

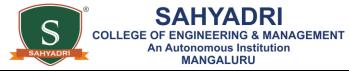
SOFTWARE ENGINEE (Effective from		ROJECT MANAGEM Year 2023 - 2024)	ENT	
	VI SEMESTE	CR .		
Course Code	21CS61	CIA Marks	50	
Number of Contact Hours/Week (L:T:P:S)	3:0:0:0	SEE Marks	50	
Total Contact Hours	40	Exam Hours	03	
	CREDITS - 3		·	
<b>COURSE PREREQUISITES:</b>				
• Fundamentals of software Developme	ent activities, Ma	nagement functions.		
COURSE OBJECTIVES:				
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- 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.
- Infer the fundamentals of object-oriented concepts, differentiate system models, use UML diagrams and apply design patterns.
- Explain the importance of Agile Software Development.
- Discuss various types of software testing practices and software evolution processes.
- Recognize the importance Project Management with its methods and methodologies.
- Identify software quality parameters and quantify software using measurements and metrics. List software quality standards and outline the practices involved

## **TEACHING - LEARNING STRATEGY:**

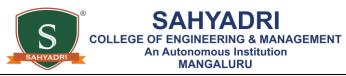
- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

5 1	
COURSE CONTENTS	
MODULE - I	
Introduction: The evolving role of software, The changing nature of software, Software	8 Hours
engineering, A Process Framework, Process Patterns, Process Assessment, Personal and Team	
Process Models, Process Technology, Product and Process.	
<b>Process Models</b> : Prescriptive models Waterfall model. Incremental process models.	



Evolutionary process models, Specialized process models.
MODULE - II

Various process modelsCL2CO2Explain the basics of object-oriented concepts and build a suitable class model using modelling techniquesCL2CO3Describe various software testing methods and to understand the importance of agile methodology.CL2CO4Illustrate the role of project planning and quality management in software developmentCL3CO5Understand the activities involved in software engineering and analyse the role of various process modelsCL2		MODULE - II	
Software Testing: A Strategic Approach to Software Testing, Strategic Issues, Test Strategies for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing, System Testing, The Art of Debugging.         8 Hours           Agile Methodology: Before Agile – Waterfall, Agile Development, MODULE - IV         8 Hours           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.         8 Hours           MODULE - V         MODULE - V         8 Hours           Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass- Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.         8 Hours           Software Quality: Introduction, the place of software quality management systems, process capability models, techniques to enhance software quality quality plans.         5           CO         Course Outcome Description         Taxonomy Level           CO1         Understand the activities involved in software engineering and analyse the role of various process models         CL2           CO2         Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques         CL2           CO3         Describe vario	of OO abstrac associa	development; OO modelling history. Modelling as Design technique: Modelling, tion, The Three models. Class Modelling: Object and Class Concept, Link and tions concepts, Generalization and Inheritance, A sample class model, Navigation of	8 Hours
for Conventional Software, Test Strategies for Object -Oriented Software, Validation Testing,       System Testing, The Art of Debugging.         Agile Methodology: Before Agile – Waterfall, Agile Development,       MODULE - IV         Introduction to Project Management: Introduction, Project and Importance of Project Management, Contract Management, Activities Covered by 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.       8 Hours         Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.       8 Hours         Software quality: Introduction, the place of software quality management systems, process capability models, techniques to enhance software quality quality plans.       Bloom's Taxonomy Level         CO       Course Outcome Description       Cl.2         No.       Course Outcome Description       Cl.2         CO       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       Cl.2         CO       Explain the basics of bipect-oriented concepts and build a suitable class model using modelling techniques       Cl.2         CO       Describe various software testing methods and to understand the importance of agile methodology.       Cl.2 <td< td=""><td></td><td>MODULE - III</td><td></td></td<>		MODULE - III	
MODULE - IV           Introduction to Project Management: Introduction, Project and Importance of Project Management, Activities Covered by Software Project Management, Plans, Methods and Methodologies, some ways of categorizing Software Project Management, Statkeholders, Setting Objectives, Business Case, Project Success and Failure, Management and Management Control, Project Management life cycle, Traditional versus Modern Project Management Practices.         8 Hours           MODULE - V         MODULE - V         MODULE - V         8 Hours           Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass- Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.         8 Hours           Software quality. Introduction, the place of software quality in project planning, Importance of software quality models, techniques to enhance software quality plans.         8 Bloom's Taxonomy Level           CO         Course Outcome Description         CL2           CO         Vuderstand the activities involved in software engineering and analyse the role of various process models         CL2           CO2         Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques         CL2           CO3         Describe various software testing methods and to understand the importance of agile methodology.         CL2           CO4         Illustrate the role of project planning and quality management in software development CL3	for Co	nventional Software, Test Strategies for Object -Oriented Software, Validation Testing,	8 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.       8 Hours         MODULE - V       MODULE - V         Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.       8 Hours         Software Quality: Introduction, the place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality plans.       8 Bloom's Taxonomy Level         CO       No.       Course Outcome Description       8 Bloom's Taxonomy Level         CO1       Understand the activities involved in software engineering and analyse the role of various process models       CL2         CO2       Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques       CL2         CO3       Describe various software testing methods and to understand the importance of agile methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development various process models       CL2	Agile N	Methodology: Before Agile – Waterfall, Agile Development,	
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.       MODULE - V         Activity Planning: Objectives of Activity Planning, When to Plan, Project Schedules,       8 Hours         Sequencing and Scheduling Activities, Network Planning Models, Forward Pass – Backward       8 Hours         Software Quality: Introduction, the place of software quality in project Duration, Activity on Arrow       8 Hours         Software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans.       8 Bloom's         CO       Course Outcome Description       Taxonomy Level         CO1       Understand the activities involved in software engineering and analyse the role of various process models       CL2         CO2       Explain the basics of object-oriented concepts and build a suitable class model using modeling techniques       CL2         CO3       Describe various software testing methods and to understand the importance of agile methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development       CL3         CO4       Understand the a		MODULE - IV	
Activity       Planning:       Objectives of Activity Planning, When to Plan, Project Schedules, Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow Networks.       8 Hours         Software       Quality: Introduction, the place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans.       Bloom's         COURSE OUTCOMES         Upon       Course Outcome Description       Bloom's Taxonomy Level         CO1       Understand the activities involved in software engineering and analyse the role of various process models       CL2         CO2       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         CO3       Describe various software testing methods and to understand the importance of agile methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development       CL3         CO4       Understand the activities involved in software engineering and analyse the role of various process models       CL2	Manag Plans, I Setting Contro	ement, Contract Management, Activities Covered by Software Project Management, Methods and Methodologies, some ways of categorizing Software Projects, Stakeholders, Objectives, Business Case, Project Success and Failure, Management and Management I, Project Management life cycle, Traditional versus Modern Project Management	8 Hours
Sequencing and Scheduling Activities, Network Planning Models, Forward Pass– Backward         Pass, identifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow         Networks.         Software Quality: Introduction, the place of software quality in project planning, Importance of software quality, software quality models, ISO 9126, quality management systems, process capability models, techniques to enhance software quality, quality plans.         COURSE OUTCOMES         Upon completion of this course, the students will be able to:         CO       No.         Course Outcome Description       Bloom's Taxonomy Level         C01       Understand the activities involved in software engineering and analyse the role of various process models       CL2         C02       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         C03       Describe various software testing methods and to understand the importance of agile methodology.       CL2         C04       Illustrate the role of project planning and quality management in software development       CL3         C05       Understand the activities involved in software engineering and analyse the role of various process models       CL2		MODULE - V	
Software quality, software quality models, ISO 9126, quality management systems, process         COURSE OUTCOMES         Upon completion of this course, the students will be able to:         CO       Bloom's         Taxonomy       Level         CO1       Understand the activities involved in software engineering and analyse the role of various process models       CL2         CO2       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         CO3       Describe various software testing methods and to understand the importance of agile methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development       CL3         CO4       Understand the activities involved in software engineering and analyse the role of various process models       CL2	Sequer Pass, io Networ	cing and Scheduling Activities, Network Planning Models, Forward Pass– Backward dentifying critical path, Activity Float, Shortening Project Duration, Activity on Arrow rks.	8 Hours
Course outcome Description         Bloom's Taxonomy Level         CO       Course Outcome Description       Bloom's Taxonomy Level         C01       Understand the activities involved in software engineering and analyse the role of various process models       CL2         C02       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         C03       Describe various software testing methods and to understand the importance of agile methodology.       CL2         C04       Illustrate the role of project planning and quality management in software development various process models       CL3			
COURSE OUTCOMES         COURSE OUTCOMES         Upon completion of this course, the students will be able to:       Bloom's         CO       Course Outcome Description       Bloom's         Taxonomy       Level         CO1       Understand the activities involved in software engineering and analyse the role of various process models       CL2         CO2       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         CO3       Describe various software testing methods and to understand the importance of agile methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development       CL3         CO5       Understand the activities involved in software engineering and analyse the role of various process models       CL3			
Upon completion of this course, the students will be able to:       Bloom's         CO       Course Outcome Description       Bloom's         Taxonomy       Level         C01       Understand the activities involved in software engineering and analyse the role of various process models       CL2         C02       Explain the basics of object-oriented concepts and build a suitable class model using modelling techniques       CL2         C03       Describe various software testing methods and to understand the importance of agile methodology.       CL2         C04       Illustrate the role of project planning and quality management in software development       CL3         C05       Understand the activities involved in software engineering and analyse the role of various process models       CL3			
CO No.Course Outcome DescriptionBloom's Taxonomy LevelC01Understand the activities involved in software engineering and analyse the role of various process modelsCL2C02Explain the basics of object-oriented concepts and build a suitable class model using modelling techniquesCL2C03Describe various software testing methods and to understand the importance of agile methodology.CL2C04Illustrate the role of project planning and quality management in software development various process modelsCL3C05Understand the activities involved in software engineering and analyse the role of various process modelsCL2	Upon c		
CO1various process modelsCL2CO2Explain the basics of object-oriented concepts and build a suitable class model using modelling techniquesCL2CO3Describe various software testing methods and to understand the importance of agile methodology.CL2CO4Illustrate the role of project planning and quality management in software developmentCL3CO5Understand the activities involved in software engineering and analyse the role of various process modelsCL2		Course Outcome Description	Taxonomy
CO2modelling techniquesCL2CO3Describe various software testing methods and to understand the importance of agile methodology.CL2CO4Illustrate the role of project planning and quality management in software developmentCL3CO5Understand the activities involved in software engineering and analyse the role of various process modelsCL2	CO1		CL2
CO3       methodology.       CL2         CO4       Illustrate the role of project planning and quality management in software development       CL3         CO5       Understand the activities involved in software engineering and analyse the role of various process models       CL2	CO2		CL2
CO5 Understand the activities involved in software engineering and analyse the role of various process models CL2	CO3		CL2
various process models CL2	CO4	Illustrate the role of project planning and quality management in software development	CL3
CO-PO-PSO MAPPING	CO5		CL2
		CO-PO-PSO MAPPING	



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CO2	2	2	2		2	1		2	2	2	2	2	2	1		
CO3	2	2	2		2			2	2	3	1	2	3	1	1	
CO4	2	2	2		2			2	3	3	2	2	3	1	1	
CO5	2	2	2		2	2	2	2	3	3	2	2	3	1	1	
3:	Subs	tantial	(High	i)	2:	Mode	erate (I	Mediu	m)			1: F	Poor (L	ow)	•	
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9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands.

