



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

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

Avalahalli, Yelahanka, Bengaluru 560064



Bachelor of Engineering

**Department of Computer Science and
Engineering**

**V and VI Semester Scheme and Syllabus
2021 Scheme - Autonomous**

Approved in the BoS meeting held on 22.05.2023

Vision and Mission of the Department

Vision:

To develop technical professionals acquainted with recent trends and technologies of computer science to serve as valuable resource for the nation/society.

Mission:

Facilitating and exposing the students to various learning opportunities through dedicated academic teaching, guidance and monitoring.

Program Educational Objectives (PEOs)

PEO'S

PEO1	Lead a successful career by designing, analysing and solving various problems in the field of Computer Science & Engineering.
PEO2	Pursue higher studies for enduring edification.
PEO3	Exhibit professional and team building attitude along with effective communication.
PEO4	Identify and provide solutions for sustainable environmental development.

Program Specific Outcomes (PSOs)

PSO'S

PSO-1	Analyze the problem and identify computing requirements appropriate to its solution.
PSO-2	Apply design and development principles in the construction of software systems of varying complexity.

Scheme of VI Semester



BMS INSTITUTE OF TECHNOLOGY AND MANAGEMENT

(Autonomous Institute affiliated to VTU)

Scheme of Teaching and Examination: Effective from AY 2021- 22 Choice Based Credit System (CBCS)

UG PROGRAM: Department of Computer Science and Engineering

Semester: VI

Sl. No	Course Category	Course Code	Course Title	Teaching Dept.	Teaching Hours /Week				Credits	Examination			
					L	T	P	PW		Duration	CIE Marks	SEE Marks	Total Marks
1	HS	21HSS61	Project and Finance Management	CSE	2	0	0	0	2	3	50	50	100
2	AEC	21AEC62	Bioinformatics	CSE	1	0	0	0	1	1	50	50	100
3	AEC	21CS63	Green IT and Sustainability	CSE	1	0	0	0	1	1	50	50	100
4	PE	21CS64X	Professional Elective – II	CSE	3	0	0	0	3	3	50	50	100
5	OE	21CS65X	Open Elective – I	CSE	3	0	0	0	3	3	50	50	100
6	PW	21CS66	Mini Project	CSE	0	0	0	4	2	4	50	50	100
7	PC	21CS67	Data Science and Machine Learning	CSE	3	0	0	0	3	3	50	50	100
8	PC	21CS68	Theory of computation	CSE	3	0	0	0	3	3	50	50	100
9	PC	21CSL69A	Data Science and Machine Learning Laboratory	CSE	0	0	2	0	1	2	50	50	100
10	PC	21CSL69B	Emerging Technology Laboratory	CSE	0	0	2	0	1	2	50	50	100
11	PC	21CSL69C	Mobile Application Development Laboratory	CSE	0	0	2	0	1	2	50	50	100
TOTAL					16	0	6	4	21	----	550	550	1100

Professional Elective - Group II

Course Code	Course Title
21CS641	Computer Network and Security
21CS642	Agile Technologies and DevOps
21CS643	Robotic Process Automation

21CS644	Augmented and Virtual Reality
21CS645	Big Data Analytics

Open Elective (OE) - Group I	
Course Code	Course Title
21CS651	Operating System
21CS652	OOPS with C++
21CS653	Web Programming
21CS654	Java Applications



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Yelahanka, Bengaluru-560064

Date: 14.06.2023

CIE and SEE Pattern for 2021 Scheme (Applicable from the AY 2021-22 onwards)

Important Note:

The weightage of Continuous Internal Evaluation (CIE) is 50% and for Semester End Examinations (SEE) is 50%. The minimum passing mark for the CIE is 40% of the maximum marks (20 marks out of 50) and for SEE minimum passing mark is 35% of the maximum marks (18 marks out of 50). The student is declared as a pass in the course if he / she 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.

4 CREDIT and 3 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs to be conducted for 40 Marks (90 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks**.
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10 marks, total **20 marks**.
- CIE marks = 60 + 20 + 20 = 100 and same can be scale down to **50 marks**.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (3 hours).

Question Paper Pattern:

Part - A: Comprises 20 objective type questions carrying 1 Mark each with a total 20 Marks.

Part - B: There will be **5 modules**. Each module will have **TWO questions carrying 16 marks** each. There will be a maximum of three sub section for each question. **Student has to answer any ONE full question from each module.**

SEE Marks = 20 + 80 = 100 marks and can be scale down to 50 marks.

2 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks**.
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10marks, total **20 marks**.
- CIE marks = $60 + 20 + 20 = 100$ and same can be scale down to **50 marks**.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks (2 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 100 questions each of 01 marks. The same is scale down to 50 marks.

1 CREDIT COURSES

I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS

- Internal Assessment (IA) Tests: 3 IAs of MCQ type to be conducted for 40 Marks (60 minutes each). Total of 3 tests will be 120 and the same can be scale down to **60 marks**.
- Alternate Assignment Tool (AAT): 2 AATs each of 10 marks, total **20 marks**.
- Assignments: 2 assignments of each 10marks, total **20 marks**.
- CIE marks = $60 + 20 + 20 = 100$ and same can be scale down to **50 marks**.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 50 Marks (1 hours).

Question Paper Pattern:

- The pattern of the question paper is MCQ.
- SEE question paper will be set for 50 questions each of 01marks. The same is scale down to 50 marks.

1 CREDIT LABORATORY COURSES


I. CONTINUOUS INTERNAL EVALUATION (CIE): 50 MARKS


- Cumulative Assessment (CA) of each experiment is 20 Marks (Conduction 10 marks + Records 5 marks + Viva 5 marks). The average of all the experiments to be taken for **20 marks**.
- Open Ended Experiments (OE) **10 marks**.
- 2 IAs Test to be conducted for 100 marks. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks. The average of 2 IA marks is scale down to **20 marks**.
- CIE marks = 20 (CA) + 10 (OE) + 20 (IA test) = 50 marks.
- Student has to score minimum of 20 marks (40%).

II. SEMESTER END EXAMINATIONS (SEE): 50 MARKS

SEE is conducted for 100 Marks and scale down to 50 Marks.

Examinations to be conducted jointly by Two examiners. All the experiments are to be included for practical examination. General rubrics suggested for SEE are: Writeup 20 marks, Conduction of the experiments, calculations, graphs, results, etc.,: 60 marks and Viva: 20 marks.


CoE 16/06/2023


Dean AA 16/06/2023


Principal
19/6/23

VI Semester Syllabus

<p align="center">B.E. COMPUTER SCIENCE AND ENGINEERING</p> <p align="center">Choice Based Credit System (CBCS)</p> <p align="center">SEMESTER - VI</p>			
PROJECT & FINANCE MANAGEMENT (2:0:0) 2 (Effective from the academic year 2021-22)			
Course Code	21HSS61	CIE Marks	50
Teaching Hours/Week (L:T:P)	2:0:0	SEE Marks	50
Total Number of Contact Hours	25	Exam Hours	01
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Define the fundamentals of Project Management. 2. Identify the strategies involved in selection, prioritization, planning & scheduling of a project. 3. Understand the time value of money & apply it for decision making. 4. Analyse project risk, progress & results. 5. Make awareness about various sources of finance. 6. Gain Knowledge on working capital & capital budgeting. 			
Preamble: Project Management: Need for project management, management practices to meet the challenges of new economic environment, globalization process, rapid technological advancement, and quality concerns of the stakeholders.			
Module – 1			
Project Management: Definition of project, characteristics of projects, types of projects, project roles. Project Selection & Prioritization: Strategic planning process, strategic objectives, identifying potential projects, feasibility study (environment, society), methods of selecting projects, prioritizing projects, securing and negotiating projects.			
(05 Hours)			
Module – 2			
Project planning & scheduling: Project scope & check list, work break down structure, project schedule, uncertainty in project schedules. Project resourcing & risk planning: Abilities needed when resourcing projects, estimate resource needs, cost planning & estimating, risk management planning, risk identification, risk analysis, project quality planning and project kick-off.			
(05Hours)			
Module – 3			
Project performing, progress & results: Project supply chain management, project balanced score card approach, terminate project early, finish project, customer feedback & approval.			
(05Hours)			

