

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		
<p>Course objectives: This course will enable students to,</p> <ul style="list-style-type: none"> • 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. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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	
<p>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</p> <p>Textbook 1: Chapter 1: 1.1 to 1.6, Chapter 2: 2.1 to 2.5</p>			
MODULE-2		12 hours	
<p>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</p>			
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)

COMPUTER NETWORKS		Semester	V
Course Code	BCS502	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	03
Examination nature (SEE)	Theory/practical		
<p>Course objectives: This course will enable students to,</p> <ul style="list-style-type: none"> • Study the TCP/IP protocol suite, switching criteria and Medium Access Control protocols for reliable and noisy channels. • Learn network layer services and IP versions. • Discuss transport layer services and understand UDP and TCP protocols. • Demonstrate the working of different concepts of networking layers and protocols. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies; that teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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			
<p>Introduction: Data Communications, Networks, Network Types, Networks Models: Protocol Layering, TCP/IP Protocol suite, The OSI model, Introduction to Physical Layer: Transmission media, Guided Media, Unguided Media: Wireless. Switching: Packet Switching and its types. Textbook: Ch. 1.1 - 1.3, 2.1 - 2.3, 7.1 – 7.3, 8.3.</p>			
MODULE-2			
<p>Data Link Layer: Error Detection and Correction: Introduction, Block Coding, Cyclic Codes. Data link control: DLC Services: Framing, Flow Control, Error Control, Connectionless and Connection Oriented, Data link layer protocols, High Level Data Link Control. Media Access Control: Random Access, Controlled Access. Check Sum and Point to Point Protocol Textbook: Ch. 10.1-10.4, 11.1 -11.4, 12.1 - 12.2</p>			
MODULE-3			
<p>Network Layer: Network layer Services, Packet Switching, IPv4 Address, IPv4 Datagram, IPv6 Datagram, Introduction to Routing Algorithms, Unicast Routing Protocols: DVR, LSR, PVR, Unicast Routing protocols: RIP, OSPF, BGP, Multicasting Routing-MOSPF Textbook: Ch. 18.1, 18.2, 18.4, 22.2,20.1-20.3, 21.3.2</p>			
MODULE-4			
<p>Introduction to Transport Layer: Introduction, Transport-Layer Protocols: Introduction, User Datagram Protocol, Transmission Control Protocol: services, features, segments, TCP connections, flow control, Error control, Congestion control. Textbook: Ch. 23.1- 23.2, 24.1-24.3.4, 24.3.6-24.3.9</p>			
MODULE-5			

Introduction to Application Layer: Introduction, Client-Server Programming, Standard Client-Server Protocols: World Wide Web and HTTP, FTP, Electronic Mail, Domain Name System (DNS), TELNET, Secure Shell (SSH)
Textbook: Ch. 25.1-25.2, 26.1-26.6

PRACTICAL COMPONENT OF IPCC

Sl.NO	Experiments
1	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.
2	Implement transmission of ping messages/trace route over a network topology consisting of 6 nodes and find the number of packets dropped due to congestion.
3	Implement an Ethernet LAN using n nodes and set multiple traffic nodes and plot congestion window for different source / destination.
4	Develop a program for error detecting code using CRC-CCITT (16- bits).
5	Develop a program to implement a sliding window protocol in the data link layer.
6	Develop a program to find the shortest path between vertices using the Bellman-Ford and path vector routing algorithm.
7	Using TCP/IP sockets, write a client – server program to make the client send the file name and to make the server send back the contents of the requested file if present.
8	Develop a program on a datagram socket for client/server to display the messages on client side, typed at the server side.
9	Develop a program for a simple RSA algorithm to encrypt and decrypt the data.
10	Develop a program for congestion control using a leaky bucket algorithm.