## **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- 1. Roger S. Pressman: Software Engineering-A Practitioners approach, 7th Edition, Tata McGraw Hill.
- 2. Michael Blaha, James Rumbaugh: Object Oriented Modelling and Design with UML, 2nd Edition, Pearson Education, 2005.
- 3. Bob Hughes, Mike Cotterell, Rajib Mall: Software Project Management, 6th Edition, McGraw Hill Education, 2018.
- 4. Deepak Gaikwad, Viral Thakkar, DevOps Tools from Practitioner's Viewpoint, Wiley.
- 5. Pankaj Jalote: An Integrated Approach to Software Engineering, Wiley India

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E-RESOURCES):**

- 1. https://onlinecourses.nptel.ac.in/noc20\_cs68/preview
- 2. https://www.youtube.com/watch?v=WxkP5KR\_Emk&list=PLrjkTql3jnm9b5nrggx7Pt1G4UAHeFlJ
- 3. http://elearning.vtu.ac.in/econtent/CSE.php
- 4. http://elearning.vtu.ac.in/econtent/courses/video/CSE/15CS42.html
- 5. https://nptel.ac.in/courses/128/106/128106012/ (DevOps)





## MANGALURU SYSTEM SOFTWARE AND COMPILER DESIGN (Effective from the Academic Year 2023 - 2024)

An Autonomous Institution

& MANAGEMENT

<b>VI SEMESTER</b>										
Course Code	21CS62	CIA Marks	50							
Number of Contact Hours/Week (L: T: P: S)	3:0:2:0	SEE Marks	50							
Total Hours of Pedagogy	40L + 20P	Exam Hours	03							
CREDITS – 4										

## **COURSE PREREQUISITES:**

• Computer Orgainzation , Theory of Computation, Operating System, Knowledge of programming language (C, C++, java)

## **COURSE OBJECTIVES:**

- Define System Software.
- Familiarize with source file, object file and executable file structures and libraries
- Describe the front-end and back-end phases of compiler and their importance to students

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS	
MODULE - I	
Introduction to System Software, Machine Architecture of SIC and SIC/XE. Assemblers: Basic	8 Hours
assembler functions, machine dependent assembler features, machine independent assembler	
features, assembler design options. Basic Loader Functions	
MODULE - II	
Introduction: Language Processors, The structure of a compiler, The evaluation of	8 Hours
programming languages, The science of building a compiler, Applications of compiler	
technology.	
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Lexical Analysis: The role of lexical analyser, Input buffering, Specifications of token,	
recognition of tokens.	
MODULE - III	
Syntax Analysis: Introduction, Context Free Grammars, Writing a grammar, TopDown	8 Hours
Parsers, Bottom-Up Parsers	
MODULE - IV	
Syntax Directed Translation, Intermediate code generation, Code generation	8 Hours



	An Autonomous Institution MANGALURU							
	MODULE – V							
Lex a	and Yacc - The Simplest Lex Program, Grammars, Parser-Lexer Communication	ation, A	8 Hours					
YAC	C Parser, The Rules Section, Running LEX and YACC, LEX and Hand- Written	Lexers,						
Using	LEX - Regular Expression, Examples of Regular Expressions, A Word C	Counting						
Progra	am, Using YACC - Grammars, Recursive Rules, Shift/Reduce Parsing, What	YACC						
Canno	ot Parse, A YACC Parser - The Definition Section, The Rules Section, The I	LEXER,						
Comp	iling and Running a Simple Parser, Arithmetic Expressions and Ambiguity.							
	COURSE OUTCOMES							
Upon	completion of this course, the students will be able to:							
			Bloom's					
CO	Course Outcome Description		Taxonomy					
No.			Level					
CO1	Apply the concepts of system software and make use of it to generate machine	codes	CL3					
con	Make use of the functionality of each phase involved in compilation proc	ess and						
CO2	construct the grammar for the given regular expressions		CL3					
<u> </u>	Apply the parsing techniques for the given programming construct described in	for the given programming construct described in						
CO3	context free grammar							
CO4	Construct syntax directed tree and develop machine level codes							
CO5	5 Make use of LEX and YACC tool to describe the concept of lexer and parser							
	LABORATORY COMPONENTS							
Б		00	Bloom's					
Exp.	Experiment Description	CO	Taxonomy					
No.		No.	Level					
	Write a LEX program to recognize valid arithmetic expression. Identifiers in							
1.	the expression could be only integers and operators could be + and *. Count	CO2	CL3					
	the identifiers & operators present and print them separately.							
	Develop, Implement and Execute a program using YACC tool to recognize all							
2.	strings ending with b preceded by n a's using the grammar a n b (note: input	CO3	CL3					
	n value)							
	Design, develop and implement YACC/C program to construct Predictive /							
3.	LL(1) Parsing Table for the grammar rules: A $\rightarrow aBa$ , B $\rightarrow bB \mid \epsilon$ . Use this	CO3	CL3					
	table to parse the sentence: abba\$							
	Design, develop and implement YACC/C program to demonstrate Shift							
4.	Reduce Parsing technique for the grammar rules: $E \rightarrow E+T \mid T, T \rightarrow T^*F \mid F, F$	CO3	CL3					
	$\rightarrow$ (E)   id and parse the sentence: id + id * id.							
	Design, develop and implement a C/Java program to generate the machine							
	code using Triples for the statement $A = -B * (C + D)$ whose intermediate code							
	in three-address form:							

5.	to de using Triples for the statement $A = -B^{-1}(C + D)$ whose intermediate code in three-address form: T1 = -B T2 = C + D T3 = T1 + T2	CO1	CL3
	A = T3		
6.	Write a LEX program to eliminate comment lines in a C program and copy the resulting program into a separate file.	CO4	CL3



					C	<b>D-PO-</b>	PSO N	IAPPI	NG											
CO No.				Р	rograi	nme C	Outcon	nes (PC	<b>)</b> )				Programme Specific Outcome (PSO							
	1	2	3	4	5	6	7	8	9	10	11	12	1	· · ·						
C01	3	2	_	1	_			_	-	-			1		1					
CO2	2	1		1																
CO3	2	2		1		1							1	1	1					
CO4	3					1									1					
CO5	2	2		1									1	1						
3: \$	Substar	ntial (I	High)		2:	Mode	rate (I	Mediu	n)		-	l: Poo	r (Low	v)						
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Assessme methods: <b>Sl. No.</b>	nt will				EE. Stu			-		ssed us	sing D	irect ar								
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1	(CIA		s Inter	nal As	ssessm	ent	100 %					5	50							
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		ctical S		n (Labo	oratory		40 %					2	20							
2				amina	tion (S	EE) 100 %						5	50							
					AS	SESSN	MENT	DETA	ILS											
	Contin	uous I	nterna	al Asse	essmen	t (CIA	A) (50%	<b>(</b> 0)		Seme	ester E	nd Ex	am (S	EE) (5	0%)					
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		(60%)	)				(40	%)												
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NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.



## **SEE QUESTION PAPER PATTERN:**

- 1. The question paper will have **TEN** full questions from **FIVE** Modules
- 2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- 3. Each full question may have a maximum of four sub-questions covering all the topics under a module.

4. The students will have to answer FIVE full questions, selecting one full question from each module.

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& MANAGEMENT

## **REFERENCE BOOKS**:

- 1. System Software by Leland. L. Beck, D Manjula, 3rd edition, 2012
- 2. Alfred V Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers-Principles, Techniques and Tools, Pearson, 2nd edition, 2007
- 3. Doug Brown, John Levine, Tony Mason, lex & yacc, O'Reilly Media, October 2012.
- 4. Systems programming Srimanta Pal, Oxford university press, 2016
- 5. System programming and Compiler Design, K C Louden, Cengage Learning
- 6. System software and operating system by D. M. Dhamdhere TMG
- 7. Compiler Design, K Muneeswaran, Oxford University Press 2013.

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=17&lesson=18
- 2. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=26&lesson=27
- 3. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=43&lesson=44
- 4. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=52&lesson=53
- 5. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=75&lesson=76





SAHYADRI	An Autonomous MANGAL									
COMPUTER GRAPHICS AND FU	NDAMENT	TALS OF IMAGE PROC	ESSING							
(Effective from the	Academic Y	Year 2023 - 2024)								
<b>VI SEMESTER</b>										
Course Code	21CS63	CIA Marks	50							
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50							
Total Hours of Pedagogy	40L	Exam Hours	03							
C	REDITS – 3									
COURSE PREREQUISITES:										
Desig Imoviladas of methometics										
Basic knowledge of mathematics     COURSE OBJECTIVES:										
COURSE OBJECTIVES:										
• Overview of Computer Graphics along w	ith its application	tions.								
• Exploring 2D and 3D graphics mathemat	ics along with	OpenGL API's.								
• Use of Computer graphics principles for a		design of GUI's .								
Introduction to Image processing and Ope	en CV.									
• Image segmentation using Open CV										
TEACHING - LEARNING STRATEGY:										
	ct to the Cours									
	IODULE - I		T							
<b>Overview:</b> Computer Graphics and OpenGL: graphics, Application of Computer Graphics, V tube, Random Scan and Raster Scan displays, colo Introduction to OpenGL, coordinate reference coordinate reference frames in OpenGL, OpenG point attributes, line attributes, curve attributes, line attribute functions, Line drawing algorithm algorithms (Bresenham"s)	Video Display or CRT monito frames, speci GL point func OpenGL poir	Devices: Refresh cathode ray or, graphics software. OpenGL: fying two-dimensional world tions, OpenGL line functions, at attribute functions, OpenGL								
	ODULE - II		<u>.</u>							
2D and 3D graphics with OpenGL: 2D Geom	netric Transfor	mations: Basic 2D Geometric	8 Hours							
Transformations, matrix representations and	homogeneous	coordinates, 2D Composite								
transformations, other 2D transformations, rast	ter methods f	or geometric transformations,								
OpenGL raster transformations, OpenGL geomet	tric transforma	ations functions								
3D Geometric Transformations: Transla	tion. rotation	n. scaling, composite 3D	1							

**3D Geometric Transformations:** Translation, rotation, scaling, composite 3D transformations, other 3D transformations, OpenGL geometric transformations functions



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Color models: color model, RGB color model, CMY color model															
MODULE - IIIInteractive Input Methods and Graphical User Interfaces: Graphical Input Data, Logical Classification of Input Devices, Input Functions for Graphical Data, Interactive Picture- Construction Techniques, Virtual-Reality Environments, OpenGL Interactive Input-Device Functions, OpenGL Menu Functions, Designing a Graphical User Interface.Computer Animation: Raster Method for computer animation, Design of Animation Sequences, Traditional Animation Techniques, General Computer-Animation Functions, Computer-Animation Languages, Character Animation, Periodic Motions, OpenGL Animation ProceduresMODULE - IVIntroduction of image processing: Overview of image processing, Nature of image										- e n s,	Hours				
															Hours
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Image	e Se	gmen	tation	: Intr	oductio	on, cla				on of	discor	ntinuitie	es, Edg	e <b>81</b>	Hours
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Upon	com	pletior	n of thi	s cour	se, the	studen	ts will	be able	e to:						
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CO2	Illu	strate	2D and	d 3D g	eomet	ric tran	sforma	ations u	ising C	penGL.	_			(	CL3
CO3	De	sign G	UI wit	h nece	essary t	echniq	ues rec	quired (	to anin	ate the	created	d objec	ts	(	CL3
CO4					1	-	•	-		ations.				(	CL3
CO5						ng simj	ole app	licatio	ns.	along w	ith pr	ogramr	ning,	(	CL3
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CO3	2	3	2	3	3				2		3	3	3		3
<b>CO4</b>	2	3	2	3	3				2		3	3	3		3
CO5	2	3	2	3	3				2		3	3	3		3
3: Substantial (High)2: Moderate (Medium)1: Poor (Low)								v)							

## ASSESSMENT STRATEGY

Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl.											
No.	Assessment Description			Weightage (%	) Ma	Max. Marks					
1	Continuous Internal Assessment (CIA)			100 %		50					
	Co	ontinuous Interr (CIE		60 %		30					
	A	Assignments		40 %		20					
2	Seme	ester End Exar	nination (SEE)	100 %		50					
			ASS	ESSMENT DETAI	LS						
	Con	tinuous Intern	al Assessment (	CIA) (50%)	Semester End Exa	am (SEE) (50%)					
Con	tinuou	s Internal Eva (60%)	luation (CIE)	Assignment/ Activities (40%)							
	I	(00 / 0) II	III	(4070)							
		Syllabus Cover		Syllabus Coverage	Svllabus	s Coverage					
4(	0%	30%	30%	100%	•	00%					
	<u>/I</u>			MI		MI					
	111	MII		MII		MII					
				MIII					MIII		<b>/</b> III
			MIV	MIV	N	/IV					
Note	· For E		MIV MV	MIV MV (E) the question pap	N	AIV AV questions manned					
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## SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- 1. Donald D Hearn, M Pauline Baker and Warren Carithers: Computer Graphics with OpenGL 4<sup>th</sup> Edition, Pearson, 2014
- 2. S. Sridhar, Digital Image Processing, second edition, Oxford University press 2016.
- Edward Angel: Interactive Computer Graphics- A Top Down approach with OpenGL, 5th edition. Pearson Education, 2008
- 4. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://nptel.ac.in/courses/106/106/106106090/
- 2. https://nptel.ac.in/courses/106/102/106102063/
- 3. https://nptel.ac.in/courses/106/103/106103224/
- 4. https://nptel.ac.in/courses/106/102/106102065/
- 5. https://www.tutorialspoint.com/opencv/ (Tutorial, Types of Images, Drawing Functions)





## AGILE SOFTWARE DEVELOPMENT (Effective from the Academic Year 2023 - 2024)

## **VI SEMESTER**

Course Code	21CS641	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03
CREDIT	5_3		

## **COURSE PREREQUISITES:**

• Knowledge of software engineering fundamentals.

## **COURSE OBJECTIVES:**

- Interpret the concept of agile software engineering and its advantages in software development.
- Analyze the core practices behind several specific agile methodologies
- Identify the roles and responsibilities in agile projects and their difference from projects following traditional methodologies.