Module – 4	
<p>Financial Management: Evolution of financial management, key activities of finance manager, key decision areas in financial management, financial statement with balance sheet. Efficient utilization and generation of monetary resources and funds, a comparative study of finance and economics, Costs and revenue evaluation for various engineering operations.</p> <p>Capital Budgeting: Types of capital budgeting decisions, capital budgeting proposals, estimating cash flows for project appraisal, green capital budgeting.</p> <p>Number of Hours: 05</p>	
Module – 5	
<p>Working capital management: Factors affecting working capital requirement, operating cycle analysis, negative working capital, cash planning & managing cash flows.</p> <p>Cost of capital and leverage Analysis: Concept, significance, assumptions, factors affecting cost of capital, Leverage Analysis: operating leverage, financial leverage. Recap: All the 5 modules.</p> <p style="text-align: right;">(05 Hours)</p>	
<p>Course outcomes:</p> <p>The students will be able to:</p> <p>CO1: Understand the selection, prioritization & initiation of individual projects.</p> <p>CO2: Understand WBS, scheduling, uncertainty & risks associated in project.</p> <p>CO3: Identify & Evaluate the progress and results of the project. CO4: Understand time value of money & use it for decision making.</p> <p>CO5: Outline capital requirements for starting a business & management of working capital.</p>	
Textbooks	
1.	Timothy J Kloppenborg, Project Management, Cengage Learning, 2 nd Edition, 2009.
2.	John J Hampton, Financial Management, PHI Publication, 4 th edition.
References	
1.	Pennington Lawrence, Project Management, McGraw-Hill, 1 st edition.
2.	Joseph A Moder, Philips New Yark, Project Management with CPM & PRT, McGraw-Hill, 2 nd edition, 1983.
3.	Harold Kerzner, Project Management A system approach to Planning, Scheduling & Controlling, CBS Publication, 2 nd Edition, 2006.
4.	S.D. Sharma, Operations Research, Kedar Nath Ramnath, Meerut, New Edition, 2015.
5.	M.Y. Khan, Financial Management, Tata Mc-Graw Hill, Fifth Edition, 2007.
6.	O.P. Khanna, Industrial Engineering & Management, Dhanpat Rai Publications, Second Edition, 1999.

B.E COMPUTER SCIENCE and ENGINEERING Choice Based Credit System (CBCS) SEMESTER VI			
Bioinformatics (1:0:0) 1 (Effective from the academic year 2021-22)			
Course Code	21AEC62	CIE Marks	50
Teaching Hours/Week (L:T:P)	1:0:0	SEE Marks	50
Total Number of Contact Hours	15	Exam. Hours	3
Course Objectives: <ol style="list-style-type: none"> 1. Better understanding of dynamic biological processes and their understanding at molecular level enabled through and correlated using internet and Bioinformatics. 2. To relate the basic knowledge in Genetics & Molecular Biology and see how it can be applied through Bioinformatics perspective. 3. To utilize bioinformatics tools and databases for retrieving, analyzing, understanding and managing biological data. 			
Preamble: Bioinformatics is an interdisciplinary field mainly involving molecular biology and genetics, computer science, mathematics, and statistics. Data intensive, large-scale biological problems are addressed from a computational point of view.			
Module - 1			
Biological Data Acquisition The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information <div style="text-align: right;">(3 Hours)</div>			
Module - 2			
DATABASES Format and Annotation: Conventions for database indexing and specification of search terms, Common sequence file formats. Annotated sequence databases – primary sequence databases, protein sequence and structure databases, Organism specific databases. <div style="text-align: right;">(3 Hours)</div>			
Module - 3			
DATA PROCESSING Data – Access, Retrieval and Submission: Standard search engines; Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Local versus global. Distance metrics. Similarity and homology. Scoring matrices. <div style="text-align: right;">(3 Hours)</div>			
Module - 4			
METHODS OF ANALYSIS Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequence alignment, FASTA, and PSI BLAST. <div style="text-align: right;">(3 Hours)</div>			
Module - 5			
APPLICATIONS Genome Annotation and Gene Prediction; ORF finding; Phylogenetic Analysis: Comparative genomics, orthologs, paralogs. <div style="text-align: right;">(3 Hours)</div>			

<p>Course Outcomes: The students will be able to:</p> <p>CO1: Apply the basic methodology in Bioinformatics to retrieve data.</p> <p>CO2: Analyse bioinformatics tools and databases for understanding and managing biological data.</p> <p>CO3: Examine the applications of bioinformatics in allied areas.</p>
<p>Textbooks:</p>
<ol style="list-style-type: none"> 1. Introduction to Bioinformatics by Arthur K. Lesk , Oxford University Press. 2. Algorithms on Strings, Trees and Sequences by Dan Gusfield, Cambridge University Press. 3. Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids by Durbin, S.Eddy, A.Krogh, G.Mitchison. 4. Bioinformatics Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press. 5. Beginning Perl for Bioinformatics: An introduction to Perl for Biologists by James Tindall, O'Reilley Media.
<p>References:</p>
<ol style="list-style-type: none"> 1. Bioinformatics The Machine Learning Approach by Pierre Baldi and Soren Brunak.

**B.E COMPUTER SCIENCE and
ENGINEERING**

Choice Based Credit System (CBCS)

SEMESTER – VI

Green IT And Sustainability (1:0:0) 1
(Effective from the academic year 2021 -2022)

Course Code	21CS63	CIE Marks	50
Teaching Hours/Week (L: T:P)	0:2:0	SEE Marks	50
Total Number of Contact Hours	2	Exam Hours	3 Hours

Course Objectives:

1. Understanding the issues in Green ICT.
2. Analyse the environmental impact due to technological changes.
3. Understanding the different parameters, aspects and metrics of ICT.
4. Evaluate the various parameters related to sustainable cloud computing.
5. Understanding the effects of software design on sustainability..

Module – 1

Introduction: , Industrial Revolution, The Emergence of Information and Communication Technologies, The Agenda and Challenges Ahead.

(3 Hours)

Module – 2

Introduction: Number of Connected Devices, Increased, Functionality, Increased Number of Separate Functions, Increased Demand for Speed and Reliability, Obsolescence - The Problem of Backward Compatibility, The Other Side of the Balance Sheet, Videoconference as an Alternative to Business Travel, Dematerialization of Product Chain, Travel Advice/Road Traffic Control, Intelligent Energy Metering, Building Management Systems, Saving IT Resources

(3 Hours)

Module – 3

Introduction: Number of Connected Devices, Increased, Functionality, Increased Number of Separate Functions, Increased Demand for Speed and Reliability, Obsolescence - The Problem of Backward Compatibility, The Other Side of the Balance Sheet, Videoconference as an Alternative to Business Travel, Dematerialization of Product Chain, Travel Advice/Road Traffic Control, Intelligent Energy Metering, Building Management Systems, Saving IT Resources.

(3 Hours)

Module – 4

Introduction: Challenges in the Use of Cloud Computing as Green Technology, Cloud Computing and Sustainability, Sustainable Applications of Cloud Computing.

(3 Hours)

Module – 5

Introduction: Overview and Scope, Evaluating Sustainability Effects, Sustainability and the Product Life Cycle, Direct Effects: Sustainability During Use, Runtime Energy Consumption Basics, Analyzing the Energy Consumption of an Application, Energy Consumption Reduction Using Physical Properties of Semiconductors, Optimizing the Energy Consumption of an Application: Compiler Techniques, Optimizing the Energy Consumption of an Application: Runtime Approaches.

(3 Hours)

Course Outcomes:

After the completion of the course students should be,

CO 1 : Analyse the challenges for Green ICT

CO 2: Understand the environmental impact due to emerging technologies.

CO 3: Understand different aspects of ICT metrics.

CO 4: Analyse the various parameters related to Sustainable Cloud Computing.

CO 5: Analyse the effects of software design on the sustainability.

Textbooks:

- 1 1 .Green Information Technology – A Sustainable Approach, Mohammad Dastbaz Colin Pattinson, Babak Akhgar, Elsevier, 2015 Inc. (<http://b3.stmikbanjarbaru.ac.id/data.bc/100.%20Other/2015%20Green%20Information%20Technology%20A%20Sustainable%20Approach.pdf>).
- 2 Links: <https://www.youtube.com/watch?v=S2m49Op25Zw>.

References:

1. 1. San Murugesan; G. R. Gangadharan, Harnessing Green IT: Principles and Practices, Wiley-IEEE Press.
http://www.vandemataramcollege.com/app/webroot/files/NOTES_sem246/Green_IT-FYCS-Sem2.pdf
2. Links: <https://cloudblogs.microsoft.com/industry-blog/engb/technetuk/2021/08/19/sustainability-and-green-software-engineering/>
<https://www.youtube.com/watch?v=OSM-785tnGM>
<https://www.youtube.com/watch?v=XZmGGAbHqa0>

<p align="center">DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI</p>			
Theory of Computation (3:0:0) 3 ((Effective from the academic year 2021-22))			
Course Code	21CS66	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Apply the core concepts in Automata and Theory of Computation 2. Identify different Formal Language Classes and their Relationships 3. Design Grammars and Recognizers for different formal languages 4. Prove or disprove theorems in automata theory using their properties 5. Determine the decidability and intractability of Computational problems 			
Preamble: Implication and Scope of Theory of Computation and its Importance in Economic growth of Nation, Impact of the course on Societal Problems/ Sustainable Solutions/ National Economy, Career Perspective, Overview of the course in current Innovations and Research trends.			
Module – 1			
Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. Finite automata with Epsilon-transitions. <p align="right">(8 Hours)</p>			
Module – 2			
Regular expressions, Properties of Regular Languages: Finite Automata and Regular Expressions; Applications of Regular Expressions. Kleene's theorem. Regular languages: Proving languages not to be regular languages; Equivalence and minimization of automata. <p align="right">(8 Hours)</p>			
Module – 3			
Closure properties of regular languages: Decision properties of regular languages; Context-Free Grammars And Languages: Context-free grammars; Writing a grammar, Leftmost derivation, rightmost derivation, derivation trees; Applications; Ambiguity in grammars and Languages. <p align="right">(8 Hours)</p>			
Module – 4			
Properties of Context-Free Languages: Normal forms for CFGs. Closure properties of CFLs. Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata. <p align="right">(8 Hours)</p>			

