computer Vision - An Introduction into Theory and Algorithms, Springer, 2014.

Web links and Video Lectures (e-Resources):

- Virtual Labs: https://cse19-iiith.vlabs.ac.in/
- https://onlinecourses.nptel.ac.in/noc21_ee78/preview
- Introduction to Machine Vision: https://www.youtube.com/watch?v=tY2gczObpfU
- https://coral.ise.lehigh.edu/optml/files/2019/10/OptML_CV_tutorial_1_compressed.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based Learning

- Programming Assignment-1: Implementation of important concepts of Image enhancement (point & filters) and restoration techniques with C++/Java/Python - 10 Marks
- Programming Assignment-2: Implementation of segmentation, Morphological and color image processing techniques with C++/Java/Python - 15 Marks

	EMBEDDED SYSTEM		Semester	V
	Course Code	**BCE515B**	CIE Marks	50
	Teaching Hours/Week (L:T:P: S)		SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	03
	Examination type (SEE)	Theory		

Course objectives:

- To understand the basic components of embedded system.
- To illustrate the applications of embedded system.
- To demonstrate the electronic components in PCB layout.
- To understand the use of Embedded C language in embedded applications.
- To discuss the importance of RTOS in real time applications.

Teaching-Learning Process (General Instructions)
These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. **Chalk and Talk**
2. **PPT presentation**
3. **Animation based videos**

Module-1

Introduction to Embedded system: Embedded systems versus General computing systems, classification of Embedded systems, applications of embedded systems, purpose of embedded systems, core of embedded system, memory, sensors and actuators, Communication interface, other system components.
Textbook 1: 1.2, 1.4, 1.5, 1.6, 2.1, 2.2.1, 2.2.2, 2.3, 2.4

Module-2

Attributes of Embedded system: Characteristics of embedded system, quality attributes of embedded system, washing machine- application specific embedded system, automotive- domain specific examples of embedded system, factors to be considered in Selecting a Controller, Embedded system development environment.
Textbook 1: 3.1, 3.2, 4.1, 4.2, 5.1, 13.1

Module-3

Embedded Hardware design: Fundamental issues in Hardware Software Co-design, Computational models in Embedded System Design, analog Electronic Components, Digital Electronic Components, VLSI & Integrated Circuit Design, PCB Layout design.
Textbook 1: 7.1, 7.2, 8.1, 8.2, 8.3, 8.7

Module-4

Embedded Firmware design: Embedded Firmware Design Approaches, Embedded Firmware Development Languages, programming in Embedded C.
Textbook 1: 9.1, 9.2, 9.3

Module-5

RTOS based Embedded system design: Types of operating system, tasks, process and threads, multiprocessing and multitasking, task communication, task synchronization, device drivers, how to choose an RTOS.
Textbook 1: 10.2, 10.3, 10.4, 10.5, 10.7, 10.8, 10.9, 10.10

Course outcome (Course Skill Set)

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

1. Explain the need of core components in embedded system.
2. Apply the knowledge of embedded components to design real time applications.
3. Make use of electronic components to design PCB layout.
4. Develop program using embedded C for a real-time scenario.
5. Utilize the concepts of RTOS required to develop real-world applications.

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Books:

1. Introduction to Embedded system by Shibu K V, McGraw Hill, 2009.

Reference books:

1. Embedded systems by Rajkamal, McGraw Hill, 2nd Edition.
2. Principles of embedded computing system design by Wayne wolf, Morgan Kauffman publication, 2000

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/108102045

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Course project (Using Embeded C) - 25 Marks

	UNIX SYSTEM PROGRAMMING		Semester	V
	Course Code	**BCS515C**	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
	Total Hours of Pedagogy	40	Total Marks	100
	Credits	03	Exam Hours	03
	Examination type (SEE)	Theory		

Course objectives: This course will enable students to

- To help the students to understand effective use of Unix concepts, commands and terminology. Identify, access, and evaluate UNIX file system
- Explain the fundamental design of the unix operating system
- Familiarize with the systems calls provided in the unix environment
- Design and build an application/service over the unix operating system

Teaching-Learning Process (General Instructions)

These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyze information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem with different circuits/logic and encourage the students to come up with their own creative ways to solve them.
8. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Introduction: Unix Components/Architecture. Features of Unix. The UNIX Environment and UNIX Structure, Posix and Single Unix specification. General features of Unix commands/ command structure. Command arguments and options. Basic Unix commands such as echo, printf, ls, who, date, passwd, cal, Combining commands. Meaning of Internal and external commands. The type command: knowing the type of a command and locating it. The root login. Becoming the super user: su command.