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS							
MODULE – I							
Introduction: Need of Agile software development, agile context– Manifesto, Principles,	8 Hours						
Methods, Values, Roles, Artifacts, Stakeholders, and challenges. Business benefits of							
software agility.							
MODULE – II							
Project Planning: Recognizing the structure of an agile team– Programmers, Managers,	8 Hours						
Customers. User stories- Definition, Characteristics, and content. Estimation- Planning							
poker, Prioritizing, and selecting user stories with the customer, projecting team velocity							
for releases and iterations.							
MODULE – III							
Project Design: Fundamentals, Design principles-Single responsibility, Open-closed,	8 Hours						
Liskov substitution, Dependency-inversion, Interface-segregation.							
MODULE – IV							
Design Methodologies: Need of scrum, Scrum practices –Working of scrum, Project	8 Hours						
velocity, Burn down chart, Sprint backlog, Sprint planning and retrospective, Daily scrum,							
Scrum roles- Product Owner, Scrum Master, Scrum Team. Extreme Programming- Core							



principles, values and practices. Kanban, Feature-driven development, Lean software										ftware					
development.															
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Test at	itomati	on.				COUD	CE C								
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Upon completion of this course, the students will be able to:												В	Bloom'	s	
CO				C	Course	Outcor	ne D	escriptio	n					axonor	
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CO2	Summ	narize tl	he roles	s and re	esponsi	bilities	in agi	ile projec	ts and t	heir di	fferenc	e		CI 2	
CO3	from J	projects	s follow	ving tra	ditiona	l metho	odolog	gies.						CL2	
CO4	Apply	functi	onal tes	sting, u	nit testi	ng, and	l cont	inuous in	itegratio	on.				CL3	
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No. CO1 CO2 CO3 CO4 CO5 Assess methoo Sl. No.	2 2 2 3: Su ment w ds: Conti	2 2 2 bstant vill be b Ass nuous ontinuou	2 2 2 ial (Hig both CL sessment International us International International International International	4 gh) A and S nt Desc al Asse	5 3 3 SEE. St cription aluation	6 1 3 2: M SSESSM udents n t (CIA) n (CIE) E)	7 3 Ioder MEN learn	8           2           2           2           2           2           2           ate (Med           T STRA'           ing will b           Weighta           100           60           40           100	9 2 2 2 lium) TEGY be assess nge (%) % % % %	2 2 3 3 3 3 sed usi	2 1 1 1	2 2 2 2 1: Poor ect and Max. 1 5 3 2	0 1 2 3 3 3 (Low Marks 0 0	Putcom           Qutcom           (PSO)           2           1	<b>3</b>
No. CO1 CO2 CO3 CO4 CO5 Assess method Sl. No. 1	2 2 2 3: Su ds: Conti Co A Seme	2 2 2 3 <b>bstant</b> vill be b Ass <b>nuous</b> ontinuou ssignm <b>ster En</b>	2 2 2 ial (Hig both CL sessment international us International internati	4 gh) A and S nt Desc al Asse mal Eva	5 3 3 SEE. St cription essment aluation on (SE) A	6 1 3 2: M SSESSN udents t (CIA) n (CIE) E) SSESS	7 3 oder VIEN learn	8           2           2           2           2           2           2           ate (Med           T STRA'           ing will b           Weighta           60           40           100           NT DET	9 2 2 2 lium) TEGY be assess nge (%) % % % %	2 2 3 3 3 3 3 5 sed usi	2 1 1 1	2 2 2 2 1: Poor ect and Max. 1 5 3 2 5	0 1 2 3 3 3 (Low Indire Marks 0 0 0 0	Putcom       (PSO)       2       1   <	<b>3</b>
No. CO1 CO2 CO3 CO4 CO5 SI. No. 1 2	2 2 2 3: Su ment w ds: Conti Co Seme:	2 2 2 ibstant vill be b Ass nuous ontinuou ssignm ster En	2 2 2 ial (Hig both CL sessment international internatinternational international international international inte	4 gh) A and S nt Desc al Asse mal Eva	5 3 3 SEE. St cription aluation aluation <b>SSMEN</b>	6 1 3 2: M SSESSN udents t (CIA) n (CIE) E) SSESS Ent (C	7 3 Ioder MEN learn	8           2           2           2           2           2           2           ate (Med           T STRA'           ing will b           Weighta           60           40           100           NT DET	9 2 2 2 2 lium) TEGY be assess age (%) % % % % % % % % % % % % % % % % % %	2 2 3 3 3 3 3 5 sed usi	2 1 1 1 ing Dir	2 2 2 2 1: Poor ect and Max. 1 5 3 2	0 1 2 3 3 3 (Low Indire Marks 0 0 0 0	Putcom       (PSO)       2       1   <	<b>3</b>

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I	II	III	Activities (40%)	
Sy	llabus Coverag	ge	Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

SI. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

## **SEE QUESTION PAPER PATTERN:**

A SSLCNIMENT TYDES WITH WEIGHTACES

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

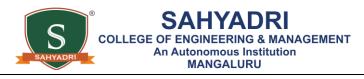
## **REFERENCE BOOKS:**

- 1. Ken Schawber, Mike Beedle, "Agile Software Development with Scrum", International Edition, Pearson.
- 2. Robert C. Martin, "Agile Software Development, Principles, Patterns and Practices", First International Edition, Prentice Hall.
- 3. Pedro M. Santos, Marco Consolaro, and Alessandro Di Gioia, "Agile Technical Practices Distilled: A learning journey in technical practices and principles of software design", First edition, Packt Publisher



- 4. Lisa Crispin, Janet Gregory, "Agile Testing: A Practical Guide for Testers and Agile Teams", International edition, Addison Wesley.
- 5. Alistair Cockburn, "Agile Software Development: The Cooperative Game", 2nd Edition, Addison-Wesley





## NATURAL LANGUAGE PROCESSING (Effective from the Academic Year 2023 - 2024)

<b>VI SEMESTER</b>								
Course Code <b>21CS642</b> CIA Marks50								
Number of Contact Hours/Week (L: T: P: S)3:0:0:0SEE Marks50								
Total Hours of Pedagogy40LExam Hours03								
	CREDITS – 3							

## **COURSE PREREQUISITES:**

Fundamentals of Automata Theory and Basic knowledge of English Grammar.

## **COURSE OBJECTIVES:**

- Define the natural language and analyze the importance of natural language.
- Analyze spelling error detection and correction methods and parsing techniques in NLP.
- Understand the Applications of natural language processing.
- Illustrate the information retrieval models in natural language processing.

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS	
MODULE - I	
Overview and language modeling: Overview: Origins and challenges of NLP-Language and	8 Hours
Grammar-Processing Indian Languages- NLP Applications,	
Language Modeling: Statistical Language Model- N-gram model- (unigram, bigram),	
Paninion Framework, Karaka theory, Smoothing Technique.	
MODULE - II	
Word Level Analysis: Regular Expressions, Finite State Automata, Morphological Parsing,	8 Hours
Spelling Error Detection and Correction, Words and Word Classes-Part-of Speech Tagging.	
Syntactic Analysis: Context-free Grammar, Constituency, top-down and bottom-up Parsing,	
CYK parsing.	
MODULE - III	
Naive Bayes and Sentiment Classification: Naive Bayes Classifiers, Training the Naive Bayes	8 Hours
Classifier, Worked example, Optimizing for Sentiment Analysis, Naive Bayes for other text	
classification tasks, Naive Bayes as a Language Model	



	MODULE - IV														
Inform	rmation Retrieval and Lexical Resources: Information Retrieval: Design features of										of	8 Ho	urs		
Information	mation Retrieval Systems-Classical, Non-classical, Alternative Models of Information										on				
Retriev	al- Cı	ister m	odel, F	uzzy m	odel, L	STM mo	del, I	Major I	ssues in	Infor	nation	Retriev	al.		
Lexica	l Reso	ources:	World	Net, F	rame N	let, Stem			agger-	Resear	ch Cor	pora.			
								LE - V							
														8 Ho	urs
	achine Translation: Language Divergences and Typology, Machine Translation using coder-Decoder, Details of the Encoder-Decoder Model, Translating in low-resource nations, MT Evaluation, Bias and Ethical Issues											rce			
Situatio		I Litur	<u>uuuioii,</u>	Diaba				JTCON	MES						
Upon c	omple	etion of	f this co	ourse, t		ents will									
CO No.					Cour	se Outco	me E	Descrip	tion				]	Blooi Faxon Lev	omy
CO1			concepting tech	-		d demons	strate	the sta	tistical-	based	langua	ge mod	els		
CO2	Dem Tran	ionstrat sducer	te the s, spelli	use of	morph or detec	nological tion and o ing appro	corre	ction, p							
CO3	App	ly the	Naïve	Bayes	classi	fier and			malysis	for N	Jatural	langua	ige		
CO4	<ul> <li>problems and text classifications.</li> <li>Illustrate the use of Information Retrieval in the context of NLP and understand</li> <li>the concept of lexical semantics, lexical dictionaries such as WordNet, lexical computational semantics, distributional word similarity.</li> </ul>														
CO5	Deve	elop the	e Mach	ine Tra	inslatio	n applica	tions	using l	Encoder	and D	ecode	model			
						CO-PO-	PSO	MAPP	ING				•		
CO No.					Progra	umme Ou	ıtcon	nes (PC	<b>)</b> )				S O	ogram pecifi utcon (PSO)	c 1e
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	2							2		2		2	1	1	
CO2	2	2	2			1		2		2	2	2	2	1	2
CO3	2	2	2					2	2	3	1	2	3	1	2
CO4	2	2	2		3			2	2	3	1	2	3	1	
CO5	2	2	2		3	3	3	2	2	3	1	2	3	1	
3:	Subs	tantial	(High	)		: Modera					1	: Poor	(Low)		
Assessi method		will be	both C	IA and		SSESSM				essed u	sing D	irect and	d Indii	ect	
Sl. No.		Ass	essmer	nt Desc	ription	l	W	Veighta	ge (%)			Max.	Mark	S	
1	Con (CIA		s Inter	nal As	sessme	nt		100	%			5	50		

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			-		
	Conti	nuous Internal E	valuation (CIE)	60 %	30
	As	Assignments 40 %	40 %	20	
2	Semes	ter End Examin	ation (SEE)	100 %	50
			ASSESSI	MENT DETAILS	<u>.</u>
	Con	tinuous Interna	l Assessment (C	IA) (50%)	Semester End Exam (SEE)
Conti	nuous In	ternal Evaluation	on (CIE) (60%)	Assignment/	(50%)
	Ι	II III Activities (40%)		Activities (40%)	
	S	Syllabus Covera	ge	Syllabus Coverage	Syllabus Coverage
4	0%	30%	30%	100%	100%
l	MI			MI	MI
Ν	MII	MII		MII	MII
		MIII		MIII	MIII
			MIV	MIV	MIV
			MV	MV	MV
37.					

MANAGEMENT

tution

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES									
Sl.	Assignment Description	Max. Weightage	Max.						
No.	Assignment Description	(%)	Marks						
1	Written Assignments	25 %	05						
2	Quiz	10 %	02						
3	Case Studies	25 %	05						
4	Seminar/Presentation	15 %	03						
5	Peer - to - Peer Learning	10 %	02						
6	Activity Based Learning	50 %	10						
7	Project Based Learning	50 %	10						
8	Field Work + Report	50 %	10						
9	Industry Visit + Report	50 %	10						
	NPTEL/MOOC Courses - Registration and Assignment	50 %	10						
10	Submissions	50 %	10						
	NPTEL Certification	75 %	15						
11	Any other Innovative Assignments (CL4 and above)	50 %	10						

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

## **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

1. Tanveer Siddiqui, U.S. Tiwary, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.

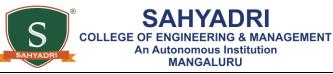


- 2. D. Jurafsky, J. H. Martin, "Speech and Language Processing, An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition (3e)", Pearson Education, 2023.
- 3. Akshay Kulkarni, Adarsha Shivananda, "Natural Language Processing Recipes Unlocking Text Data with Machine Learning and Deep Learning using Python", Apress, 2019
- 4. James Allen, "Natural Language Understanding", 2nd edition, Benjamin/Cummings publishing company, 1995.
- 5. Gerald J. Kowalski and Mark.T. Maybury, "Information Storage and Retrieval systems", Kluwer Academic Publishers, 2000

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E-RESOURCES):**

- 1. https://www.youtube.com/watch?v=M7SWr5xObkA
- 2. https://youtu.be/02QWRAhGc7g
- 3. https://www.youtube.com/watch?v=CMrHM8a3hqw





## SOCIAL NETWORK ANALYSIS (Effective from the Academic Year 2023 - 2024)

<b>VI SEMESTER</b>								
Course Code	21CS643	CIA Marks	50					
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50					
Total Hours of Pedagogy	40L	Exam Hours	03					
CREDITS – 3								

## **COURSE PREREQUISITES:**

• Fundamental knowledge of Mathematics, Data Structures and algorithms.

## **COURSE OBJECTIVES:**

This course will enable students to:

- To understand the science of networks, including the principles of graph theory and key statistical properties of network.
- To acquire a working knowledge of descriptive network analysis techniques.
- Gain proficiency in evaluating network structure through the analysis of nodes and edges, calculating network diameter, and determining average path length To visualize social networks.
- Study the dynamics of information and influence propagation on networks, including the basic cascade model and strategies for influence maximization.

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS						
MODULE – I						
Introduction to social network analysis and Descriptive network analysis: Introduction	8 Hours					
to new science of networks. Network examples. Graph theory basics. Statistical network						
properties. Degree distribution, clustering coefficient. Frequent patterns. Network motifs.						
Cliques and k-cores.						
MODULE – II						
Network structure, Node centralities and ranking on network: Nodes and edges, network	8 Hours					
diameter and average path length. Node centrality metrics: degree, closeness and between-						
ness centrality. Eigenvector centrality and PageRank, Algorithm HITS.						
MODULE – III						
Network communities and Affiliation networks: Networks communities. Graph	8 Hours					
partitioning and cut metrics. Edge betweenness. Modularity clustering. Affiliation network						
and bipartite graphs. 1-mode projections. Recommendation systems.						