Module – 5	
<p>Introduction to Turing Machine: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.</p> <p>Undecidability: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; Other undecidable problems.</p> <p>Recap: Summary of the Course</p> <p style="text-align: right;">(8 Hours)</p>	
<p>Course Outcomes: The students will be able to:</p> <p>C01: Analyse the concept of abstract machines and their power to recognize the languages.</p> <p>C02: Apply the finite state machines for modelling and solving computing problems.</p> <p>C03: Design context free grammars for formal languages.</p> <p>C04: Analyse difference between decidability and undecidability.</p> <p>C05: Achieve the proficiency with mathematical tools and formal methods.</p>	
<p>Text books</p> <ol style="list-style-type: none"> 1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman ,Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd Edition, 2007 2. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education, 2012/2013. <p>References:</p> <ol style="list-style-type: none"> 1. Peter Linz, An Introduction to Formal Languages and Automata, 3rd Edition, Narosa Publishers, 1998. 2. K.L.P. Mishra, Theory of Computer Science, Automata, Languages, and Computation, PHI Learning, 3rd Edition, 2009. 3. John C Martin, Introduction to Languages and Automata Theory, Tata McGraw-Hill, 3rd Edition, 2007. 4. Allen I Holub, Compiler design in C, Prentice-Hall software series. 	

B.E COMPUTER SCIENCE and ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Data Science and Machine Learning (3:0:0) 3 (Effective from the academic year 2021-22)			
Course Code	21CS65	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Discuss the concepts of statistical learning 2. summarize Linear regression and Classification techniques and outline Tree based methods 3. Explain unsupervised learning with statistical learning. Learning about a set of tools for modelling and understanding complex datasets.			
Preamble: <p>Significance and Scope of the course: Data Science helps with creating insights from data that deals with real world complexities and Machine Learning helps in accurately predicting or classifying outcomes for new data points by learning patterns from historical data. Data scientists can work with machine learning with equal ease.</p> <p>Data science allows data collected for other purposes to be applied to model problems related to various domains. Machine learning is expanding across all fields such as banking and finance, information technology, media & entertainment, gaming etc.</p> <p>An Overview of Statistical Learning: <i>Wage Data, Stock Market Data, Gene Expression Data</i>, A Brief History of Statistical Learning</p>			
Module – 1			
Statistical Learning: What Is Statistical Learning, Assessing Model Accuracy			(8 Hours)
Module – 2			
Linear Regression: Simple Linear Regression, Multiple Linear Regression, Other Considerations in the Regression Model, Comparison of Linear Regression with <i>K</i> -Nearest			(8 Hours)
Module – 3			
Classification: An Overview of Classification, Why Not Linear Regression? Logistic Regression, Linear Discriminant Analysis			(8 Hours)
Module – 4			
Tree-Based Methods: The Basics of Decision Trees, Bagging, Random Forests, Boosting			(8 Hours)
Module – 5			

Unsupervised Learning: The Challenge of Unsupervised Learning, Principal Components Analysis, Clustering Methods

Self-Study Topics:

- Reinforcement learning
- Convolutional Neural Network.
- Deep Learning algorithms

Recap/ Summary: Overview of various techniques under supervised and unsupervised learning with focus on application in each domain.

(8 Hours)

Course Outcomes: The students will be able to:

CO1: Apply the concepts of statistical learning.

CO2: Solve the given problem by using the supervised learning methods.

CO3: Use the unsupervised learning methods for prediction.

CO4: Analyze statistical learning methods for various areas.

Textbooks:

1. Gareth James, Daniela Witten, Trevor Hastie and Robert Tibshirani. "Introduction to Statistical Learning (with Applications in R)", Springer, 2017.

References:

1. A First Course in Machine Learning (Chapman& Hall/Crc Machine Learning & Pattern Recognition) Simon Rogers, Mark Girolami, CRC Press, 2011.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Theory of Computation (3:0:0) 3 ((Effective from the academic year 2021-22))			
Course Code	21CS66	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Apply the core concepts in Automata and Theory of Computation 2. Identify different Formal Language Classes and their Relationships 3. Design Grammars and Recognizers for different formal languages 4. Prove or disprove theorems in automata theory using their properties 5. Determine the decidability and intractability of Computational problems 			
Preamble: Implication and Scope of Theory of Computation and its Importance in Economic growth of Nation, Impact of the course on Societal Problems/ Sustainable Solutions/ National Economy, Career Perspective, Overview of the course in current Innovations and Research trends			
Module – 1			
Introduction to Finite Automata: Introduction to Finite Automata; The central concepts of Automata theory; Deterministic finite automata; Nondeterministic finite automata. Finite automata with Epsilon-transitions. <div style="text-align: right;">(8 Hours)</div>			
Module – 2			
Regular expressions, Properties of Regular Languages: Finite Automata and Regular Expressions; Applications of Regular Expressions. Kleene's theorem. Regular languages: Proving languages not to be regular languages; Equivalence and minimization of automata. <div style="text-align: right;">(8 Hours)</div>			
Module – 3			
Closure properties of regular languages: Decision properties of regular languages; Context-Free Grammars And Languages: Context-free grammars; Writing a grammar, Leftmost derivation, rightmost derivation, derivation trees; Applications; Ambiguity in grammars and Languages. <div style="text-align: right;">(8 Hours)</div>			
Module – 4			
Properties of Context-Free Languages: Normal forms for CFGs. Closure properties of CFLs. Pushdown Automata: Definition of the Pushdown automata; the languages of a PDA; Equivalence of PDA's and CFG's; Deterministic Pushdown Automata. <div style="text-align: right;">(8 Hours)</div>			

Module – 5	
<p>Introduction to Turing Machine: Problems that Computers cannot solve; The turning machine; Programming techniques for Turning Machines; Extensions to the basic Turning Machines; Turing Machine and Computers.</p> <p>Undecidability: A Language that is not recursively enumerable; An Undecidable problem that is RE; Post's Correspondence problem; Other undecidable problems.</p> <p>Recap: Summary of the Course</p> <p style="text-align: right;">(8 Hours)</p>	
<p>Course Outcomes: The students will be able to:</p> <p>C01: Analyse the concept of abstract machines and their power to recognize the languages.</p> <p>C02: Apply the finite state machines for modelling and solving computing problems.</p> <p>C03: Design context free grammars for formal languages.</p> <p>C04: Analyse difference between decidability and undecidability.</p> <p>C05: Achieve the proficiency with mathematical tools and formal methods.</p>	
<p>Text books</p> <ol style="list-style-type: none"> 1. John E. Hopcroft, Rajeev Motwani, Jeffrey D.Ullman ,Introduction to Automata Theory, Languages and Computation, Pearson Education, 3rd Edition, 2007 2. Elaine Rich, Automata, Computability and Complexity, 1st Edition, Pearson Education, 2012/2013. <p>References:</p> <ol style="list-style-type: none"> 1. Peter Linz, An Introduction to Formal Languages and Automata, 3rd Edition, Narosa Publishers, 1998. 2. K.L.P. Mishra, Theory of Computer Science, Automata, Languages, and Computation, PHI Learning, 3rd Edition, 2009. 3. John C Martin, Introduction to Languages and Automata Theory, Tata McGraw-Hill, 3rd Edition, 2007. 4. Allen I Holub, Compiler design in C, Prentice-Hall software series. 	

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

Choice Based Credit System (CBCS)

SEMESTER – VI

Data Science and Machine Learning Laboratory (0:0:2) 1

(Effective from the academic year 2021-22)

Course Code	21CSL67A	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:3	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3

Course Objectives:

This course will enable students to:

1. To learn basics of R.
2. Implementation of the various machine learning techniques.

Write the R programming for the following Questions.

Q1.

- a) Load Auto. Data file.
- b) View the data in a spread sheet using fix () function.
- c) Handle the missing element of the data matrix.
- d) Check for dimension and Variable names.

Q2.

- a) Plot the scatterplots of the quantitative scatterplot variables.
- b) Produce a numerical summary of each variable in Auto. Data file.

Q3.

- a) Fit a Simple Linear Regression model using least square.
- b) Produce confidence intervals and prediction intervals.
- c) Analyse detailed information using summary function.

Q4.

- a) Fit a multiple linear regression model using least squares.
- b) Analyse detailed information using summary function.
- c) Include interaction terms in a linear model using the lm() function.
- d) Analyse detailed information using summary function.

Q5.