Unix files: Naming files. Basic file types/categories. Organization of files. Hidden files. Standard directories. Parent-child relationship. The home directory and the HOME variable. Reaching required files- the PATH variable, manipulating the PATH, Relative and absolute pathnames. Directory commands – pwd, cd, mkdir, rmdir commands. The dot (.) and double dots (..) notations to represent present and parent directories and their usage in relative path names. File related commands – cat, mv, rm, cp, wc and od commands.

	Text Book1: Chapter-1, 2, 3, 4, 5
	Module-2
	File attributes and permissions: The ls command with options. Changing file permissions: the relative and absolute permissions changing methods. Recursively changing file permissions. Directory permissions. **The shells interpretive cycle:** Wild cards. Removing the special meanings of wild cards. Three standard files and redirection. **Connecting commands:** Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions. **Shell programming:** Ordinary and environment variables. The. profile. Read and read-only commands. Command line arguments. exit and exit status of a command. Logical operators for conditional execution. The test command and its shortcut. The if, while, for and case control statements. The set and shift commands and handling positional parameters. The here (<<) document and trap command. Simple shell program examples. **Text Book1: Chapter-6,8,13,14**
	Module-3
	Unix Standardization and Implementations: Introduction, Unix Standardization, UNIX System Implementation. **File I/O:** Introduction, File Description, open, create, read, write, close, fcntl functions. **Files and Dictionaries:** mkdir and rmdir functions, reading dictionaries, chdir, fchdir and getcwd functions. Device Special files. **The Environment of a UNIX Process:** Introduction, main function, Process Termination, Command-Line Arguments, Environment List, Memory Layout of a C Program, Shared Libraries, Memory Allocation, Environment Variables, setjmp and longjmp Functions, getrlimit, setrlimit Functions. **Text Book 2: 2,3,4,7.**
	Module-4
	Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions. **Overview of IPC Methods**, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores. **Shared Memory**, Client-Server Properties, Passing File Descriptors, An Open Server-Version 1. **Text Book2: Chapter 8, 15,17**
	Module-5

	Signals and Daemon Processes: Introduction, Signal Concepts, Signal Functions, SIGCLD Semantics, Kill and Raise functions, Alarm and Pause Functions, Signal Sets, sigprocmask Function, sigpending function, sigaction function, sigsetjmp and siglongjmp functions, sigsuspend function, abort function, system function, sleep, nanosleep and clock_nanosleep functions, sigqueue functions, job-control signals, signal names and numbers. **Daemon Processes:** Introduction, Daemon Characteristics, Coding Rules, Error Logging, Client-Server Model. **Text Book 2: Chapter 10, 13**

Course outcome (Course Skill Set)

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

- Demonstrate the basics of Unix concepts and commands.
- Demonstrate the UNIX file system.
- Apply comands to reflect changes in file system.
- Demonstrate IPC and process management.
- Develop an application/service over a Unix system.

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
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- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:
Text Books:

1. Sumitabha Das., Unix Concepts and Applications., 4thEdition., Tata McGraw Hill
2. W. Richard Stevens: Advanced Programming in the UNIX Environment, 2nd Edition, Pearson Education, 2005

Reference Books:

1. Unix System Programming Using C++ - Terrence Chan, PHI, 1999.
2. M.G. Venkatesh Murthy: UNIX & Shell Programming**,** Pearson Education.
3. Richard Blum, Christine Brenham: Linux Command Line and Shell Scripting Bible, 2ndEdition, Wiley, 2014.

Web links and Video Lectures (e-Resources):

https://www.youtube.com/watch?v=ffYUfAqEamY
https://www.youtube.com/watch?v=Q05NZiYFcD0
https://www.youtube.com/watch?v=8GdT53KDIyY
https://www.youtube.com/watch?app=desktop&v=3Pga3y7rCgo

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

Programming assignment -1 (Shell level) - 10 marks
Programming assignment -2 (API level) - 15 marks

	DISTRIBUTED SYSTEMS		Semester	5
	Course Code	**BCS515D**	CIE Marks	50
	Teaching Hours/Week (L: T:P: S)	3:0:0:0	SEE Marks	50
	Total Hours of Pedagogy	3Hrs	Total Marks	100
	Credits	03	Exam Hours	
	Examination type (SEE)	Theory		

Course objectives:

- Understand the goals and challenges of distributed systems
- Describe the architecture of RPC/RMI, distributed file systems and name services
- Learn clock synchronization algorithms to monitor and order the events, mutual exclusion, election and consensus algorithms.
- Study the fundamental concepts and algorithms related to distributed transactions and replication.