Course outcomes (Course Skill Set):

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

- **Explain** the fundamentals of computer networks.
- **Apply** the concepts of computer networks to demonstrate the working of various layers and protocols in communication network.
- **Analyze** the principles of protocol layering in modern communication systems.
- **Demonstrate** various Routing protocols and their services using tools such as Cisco packet tracer.

Note: For the Simulation experiments modify the topology and parameters set for the experiment and take multiple rounds of reading and analyze the results available in log files. Plot necessary graphs and conclude using NS2 or NS3. 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 scored by 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

- Implementation of various protocols using open source simulation tools. (5 marks)
- Simulation of Personal area network, Home area network, achieve QoS etc. (5 marks)

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		
<p>Course objectives:</p> <ul style="list-style-type: none"> • 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. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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: <ol style="list-style-type: none"> 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 220B2.4, 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 Chandrashekar, 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)

OO Design Patterns Lab		Semester	V
Course Code	BCGL504	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:			
<ul style="list-style-type: none"> • To introduce students to the fundamental principles and concepts of design patterns and their role in object-oriented software development. • To equip students with the skills to identify and apply the most appropriate design patterns to solve common software design problems. • To develop the ability to analyze the advantages and disadvantages of different design patterns in real-world applications. • To provide hands-on experience in implementing various design patterns using object-oriented programming languages. 			
Sl.NO	Experiments (Implementation using Star UML)		
1	Design and implement ShapeFactory class that generates different types of Shape objects (Circle, Square, Rectangle) based on input parameters using Factory Design Pattern.		
2	Design and Implement an AbstractFactory class to create families of related or dependent objects with respect to decathlon store without specifying their concrete classes using Abstract Factory.		
3	Design and implement a complex object like a House using a step-by-step Builder pattern, allowing different representations of the house (wooden, brick, etc.).		
4	Design and Implement to Extend a Coffee object with dynamic features (e.g., milk, sugar, whipped cream) using Decorators.		
5	Design and Implement a Logger class ensuring a single instance throughout the application		
6	Design and implement an Adapter Pattern for a Music System.		
7	Design and Implement an Observer pattern for a news agency to notify subscribers of updates.		
8	Design and Implement a Façade pattern for home theatre system.		
9	Design and Implement a Template Method for Document Processing (word, pdf, excel)		
10	Design and Implement weather monitoring system that notifies multiple display devices whenever the weather conditions change that follows the Observer Design Pattern.		
11	Design and Implement a Proxy pattern to control access to an object (e.g., a protected resource or remote service).		
12	Design and Implement a Mediator pattern to manage communication between a set of objects (e.g., chat room with multiple participants).		

Course outcomes (Course Skill Set):

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

- Design the model for the given problem using UML concepts and notations.
- Develop the solution for the given real world problem using design patterns .
- 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:

- Alan Shalloway, James R Trot, "Design Patterns Explained – A New Perspective on Object Oriented Design", Pearson, 2nd Edition, 4th Impression 2010.
- Eric Freeman, Elisabeth Freeman, "Head First Design Patterns", O'reilly Publications, October 2004, 1st Edition.
- Satzinger, Jackson, Burd, "Object Oriented Analysis and Design with Unified Process", Thomson Learning, 1st Indian Reprint 2007.
- <https://www.udemy.com/course/design-patterns-java/>
- <https://nptel.ac.in/courses/106105224>