- a) Fit a logistic regression model. Use the functions to access coefficients and particular aspects of the fitted model.
- b) Compute the confusion matrix in order to determine how many observations were correctly or incorrectly classified.
- c) Fit a linear discriminant analysis model.

Q6.

- d) knn() function to predict the market's movement, for K=1
- e) Compare the result with K=3.
- f) Fit a QDA model to the Smarket data.

Q7.

- a) Fit a classification tree in order to predict target variable
- b) Lists the variables that are used as internal nodes in the tree, the number of terminal nodes, and the (training) error rate.
- c) Plot the tree Structure, display the node labels.
- d) Evaluate its performance on the test data.
- e) Find the number of terminal nodes of each tree considered (size) as well as the corresponding error rate and the value of the cost-complexity parameter used.

Q8.

- a) Fit boosted regression trees to the Boston data set.
- b) Produce partial dependence plots for two variables considered.
- c) Produces a relative influence plot and also outputs the relative influence statistics.
- d) Produce partial dependence plots.
- e) Use the boosted model to predict target variable on the test set.

Q9.

- a) Perform PCA on the USArrests data set.
- b) Plot the first two principal components.
- c) Output the standard deviation of each principal component.
- d) Compute the proportion of variance explained by each principal component.
- e) Plot the PVE explained by each component and cumulative PVE,

Q10.

- a) Performs K-means clustering.
- b) Plot the data, with each observation colored according to its cluster assignment.
- c) Implements hierarchical clustering.
- d) Compute the 50×50 inter-observation Euclidean distance matrix.
- e) Plot the dendrograms.

Course Outcomes: The students will be able to:

- C01: Interpret various Supervised and Unsupervised learning methods.
- C02: Analyze statistical learning methods for various data set.

B.E COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Emerging Technology Laboratory (0:0:2) 1 (Effective from the academic year 2021 -22)			
Course Code	21CSL69B	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	26	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. To apply essential software tools used for cross platform development software. 2. To analyse the contemporary advances and innovation in various fields of technology. 3. To study and implement converging technologies that is emerging in the domain. 4. To Add to the research component in view of the future enhancements. 			
Tools Exploration A comprehensive report contains purpose, working, inference, merits, and demerits of the tool. Snapshots of working with tool to be added. The list of tools is not just limited to the list given below. Students to choose any one tool under cyber forensics, data science and software engineering and submit the report.			
List of tools			
Cyber Forensics <ol style="list-style-type: none"> 1. Wireshark 2. SamSpade 3. NESSUS 4. NMAP 5. Forensics Acquisition of Websites 			
Data Science <ol style="list-style-type: none"> 1. ETL Tool (Any tool Kettle, Octopus etc.s,) 2. KNIME 3. Rapid Miner 4. R tool 5. Apache Spark / Hadoop 			
Software Engineering Rational Rose/Metamil/Enterprise Architecture: Introduction, creating class diagram, developing use case model, Domain model, UML Sequence diagrams, state charts and activity diagrams. <ol style="list-style-type: none"> 1. Identify Use Cases and develop the Use Case model for ONLINE PURCHASE SYSTEM 2. Identify the conceptual classes and develop a domain model with UML Class diagram for LIBRARY MANAGEMENT SYSTEM. 3. Using the identified scenarios, find the interaction between objects and represent 			

Course Outcomes: The students will be able to:

CO1: Analyze the state of art and literature in the fields/domains of Cyber Forensics, Data Science and software Design and Engineering

CO2: Apply the concepts and implement the research component of the new technology to the solution.

CO3: Assess the applicability of the design in various fields of modern technology including the emerging ones based on literature survey

them using UML Sequence diagrams, statecharts and activity diagrams for E- TICKETING.

<p align="center">B.E COMPUTER SCIENCE and ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI</p>			
<p align="center">Mobile Application Development Laboratory (0:0:2) 1 (Effective from the academic year 2021-22)</p>			
Course Code	21CSL69C	CIE Marks	50
Teaching Hours/Week (L:T:P)	0:0:2	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
<p>Course Objectives:</p> <ol style="list-style-type: none"> 1. Learn and acquire the art of Android Programming. 2. Install and Configure Android studio and its development tools to run the applications. 3. Use User Interface components for android application development. 4. Create Android applications using mobile related server-less database like SQLITE. 5. Inspect different methods of sharing data using services. <ul style="list-style-type: none"> • The installation procedure of Android Studio & Java JDK tools shall be demonstrated and carried out in groups. • Students shall learn and execute programs either in Java or Kotlin Language. The students are free to design their user interface layouts and controls to design the application programs in the syllabus. • The mini project from Part B can be designed and developed using any modern tools relevant to Android Studio and can improvise by adding extra features to the existing topics (Projects/ Programs are not limited to the list given in Part B). 			
<p align="center">Part A</p>			
<ol style="list-style-type: none"> 1. Create an application to design a Digital Business Card. The card should have a company logo, the company name, and information like the name of the employee, job title, phone number, address, email, fax, Github Profile, LinkedIn Profile links and the website address. Design the application by using different fonts, colors, and with professional UI design outlook. 2. Develop an Android application using controls like Button, TextView, EditText for designing a native calculator having basic functionality like Addition, Subtraction, Multiplication, and Division. Also learn the different ways of handling button events. 3. Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds. 4. Design an application for a simple alarm clock. Add features like setting up once-off alarm/ recurring and alarm, dismiss and snooze alarm. 5. Develop a simple application with one EditText so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts the user input text into voice. 6. Design an application for SMS application using Intent . Design a simple layout which 			

shows a text called *message* in the top and followed by the header called *mobile number* and a *input field* which allows the user to enter the mobile number to which the message has to be sent. And also a *big input field* where the user is going to write the text message and a *send button*. A *toast message* that shows success/failure of SMS sending.

7. Create an activity like a phone dialer with CALL and SAVE buttons. On pressing the CALL button, it must call the phone number and on pressing the SAVE button it must save the number to the phone contacts
8. Create a SIGN Up activity with Username and Password. Validation of passwords should happen based on the following rules:
 - Password should contain uppercase and lowercase letters.
 - Password should contain letters and numbers.
 - Password should contain special characters.
 - Minimum length of the password (the default value is 8).

On successful SIGN UP proceed to the next Login activity.

Here the user should SIGN IN using the Username and Password created during the signup activity. If the Username and Password are matched then navigate to the next activity which displays a message saying “Successful Login” or else displays a toast message saying “Login Failed”. The user is given only two attempts and after that displays a toast message saying “Failed Login Attempts” and disable the SIGN IN button. Use Bundle to transfer information from one activity to another.

Part B

1. Design an application that accesses your camera and scans the QR code or barcode and returns the results by Integrating the Mobile Vision API of Google Play Service.
2. Create two files of XML and JSON type with values for City_Name, Latitude, Longitude, Temperature, and Humidity. Develop an application to create an activity with two buttons to parse the XML and JSON files which when clicked should display the data in their respective layouts side by side.
3. Design an android media player application that includes audio, video and recording media. The applications should be able to control the audio/video playback like start, stop, pause etc, record the audio/video file and store it in the external directory in mp3/mp4 format.
4. Design an application using SQLite database to perform database operations on Student database like Name, USN, contact details and email id. Create the database handler class that extends SQLiteOpenHelper and implement its methods.
5. Develop a content provider application with an activity called “Meeting Schedule” which takes Date, Time and Meeting Agenda as input from the user and store this information into the SQLite database. Create another application with an activity called “Meeting Info” having DatePicker control, which on the selection of a date should display the Meeting Agenda information for that particular date, else it should display a toast message saying “No Meeting on this Date”.

6. Write a program to create an activity having a Text box, and also Save, Open and Create buttons. The user has to write some text in the Text box. On pressing the Create button the text should be saved as a text file in Msdcard. On subsequent changes to the text, the Save button should be pressed to store the latest content to the same file. On pressing the Open button, it should display the contents from the previously stored files in the Text box. If the user tries to save the contents in the Textbox to a file without creating it, then a toast message has to be displayed saying "First Create a File".
7. Develop an application to demonstrate the use of Asynchronous tasks in android. The asynchronous task should implement the functionality of a simple moving banner. On pressing the Start Task button, the banner message should scroll from right to left. On pressing the Stop Task button, the banner message should stop. Let the banner message be "Demonstration of Asynchronous Task".
8. Develop an application that makes use of the clipboard framework for copying and pasting text. The activity consists of two EditText controls and two Buttons to trigger the copy- and-paste functionality.

Procedure to Conduct Practical Examination

☐ Experiment distribution

For laboratories having only one part: Students are allowed to pick one experiment from the lot with equal opportunity from Part A. Part B would be a mini project.

Change of experiment is allowed only once and marks are allotted for the procedure to be made zero of the changed part only.

☐ Marks Distribution

For laboratories having PART A and PART B

i. Part A – Procedure + Execution + Viva = 7 + 35 + 8 = 50 Marks

ii. Part B – Project Demo and Presentation + Viva = 7 + 35 + 8 = 50 Marks

Text Books:

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017.