				$\sim$											
						MO	DULE	$\mathbf{L} - \mathbf{I}\mathbf{V}$							
Informati	mation and influence propagation on networks and Network visualization: Social										8 Ho	ours			
Diffusion.	. Basic cascade model. Influence maximization. Most influential nodes in the														
network.	ork. Network visualization and graph layouts. Graph sampling. Low -dimensional														
projection	S.														
							DULI								
Social me	edia m	ining	and	SNA i	n real	worl	d: FB	/VK a	ind Ty	vitter	analysi	is: Na	tural	8 Ho	ours
language ]	process	sing a	nd sen	timent	minin	g. Pro	operties	s of la	arge so	ocial n	etwork	s: frie	nds,		
connection	ns, like	s, re-tv	veets.												
							E OU'		IES						
Upon com	pletion	n of thi	s cours	se, the	student	ts will	be abl	e to:						[	
CO														Bloo	
No.					Course	e Out	come l	Descri	ption					Taxor	•
														Lev	vel
<b>~</b> ~					y in aj										
CO1			-		their	unde	rstandı	ng thi	rough	the 10	lentitio	cation	and	CI	.2
	•			k struc									6		
CO2					dvance									CI	_3
CO3					nding o									CI	2
003	•	·			e variou res by				•			-		CI	20
CO4	-				-			-			-		on tools. CL	_3	
						-			-						
CO5	Evaluate and apply advanced techniques, including natural language processing and sentiment mining, to analyze Facebook, VK, and Twitter data.										CI	_3			
							PSO N								
													P	rogram	me
CO				P	rogram	nme C	Outcon	nes (PO	(C					Specifi	c
No.													Out	come (I	PSO)
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	1				2				2		1	
CO2	3	3	2					2				2	1		
CO3	3	3	3					2				2	1		
<b>CO4</b>	3	3	3					2				2	2		
CO5	3	3	3					2				2	3	1	
3: S	ubstar	ntial (l	High)	•	2: ]	Mode	rate (I	Mediu	m)		1	: Poor	r (Lo	w)	•
					ASSE	ESSM	ENT S	STRA	ГEGY						
				1 0 1						_					
Assessmen	nt will	be bot	h CIA	and SI	EE. Stu	dents	learnin	ng will	be ass	essed	using I	Direct a	and Ir	Idirect	
methods:				<b>D</b>	•				(0	<u></u>					
Sl. No.					iption		V	Veight	age (%	<b>(</b> 0)		Ma	$\frac{\mathbf{x}}{\mathbf{x}}$	arks	
1			s inter	mai Ag	ssessm	ent		100	) %				50		
	(CIA		no Int		valuati	<b>~</b> <i>n</i>							30		
		minuo			valuati			60	%				30		
		lacia-	,	IE)				40	0/				20		
	l F	Assignments 40 % 20													



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2	Semester End F	Examination (SEE)	100 %	50
		ASS	SESSMENT DETAILS	
	Continuous In	ternal Assessment (	CIA) (50%)	Semester End Exam (SEE)
Continuo	ous Internal Evalu	ation (CIE) (60%)	Assignment/Activities	(50%)
Ι	II	III	(40%)	
	Syllabus Cov	erage	Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNN	MENT TYPES WITH WEIGHTAGES		
Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1		25.04	
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
	NPTEL/MOOC Courses – Registration and Assignment	50 %	10
10	Submissions		10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- 1. David Easley and John Kleinberg. "Networks, Crowds, and Markets: Reasoning About a Highly Connected World." Cambridge University Press 2010.
- 2. Eric Kolaczyk, Gabor Csardi. Statistical Analysis of Network Data with R (Use R!). Springer, 2014.



 Stanley Wasserman and Katherine Faust. "Social Network Analysis. Methods and Applications." Cambridge University Press, 1994.





## DATA SCIENCE AND APPLICATION (Effective from the Academic Year 2023 - 2024)

VI SEMESTER									
Course Code	21CS644	CIA Marks	50						
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50						
Total Hours of Pedagogy	40L	Exam Hours	03						
	CREDITS – 3								

## **COURSE PREREQUISITES:**

## **COURSE OBJECTIVES:**

- To learn data collection and preprocessing techniques for data science
- To Understand and practice analytical methods for solving real life problems.
- To study data exploration techniques
- To learn different types of data and its visualization
- To map element of visualization well to perceive information

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS						
MODULE – I						
Introduction to data Science: Brief History of Data Science, Data Science role and skill	8 Hours					
tracks, What kind of question can Data sceice solve ,Structure of Data Science Team,						
Data science roles.						
MODULE – II						
Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Some Other	8 Hours					
Correlational Caveats, Correlation and Causation						
Probability : Dependence and Independence, Conditional Probability, Bayes's Theorem,						
Random Variables, Continuous Distributions, The Normal Distribution.						
MODULE – III						
Data Analysis : Getting Data ,Working with Data ,KNN, Simple Linear regression,	8 Hours					
Multiple regression.						
MODULE – IV						
Visualizing Data: Numpy, Pandas, Matplotlib, Bar, chart, Line chart, Scatter Plot.	8 Hours					



				$\checkmark$		MO		$\frac{\mathbf{IANGAL}}{\mathbf{E} - \mathbf{V}}$	UKU						
Controll	<b>ifying Visualizations using Seaborn:</b> Introduction, Advantages of Seaborn olling Figure Aesthetics: Seaborn Figure Styles, Removing Axes Spines, Contexts; Palettes: Categorical Color Palettes, Sequential Color Palettes, Diverging Color								ntexts;	8 Hours		irs			
		Interesting Plots in Seaborn: Bar Plots, Kernel Density Estimation, Plotting													
	variate Distributions, Visualizing Pairwise Relationships, Violin Plots											e			
					(	COURS	E OU	TCON	AES						
Upon co	mpleti	on of th	nis cou	rse, the	e stude	nts will	be abl	le to:							
CO No.		Course Outcome Description										Та	Bloon Ixon Leve	omy	
CO1		y data p for anal	-	essing	metho	ds on op	pen ac	cess da	ata and	genera	ite qual	lity		CL	3
CO2		y and a roblem	-	classi	ficatio	n and re	egress	ion dat	a analy	tical r	nethod	s for real		CL3	3
CO3	-					sing Pyt								CL	
CO4						n techni								CL	
CO5	Analy	ze the	data us	sing su		method,			-	open s	source	tool.		CL	3
CO No.	CO-PO-PSO MAPPING Programme Outcomes (PO)								12	Programm Specific Outcome (PSO)		fic me ))			
<u>CO1</u>	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1 CO2	22	22		$\frac{2}{2}$	22				2 2	$\frac{2}{2}$	2	2 2	22		$\frac{2}{2}$
CO2 CO3	2	2		$\frac{2}{2}$	2				2	$\frac{2}{2}$	2	2	2		$\frac{2}{2}$
CO4	2	2		$\frac{2}{2}$	2				2	$\frac{2}{2}$	2	2	2		2
CO5	2	2		2	2				2	2	2	2	2		2
	: Subst	tantial	(High)	)		2: Mode	erate	(Mediu	ım)		1	l: Poor (L	ow)		
Assessm methods <b>Sl. No.</b>			oth CIA		EE. St		earnir		be asse		-	irect and In Max. Mar		ct	
1	Conti (CIA	inuous	Intern		-			100 %				50			
	Cont	tinuous	Intern	al Eval	luation	(CIE)		60 %	)			30			
		Assignn						40 %				20			
2	Seme	ster E	nd Exa	minat				100 %				50			
						SSESSN			AILS	1					
						ent (CIA	, ,			Sem	ester <b>E</b>	End Exam	(SE)	E) (5	0%)
Contin	uous Ir I	nternal	l Evalu II	ation	(CIE) III	. ,	_	ssignn Activit	ies						
-								(40%	)						



Sy	vllabus Cover	age	Syllabus Coverage	
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
	NPTEL/MOOC Courses - Registration and Assignment	50 %	10
10	Submissions	30 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

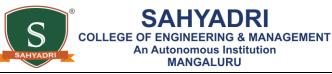
## **REFERENCE BOOKS:**

- 1. Data Science from Scratch : Joel Grus, O'Reilly Media Inc., ISBN: 9781491901427
- 2. Data Visualisation Workshop, Tim Grobmann and Mario Dobler, Packt Publishing
- 3. Practitioner's Guide to Data Science : Hui Lin and Ming Li
- 4. Big data black book, Dream tech publication
- 5. Getting Started with Business Analytics: Insightful Decision-Making , David Roi Hardoon, GalitShmueli, CRC Press



- 6. Business Analytics , James R Evans, Pearson
- 7. Python Data science Handbook, Jake VanderPlas, Orielly publication
- 8. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, Vovost Foster, Fawcett Tom





# BLOCKCHAIN & APPLICATIONS (Effective from the Academic Year 2023 - 2024)

VI SEMESTER							
Course Code:	21CS651	CIA Marks	50				
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50				
Total Hours of Pedagogy	40L	Exam Hours	03				
	CREDITS – 3						

## **COURSE PREREQUISITES:**

• Fundamental knowledge of Mathematics, Data Structures, Networking

## **COURSE OBJECTIVES:**

- Define and explain the fundamentals of Block chain
- Illustrate the technologies of Block chain
- Describe the models of Block chain
- Analyze and demonstrate the Ethereum

## **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

MODULE - I					
Introduction to Blockchain Technology: Distributed systems, The history of blockchain,	8 Hours				
CAP theorem and blockchain, Benefits and limitations of blockchain, Decentralization using					
blockchain, Methods of decentralization, Routes to decentralization.					
MODULE - II					
Cryptography in Blockchain: Introduction, cryptographic primitives, Asymmetric	8 Hours				
cryptography, public and private keys, RSA, ECC, Hash functions, financial markets and					
trading					
MODULE - III					
Bit Coin Introduction, Transactions: Structure, Transactions types, The structure of a block,	8 Hours				
The genesis block, The bitcoin network, Wallets and its types, Bitcoin payments, Bitcoin					
investment and buying and selling bitcoins, Bitcoin installation, Bitcoin programming and the					
command-line interface, Bitcoin improvement proposals (BIPs).					
MODULE - IV					
Ethereum: Ethereum block chain, Ethereum network, Components of the Ethereum	8 Hours				
ecosystem, Keys and Addresses, Accounts and its types, Transactions and Messages, Contract					

**COURSE CONTENTS** 

				SAHY		COLLEG	E OF EN An Aut	IGINEER	s Institu	ANAGE	MENT				
Creati	ion trar	nsactior	n, Mess	sage ca	ll trans	saction,	messa	ges, C	alls, Tr	ansacti	on Val	idation	n and		
		Transac					U								
		cy / toł			d ETH)	), The I	Ethereu	ım Vir	tual Ma	achine (	(EVM)	, Exec	ution		
enviro	onment	, Native	e contra	acts.		M	IODUI	FV							
Smart	t Conti	ract and	d Hyn	er ledø	er Ric					n deve	loned o	on Ethe	rium	8 H	ours
: The I		act and	unjp	ci icug		urururi	contrac	, 11p	pileutio	in de ve	loped (			0 11	Juis
Hyper	r ledge	r: Hyp	er ledg	er proj	ects, H	yperlec	lger as	a prote	ocol, T	he refe	rence a	rchited	cture,		
Requir	rement	s and d	esign g	goals of	f Hyper	ledger	Fabric	, Appli	cations	on blo	ckchai	n on fa	abric,		
Conse	nsus in	Hyper	ledger	Fabric	, The tr	ansacti	on life	cycle i	n Hype	erledge	r Fabri	c, Saw	tooth		
Lake,	Corda	Archite	cture.												
			.1 .			COUR			MES						
Upon	comple	etion of	this co	ourse, tl	he stud	ents wi	II be at	ole to:						יח	• • •
CO No.					Cour	se Out	come I	Descrij	otion					Taxo	om's nomy vel
CO1	Apply basic concepts of Blockchain and evaluate the benefits and limitation of Blockchain							CL3							
CO2	Examine the decentralization concepts and apply the cryptography techniques in Blockchain							CL3							
CO3								CL3							
CO4									CL3						
CO5	Illustrate the usage of Smart contract and architecture of Hyperledger           CO-PO-PSO MAPPING						Cl	L3							
						CO-PC	<b>)-PSO</b>	MAPI	ING				D.		
CO				T	Program	mme (	Dutcom	nes ( <b>Pf</b>	))					rogramme Specific	
No.				-	ingia		utcom		•)					come (PSO)	
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2						1		2	2	2	1	1
CO2	3	3	2						1		2	2	2	1	1
CO3	3	3	2		2				1		2	2	2	1	1
<b>CO4</b>	3	3	2		2				1		2	2	2	1	1
CO5	3	3	2		2				1		2	2	2	1	1
	<b>3: Sul</b>	ostantia	al (Hig	<b>h</b> )			derate			7		1: Poo	r (Lov	<b>v</b> )	
Assess		will be l	ooth C	IA and		SSESSI Students					ising D	oirect a	nd Ind	irect	
Sl. No.	Assessment Description					W	eighta	ge (%)		Max. Marks					
1	Cont (CIA	inuous )	Interr	nal Ass	sessmer	nt		100	%		50				
		ntinuou		nal Eva	luation	(CIE)		60 9					30		
		Assignn			_			40 9					20		
2	Seme	ester Ei	nd Exa	minat	ion (SF	EE)		100	%			-	50		



		ASSESSM	IENT DETAILS	
Conti	nuous Interna	Semester End Exam (SEE) (50%)		
<b>Continuous Int</b>	ternal Evaluat	ion (CIE) (60%)	Assignment/	
Ι	II	III	Activities (40%)	
S	yllabus Covera	age	Syllabus Coverage	Syllabus Coverage
40%	30%	30%	100%	100%
MI			MI	MI
MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES							
Sl.	Againment Description	Max. Weightage	Max.				
No.	Assignment Description	(%)	Marks				
1	Written Assignments	25 %	05				
2	Quiz	10 %	02				
3	Case Studies	25 %	05				
4	Seminar/Presentation	15 %	03				
5	Peer - to - Peer Learning	10 %	02				
6	Activity Based Learning	50 %	10				
7	Project Based Learning	50 %	10				
8	Field Work + Report	50 %	10				
9	Industry Visit + Report	50 %	10				
	NPTEL/MOOC Courses - Registration and Assignment	50 %	10				
10	Submissions	50 70	10				
	NPTEL Certification	75 %	15				
11	Any other Innovative Assignments (CL4 and above)	50 %	10				

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

## **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- 1. Bashir, Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained, 2nd Edition, 2nd Revised edition. Birmingham: Packt Publishing, 2018.
- 2. A. M. Antonopoulos, Mastering bitcoin, First edition. Sebastopol CA: O'Reilly,2015.