VIDEO PROCESSING		Semester	5
Course Code	BCG515A	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		
<p>Course objectives:</p> <ul style="list-style-type: none"> ● To understand the image and video processing fundamentals ● To study the 2D and 3D motion estimation methods ● To learn about various video filtering and restoration methods ● To study various video compression methods, video compression standards and video transmission types 			
<p>Teaching-Learning Process (General Instructions)</p> <p>These are sample strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Lecturer method (L) does not mean only the traditional lecture method, but different types of teaching methods may be adopted to achieve the outcomes. 2. Utilize video/animation films to illustrate the functioning of various concepts. 3. Promote collaborative learning (Group Learning) in the class. 4. Pose at least three HOT (Higher Order Thinking) questions in the class to stimulate critical thinking. 5. Incorporate Problem-Based Learning (PBL) to foster students' analytical skills and develop their ability to evaluate, generalize, and analyze information rather than merely recalling it. 6. Introduce topics through multiple representations. 7. Demonstrate various ways to solve the same problem and encourage students to devise their own creative solutions. 8. Discuss the real-world applications of every concept to enhance students' comprehension. 9. Use any of these methods: Chalk and board, Active Learning, Case Studies. 			
Module-1			
<p>Digital Images and Video: Human Visual System and Color, Analog Video, Digital Video, 3D Video, Digital Video-Applications, Image and Video Quality.</p> <p>Textbook: Chapter 2.</p>			
Module-2			
<p>Motion Estimation: Image Formation, Motion Models, 2D Apparent-Motion Estimation, Differential Methods, Matching Methods, Nonlinear Optimization Methods, Transform-Domain Methods, 3D Motion and Structure Estimation.</p> <p>Textbook: Chapter 4</p>			

Module-3
Video Segmentation and Tracking: Image Segmentation, Change Detection, Motion Segmentation, Motion Tracking, Image and Video Matting, Performance Evaluation. Textbook: Chapter 5
Module-4
Video Filtering: Theory of Spatio-Temporal Filtering, Video-Format Conversion, Multi-Frame Noise Filtering, Multi-Frame Restoration, Multi-Frame Super-Resolution. Textbook: Chapter 6
Module-5
Video Compression: Video-Compression Approaches, Early Video-Compression Standards, MPEG-4AVC/ITU-T H.264 Standard, High-Efficiency Video-Coding (HEVC) Standard, Scalable-Video Compression, Stereo and Multi-View Video Compression. Textbook 1: Chapter 8
<p>Course outcome (Course Skill Set)</p> <p>At the end of the course, the student will be able to:</p> <ol style="list-style-type: none"> 1. Explain the digital image and video processing fundamentals and digital video applications. 2. Analyze the 2D and 3D motion estimation methods in digital video processing. 3. Analyze the image segmentation and change detection as well as segmentation of dominant motion or multiple motions using various methods. 4. Explain the various video filtering methods and restoration techniques. 5. Describe the video compression methods, video compression standards and interactive video transmission types.

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 220B2.4, 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 Book:**

1. A Murat Tekalp, "Digital Video Processing", 2nd Edition, Prentice Hall Signal Processing Series, 2015.

Reference Books:

1. Yao Wang, Jorn Ostermann, Ya-Qin Zhang, "Video Processing and Communications", Prentice Hall Publishers, 2002.
2. Charles Poynton, "Digital Video and HD – Algorithms and Interfaces", 2nd Edition, Elsevier, 2018.

Web links and Video Lectures (e-Resources):

- <https://download.e-bookshelf.de/download/0003/9259/52/L-G-0003925952-0013267751.pdf>
- <https://in.mathworks.com/solutions/image-video-processing/video-processing.html>
- <https://link.springer.com/journal/11760>
- https://www.youtube.com/watch?v=QoZ8pccsYo4&list=PLWKotBjTDoLgK5TsgSZG_uIqhre2Im3Cj&index=3
- <https://www.youtube.com/watch?v=AxIc-vGaHQ0>
- <https://archive.nptel.ac.in/courses/117/104/117104020/>

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

- Practical assignments on Digital Video Manipulation, Image and Video Segmentation, Noise Filtering, Video Compression, etc., using MATLAB. (25 marks)