<https://www.gitbook.com/book/google-developer-training/android-developer-fundamentals-course-concepts/details>

(Download pdf file from the above link)

Reference Books:

1. Erik Hellman, "Android Programming – Pushing the Limits", 1st Edition, Wiley India Pvt Ltd, 2014. ISBN-13: 978-8126547197
2. Dawn Griffiths and David Griffiths, "Head First Android Development", 1st Edition, O'Reilly SPD Publishers, 2015. ISBN-13: 978-9352131341
3. Bill Phillips, Chris Stewart and Kristin Marsicano, "Android Programming: The Big Nerd Ranch Guide", 3rd Edition, Big Nerd Ranch Guides, 2017. ISBN-13: 978-0134706054

<p>Course Outcomes: The students will be able to:</p>

CO1:Create, test and debug Android application by setting up Android development environment.

CO2:Implement adaptive, responsive user interfaces that work across a wide range of devices.

CO3:Infer long-running tasks and background work in Android applications. CO4:Demonstrate methods in storing, sharing and retrieving data in Android applications. CO5:Infer the role of permissions and security for Android applications.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Computer Network and Security (3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS641	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	03
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Learn fundamentals of cryptography and its application to network security. 2. Apply basic number theory in cryptography, the design principals of symmetric and asymmetric cryptography, AES, and RSA. 3. The course will be emphasizing on the algorithmic complexity and security vs performance trade off. 4. Understand network security threats, security services, and countermeasures. 5. Analyze well-known network security protocols such as IPSec, SSL, and WEP. 6. Explore vulnerability analysis of network security, hash functions, authentication, firewalls, and intrusion detection techniques. 			
Module – 1			
Preamble: This course describes the explosive growth in computer systems and their interconnections via networks. It has increased the dependence of both organizations and individuals on the information stored and communicated using these systems. This, in turn, has led to a heightened awareness of the need to protect data and resources from disclosure, to guarantee the authenticity of data and messages, and to protect systems from network-based attacks and the disciplines of cryptography and network security have matured, leading to the development of practical, readily available applications to enforce network security			
Foundations of cryptography and block Cipher Techniques: OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, model for Network Security. Classical Encryption Technique: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques.			
(8 Hours)			
Module – 2			
Data Encryption and advanced encryption techniques: Block Ciphers, Data Encryption Standard and Advanced Encryption Standard Block Cipher Principles, The Data Encryption Standard, Block Cipher Design Principles and Modes of operation, Evaluation Criteria for AES, AES Cipher-Encryption and Decryption, Data Structure, Encryption Round. Public Key Cryptography and Key Management: Principles of Public Key Cryptosystem, RSA algorithm, Key management, Diffie Hellman Key exchange.			
(8 Hours)			
Module – 3			
Message Authentication and Hash Function: Authentication Requirement, Authentication Functions, Message Authentication Code, Hash Functions, Digital Signatures, Digital Signature Standard. Authentication Applications: Kerberos, X.509 Authentication Service.			
(8 Hours)			
Module – 4			
Electronic Mail Security: Pretty Good Privacy (PGP), S/MIME IP Security: IP Security Overview; IP Security Architecture; Authentication Header; Encapsulating Security Payload; Combining Security Associations; Key Management.			
(8 Hours)			

Module – 5

Web Security: Web security Considerations; Secure Socket layer (SSL) and Transport layer Security (TLS); Secure Electronic Transaction (SET). System Security: Intruders, Intrusion Detection, Firewall Design Principles- Characteristics, Types of Firewall and Firewall Configuration.

Recap: This course has highlighted the topics namely fundamentals of cryptography, block ciphers, encryption algorithms, Message Authentication and Hash Algorithms, Security issues in E-mail, IP and also in the context of the Web. Further explores security systems namely IDS and Firewalls. The course facilitates the learning at higher cognitive levels to gain deeper understanding.

(8 Hours)

Course Outcomes: At the end of the course the students will be able to:

CO1: Apply encryption techniques for the given problem and analyze the results.

CO2: Design the Cipher technique and analyze the functioning of Cipher for the given problem.

CO3: Implement the Public and Private key based cryptography algorithms and conclude the results of algorithm based on output.

CO4: Design and implement the cryptographic algorithms using programming languages/ tools for the given problem/context.

CO5: Design the security planning for the given case study for data classification, access control and propose technical solution, and submit the detailed report with plagiarism check.

Question paper pattern:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
 - a. There will be a maximum of three sub-questions from each module.
 - b. There will be a choice from two full questions from each module.

Text Books:

1. William Stallings, "Cryptography and Network Security – Principles and Practices", 4th Edition, Pearson Education, 2009. (Chapters: 1, 2.1-2.3, 3.1,3.2,3.5, 5.1,5.2, 6.2, 9.1,9.2, 10.1,10.2, 11.1- 11.4, 13.1, 13.3, 14.1, 4.2, 15.1, 15.2, 16.1-16.6, 17.1-17.3, 18.1, 18.2, 20.1; Exclude the topic not mentioned in the syllabus)

References:

1. Behrouz A. Forouzan and Debdeep Mukhopadhyay: "Cryptography and Network Security", 2nd Edition, Tata McGraw-Hill, 2010. Atul Kahate, "Cryptography and Network Security" 2nd Edition TMH

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Agile Technologies and DevOps (3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS642	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Understand the differences between conventional and agile approaches 2. Estimate in an incremental and iterative fashion using practical techniques 3. Apply agile principles to a range of decision possibilities 4. Learn DevOps for CI/CD using containers, container orchestration and pipelines. 			
Module – 1			
<p>Preamble: Agile Technologies involves discovering requirements and developing solutions through the collaborative effort of self-organizing and cross-functional teams and their customers and users. It advocates adaptive planning, evolutionary development, early delivery, and continual improvement, and it encourages flexible responses to changes in requirements, resource availability, and understanding of the problems to be solved.</p> <p>DevOps is a set of practices that combines software development and IT operations . It aims to shorten the systems development life cycle and provide continuous delivery with high software quality.</p> <p>This course will be discussing about Agile requirements, Agile Tools: JIRA, Scrum, Agile Process, Sprints, Testing, Test Automation, Devops on Cloud.</p> <p>Introduction: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective.</p> <p>Introduction to Agile: Agile versus traditional method comparisons and process tailoring Software Process Models – overview, Introduction to Agile, Various Agile methodologies - Scrum, XP, Lean, and Kanban, Agile Manifesto, Scrum: Scrum process, roles - Product Owner, ScrumMaster, Team, Project Manager, product manager, architect, events, and artifacts; Product Inception: Product vision, stakeholders, initial backlog creation;</p> <p style="text-align: right;">(8 Hours)</p>			
Module – 2			
<p>Agile Requirements - User personas, story mapping, user stories, 3Cs, INVEST, acceptance criteria, sprints, requirements, product backlog and backlog grooming; Tools: Agile tracking tools such as JIRA; Scaled agile frameworks: SAFe, Scrum@Scale, Disciplined Agile.</p> <p style="text-align: right;">(8 Hours)</p>			

Module – 3
Agile Process: Definition of Done, Definition of Ready; Estimation; Agile forecasting and project Management - Big visible information radiators, velocity, progress tracking, Track Done pattern, project forecasting, Ux Design, Control the Flow: Sprint Planning, Sprint Reviews, Sprint Retrospectives, Sprint Planning - Agile release and iteration (sprint) planning, Develop Epics and Stories, Estimating Stories, Prioritizing Stories (WSJF technique from SAFe), Create product roadmap (8 Hours)
Module – 4
Sprints: Iterations/Sprints Overview. Velocity Determination, Iteration Planning Meeting, Iteration, Planning Guidelines, Development, Testing, Daily Stand-up Meetings, Progress Tracking, Velocity Tracking, Monitoring and Controlling: Burn down Charts, Inspect & Adapt (Fishbone Model), Agile Release Train. (8 Hours)
Module – 5
Testing: Functionality Testing, UI Testing, Performance Testing, Security Testing, Tools - Selenium Agile Testing: Principles of agile testers; The agile testing quadrants, Agile automation, Test automation pyramid DevOps: Continuous Integration and Continuous Delivery CI/CD: Jenkins Creating pipelines, Setting up runners Containers and container orchestration (Dockers and Kubernetes) for application development and deployment; Checking build status; Fully Automated Deployment; Continuous monitoring with Nagios; Introduction to DevOps on Cloud. Summary: Recap of the essential agile techniques and DevOps (8 Hours)
Course Outcomes: The student will be able to: C01: Understand Agile Testing principles for real life situations and learn the basics of SAFe for scaled agile C02: Interpret and apply various principles, phases and activities of the Scrum methodology. C03: Compare and contrast the differences between Agile and other project management methodologies. C04: Identify and use various tools for Agile development and CI/CD.
Question paper pattern: <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module. b. There will be a choice from two full questions from each module.
Text Books: <ol style="list-style-type: none"> 1. Jim Highsmith, “Agile Project Management: Creating Innovative Products”, Second Edition By, Addison-Wesley Professional, 2009. 2. James A. Crowder, Shelli Friess, “Agile Project Management: Managing for Success”, Springer 2014 References: <ol style="list-style-type: none"> 2. Lisa Crispin, Janet Gregory, “Agile Testing: A Practical Guide For Testers And Agile Teams”, Pearson, 2010 3. Thomas Uphill, John Arundel, Neependra Khare, Hideto Saito, Hui-Chuan Chloe Lee “DevOps: Puppet, Docker, and Kubernetes”, Ke-Jou Carol Hsu, Packet, 201 Sricharan Vadapalli, DevOps: Continuous Delivery, Integration, and Deployment with DevOps: Dive, Packet, 2018