 Z. Zheng, S. Xie, H. Dai, X. Chen, and H. Wang, —An Overview of Blockchain Technology: Architecture, Consensus, and Future Trends in 2017 IEEE International Congress on Big Data (Bigdata Congress), 2017, pp.557–564

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://ethereum.org/en/
- 2. https://www.blockchain.com/explorer





## INTERNET OF THINGS (Effective from the Academic Year 2023 - 2024)

<b>VI SEMESTER</b>							
Course Code	21CS652	CIA Marks	50				
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50				
Total Hours of Pedagogy	40L	Exam Hours	03				
CREDITS -3							

## **COURSE PREREQUISITES:**

• Fundamentals of embedded system and computer communication

## **COURSE OBJECTIVES:**

- Familiarize genesis and impact of IoT applications, architectures
- Familiarize the diverse methods of deploying smart objects and connect them to networks.
- Familiarize the IoT protocols and Security

## **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

## **COURSE CONTENTS**

MC	DD	JLE	- ,	Ι	

Introduction to IoT: Genesis of IoT, IoT and Digitization, IoT Impact, Convergence of IT<br/>and IoT, IoT Challenges, IoT Network Architecture and Design, Drivers Behind New Network<br/>Architectures, Comparing IoT Architectures, A Simplified IoT Architecture, The Core IoT<br/>Functional Stack, IoT Data Management and Compute Stack.8 Hours

#### **MODULE - II**

Smart Objects: The "Things" in IoT, Sensors, Actuators, and Smart Objects, Sensor	8 Hours					
Networks, Connecting Smart Objects, Communications Criteria, IoT Access Technologies.						

# MODULE - III

IP as the IoT Network Layer, The Business Case for IP, The need for Optimization, Optimizing IP for IoT, Profiles and Compliances, Application Protocols for IoT, The Transport Layer, IoT Application Transport Methods. MODULE - IV

# Data and Analytics for IoT, An Introduction to Data Analytics for IoT, Machine Learning, Big<br/>Data Analytics Tools and Technology, Edge Streaming Analytics, Network Analytics,<br/>Securing IoT, A Brief History of OT Security, Common Challenges in OT Security, How IT<br/>and OT Security Practices and Systems Vary, Formal Risk Analysis Structures: OCTAVE and<br/>FAIR, The Phased Application of Security in an Operational Environment.8 Hours



				$\checkmark$		М									
IoT Ph	vsical Dev	ices an	d Endr	nints -	Ardu				on to A	rduin	Ardı	uino III	NO	8 Ho	nire
	ysical Devices and Endpoints - Arduino UNO: Introduction to Arduino, Arduino UNO, ing the Software, Fundamentals of Arduino Programming. IoT Physical Devices and							0 110	Juis						
	-						-		-	-					
-	_	ts -RaspberryPi: Introduction to RaspberryPi, About the RaspberryPi Board: re Layout, Operating Systems on RaspberryPi, Configuring RaspberryPi,													
	mming Ra		-				-	-		-	-				
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	S18B20 s						-				-	-			
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Strateg	y for Sina		.103, 011						IES						
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CO				C	Course	Outco	ome Do	escript	ion					Taxo	
No.														Le	•
CO1	Assess th	ne gene	esis and	l impa	ct of Ic	T appl	icatior	ns, arch	itectur	es in th	ne real	world		CI	
CO2	Illustrate													CI	
CO3	Appraise					-		-						CI	
CO4	Elaborat			_										CI	_3
	Illustrate				-			-		entities	and i	dentify			
CO5	the appli				-	-		C						CI	_3
						0-PO-	PSO N	APPI	NG					1	
CO	Programme Outcomes (PO)							rogramme							
No.				110	-51 uiii			5(10)						Specific	
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	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	2	3					2			3	3	2
CO2	3	3	3	2	3					2			3	3	2
CO3	3	3	3	2	3					2			3	3	2
CO4	3	3	3	2	3					2			3	3	2
CO5	3	3	3	2	3					2			3	3	2
	3: Substa	ntial (I	High)			Mode						1: <b>Poo</b>	r (Lo	w)	
					A33	ESSM	LINI S	JIKA	IEGY						
Assess	ment will	be both	n CIA a	and SE	E. Stu	dents le	earning	g will b	e asses	ssed us	ing Di	rect an	d Ind	irect	
method											C				
Sl.		agogg	nont D	acarin	tion		Wei	ahtaga	(0/)			Mon	Manh		
No.	F	Ssessr	nent D	escrip	uon		vvei	ghtage	:(70)			Max.	Wark	15	
1	Continu	ous In	ternal	Assess	sment			100 %				5	50		
-	(CIA)														
	Continuo		ernal E	valuati	on (C	E)		60%				3	80		
	Assignm							40 %					20		
2	Semeste	r End	Exami	nation	n (SEE	<b>Z</b> )		100 %	)			5	50		



#### ASSESSMENT DETAILS

Semester End Exam (SEE) (50%)	Continuous Internal Assessment (CIA) (50%)				
	Continuous Internal Evaluation (CIE) (100%)				
	III	II	I		
Syllabus Coverage	e	Syllabus Coverage			
100%	30%	30%	40%		
MI			MI		
MII		MII	MII		
MIII		MIII			
MIV	MIV				
MV	MV				

## NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

## **SEE QUESTION PAPER PATTERN:**

- 1. The question paper will have **TEN** full questions from **FIVE** Modules
- 2. There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- 3. Each full question may have a maximum of four sub-questions covering all the topics under a module.
- 4. The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Robert Barton, Jerome Henry,"IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", 1<sup>st</sup>Edition, Pearson Education (Cisco Press Indian Reprint). (ISBN: 978-9386873743)
- 2. Srinivasa K G, "Internet of Things", CENGAGE Leaning India, 2017
- 3. S Vijay Madisetti and Arshdeep Bahga, "Internet of Things (A Hands-on-Approach)", 1<sup>st</sup>Edition, VPT, 2014. (ISBN: 978-8173719547)
- 4. Raj Kamal, "Internet of Things: Architecture and Design Principles", 1<sup>st</sup> Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

## **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=17&lesson=18
- 2. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=26&lesson=27
- 3. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=43&lesson=44
- 4. https://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=52&lesson=53
- 5. dttps://onlinecourses.nptel.ac.in/noc22\_cs93/unit?unit=75&lesson=76

Engineering \* \* \* \* \* \*



## PARALLEL COMPUTING (Effective from the Academic Year 2023 - 2024)

<b>VI SEMESTER</b>						
Course Code	21CS653	CIA Marks	50			
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50			
Total Hours of Pedagogy	40L	Exam Hours	03			
CREDITS – 3						

## **COURSE PREREQUISITES:**

• Fundamental knowledge of OS, Data Structures.

## **COURSE OBJECTIVES:**

- Introduce students the design, analysis, and implementation, of high performance computational science and engineering applications.
- Illustrate on advanced computer architectures, parallel algorithms, parallel languages, and performance-oriented computing.

## **TEACHING - LEARNING STRATEGY:**

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS						
MODULE – I						
Introduction to Parallel Computing: Motivating Parallelism, Scope of Parallel Computing,	8 Hours					
Parallel Programming Platforms: Implicit Parallelism: Trends in Microprocessor						
Architectures, Limitations of Memory System Performance, Dichotomy of Parallel						
Computing Platforms, Physical Organization of Parallel Platforms, Communication Costs in						
Parallel Machines, Routing Mechanisms for Interconnection Networks, Impact of Process-						
Processor Mapping and Mapping Techniques.						
MODULE – II						
Principles of Parallel Algorithm Design: Preliminaries, Decomposition Techniques,	8 Hours					
Characteristics of Tasks and Interactions, Mapping Techniques for Load Balancing, Methods						
for Containing Interaction Overheads, Parallel Algorithm Models						
Basic Communication Operations: One-to-All Broadcast and All-to-One Reduction, All to-						
All Broadcast and Reduction, All-Reduce and Prefix-Sum Operations, Scatter and Gather,						
All-to-All Personalized Communication, Circular Shift, Improving the Speed of Some						
Communication Operations						



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	MODULE – III	
Analyt	ical Modeling of Parallel Programs: Sources of Overhead in Parallel Programs,	8 Hours
Perform	nance Metrics for Parallel Systems, The Effect of Granularity on Performance,	
Scalabi	lity of Parallel Systems. Minimum Execution Time and Minimum Cost-Optimal	
Execut	ion Time, Asymptotic Analysis of Parallel Programs. Other Scalability Metrics,	
Program	nming Using the Message-Passing Paradigm: Principles of Message-Passing	
Program	nming, The Building Blocks: Send and Receive Operations, MPI: the Message Passing	
Interfac	e, Topologies and Embedding, Overlapping Communication with Computation,	
	ive Communication and Computation Operations, Groups and Communicators.	
	MODULE – IV	
Progra	mming Shared Address Space Platforms: Thread Basics, Why Threads?, The	8 Hours
U	Thread API, Thread Basics: Creation and Termination, Synchronization Primitives in	
	ls, Controlling Thread and Synchronization Attributes, Thread Cancellation,	
	site Synchronization Constructs, Tips for Designing Asynchronous Programs,	
-	IP: a Standard for Directive Based Parallel Programming, Dense Matrix Algorithms:	
-	Vector Multiplication, Matrix-Matrix Multiplication,	
	g a System of Linear Equations, Sorting: Issues in Sorting on Parallel Computers,	
-	Networks, Bubble Sort and its Variants.	
~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~ ~	MODULE – V	
Granh	Algorithms: Definitions and Representation, Minimum Spanning Tree: Prim's	8 Hours
_	hm, Single-Source Shortest Paths: Dijkstra's Algorithm, All-Pairs Shortest Paths,	0 110 115
-	ive Closure, Connected Components, Algorithms for Sparse Graphs, Search	
	hms for Discrete Optimization Problems: Definitions and Examples, Sequential Search	
-	hms, Search Overhead Factor, Parallel Depth-First Search, Parallel Best-First Search,	
	p, Anomalies in Parallel Search Algorithms.	
opeeda	COURSE OUTCOMES	
Upon c	ompletion of this course, the students will be able to:	
e pon e		Bloom's
CO		
	Course Outcome Description	
No.	Course Outcome Description	Taxonomy
No.		Taxonomy Level
	Demonstrate understanding of Parallel Computing Ecosystem.	Taxonomy
No.	Demonstrate understanding of Parallel Computing Ecosystem. Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design.	Taxonomy Level
<b>No.</b> CO1	Demonstrate understanding of Parallel Computing Ecosystem.         Showcase expertise in parallel algorithm design by developing a robust	Taxonomy Level CL2
<b>No.</b> CO1	Demonstrate understanding of Parallel Computing Ecosystem. Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design.	Taxonomy Level CL2
<b>No.</b> CO1 CO2	Demonstrate understanding of Parallel Computing Ecosystem. Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design. Identify and analyze sources of overhead in parallel programs, recognizing their	Taxonomy Level CL2 CL3
<b>No.</b> CO1 CO2	Demonstrate understanding of Parallel Computing Ecosystem. Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design. Identify and analyze sources of overhead in parallel programs, recognizing their impact on performance; assess performance metrics for parallel systems, gaining	Taxonomy Level CL2 CL3
<b>No.</b> CO1 CO2	Demonstrate understanding of Parallel Computing Ecosystem. Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design. Identify and analyze sources of overhead in parallel programs, recognizing their impact on performance; assess performance metrics for parallel systems, gaining expertise in MPI.	Taxonomy Level CL2 CL3
No.           CO1           CO2           CO3	Demonstrate understanding of Parallel Computing Ecosystem.Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design.Identify and analyze sources of overhead in parallel programs, recognizing their impact on performance; assess performance metrics for parallel systems, gaining expertise in MPI.Master Thread-Based Parallel Programming, utilizing the OpenMP Standard for	Taxonomy Level CL2 CL3 CL4
No.           CO1           CO2           CO3	Demonstrate understanding of Parallel Computing Ecosystem.Showcase expertise in parallel algorithm design by developing a robust understanding of parallel algorithm models and their implications on design.Identify and analyze sources of overhead in parallel programs, recognizing their impact on performance; assess performance metrics for parallel systems, gaining expertise in MPI.Master Thread-Based Parallel Programming, utilizing the OpenMP Standard for directive-based parallel programming, with a focus on dense matrix algorithms and	Taxonomy Level CL2 CL3 CL4