ARTIFICIAL INTELLIGENCE		Semester	V
Course Code	BCS515B	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		
<p>Course objectives:</p> <ul style="list-style-type: none"> • Learn the basic principles and theories underlying artificial intelligence, including machine learning, neural networks, natural language processing, and robotics. • Apply AI techniques to solve real-world problems, including search algorithms, optimization, and decision-making processes. • Understand the ethical, legal, and societal implications of AI, including topics such as bias, fairness, accountability, and the impact of AI on the workforce and privacy. 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies, which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 1. Use of Video/Animation to explain functioning of various concepts. 2. Encourage collaborative (Group Learning) Learning in the class. 3. Discuss application of every concept to solve the real-world problems. 4. Demonstrate ways to solve the same problem and encourage the students to come up with their own creative solutions. 			
Module-1			
<p>Introduction: What Is AI? , The State of The Art. Intelligent Agents: Agents and environment, Concept of Rationality, The nature of environment, The structure of agents. Chapter 1 - 1.1, 1.4 Chapter 2 - 2.1, 2.2, 2.3, 2.4</p>			
Module-2			
<p>Problem-solving: Problem-solving agents, Example problems, Searching for Solutions Uninformed Search Strategies Chapter 3 - 3.1, 3.2, 3.3, 3.4</p>			
Module-3			
<p>Problem-solving: Informed Search Strategies, Heuristic functions Logical Agents: Knowledge-based agents, The Wumpus world, Logic, Propositional logic, Reasoning patterns in Propositional Logic Chapter 3 - 3.5, 7.6 Chapter 7 - 7.1, 7.2, 7.3, 7.4</p>			
Module-4			
<p>First Order Logic: Representation Revisited, Syntax and Semantics of First Order logic, Using First Order logic, Knowledge Engineering In First-Order Logic Inference in First Order Logic: Propositional Versus First Order Inference, Unification, Forward Chaining Chapter 8- 8.1, 8.2, 8.3, 8.4 Chapter 9- 9.1, 9.2, 9.3</p>			

Module-5

Inference in First Order Logic: Backward Chaining, Resolution

Classical Planning: Definition of Classical Planning, Algorithms for Planning as State-Space Search, Planning Graphs

Chapter 9-9.4, 9.5

Chapter 10- 10.1,10.2,10.3

Course outcomes (Course Skill Set)

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

1. Explain the architecture and components of intelligent agents, including their interaction with the AI environment.
2. Apply problem-solving agents and various search strategies to solve a given problem.
3. Illustrate logical reasoning and knowledge representation using propositional and first-order logic.
4. Demonstrate proficiency in representing knowledge and solving problems using first-order logic.
5. Describe classical planning in the context of artificial intelligence, including its goals, constraints, and applications in problem-solving.

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

Suggested Learning Resources:**Text Book**

Stuart J. Russell and Peter Norvig, Artificial Intelligence, 3rd Edition, Pearson, 2015

Reference Books

1. Elaine Rich, Kevin Knight, Artificial Intelligence, 3rd edition, Tata McGraw Hill, 2013
2. George F Luger, Artificial Intelligence Structure and strategies for complex, Pearson Education, 5th Edition, 2011
3. Nils J. Nilsson, Principles of Artificial Intelligence, Elsevier, 1980
4. Saroj Kaushik, Artificial Intelligence, Cengage learning, 2014

Web links and Video Lectures (e-Resources):

1. <https://www.kdnuggets.com/2019/11/10-free-must-read-books-ai.html>
2. <https://www.udacity.com/course/knowledge-based-ai-cognitive-systems--ud409>
3. <https://nptel.ac.in/courses/106/105/106105077/>

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

1. Using OpenAI tool, develop a chatbot (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		
<p>Course objectives: This course will enable students to</p> <ul style="list-style-type: none"> ● 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 			
<p>Teaching-Learning Process (General Instructions) These are sample Strategies; which teachers can use to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> 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			
<p>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.</p> <p>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.</p>			