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Robotic Process Automation(3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS643	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Gain a clear understanding of RPA and benefits, understanding the limits and constraints of automation. 2. Understand the basic AA components, features and technology. 3. Acquire the knowledge on purpose and use of the control center. 4. Understand the various use cases and write bots. 			
Module – 1			
Preamble: Robotic process automation (RPA) is a form of business process automation technology based on metaphorical software robots or on artificial intelligence /digital workers. It is sometimes referred to as software robotics. RPA involves the use of software that mimics human actions while interacting with applications in a computer and accomplishing rule-based tasks. This often requires reading from and typing or clicking on existing applications that are used to perform the given tasks. RPA Foundations: What is RPA, Flavors of RPA, History of RPA, The Benefits of RPA- The downsides of RPA, RPA Compared to BPO, BPM and BPA, Consumer Willingness for Automation, The Workforce of the Future. RPA Skills: On-Premise Vs. the Cloud, Web Technology, Programming Languages and Low Code, OCR, Databases, APIs, AI, Cognitive Automation, Agile, Scrum, Kanban and Waterfall, DevOps, Flowcharts.			
(8 Hours)			
Module – 2			
Components of RPA, RPA Platforms, About UiPath, The future of automation. Record and Play: UiPath stack, Downloading and installing UiPath Studio, Learning UiPath Studio, Task recorder, Step-by-step examples using the recorder.			
(8 Hours)			
Module – 3			
Sequence, Flowchart, and Control Flow: Sequencing the workflow, Activities, Control flow, various types of loops, and decision making, Step-by-step example using Sequence and Flowchart, Step-by-step example using Sequence and Control flow. Data Manipulation: Variables and scope, Collections, Arguments – Purpose and use, Data table usage with examples, Clipboard management, File operation with step-by-step example, CSV/Excel to data table and vice versa (with a step-by-step example)			
(8 Hours)			
Module – 4			
Taking Control of the Controls: Finding and attaching windows, Finding the control, Techniques for waiting for a control, Act on controls – mouse and keyboard activities, Working with UiExplorer, Handling events, Revisit recorder, Screen Scraping, When to use OCR, Types of OCR available, How to use OCR, Avoiding typical failure points.			
(8 Hours)			

Module – 5	
Exception Handling, Debugging, and Logging: Exception handling, Common exceptions and ways to handle them, Logging and taking screenshots, Debugging techniques, Collecting crash dumps, Error reporting. Recap/Summary of the Course	
(8 Hours)	
Course Outcomes: The students will be able to: C01: Apply the robotic process automation knowledge to solve problems. C02: Analyze RPA Scripts for different use cases. C03: Interpret various aspects of debugging of RPA applications. C04: Develop basic robots using UiPath Community Edition.	
Question paper pattern: <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module. b. There will be a choice from two full questions from each module. 	
Text Books: <ol style="list-style-type: none"> 5. Tom Taulli, The Robotic Process Automation Handbook: A Guide to Implementing RPA Systems, 2020, ISBN-13 (electronic):978-7-4842-5729-6, Publisher: A press 6. Alok Mani Tripathi, Learning Robotic Process Automation, Packt, 1st Edition, 2018. References: <ol style="list-style-type: none"> 1. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and Their Benefits, CreateSpace Independent Publishing Platform, 2018. 	

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Augmented and Virtual Reality (3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS644	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	100
Course objectives: This course will enable students to: <ol style="list-style-type: none"> 1. To understand the basics of virtual reality. 2. To understand geometric modeling and Virtual environment. 3. To study about Virtual Hardware's and Software's. 4. To develop Virtual Reality applications. 			
Module – 1			
Preamble: Understanding the importance of the study of virtual reality and its applications in the field of Engineering.			
Introduction to virtual reality: Virtual Reality & Virtual Environment : Introduction – Computer graphics – Real time computer graphics –Flight Simulation – Virtual environments –requirement – benefits of virtual reality- Historical development of VR : Introduction – Scientific Landmark -3D Computer Graphics :Introduction – The Virtual world space – positioning the virtual observer – the perspective projection – human vision – stereo perspective projection – 3D clipping – Colour theory – Simple 3D modeling – Illumination models – Reflection models – Shading algorithms- Radiosity – Hidden Surface Removal – Realism-Stereographic image.			
			(8 Hours)
Module – 2			
Virtual environment: Animating the Virtual Environment: Introduction – The dynamics of numbers – Linear and Non-linear interpolation - The animation of objects – linear and non-linear translation - shape & object in between – free from deformation – particle system-Physical Simulation : Introduction – Objects falling in a gravitational field – Rotating wheels – Elastic collisions – projectiles – simple pendulum – springs – Flight dynamics of an aircraft.			
			(8 Hours)
Module – 3			
Geometric modeling: Geometric Modeling: Introduction – From 2D to 3D – 3D space curves – 3D boundary representation - Geometrical Transformations: Introduction – Frames of reference – Modeling transformations – Instances –Picking – Flying – Scaling the VE – Collision detection - A Generic VR system: Introduction – The virtual environment – the Computer environment – VR Technology – Model of interaction – VR Systems.			
			(8 Hours)
Module – 4			
Introduction to Augmented Reality: Definition, scope, brief history, Examples, Related Fields			
			(8 Hours)
Module – 5			
Displays: Multimodal displays, Visual Perception, Requirements and characteristics, spatial display and visual display Summary: The student will be able to analyze and apply various concepts related to vector			

calculus and differential equations.	(8 Hours)
Course outcomes: The students will be able to: CO1: Adopt various principles and concepts of virtual reality and its application. CO2: Apply different geometric modelling. CO3: Develop virtual model for different problems.	
Question paper pattern: <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module. b. There will be a choice from two full questions from each module. 	
Text Books: <ol style="list-style-type: none"> 1. John Vince," Virtual Reality Systems", Pearson Education,2007 	
References: <ol style="list-style-type: none"> 7. Dieter Schmalstieg, Tobias Hollerer, "Principles and Practices Augmented Reality Principles and Practices", Addison Wesley, Ebook 	

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER - VI			
Big Data Analytics (3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS645	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Understand Data Analytics, Data and Relations, Data Visualization 2. Understand the fundamentals of Big Data Types and Big Data Technology Landscape 3. Understand the Business Intelligence in the view of IT Applications 4. Understand the Business Intelligence Framework and components, Business Intelligence Project Life Cycle. 			
Module – 1			
Preamble: Big data analytics helps organizations harness their data and use it to identify new opportunities. That, in turn, leads to smarter business moves, more efficient operations, higher profits and happier customers. Big data and data analytics offer a huge scope for individuals to grow. Since every job requires the use of data, a basic understanding of data is important. With a specialized course in this field, the opportunities multiply and even the exposure that you can get improves.			
Introduction to Data Analytics: Data and Relations, Data Visualization, Correlation, Regression, Forecasting, Classification, Clustering.			
(8 Hours)			
Module – 2			
Big Data Technology Landscape: Fundamentals of Big Data Types, Big data Technology Components, Big Data Architecture, Big Data Warehouses, Functional vs. Procedural Programming Models for Big Data.			
(8 Hours)			
Module – 3			
Introduction to Business Intelligence: Business View of IT Applications, Digital Data, OLTP vs. OLAP, Why, What and How BI? , BI Framework and components, BI Project Life Cycle, Business Intelligence vs. Business Analytics.			
(8 Hours)			
Module – 4			
Big Data Analytics: Big Data Analytics, Framework for Big Data Analysis, Approaches for Analysis of Big Data, ETL in Big Data, Introduction to Hadoop Ecosystem, HDFS, Map-Reduce Programming, Understanding Text Analytics and Big Data, Predictive analysis on Big Data, Role of Data analyst.			
(8 Hours)			