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						CO-PO		MANGAL							
CO No.						amme (			Programme Specific Outcome (PSO)						
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	3	3	2	2			2	1	1	3	3	3	
CO2	3	3	3	3	2		1	1 2 1 1 3	3	3					
CO3	3	3	3	3	2				2	1	1	3	3	3	
<b>CO4</b>	3	3	3	3	2				2	1	1	3	3	3	
CO5	3	3	3	3	2				2	1	1	3	3	3	
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6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
	NPTEL/MOOC Courses - Registration and Assignment	50 %	10
10	Submissions		_
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

# **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- 1. Introduction to Parallel Computing, Ananth Grama, Anshul Gupta, George Karypis, and Vipin Kumar, 2nd edition, Addison-Welsey, 2003.
- 2. Grama, A. Gupta, G. Karypis, V. Kumar, An Introduction to Parallel Computing, Design and Analysis of Algorithms: 2/e, Addison-Wesley, 2003
- 3. G.E. Karniadakis, R.M. Kirby II, Parallel Scientific Computing in C++ and MPI: A Seamless Approach to Parallel Algorithms and their Implementation, Cambridge University Press, 2003.
- 4. Wilkinson and M. Allen, Parallel Programming: Techniques and Applications Using Networked Workstations and Parallel Computers, 2/E, Prentice Hall, 2005.
- 5. M.J. Quinn, Parallel Programming in C with MPI and OpenMP, McGraw-Hill, 2004.
- 6. G.S. Almasi and A. Gottlieb, Highly Parallel Computing, 2/E, Addison-Wesley, 1994.
- 7. David Culler Jaswinder Pal Singh,"Parallel Computer Architecture: A hardware/Software Approach", Morgan Kaufmann, 1999.
- 8. Kai Hwang, "Scalable Parallel Computing", McGraw Hill 1998.

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://www.youtube.com/watch?v=gY0MwGLq9W8&list=PLyqSpQzTE6M9DKhN7z2fOpKTJW u-639\_P
- 2. https://www.youtube.com/watch?v=5Y8Lfsreeck&list=PL7DC83C6B3312DF1E
- 3. https://www.youtube.com/watch?v=S47aSEqm\_0I&list=PLgj\_V-
  - ZKxRKrxgFyOutPJpoLFBaQMOpK-



#### COLLEGE OF ERING & MANAGEMENT An Autonomous Institution MANGALURU SOFTWARE ARCHITECTURE AND DESIGN PATTERNS (Effective from the Academic Year 2023 - 2024) **VI SEMESTER** Course Code 21CS654 50 CIA Marks Number of Contact Hours/Week (L: T: P: S) SEE Marks 50 3:0:0:0 Total Hours of Pedagogy **40L** Exam Hours 03 **CREDITS – 3 COURSE PREREOUISITES:** • Fundamental software development life cycle, Object orientation principles and modeling **COURSE OBJECTIVES:** • Learn How to add functionality to designs while minimizing complexity. • What code qualities are required to maintain to keep code flexible? • To understand the common design patterns. • To explore the appropriate patterns for design problems **TEACHING - LEARNING STRATEGY:** Following are some sample strategies that can be incorporate for the Course Delivery • Chalk and Talk Method/Blended Mode Method • Power Point Presentation • Expert Talk/Webinar/Seminar • Video Streaming/Self-Study/Simulations • Peer-to-Peer Activities • Activity/Problem Based Learning • Case Studies • MOOC/NPTEL Courses • Any other innovative initiatives with respect to the Course contents **COURSE CONTENTS MODULE - I** Introduction to design pattern: Describing, the catalog of, organizing the catalog, solve 8 Hours design problems, select and how to use - design pattern. A Notation for Describing Object-**Oriented Systems** Analysis a System: overview of the analysis phase, gathering the requirements functional requirements specification, defining conceptual classes and relationships, using the knowledge of the domain. Design and Implementation. **MODULE - II** Design Pattern Catalog: Structural patterns, Adapter, bridge, composite, decorator, facade, 8 Hours flyweight, proxy. **MODULE - III** Behavioral Patterns: Chain of Responsibility, Command, Interpreter, Iterator, Mediator, 8 Hours

Memento, Observer, State, Template Method

# **MODULE - IV**

Interactive systems and the MVC architecture: Introduction, The MVC architectural 8 Hours pattern, analysing a simple drawing program, designing the system, designing of the subsystems, getting into implementation, implementing undo operation, drawing incomplete



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COI	real-world objects.																
CO2	Inter	pret the	e Struc	tural d	esign p	attern	s for de	evelopi	ng des	ign pat	ttern ca	atalog.		CI	_2		
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CO5	Desc	ribe cli	ient sei	rver, R			ementa			on the	web.			CI	_3		
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CO2	2	2	2	1	2	1		2	2	2	2	2	2	1	1		
CO3	2	2	2	1	2			2	2	2	1	2	2	1	1		
CO4	2	2	2	1	2		2	2	3	3	2	2	2	1	1		
CO5	2 Substa	$\frac{2}{2}$	2	1	2	Mode	2	2	3	3	2	2	$\frac{2}{1}$	<u>1</u>	1		
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Assessme	nt will	be bot	h CIA	and SE	EE. Stu	dents	learnin	g will	be asse	essed u	sing D	irect a	nd Ind	lirect			
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MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

#### ASSIGNMENT TYPES WITH WEIGHTAGES

Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- 1. Erich Gamma, Richard Helan, Ralph Johman, John Vlissides, Design Patterns, Pearson Publication, 2013.
- 2. Brahma Dathan, Sarnath Ramnath, Object-oriented analysis, design and implementation, Universities Press, 2013
- Frank Bachmann, RegineMeunier, Hans Rohnert "Pattern Oriented Software Architecture" Volume 1, 1996.
- 4. William J Brown et al., "Anti-Patterns: Refactoring Software, Architectures and Projects in Crisis", John Wiley, 1998.



# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

1. https://darrenfinch.com/moving-from-mvvm-to-mvc-architecture-a-case-study-in-android/

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2. 221587296\_Web\_Services\_versus\_Distributed\_Objects\_A\_Case\_Study\_of\_Performance\_and\_Inte rface\_Design



#### MANGALURU **COMPUTER GRAPHICS AND IMAGE PROCESSING LABORATORY** (Effective from the Academic Year 2023- 2024) **VI SEMESTER** Course Code 21CSL66 CIA Marks 50 Number of Contact Hours/Week (L: T: P: S) 0:0:2:0 **SEE Marks** 50 Total Hours of Pedagogy 20P Exam Hours 03 **CREDITS** – 1 **COURSE PREREQUISITES:** • Basic Knowledge of C **COURSE OBJECTIVES:** • Demonstrate the use of Open GL. • Demonstrate the different geometric object drawing using openGL • Demonstration of 2D/3D transformation on simple objects. • Demonstration of lighting effects on the created objects. • Demonstration of Image processing operations on image/s. **TEACHING - LEARNING STRATEGY:** Following are some sample strategies that can be incorporate for the Course Delivery · Chalk and Talk Method/Blended Mode Method Power Point Presentation • Expert Talk/Webinar/Seminar • Video Streaming/Self-Study/Simulations • Peer-to-Peer Activities • Activity/Problem Based Learning • Case Studies

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- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

	LIST OF EXPERIMENTS						
Sl. No.	Description						
1	Implement Brenham's line drawing algorithm for all types of slopes.						
2	Write a program in OpenGL that demonstrates basic 2D geometric transformations such as translation, rotation, and scaling. Allow the user to interactively apply these transformations to a 2D object.						
3	Develop a program to demonstrate 3D transformation on 3D objects						
4	Write a program that takes an RGB color as input and converts it to its corresponding CMY values.						
5	Create a program that captures user input to dynamically adjust the properties of a shape (e.g., size, color).						
6	Write a Program to read a digital image. Split and display image into 4 quadrants, up, down, right and left						
7	Read an image and extract and display low-level features such as edges, textures using filtering techniques						
8	Write a program to blur and smoothing an image.						



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CO3						ign and						-		(	CL3	
CO4		oly the cepts	conce	pts to c	levelop	o user fi	riendl	y appl	ication	s using	g Grap	hics an	d IP	(	CL3	
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CO3	2	2	3	3	3				3	2	3	3	2	2	2	
CO4	2	2	3	3	3				3	2	3	3	2	2	3	
CO5	2	2	3	3	3				3	2	3	3	2	2	2	
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**Assessment Mode:** Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50%



weightage (25 Marks), and (B) will have 50% weightage (25 Marks).

Assessment Mode: The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B)

The Sum of marks obtained across (A) and (B) will be the Final CIA marks.

- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)
  - The respective course instructor will design the assessment criteria for the said assessment components.
  - The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

# SEE QUESTION PAPER PATTERN:

- 1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
- 2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
- 3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
- 4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

#### **REFERENCE BOOKS:**

- 1. Donald Hearn & Pauline Baker: Computer Graphics with OpenGL Version,3rd/4th Edition, Pearson Education,2011
- 2. James D Foley, Andries Van Dam, Steven K Feiner, John F Huges Computer graphics with OpenGL: Pearson education

#### **REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):**

- 1. https://nptel.ac.in/courses/106/106/106106090/
- 2. https://nptel.ac.in/courses/106/102/106102063/
- 3. https://nptel.ac.in/courses/106/103/106103224/
- 4. https://nptel.ac.in/courses/106/102/106102065/
- 5. https://www.tutorialspoint.com/opencv/
- 6. https://medium.com/analytics-vidhya/introduction-to-computer-vision-opencv-in-pythonfb722e805e8b



# CLOUD COMPUTING AND SECURITY (Effective from the Academic Year 2023 - 2024)

l l	II SEMESTER		
Course Code	21CS71	CIA Marks	50
Number of Contact Hours/Week (L:T:P:S)	3:0:2:0	SEE Marks	50
Total Contact Hours	40	Exam Hours	03
	CREDITS - 4	•	

### **COURSE PREREQUISITES:**

• Fundamental knowledge of databases, Operating Systems and Networking

#### **COURSE OBJECTIVES:**

This course will enable students to:

- Discuss the concepts, characteristics, delivery models and benefits of cloud computing.
- Explore the key technical, organizational and compliance challenges of cloud computing.
- Explore the security issues that arise from cloud computing architectures intended for delivering Cloud based enterprise IT services.