Text Book1: Chapter-1, 2, 3, 4, 5
Module-2
<p>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.</p> <p>The shells interpretive cycle: Wild cards. Removing the special meanings of wild cards. Three standard files and redirection.</p> <p>Connecting commands: Pipe. Basic and Extended regular expressions. The grep, egrep. Typical examples involving different regular expressions.</p> <p>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.</p> <p>Text Book1: Chapter-6,8,13,14</p>
Module-3
<p>Unix Standardization and Implementations: Introduction, Unix Standardization, UNIX System Implementation.</p> <p>File I/O: Introduction, File Description, open, create, read, write, close, fcntl functions.</p> <p>Files and Dictionaries: mkdir and rmdir functions, reading dictionaries, chdir, fchdir and getcwd functions. Device Special files.</p> <p>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.</p> <p>Text Book 2: 2,3,4,7.</p>
Module-4
<p>Process Control: Introduction, Process Identifiers, fork, vfork, exit, wait, waitpid, wait3, wait4 Functions, Race Conditions, exec Functions.</p> <p>Overview of IPC Methods, Pipes, popen, pclose Functions, Coprocesses, FIFOs, System V IPC, Message Queues, Semaphores.</p> <p>Shared Memory, Client-Server Properties, Passing File Descriptors, An Open Server-Version 1.</p> <p>Text Book2: Chapter 8, 15,17</p>
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 commands 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.
- 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 220B2.4, 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

Designing Human Centred Systems		Semester	5
Course Code	BCG515D	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		
<p>Course objectives:</p> <ul style="list-style-type: none"> To enable the students to understand how human interaction, perception and cognition influence user interactions. To discuss Gestalt principles and visual hierarchy for intuitive interfaces To enable students to design for efficiency by responsive interfaces meeting time requirements To enable the students to understand error prevention and recovery for enhanced usability. To support problem solving by enabling the students to understand interfaces that support effective user problem-solving. 			
<p>Teaching-Learning Process (General Instructions) Teachers can use the following strategies to accelerate the attainment of the various course outcomes.</p> <ol style="list-style-type: none"> Lecturer method (L) needs not to be only a traditional lecture method, but alternative effective teaching methods could be adopted to attain the outcomes. Use of Video/Animation to explain functioning of various concepts. Encourage collaborative (Group Learning) Learning in the class. Ask at least three HOT (Higher order Thinking) questions in the class, which promotes critical thinking. 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. Use animations/videos to help the students to understand the concepts. Use of case studies and demonstration of concepts. 			
Module-1			
<p>Our Perception is Biased - Perception Biased By Experience, Perception Biased By Current Context, Perception Biased By Goals, Taking Biased Perception Into Account When Designing. Our Vision Is Optimized To See Structure - Gestalt Principle: Proximity, Similarity, Continuity, Closure, Symmetry, Figure/Ground, Common Fate, Combined. We Seek And Use Visual Structure – Structured Information is Easier to Scan, Visual Hierarchy Helps People Find Relevant Information, Beyond Visual Hierarchy: Information Hierarchy, “Chunking” Helps People Scan and Enter Data, Even More Structure for Input: Data-specific Controls.</p> <p>Textbook: Chapter 1, 2, 3</p>			
Module-2			