Teaching-Learning Process (General Instructions)

These are sample strategies which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking.
5. Adopt Problem Based Learning (PBL), which fosters students' Analytical skills, develop design thinking skills such as the ability to design, evaluate, generalize, and analyse information rather than simply recall it.
6. Introduce Topics in manifold representations.
7. Show the different ways to solve the same problem and encourage the students to come up with their own creative ways to solve them.
8. Demonstrate every concept by implementing an OpenGL program.

Module-1

CHARACTERIZATION OF DISTRIBUTED SYSTEMS: Introduction, Focus on resource sharing, Challenges.

REMOTE INVOCATION: Introduction, Request-reply protocols, Remote procedure call, Introduction to Remote Method Invocation.

Textbook: Chapter- 1.1,1.4,1.5, 5.1-5.5

Module-2

DISTRIBUTED FILE SYSTEMS: Introduction, File service architecture.

NAME SERVICES: Introduction, Name services and the Domain Name System, Directory services.

Textbook: Chapter- 12.1,12.2, 13.1-13.3

Module-3

TIME AND GLOBAL STATES: Introduction, Clocks, events and process states, Synchronizing Physical clocks, Logical time and logical clocks, Global states

	Textbook: Chapter- 14.1-14.5
	Module-4
	COORDINATION AND AGREEMENT: Introduction, Distributed mutual exclusion, Elections, Coordination and agreement in group communication, Consensus and related problems. **Textbook: Chapter -15.1-15.5**
	Module-5
	DISTRIBUTED TRANSACTIONS: Introduction, Flat and nested distributed transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery. **REPLICATION:** Introduction. **Textbook: Chapter -17.1-17.6, 18.1**

Course outcome (Course Skill Set)

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

1. Identify the goals and challenges of distributed systems
2. Demonstrate the remote invocation techniques for communication
3. Describe the architecture of distributed file systems and name services
4. Apply clock synchronization algorithms to monitor and order the events.
5. Analyze the performance of mutual exclusion, election and consensus algorithms.
6. Illustrate the fundamental concepts and algorithms related to distributed transactions and replication

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:

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester-End Examination:

Theory SEE will be conducted by University as per the scheduled timetable, with common question papers for the course (**duration 03 hours).**

1. The question paper will have ten questions. Each question is set for 20 marks.
2. There will be 2 questions from each module. Each of the two questions under a module (with a maximum of 3 sub-questions), **should have a mix of topics** under that module.
3. The students have to answer 5 full questions, selecting one full question from each module.
4. Marks scored shall be proportionally reduced to 50 marks

Suggested Learning Resources:

Textbook's:

1. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

Web links and Video Lectures (e-Resources):

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- https://www.youtube.com/watch?v=Azyizl9w2xo&list=PLrjkTql3jnm9FEOXHA_qjRTMODlaIk-W

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Programming Assignment (15 marks)
- Literature Review/ Case Studies (10 marks)

Environmental Studies and E-Waste Management		Semester	V
Course Code	**BCS508**	CIE Marks	50
Teaching Hours/Week (L: T:P: S)	1:0:0:0	SEE Marks	50
Total Hours of Pedagogy	14	Total Marks	100
Credits	01	Exam Hours	1
Examination type (SEE)	Theory		

Course objectives:

- Identify the major challenges of environmental issues
- Develop skills, critical thinking and demonstrate socio-economic skills for Environmental protection
- Analyze the impact of issues w. r. t. waste management

Teaching-Learning Process (General Instructions)

These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.

1. Lecturer method (L) need not to be only traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes.
2. Use of Video/Animation to explain functioning of various concepts.
3. Encourage collaborative (Group Learning) Learning in the class.
4. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes Critical thinking.
5. Adopt Case study Based Learning (CBL), which fosters students' analytical skills, develop thinking skills such as the ability to evaluate, generalize, and analyse information rather than simply recall it.
6. Discuss how every concept can be applied to the real world - and when that's possible, it helps improve the students' understanding.

Module-1

Ecosystem and Sustainability:

Ecosystem: Structure of Ecosystem, Types: Forest, Desert, Wetlands, Riverine, Oceanic ecosystems.

Sustainability: 17SDG targets and possible actions.

Self-Study Component (SSC): Components of the environment.

Textbook 1: CH- 3, e-resource: 1

Module-2

Natural resources and Energy:

Natural Resources: Water resources – Availability & Quality aspects, Water borne diseases & water induced diseases, Fluoride problem in drinking water.