Module – 5
<p>Business implementation of Big Data: Big Data Implementation, Big Data workflow, Operational Databases, Graph Databases in a Big Data Environment, Real-Time Data Streams and Complex Event Processing, Applying Big Data in a business scenario, Security and Governance for Big Data, Big Data on Cloud, Best practices in Big Data implementation, Latest trends in Big Data, Latest trends in Big Data, Big Data Computation, More on Big Data Storage, Big Data Computational Limitations.</p> <p style="text-align: right;">(8 Hours)</p>
<p>Course Outcomes: The Students should be able to</p> <p>CO1: Explain the Fundamentals of Big Data</p> <p>CO2: Investigate tools for Business Intelligence, OLTP and OLAP</p> <p>CO3: Recognize the role of Business Intelligence, Data warehousing and Visualization in decision making.</p> <p>CO4: Investigate Hadoop related tools for Big Data Analytics and perform basic Hadoop Administration</p> <p>CO5: Infer the importance of Big Data in Business implementation</p>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module. b. There will be a choice from two full questions from each module.
<p>Text Books:</p> <ol style="list-style-type: none"> 1. Michael Minelli, Michele Chambers, Ambiga Dhiraj, “Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses”, Wiley CIO Series (2013),1st edition. 2. T. white, “Hadoop: The Definitive Guide”, O’ Reilly Media (2012), 3rd edition. <p>References</p> <ol style="list-style-type: none"> 8. Douglas Eadline,"Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education, 2016. 2. Anil Maheshwari, “Data Analytics”, 1st Edition, McGraw Hill Education, 2017.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Operating System (3:0:0) 3 (Effective from the academic year 2020 -2021)			
Course Code	21CS651	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Understand the structure and services of the operating system that provides to users and system. 2. Know the various CPU scheduling algorithms and multi-threading concepts. 3. Identify methods for handling deadlocks and recognize the classic synchronization problems. 4. To gain knowledge on the various memory management techniques and file systems with their storage structure. 			
Module – 1			
Preamble Operating systems are the fundamental part of every computing device to run any type of software. The increasing use of computing devices in all areas of life (leisure, work), lead to a variety of operating systems. Yet all operating systems share common principles. These principles are important for computer science students in their understanding of programming languages and software built on top of operating systems. This course will be discussing about address spaces, system call interface, process/threads, inter process communication, deadlock, scheduling, main memory, virtual memory and file systems. Introduction: Implication and Scope of Operating System and its Importance in Economic growth of Nation, Impact of the course on Societal Problems/ Sustainable Solutions/ National Economy, Career Perspective, Overview of the course in current Innovations and Research trends. Introduction: Introduction to Operating Systems, Goals of an Operating System, Operation of an Operating System, Computational Structures, Resource allocation techniques, Efficiency, Classes operating System, Batch processing, Multiprogramming, Time Sharing Systems, Real Time and distributed Operating Systems. <div style="text-align: right;">(8 Hours)</div>			
Module – 2			
Process Management: Operating System View of Processes, Threads, Kernel and User level Threads, Non-preemptive scheduling-First Come First Serve and Shortest Request Next, Preemptive Scheduling- Round Robin and Least Completed Next, Long term, medium term and short-term scheduling in a time-sharing system. <div style="text-align: right;">(8 Hours)</div>			
Module – 3			

<p>Memory Management: Contiguous Memory allocation, Non-Contiguous Memory Allocation, Paging, Segmentation with paging, Virtual Memory Management, Demand Paging, Virtual Memory handler, FIFO, LRU page replacement policies.</p> <p style="text-align: right;">(8 Hours)</p>
Module – 4
<p>Message Passing and Deadlocks: Overview of Message Passing, implementing message passing, Mailboxes, Deadlocks, Deadlocks in resource allocation, Resource state modeling, Deadlock detection algorithm, Deadlock Prevention.</p> <p style="text-align: right;">(8 Hours)</p>
Module – 5
<p>File Systems: File systems and Input /Output Control System (IOCS), File Operations, File Organizations, Directory structures, File Protection, Interface between File system and Input /Output Control System (IOCS), Allocation of disk space, Implementing file access.</p> <p>Recap: Summary of the Course</p> <p style="text-align: right;">(8 Hours)</p>
<p>Course Outcomes: The students will be able to:</p> <p>CO1: Explain the goal, structure, and types of operating systems.</p> <p>CO2: Discover the techniques for managing various resources of an operating system.</p> <p>CO3: Use the concepts in an operating system environment.</p> <p>CO4: Analyze the services of operating system.</p>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module. b. There will be a choice from two full questions from each module.
<p>Textbooks:</p> <ol style="list-style-type: none"> 1. Dhananjay M Dhamdhere, Operating Systems-A concept Based Approach, Tata McGraw-Hill, 3rd Edition,2003. 2. Silberschatz and Peter B Galvin ,Operating systems concepts, John Wiley India Pvt. Ltd, 9th Edition,2012 <p>References:</p> <ol style="list-style-type: none"> 1. William Stalling, Operating system–internals and Design Principals, Pearson Education, 7th Edition 2013 2. Andrew S Tanenbaum, Operating System Design and Implementation, Pearson Education, 3rd Edition 2006.

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
OOPS with C++ (3:0:0) 3 (Effective from the academic year 2020 -21)			
Course Code	21CS652	CIE Marks	50
Teaching Hours/Week (L: T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. To understand Object Oriented Programming concepts and basic characteristics of C++. 2. To know the principles of Class 3. To develop a java application with threads and generics classes. 4. To define exceptions and use I/O streams. 			
Module – 1			
<p>Preamble: This course deals with the overview of C++and object-oriented programming concepts, which are appropriate for various types of learning tasks in various domains. Students will be taught pointer, dynamic memory allocation. Applications in the area of oops and vision will be discussed.</p> <p>Introduction to OOPs: Object-Oriented Programming basics, Encapsulation, Polymorphism, Inheritance. C++ Overview: The Origins of C++,The General Form of a C++ Program, different data types, operators, expressions, arrays and strings, reference variables. Function Components, argument passing, inline functions, function overloading, function templates.</p>			
(8 Hours)			
Module – 2			
<p>Classes & Objects: Introduction, Class Specification, Class Objects, access members, defining member functions, data hiding, constructors, destructors, parameterized constructors, static data members, static member functions, scope resolution operator, Passing Objects to Functions, Returning Objects, Object Assignment.</p> <p>Pointers and dynamic memory allocation: Pointers, Pointer as function arguments, Dynamic Allocation Operators new and delete, Initializing Allocated Memory, Allocating Arrays, Allocating Object.</p>			
(8 Hours)			
Module – 3			
<p>Operator overloading: Operator overloading as member functions and using friend functions. Overloading of binary operators like +, -, *.Creating Prefix and Postfix forms of ++, -- Operators, Operator Overloading Restrictions, Operator Overloading Using a Friend Function to Overload ++ or --, Overloading ().</p> <p>Inheritance: Base Class, Inheritance & protected members, protected base class inheritance, inheriting multiple base classes, Constructors, Destructors & Inheritance. Passing parameters to base Class Constructors, Granting access, Virtual base classes.</p>			
(8 Hours)			

Module – 4
<p>Virtual Functions and Runtime Polymorphism: Virtual function -Calling a Virtual function through a base class reference, Virtual attribute is inherited, Virtual functions are hierarchical, pure virtual functions, abstract classes, using Virtual functions, Early & late binding.Standard C++ I/O Classes: Old vs. Modern C++ I/O, C++ Streams, The C++ Stream Classes, C++'s Predefined Streams, Formatted I/O, Formatting Using the ios Members, Setting the Format Flags, Clearing Format Flags, Overloading << and >>, manipulators</p> <p style="text-align: right;">(8 Hours)</p>
Module – 5
<p>Exception Handling: Exception Handling, Fundamentals, Catching Class Types, Using Multiple catch Statements, Handling Derived-Class Exceptions, Exception Handling Options, Catching All Exceptions, Restricting Exceptions, Rethrowing an Exception, Understanding terminate() and unexpected(), uncaught_exception() Function. The exception and bad_exception Classes, Applying Exception Handling.</p> <p>STL: Class template, An overview of STL, containers, vectors</p> <p>Recap: Object-oriented programming aims to implement real-world entities like inheritance, hiding, polymorphism, etc in programming. The main aim of OOP is to bind together the data and the functions that operate on them so that no other part of the code can access this data except that function, and it will be reviewed with an example.</p> <p style="text-align: right;">(8 Hours)</p>
<p>Course Outcomes: The students will be able to:</p> <ul style="list-style-type: none"> • Explain the basics of Object Oriented Programming concepts. • Apply the object initialization and destroy concept using constructors and destructors. • Apply the concept of polymorphism to implement compile time polymorphism in programs by using overloading methods and operators. • Utilize the concept of inheritance to reduce the length of code and evaluate the usefulness. • Apply the concept of run time polymorphism by using virtual functions, overriding functions and abstract class in programs. • Utilize I/O operations and file streams in programs.
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> b. There will be a maximum of three sub-questions from each module. c. There will be a choice from two full questions from each module.

Text Books:

1. Sourav Sahay, Object Oriented Programming with C++ , 2nd Ed, Oxford University Press, 2006
2. Herbert Schildt, Java The Complete Reference, 7th Edition, Tata McGraw Hill, 2007.