<p>Our Color Vision is Limited – How Color Vision Works, Vision is Optimized for Detection of Edges, Not Brightness, Discriminability of Colors Depends on How They are Presented, Color Blindness, External Factors That Influence Our Ability to Distinguish Colors, Guidelines for Using Color</p> <p>Our Peripheral Vision is Poor - Resolution Of The Fovea Compared With The Periphery, Is The Visual Periphery Good For Anything?, Examples From Computer User Interfaces, Common Methods Of Making Messages Visible, Heavy Artillery For Making Users Notice Messages, Visual Search Is Linear Unless Targets “Pop” In The Periphery.</p> <p>Reading is Unnatural - Is Reading Feature-Driven Or Context-Driven?, Poor Information Design Can Disrupt Reading, People Don’t Read When Using Software and the Web; They Scan, Much Of The Text in Apps and Websites Is Unnecessary.</p> <p>Textbook: Chapter 4, 5, 6</p>
Module-3
<p>Our Attention is Limited; Our Memory is Imperfect - A Modern View Of Memory, Characteristics Of Attention And Working Memory, Implications Of Working Memory Characteristics For User-Interface Design, Characteristics Of Long-Term Memory, Implications Of Long-Term Memory Characteristics For User-Interface Design.</p> <p>Limits on Attention Shape Our Thought and Action - We Notice Things More When They Are Related To Our Goals, We Use External Aids To Keep Track Of What We Are Doing, We Follow The Information “Scent” Toward Our Goal, We Prefer Familiar Paths, Our Thought Cycle: Goal, Execute, Evaluate, After We Achieve A Task’s Primary Goal, We Often Forget Cleanup Steps.</p> <p>Recognition is Easy; Recall is Hard - Recognition Versus Recall: Implications For User-Interface Design.</p> <p>Textbook: Chapter 7, 8, 9</p>
Module-4
<p>Learning from Experience and Performing Learned Actions are Easy; Novel Actions, Problem Solving, and Calculation are Hard - Learning From Experience Is (Usually) Easy, Performing Learned Actions Is Easy, Performing Novel Actions Is Hard, Problem Solving And Calculation Are Hard, Implications For User-Interface Design.</p> <p>Many Factors Affect Learning: We Learn Faster When Practice Is Frequent, Regular, And Precise, We Learn Faster When Operation Is Task Focused, Simple, Consistent and Predictable, We Learn Faster When Vocabulary Is Task Focused, Familiar, And Consistent.</p> <p>Our Hand-Eye Coordination Follows Laws - Fitts’ Law: Pointing At Displayed Targets, Steering Law: Moving Pointers Along Constrained Paths.</p> <p>Textbook: Chapter 10, 11, 13</p>
Module-5
<p>We Have Time Requirements - Responsiveness Defined, The Many Time Constants Of The Human Brain, Engineering Approximations Of Time Constants: Orders Of Magnitude, Designing To Meet Real-Time Human Interaction Deadlines, Additional Guidelines For Achieving Responsive Interactive Systems.</p> <p>We Make Errors - Mistakes Versus Slips, Types of Slips, Design to Prevent Mistakes: Provide Clear, Correct Information, Design to Help People Avoid Slips, Design to Help People Recover From Errors, Voice-Recognition Failure and Misrecognition are Not User Errors.</p> <p>Textbook: Chapter 14, 15</p>

Course outcome (Course Skill Set)

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

1. Apply the knowledge of perceptual biases, Gestalt principles, and information hierarchies in user interfaces.
2. Illustrate the knowledge of color vision, peripheral vision, and reading behaviors to design more effective and user interfaces.
3. Demonstrate role of attention limits, memory characteristics, recognition, and recall in intuitive and efficient user interfaces.
4. Explain the impact of learning and hand-eye coordination principles in user interfaces.
5. Relate the impact of time requirements and error prevention principles to user-interface design.

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 220B2.4, 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**

1. Jeff Johnson: "Designing with the Mind in Mind - Simple Guide to Understanding User Interface Design Guidelines" – 3rd Edition. Morgan Kaufmann Publishers (Available on Amazon Kindle).

Reference Books

1. Steve Kurg: "Don't Make Me Think Revisited – A Common Sense Approach to Web and Mobile Usability – 3rd Edition. Pearson Education.
2. Don Norman: "The Design of Everyday Things" Revised and Expanded Edition, Basic Books.

Web links and Video Lectures (e-Resources):

- <https://viva.pressbooks.pub/introegrdesign/chapter/introduction/>
- <https://www.springboard.com/learning-paths/user-experience-design/learn/>
- <https://www.designkit.org/resources/1.html>
- <https://www.interaction-design.org/master-classes/how-to-design-with-the-mind-in-mind>

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

Reference Book-1: Course project: Demonstration of design/usability concepts by building simple user interfaces and applications (Web or Window-based). - 25 Marks