Energy: Different types of energy, Conventional sources & Non -Conventional sources of Energy, Solar energy, Wind Energy, Hydrogen as an alternative energy

Self-Study Component (SSC): Alternative Energy sources

Textbook 1: CH- 2

Module-3

Environmental Pollution:

Environmental Pollution: Water Pollution, Noise pollution, Air pollution (Sources, Impacts, Preventive measures and Public Health Aspects.

Self-Study Component (SSC): Case studies of air pollution episodes

Textbook 1: CH- 5

Module-4

Waste management:

Waste management: Solid Waste Management , types and sources, functional elements of SWM, Biomedical Waste Management - Sources, Characteristics

Environmental Legislation: Solid Waste Management Rules, 2016, Biomedical Waste Management Rules, 2016.

Self-Study Component (SSC): Case studies on waste management options
Textbook 1: CH- 6, e-resource:2

Module-5

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.

E-waste (Management and Handling) Rules, 2011; and E-Waste (Management) Rules, 2022 - Salient Features and its implications.

Self-Study Component (SSC): E-Waste (Management) Amendment Rules, 2023, 2024
Textbook 1: CH- 6, Textbook 2: CH-2, e-resource:3

Course outcome (Course Skill Set)

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

1. Comprehend the principles of ecology and environmental issues pertaining to air, land, and water on a global scale.
2. Acquire observation skills for solving problems related to the environment.
3. Conduct survey to describe the realities of waste management system.

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 Examination (CIE)

- For the Assignment component of the CIE, there are 25 marks and for the Internal Assessment Test component, there are 25 marks.
- The first test will be administered after 40-50% of the syllabus has been covered, and the second test will be administered after 85-90% of the syllabus has been covered
- Any two assignment methods mentioned in the 22OB2.4, if an assignment is project-based then only one assignment for the course shall be planned. The teacher should not conduct two assignments at the end of the semester if two assignments are planned.
- For the course, CIE marks will be based on a scaled-down sum of two tests and other methods of assessment.

Internal Assessment Test question paper is designed to attain the different levels of Bloom's taxonomy as per the outcome defined for the course.

Semester End Examinations (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.

OR

MCQ (Multiple Choice Questions) are preferred for 01 credit courses, however, if course content demands the general question paper pattern that followed for 03 credit course, then

1. The question paper will have ten questions. Each question is set for 10 marks.
2. There will be 2 questions from each module. Each of the two questions under a module may or may not have the sub-questions (with maximum sub-questions of 02, with marks distributions 5+5, 4+6, 3+7).
3. The students have to answer 5 full questions, selecting one full question from each module.

Suggested Learning Resources:

Textbooks

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 Books:

1. Earch Barucha, "Environmental Studies for UG students", 2004.
2. Benny Joseph (2005), "Environmental Studies" , Tata McGraw – Hill Publishing Company Limited.
3. R. Rajagopalan, "Environmental Studies- From Crisis to Cure" , 2nd Edition, Oxford university press, New Delhi, 2013.
4. Johri R., E-waste: implications, regulations, and management in India and current global best practices, TERI Press, New Delhi.
5. Raman Sivakumar, "Principles of Environmental Science and Engineering", 2nd edition, Cengage learning Singapur, 2005.
6. G. Tyler Miller Jr., "Environmental Science – working with the Earth", Eleventh Edition, Thomson Brooks /Cole, 2006
7. Dr. Pratiba Singh, Dr.Anoop Singh and Dr. Piyush Malaviya, "Text Book of Environmental and Ecology", Acme Learning Pvt. Ltd. New Delhi.

8. P. Meenakshi, "Elements of Environmental Science and Engineering", Prentice Hall of India Private Limited, New Delhi, 2006

Web links and Video Lectures (e-Resources):

1. https://sdgs.un.org/goals
2. https://kspcb.karnataka.gov.in/waste-management/biomedical-waste
3. E Waste (Management) Rules, 2022: https://kspcb.karnataka.gov.in/sites/default/files/inline-files/E%20Waste%20%28Management%29%20Rules%2C%202022.pdf

Activity Based Learning (Suggested Activities in Class)/ Practical Based learning

- Analysis report of case study specified in the Textbooks and reference books (one per student). (10 marks)
- Field Survey (In Team): The students' team of the size of 2 to 4 are expected to visit the organization or Industry understand the waste management, utilization of energy, pollution concerns, e-waste handling and other related suggested best practices specified in the syllabus and then submit a detailed visit report to the concerned staff. (15 marks)