References:

1. Mahesh Bhavde and Sunil Patekar, "Programming with Java", First Edition, Pearson Education, 2008, ISBN:9788131720806.
2. Stanley B.Lippmann, Josee Lajore, C++ Primer, 4th Edition, Pearson Education, 2005.
3. Rajkumar Buyya, S Thamaras Selvi, Xingchen Chu, Object oriented Programming with Java, Tata McGraw Hill Education Private Limited.
4. Richard A Johnson, Introduction to Java Programming and OOAD, CENGAGE Learning.
5. E Balagurusamy, Programming with Java A primer, Tata McGraw Hill Companies.

<p align="center">B.E COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI</p>			
<p align="center">WEB PROGRAMMING (3:0:0) 3 (Effective from the academic year 2021 -2022)</p>			
Course Code	21CS653	CIE Marks	50
Teaching Hours/Week	3:0:0	SEE Marks	50
Total Number of Contact	40	Exam Hours	3
<p>Course Objectives: This course will enable students to:</p> <ol style="list-style-type: none"> 1. Illustrate the Semantic Structure of HTML and CSS 2. Compose forms and tables using HTML and CSS 3. Design Client-Side programs using JavaScript and Server-Side programs using PHP 4. Infer Object Oriented Programming capabilities of PHP 5. Examine JavaScript frameworks such as jQuery and Backbone 			
Module – 1			
<p>Introduction: Significance and Scope of the course, Importance of the course in societal, political and economic growth of the nation, Impact of the course on societal and ethical issues and career perspective. Introduction: Introduction to HTML, What is HTML and Where did it come from?, HTML Syntax, Semantic Markup, Structure of HTML Documents, Quick Tour of HTML Elements, HTML5 Semantic Structure Elements, Introduction to CSS, What is CSS, CSS Syntax, Location of Styles, Selectors, The Cascade: How Styles Interact, The Box Model, CSS Text Styling</p>			
			(8 Hours)
Module – 2			
<p>HTML Tables and Forms: Introducing Tables, Styling Tables, Introducing Forms, Form Control Elements, Table and Form Accessibility, Microformats, Advanced CSS: Layout, Normal Flow, Positioning Elements, Floating Elements, Constructing Multicolumn Layouts, Approaches to CSS Layout, Responsive Design, CSS Frameworks.</p>			
			(8 Hours)
Module – 3			
<p>JavaScript: Client-Side Scripting, What is JavaScript and What can it do?, JavaScript Design Principles, Where does JavaScript Go?, Syntax, JavaScript Objects, The Document Object Model (DOM), JavaScript Events, Forms, Introduction to Server-Side Development with PHP, What is Server-Side Development, A Web Server's Responsibilities, Quick Tour of PHP, Program Control, Functions.</p>			
			(8 Hours)
Module – 4			
<p>PHP: Arrays and Superglobals, Arrays, \$_GET and \$_POST Superglobal Arrays, \$_SERVER Array, \$_FILES Array, Reading/Writing Files, PHP Classes and Objects, Object-Oriented Overview, Classes and Objects in PHP, Object Oriented Design, Error Handling and Validation, What are Errors and Exceptions?, PHP Error Reporting, PHP Error and Exception Handling.</p>			
			(8 Hours)
Module – 5			

Managing State, The Problem of State in Web Applications, Passing Information via Query Strings, Passing Information via the URL Path, Cookies, Serialization, SessionState, HTML5 Web Storage, Caching, **Advanced JavaScript and jQuery**, JavaScript Pseudo-Classes, jQuery Foundations, AJAX, Asynchronous File Transmission, Animation, Backbone MVC Frameworks, XML Processing and Web Services, XML Processing, JSON, Overview of Web Services.

Recap: Summary of the Course

(8 Hours)

Course Outcomes:

The students will be able to:

C01: Discuss HTML, CSS, JS, PHP and their semantics to build web pages.

C02: Apply the underlying web technologies to meet the end user's demands.

C03: Analyze the static web contents and dynamic web contents of World Wide Web.

C04: Design Client-Side Scripts and Server-Side Scripts to generate and display the contents dynamically.

Question paper pattern:

- SEE will be conducted for 100 marks.
- Part A: First question with 20 MCQs carrying 1 mark each.
- Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice).
 - a. There will be a maximum of three sub-questions from each module.
 - b. There will be a choice from two full questions from each module.

Textbook:

1. Randy Connolly, Ricardo Hoar, Fundamentals of Web Development, Pearson Education Ltd, 1st Edition, 2011

References:

1. Robin Nixon, Learning PHP, MySQL & JavaScript with jQuery, CSS and HTML5, O'Reilly, 4th Edition, 2015
2. Luke Welling, Laura Thomson, PHP and MySQL Web Development, Pearson, 5th Edition, 2016

B.E COMPUTER SCIENCE AND ENGINEERING Choice Based Credit System (CBCS) SEMESTER – VI			
Java Applications (3:0:0) 3 (Effective from the academic year 2021 -2022)			
Course Code	21CS654	CIE Marks	50
Teaching Hours/Week (L:T:P)	3:0:0	SEE Marks	50
Total Number of Contact Hours	40	Exam Hours	3
Course Objectives: This course will enable students to: <ol style="list-style-type: none"> 1. Understand the basic principles of the object-oriented programming concepts and fundamental features of Java 2. Apprehend the object oriented paradigms like class, objects, Inheritance, Interface and abstraction in Java 3. Be able to implement exception handling, multithreading, IO Programming 4. Be able to gain knowledge on the Use of the major classes, like Collection Framework and networking with Java 			
Module – 1			
<p>Preamble: Java programming language is the most popular language used to develop several applications for the system as well as embedded devices like mobile, laptop and tablets. It's most widely used in web applications (Internet). Since Java is the most widely used language in Internet applications, this has generated huge number of job opportunities and in turn contributed to the society and economy of the nation. Java applications are available to India's rural mass, e-commerce for country's middle class, used by manufacturing sector and various forms of e-governance</p> <p>Basics of Java: Object Oriented Programming – Abstraction – objects and classes – Encapsulation- Inheritance – Polymorphism- OOP in Java –Features of Java, Byte Code and Java Virtual Machine, JDK, Data types, Operator, Control Statements, Looping statements, Arrays & Sting Class, String Buffer Class.</p> <p style="text-align: right;">(8 Hours)</p>			
Module – 2			
<p>Objects and Classes: Basics of objects and classes in java, Constructors, Overloading Constructor, Visibility modifiers, Methods and objects, this and static keyword, finalize() method, Access control, modifiers, Nested class, Inner class, Anonymous inner class, Abstract class.</p> <p style="text-align: right;">(8 Hours)</p>			
Module – 3			
<p>Inheritance and Interfaces: Use of Inheritance, Inheriting Data members and Methods, constructor in inheritance, Multilevel Inheritance – method overriding, Handle multilevel constructors – super keyword, - Final keywords, Creation and Implementation of an interface, Interface reference, instance of operator, Interface inheritance, Dynamic method dispatch, Packages, Exception Handling.</p> <p style="text-align: right;">(8 Hours)</p>			

Module – 4
<p>Multi-Threaded Programming: Multi-Threaded Programming: What are threads? How to make the classes threadable ; Extending threads; Implementing runnable; Synchronization; Changing state of the thread; Thread communication, Deadlock</p> <p>IO Programming: Introduction to Stream, Byte Stream, Character stream, Readers and Writers, File Class, File InputStream, File Output Stream, InputStreamReader, OutputStreamWriter, FileReader, FileWriter, Buffered Reader.</p> <p style="text-align: right;">(8 Hours)</p>
Module – 5
<p>Collection Classes : List, ArrayList, LinkedList, Enumeration, Vector, Properties, Introduction to Java.util package</p> <p>Networking with java.net : InetAddress class, Socket class, Datagram Socket class, Datagram Packet class</p> <p>Recap: Summary of the Course</p> <p style="text-align: right;">(8 Hours)</p>
<p>Course Outcomes: The students will be able to:</p> <p>C01: Understand object oriented programming concepts and implement in java.</p> <p>C02: Comprehend building blocks of OOPs language, inheritance, package and interfaces programs and identify exception handling methods.</p> <p>C03: Implement multithreading and I/O concepts in object oriented programming</p> <p>C04: Realize the concepts of collection classes & networking</p> <p>C05: Apply the skills to apply OOP in Java programming for real time problem solving</p>
<p>Question paper pattern:</p> <ul style="list-style-type: none"> • SEE will be conducted for 100 marks. • Part A: First question with 20 MCQs carrying 1 mark each. • Part B: Each full question is for 16 marks. (Answer five full questions out of 10 question with intra modular choice). <ul style="list-style-type: none"> a. There will be a maximum of three sub-questions from each module b. There will be a choice from two full questions from each module.
<p>Textbook:</p> <p>1. Herbert Schildt ,The Complete Reference- Java 2, TMH McGraw Hill Companies 7th Edition, 2015.</p> <p>References:</p> <p>1. Herbert Schildt & Dale Skrien, Java Fundamentals A comprehensive introduction, McGraw Hill Education 9th Edition, 2017.</p> <p>2. E. Balaguruswamy , Programming with Java A Primer, Mc Grawhill 5th Edition, 2018.</p>