# **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporated for the Course Delivery:

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem-Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS	
MODULE - I	
Introduction: The Evolution of Cloud Computing; What Is Cloud Computing?: Cloud	8 Hours
Computing Defined, The SPI Framework for Cloud Computing, The Traditional Software	
Model, The Cloud Services Delivery Model, Cloud Deployment Models, Key Drivers to	
Adopting the Cloud, The Impact of Cloud Computing on Users, Governance in the Cloud,	
Barriers to Cloud Computing Adoption in the Enterprise.	
MODULE - II	
Infrastructure Security: Infrastructure Security: The Network Level, Infrastructure Security:	8 Hours
The Host Level, Infrastructure Security: The Application Level.	
Data Security and Storage: Aspects of Data Security, Data Security Mitigation, Provider	
Data and Its Security.	
MODULE - III	
Identity and Access Management: Trust Boundaries and IAM, Why IAM?, IAM Challenges,	8 Hours

COUDSE CONTENTS

IAM Definitions, IAM Architecture and Practice, Relevant IAM Standards and Protocols for Cloud Services, IAM Standards, Protocols, and Specifications for Consumers, Comparison of

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-	ise and Consumer Authentication Standards and		
	ols, IAM Practices in the Cloud, Cloud Authorization Management, Cloud er IAM Practice	d Service	
Plovide	MODULE - IV		
Securit	y Management in the Cloud: Introduction, Security Management Standards	. Security	8 Hours
Manage Availat	ement in the Cloud, Availability Management, SaaS Availability Management bility Management, IaaS Availability Management, Access Control, ability, Patch, and Configuration Management.	ent, PaaS	
	MODULE - V	~	8 Hours
in the Manage Implica <b>Audit</b> (GRC), Control for CS	y: What Is Privacy?, What Is the Data Life Cycle?, What Are the Key Privacy C Cloud?, Who Is Responsible for Protecting Privacy? Changes to Priva ement and Compliance in Relation to Cloud Computing, Legal and Re tions, U.S. Laws and Regulations, International Laws and Regulations. <b>and Compliance:</b> Internal Policy Compliance, Governance, Risk, and Co Illustrative Control Objectives for Cloud Computing, Incremental CSP Objectives, Additional Key Management Control Objectives, Control Consi P Users, Regulatory/External Compliance, Other Requirements, Cloud e, Auditing the Cloud for Compliance.	egulatory mpliance P-Specific derations	6 110ur 3
	LABORATORY COMPONENTS		
Exp. No.	Experiment Description	CO No.	Bloom's Taxonomy Level
1.	<ul> <li>Create a simple web application that gets a token from KMS or Keycloak (open source).</li> <li>The token exchange should be enabled by cacerts verification. The token should be valid for a session only and set expiration timer. Validate by trying to access the application.</li> <li>Cloud Security Feature: Web application security on Cloud using Tokens</li> </ul>	CO2	CL3
	and Oauth Expected Outcome: When session closed or token expired, user should get invalid token or permissions error.		
2.	<ul> <li>Develop a small Java client server application that sends messages and receives acknowledgement.</li> <li>Encrypt the message using AECS or equivalent mechanism. Decrypt at the server and provide appropriate response. Validate by sending non-encrypted messages.</li> <li>Cloud Security Feature: Secure messaging over Cloud</li> </ul>	CO2	CL3
	<b>Expected Outcome:</b> Only encrypted messages should be processed.		
3.	Create a public cloud account (AWS/Azure/GCP) with free trial credit. Create IAM roles; define policies for admin, developers, customer and maintainer. Create users for each role and validate if users access are within defined limits. ( <b>Optional:</b> Write a Java program to access AWS service)	CO3	CL3

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		1			
	<b>Cloud Security Feature:</b> Authentication and Authorization <b>Expected Outcome:</b> Only admin should have complete access. Other users should have limited accesses.				
4.	On the VPC and VM created in experiment #2, deploy a "Hello World" Java web application. Control the application by creating a load balancer and API gateway or service registry. Define rules to limit access to few users. Validate the rules are working, by trying to access the webpage. <b>Cloud Security Feature:</b> Cloud application access <b>Expected Outcome:</b> Application should be working for only users with access. Others should get access denied.	со	3	CL3	
5.	Create a VPC, create a small VM, provision disk storage, and store a file in the storage. Define VPC rules, security groups for VM, access controls for storage Validate the defined security controls by creating different users. <b>Cloud Security Feature:</b> Cloud infrastructure access control <b>Expected Outcome:</b> Only admin and users with particular access should be able to connect to the VM, get file on disk. Other users should be denied.	СО	4	CL3	
	COURSE OUTCOMES				
Upon c	ompletion of this course, the students will be able to:				
CO No.	Course Outcome Description		]	Bloom's Taxonomy Level	
CO1	Outline the concept of cloud computing and discuss the types of service through cloud computing.	s offer	red	CL2	
CO2	Describe the IT infrastructure security capabilities offered by the cloud servi identify the current state of data security and the data storage in the cloud.	ces. A	lso	CL3	
	Explain the identity and access management (IAM) practice and make				
CO3	capabilities for Authentication, authorization, and auditing of users who acc services.			CL3	
CO3 CO4	capabilities for Authentication, authorization, and auditing of users who acc	ess clo	oud	CL3 CL3	
	<ul> <li>capabilities for Authentication, authorization, and auditing of users who accesservices.</li> <li>Identify the security management frameworks and the standards that are reliable the Cloud.</li> <li>Outline the privacy aspects to consider within the context of cloud computillustrate the importance of audit and compliance functions within the cloud</li> </ul>	ess clo levant	for		
CO4	<ul> <li>capabilities for Authentication, authorization, and auditing of users who accesservices.</li> <li>Identify the security management frameworks and the standards that are reliable the Cloud.</li> <li>Outline the privacy aspects to consider within the context of cloud computing the security of the context of cloud computing the privacy aspects to consider within the context of cloud computing t</li></ul>	ess clo levant	for nnd	CL3 CL2	
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**NEERING & MANAGEMENT** 

An Autonomous Institution MANGALURU

NOTE:

- Assessment will be both CIA and SEE.
- The practical sessions of the IPCC shall be for CIE only.
- The Theory component of the IPCC shall be for both CIA and SEE respectively.
- The questions from the practical sessions shall be included in Theory SEE.

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules.
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**



- 1. Tim Mather, Subra Kumaraswamy, Shahed Latif: "Cloud Security and Privacy, An Enterprise Perspective on Risks and Compliance", Oreilly Media, 2009
- 2. Vic (J.R.) Winkler: "Securing the Cloud, Cloud Computer Security Techniques and Tactics", Syngress, 2011

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://www.digimat.in/nptel/courses/video/106105167/L01.html
- 2. https://www.youtube.com/watch?v=44IBhZwa4ZM
- 3. https://www.digimat.in/nptel/courses/video/106104182/L01.html



BIG DA	ATA ANAI	LYTICS	
(Effective from the	e Academio	e Year 2023 - 2024)	
-	I SEMEST		
Course Code	21CS72	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03
	CREDITS –	3	
<b>COURSE PREREQUISITES:</b>			
• Basics of SQL			
COURSE OBJECTIVES:			
• Understand the fundamentals and application	ons of Big Da	ta analytics	
• Explore the Hadoop framework and Hadoo	-		Ecosystem
Tools	-	, I	-
• Illustrate the concepts of NoSQL using Mo	ngoDB and C	assandra for Big Data	
• Employ MapReduce programming model to	-	_	
• Understand various machine learning algor	-	-	Social
Network Analysis.	C C	· · · ·	
TEACHING - LEARNING STRATEGY:			
Following are some sample strategies that can	-	e for the Course Delivery	
• Chalk and Talk Method/Blended Mode N	Method		
• PowerPoint Presentation			
• Expert Talk/Webinar/Seminar			
Video Streaming/Self-Study/Simulations	5		
• Peer-to-Peer Activities			
Activity/Problem Based Learning			
• Case Studies			
MOOC/NPTEL Courses			
Any other innovative initiatives with resp			
	RSE CONT		
	MODULE –		0.77
Introduction to Big Data Analytics: Big Data	•		8 Hours
Data Architecture, Data Sources, Quality, P	e	0	
Analysis, Big Data Analytics Applications and			
	MODULE –		0.11
Introduction to Hadoop: Introduction, Hadoo	-	•	8 Hours
System, MapReduce Framework and Programm	ming Model,	Hadoop Yarn, Hadoop Ecosystem	
Tools.			
MapReduce: Introduction, MapReduce Map T	asks, Reduce	Tasks and MapReduce Execution,	
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•	<b>NoSQL Big Data Management:</b> Introduction, NoSQL Data Store, NoSQL Data Architecture Patterns, NoSQL to Manage Big Data, Shared-Nothing Architecture for Big Data Tasks,							ture	8 Ho	ours						
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# COLLEGE OF ENGINEERING & MANA An Autonomous Institution MANGALURU

# SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.

& MANAGEMENT

• The students will have to answer FIVE full questions, selecting one full question from each module.

# **REFERENCE BOOKS:**

- 1. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning", McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966
- 2. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1stEdition, Pearson Education, 2016. ISBN-13: 978-9332570351
- Tom White, "Hadoop: The Definitive Guide", 4th Edition, O"Reilly Media, 2015.ISBN-13: 978-9352130672
- 4. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1stEdition, Wrox Press, 2014 ISBN-13: 978-8126551071
- 5. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators", 1stEdition, O'Reilly Media, 2012.ISBN-13: 978-9350239261
- 6. Arshdeep Bahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://www.youtube.com/watch?v=n\_Krer6YWY4
- 2. https://onlinecourses.nptel.ac.in/noc20\_cs92/preview
- 3. https://www.digimat.in/nptel/courses/video/106104189/L01.html



# **ROBOTIC PROCESS AUTOMATION** (Effective from the Academic Year 2023 - 2024)

VII SEMESTER						
Course Code	21CS731	CIA Marks	50			
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50			
Total Hours of Pedagogy	40L	Exam Hours	03			
	CREDITS – 3					

# **COURSE PREREQUISITES:**

• Fundamental knowledge of any programming language

#### **COURSE OBJECTIVES:**

This course will enable students to:

- To understand basic concepts of RPA.
- To Describe RPA, where it can be applied and how its implemented
- To Describe the different types of variables, Control Flow and data manipulation techniques
- To Understand Image, Text and Data Tables Automation
- To Describe various types of Exceptions and strategies to handle

# **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

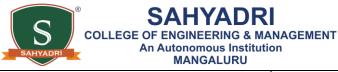
COURSE CONTENTS					
MODULE – I					
<b>INTRODUCTION TO ROBOTIC PROCESS AUTOMATION</b> - Scope and techniques of	8 Hours				
automation, Robotic process automation - What can RPA do?, Benefits of RPA, Components					
of RPA, RPA platforms, The future of automation.					
Record and Play-UI Stack-Downloading and installing UI Path Studio-Learning UI Path					
Studio-Task Recorder-Step-by-Step Examples using the Recorder.					
MODULE – II					
<b>INTRODUCTION TO RPA TOOL</b> - The User Interface - Variables - Managing Variables	8 Hours				
- Naming Best Practices - The Variables Panel - Generic Value Variables - Text Variables -					
True or False Variables - Number Variables - Array Variables - Date and Time Variables -					
Data Table Variables - Managing Arguments - Naming Best Practices - The Arguments Panel					
- Using Arguments - About Imported Namespaces - Importing New Namespaces- Control					
Flow - Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow -					
Sequences - Flowcharts - About Control Flow - Control Flow Activities - The Assign Activity					

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- The De	lay Activity - The Do While Activity - The If Activity - The Switch Activity - The	
While Ad	ctivity - The For Each Activity - The Break Activity - Data Manipulation - Data	
Manipula	tion Introduction - Scalar variables, collections and Tables - Text Manipulation -	
Data Mar	ipulation - Gathering and Assembling Data	
	MODULE – III	
ADVAN	CED AUTOMATION CONCEPTS & TECHNIQUES: Recording Introduction -	8 Hours
Basic and	1 Desktop Recording - Web Recording - Input/Output Methods - Screen Scraping -	
Data Scra	ping - Scraping advanced techniques - Selectors - Defining and Assessing Selectors	
- Custom	ization - Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image,	
Text & A	dvanced Citrix Automation - Introduction to Image & Text Automation - Image based	
automatio	on - Keyboard based automation - Information Retrieval - Advanced Citrix	
Automati	on challenges - Best Practices - Using tab for Images - Starting Apps - Excel Data	
Tables &	PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in	
excel – E	xtracting, Data from PDF - Extracting a single piece of data - Anchors - Using anchors	
in PDF.		
	MODULE – IV	
HANDL	ING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING: What	8 Hours
are assista	ant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System	
	Monitoring image and element triggers - An example of monitoring email - Example	
	ring a copying event and blocking it - Launching an assistant bot on a keyboard event.	
	TION HANDLING: Debugging and Exception Handling - Debugging Tools -	
	s for solving issues - Catching errors.	
0	MODULE – V	
DEPLOY	YING AND MAINTAINING THE BOT: Publishing using publish utility - Creation	8 Hours
	- Using Server to control the bots - Creating a provision Robot from the Server -	
	ng a Robot to Server - Deploy the Robot to Server - Publishing and managing updates	
	ng packages - Uploading packages - Deleting packages.	
	COURSE OUTCOMES	
Upon cor	npletion of this course, the students will be able to:	
		Bloom's
CO	Course Outcome Description	Taxonomy
No.		Level
<b>CO1</b>	<b>Understand</b> RPA's potential and impact on automation from basics to advanced	
CO1	concepts	CL2
~ ~ ~	<b>Illustrate</b> user interface navigation to variables, control flow, and data	
CO2	manipulation for efficient process automation	CL3
	<b>Demonstrate</b> various automation techniques, including recording methods,	
CO3	selectors, debugging, Citrix automation, and data manipulation, to excel in RPA	CL3
	implementations	
	<b>Illustrate</b> user event handling, assistant bot creation, and effective exception	
CO4	handling	CL3
	techniques for seamless RPA operation	
	Learn to <b>Apply</b> , maintain, and update bots efficiently using server control and	
CO5	Learn to <b>Apply</b> , maintain, and update bots efficiently using server control and package management techniques	CL3



CO No.	0.											Programme Specific Outcome (PSO)			
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CO2	3	3	2		2					1	1	1	3	1	1
CO3	3	3	3	1	2					1	1	1	3	1	1
<b>CO4</b>	3	3	3	1	2					1	1	1	3	1	1
CO5	3	3	3	1	2					1	1	1	3	1	1
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	e	Assignments						40 %					20		
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	ASSIGNMENT TYPES WITH WEIGHTAGES							
Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks					
1	Written Assignments	25 %	05					
2	Quiz	10 %	02					
3	Case Studies	25 %	05					
4	Seminar/Presentation	15 %	03					



5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- 1. Alok Mani Tripathi, Learning Robotic Process Automation, Publisher: Packt Publishing Release Date: March 2018 ISBN: 9787788470940.
- 2. Tom I'aulli, The Robotic Process Automation handbook: A Guide to Implementing RPA Systems,2020, ISBN-13 (electronic):978-7-4842-5729-6, Publisher: A press
- 3. Frank Casale, Rebecca Dilla, Iieidi Jaynes,Lauren Livingston,"Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation.
- 4. Richard Murdoch, I{robotic Process Automation: Guide to Building Software robots, Automate Repetitive Tasks & Become An RPA Consultant
- 5. Srikanth Merianda, Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation

#### **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

1. https://www.uipath.com/



#### An Autonomous Institution MANGALURU **CYBER SECURITY MANAGEMENT, COMPLIANCE AND GOVERNANCE** (Effective from the Academic Year 2023 - 2024) **VII SEMESTER** Course Code 21CS732 **CIA Marks** 50 Number of Contact Hours/Week (L: T: P: S) SEE Marks 50 3:0:0:0 Total Hours of Pedagogy Exam Hours 03 **40L CREDITS – 3 COURSE PREREOUISITES:** • It is recommended that students must have Basics of Internet **COURSE OBJECTIVES:** This course provides an overview of the broad and constantly emerging field of cybersecurity policy, governance, law and compliance. The importance of the role of security policy is discussed **TEACHING - LEARNING STRATEGY:** Following are some sample strategies that can be incorporate for the Course Delivery • Chalk and Talk Method/Blended Mode Method • Power Point Presentation • Expert Talk/Webinar/Seminar • Video Streaming/Self-Study/Simulations • Peer-to-Peer Activities Activity/Problem Based Learning Case Studies • MOOC/NPTEL Courses • Any other innovative initiatives with respect to the Course contents **COURSE CONTENTS MODULE – I** Introduction: Concepts of cybersecurity, its relationship with network and information security, 8 Hours cybercrime, cyber defence, and related definitions. Concepts of policy, governance, related law and compliance, and the relationships between them. Principles: Information security components and concepts, confidentiality, integrity, availability. **MODULE – II** Policy: definition, role of policy in an organization, statement of management purpose and 8 Hours organizational objectives, description of organizational approach, standards, baselines, guidelines, procedures

& MANAGEMENT

Law: Relevant laws and legal/regulatory frameworks on the national, European and international level. Different types of law related to cyberattacks – computer as the means, computer as a victim. Problems of jurisdiction, borderless nature of cybercrime, relevance and importance of data protection and privacy, investigations.



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CO5	2	2	2	1	1					2	_	2		
3: Substantial (High)       2: Moderate (Medium)       1: Poor (Low)         ASSESSMENT STRATEGY         Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect														
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		Assign	ments				40 %			20	0			
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#### SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.

EERING & MANAGEMENT

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- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

### **REFERENCE BOOKS:**

- 1. Cybersecurity for Beginners Raef Meeuwisse.
- 2. Enterprise Cybersecurity by Scott Donaldson and Stanley Siegel.
- 3. How to Measure Anything in Cybersecurity Risk by Douglas W. Hubbard and Richard Seierse.
- 4. CSX Cybersecurity Fundamentals Study Guide by ISACA.

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 4. https://www.youtube.com/watch?v=SSE4M0gcmvE
- 5. https://www.youtube.com/watch?v=\_Fn5HYfK858
- 6. https://www.youtube.com/watch?v=6n1eOf6VJDg
- 7. https://www.youtube.com/watch?v=FFzdXJ49KAI



# **CRYPTOGRAPHY AND NETWORK SECURITY**

# (Effective from the Academic Year 2023 - 2024)

#### **SEMESTER – VII**

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ERING & MANAGEMENT

Course Code	21CS733	CIA Marks	40							
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	60							
Total Hours of Pedagogy	40L	Exam Hours	03							
CREDITS – 3										

#### **COURSE PREREQUISITES:**

• Knowledge of mathematical principles, such as linear algebra, number theory, and combinatorics.

#### **COURSE OBJECTIVES:**

- Understand the concept of Cyber security.
- Obtain the knowledge of classical cryptography algorithms.

# **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS	
MODULE – I	
Classical Encryption Techniques Symmetric Cipher Model, Cryptography, Cryptanalysis	8 Hours
and Brute-Force Attack, Substitution Techniques, Caesar Cipher, Monoalphabetic Cipher,	
Playfair Cipher, Hill Cipher, Polyalphabetic Cipher, One Time Pad.	
Block Ciphers and the data encryption standard: Traditional block Cipher structure,	
stream Ciphers and block Ciphers, Motivation for the feistel Cipher structure, the feistel	
Cipher, The data encryption standard, DES encryption, DES decryption, A DES example,	
results, the avalanche effect, the strength of DES, the use of 56-Bit Keys, the nature of the	
DES algorithm, timing attacks, Block cipher design principles, number of rounds, design of	
function F, key schedule algorithm	

COURSE CONTENTS

#### MODULE-II

Public-Key Cryptography and RSA: Principles of public-key cryptosystems. Public-key	8 Hours
cryptosystems. Applications for public-key cryptosystems, requirements for public-key	
cryptosystems. public-key cryptanalysis. The RSA algorithm, description of the algorithm,	
computational aspects, the security of RSA.	
Other Public-Key Cryptosystems: Diffie-Hellman key exchange, The algorithm, key	
exchange protocols, man in the middle attack, Elgamal Cryptographic systems.	



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Elliptic	MODULE – III	
over Zp key exc Pseudor Key M encrypti transpar key dis distribu keys, pu	curve arithmetic, abelian groups, elliptic curves over real numbers, elliptic curves o, elliptic curves overGF(2m), Elliptic curve cryptography, Analog of Diffie-hellman hange, Elliptic curve encryption/ decryption, security of Elliptic curve cryptography, random number generation based on an asymmetric cipher, PRNG based on RSA. <b>fanagement and Distribution</b> : Symmetric key distribution using Symmetric ion, A key distribution scenario, Hierarchical key control, session key lifetime, a rent key control scheme, Decentralized key control, controlling key usage, Symmetric tribution using asymmetric encryption, simple secret key distribution, secret key tion with confidentiality and authentication, A hybrid scheme, distribution of public ublic announcement of public keys, publicly available directory, public key authority, keys certificates.	8 Hours
	MODULE – IV	
Authent Authent version one way descript function Domain	<b>certificates</b> . Certificates, X-509 version 3, public key infrastructure. uthentication: Remote user Authentication principles, Mutual Authentication, one way tication, remote user Authentication using Symmetric encryption, Mutual tication, one way Authentication, Kerberos, Motivation, Kerberos version 4, Kerberos 5, Remote user Authentication using Asymmetric encryption, Mutual Authentication, 9 Authentication <b>Electronic Mail Security:</b> Pretty good privacy, notation, operational; tion, S/MIME, RFC5322, Multipurpose internet mail extensions, S/MIME hality, S/MIME messages, S/MIME certificate processing, enhanced security services, h keys identified mail, internet mail architecture, EMail threats, DKIM strategy, DKIM hal flow.	8 Hours
	$\mathbf{MODULE} - \mathbf{V}$	
applicat Security processi algorith <b>Transp</b> confider	<b>urity</b> : IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, y associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication	8 Hours
applicat Security processi algorith <b>Transp</b> confider	<b>urity</b> : IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, y associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication ms, Padding, Anti replay service <b>ort and tunnel modes</b> , combining security associations, authentication plus ntiality, basic combinations of security associations, internet key exchange, key	8 Hours
applicat Security processi algorith <b>Transp</b> confider determin	<b>urity</b> : IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, y associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication ms, Padding, Anti replay service <b>fort and tunnel modes</b> , combining security associations, authentication plus ntiality, basic combinations of security associations, internet key exchange, key nations protocol, header and payload formats, cryptographic suits.	
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applicat Security processi algorith <b>Transp</b> confider determin Upon co <b>CO</b> <b>No.</b>	urity: IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication ms, Padding, Anti replay service fort and tunnel modes, combining security associations, authentication plus ntiality, basic combinations of security associations, internet key exchange, key nations protocol, header and payload formats, cryptographic suits.         COURSE OUTCOMES         ompletion of this course, the students will be able to:	Bloom's Taxonomy Level
applicat Security processi algorith <b>Transp</b> confider determin Upon co <b>CO</b> <b>No.</b> CO1	urity: IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication mus, Padding, Anti replay service ort and tunnel modes, combining security associations, authentication plus ntiality, basic combinations of security associations, internet key exchange, key nations protocol, header and payload formats, cryptographic suits.         COURSE OUTCOMES         ompletion of this course, the students will be able to:         Demonstrate cryptography and its principles         Summarize cryptography and its need to various applications         Illustrate Public and Private key cryptography	Bloom's Taxonomy Level CL2
applicat Security processi algorith <b>Transp</b> confider determin Upon co <b>CO</b> <b>No.</b> CO1 CO2	urity: IP Security overview, applications of IPsec, benefits of IPsec, Routing tions, IPsec documents, IPsec services, transport and tunnel modes, IP Security policy, associations, Security associations database, Security policy database, IP traffic ing, Encapsulating Security payload, ESP format, encryption and authentication ms, Padding, Anti replay service fort and tunnel modes, combining security associations, authentication plus ntiality, basic combinations of security associations, internet key exchange, key nations protocol, header and payload formats, cryptographic suits.         COURSE OUTCOMES         ompletion of this course, the students will be able to:         Demonstrate cryptography and its principles         Summarize cryptography algorithms and its need to various applications	Bloom's Taxonomy Level CL2 CL2



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CO No.				]	Progra	mme	Outcor	mes (P	0)				Programme Specific Outcome (PSO)			
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CO2	3	2	3	3		3		3	1			2	3	2	3	
CO3	2	3	2	3	2	3		3	3	2		2	1	1	3	
CO4	2	1	2	2	2	3		3	3	2		2	2	1		
CO5	2	2	3	2	3	3		3	3	2		2		1		
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6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
	NPTEL/MOOC Courses – Registration and Assignment	50 %	10
10	Submissions	30 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

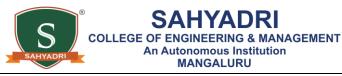
Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- William Stallings: Cryptography and Network Security, Pearson 6th edition.
- V K Pachghare: Cryptography and Information Security, PHI 2nd Edition
- Cryptography and Network Security, Behrouz A. Forouzan, TMH, 2007.



### DEEP LEARNING (Effective from the Academic Year 2023 - 2024) VII SEMESTED

V 11	SENIESIEI		
Course Code	21CS734	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03
(	CREDITS – 3		

# **COURSE PREREQUISITES:**

• It is recommended that students have a strong mathematical background (linear algebra, calculus especially taking partial derivatives, and probabilities & statistics) and at least an introductory course in Machine Learning. Strong programming skills (specifically Python) are necessary to complete the assignments.

### **COURSE OBJECTIVES:**

- Develop and Train Deep Neural Networks.
- Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and recognition
- Build and train RNNs, work with NLP and Word Embeddings
- The internal structure of LSTM and GRU and the differences between them
- The Auto Encoders for Image Processing

#### **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS								
MODULE – I								
Foundations of Neural Networks and Deep Learning: Neural Networks, Training Neural	8 Hours							
Networks,								
Activation Functions, Loss Functions, Hyperparameters, Defining Deep Learning: What Is								
Deep Learning?, Common Architectural Principles of Deep Networks: Parameters, Layers,								
Activation Functions, Loss Functions, Optimization Algorithms, Hyperparameters, Building								
Blocks of Deep Networks: RBMs, Autoencoders, Variational Autoencoders								
MODULE – II								
Architetcures of Deep Networks: Unsupervised Pretrained Networks, Convolutional Neural	8 Hours							
Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks.								
MODULE – III								



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ketworks, Modeling Handwritten Images Using CNNs, Modeling Sequence Data by Using Lecurrent Neural Networks, Using Autoencoders for Anomaly Detection, Using Variational National Networks, Using Autoencoders for Anomaly Detection, Using Variational Neurone Networks: Basic Concepts in Tuning Deep Networks, Matching Input Data and Network Architectures, Relating Model Goal and Output Layers, Working with Layer Southy Parameter Count, and Memory, Weight Initialization Strategies, Using Activation and GPUs for Faster Training.       8 Hours         MODULE – V         Note the Works Section of Optimization, Using Parallelization and GPUs for Faster Training.         COURSE OUTCOMES         Bloom's Taxonomy Level         COURSE OUTCOMES         Pontome Petworks, Restricted Boltzmann Machines, DBNs.         COURSE OUTCOMES         Pontome Petworks, Restricted Boltzmann Machines, DBNs.         COURSE OUTCOMES         Pontompletion of this course, the students will be able to:         COURSE OUTCOMES         CL2         COURSE OUTCOMES         CL2         CL2         COURSE OUTCOMES         CL2         COURSE OUTCOMES         CL2         CL2         COURSE OUTCOMES <td< td=""><td></td><td>-</td><td>-</td><td></td><td></td><td>-</td><td>-</td><td></td><td></td><td>-</td><td></td><td></td><td></td><td></td><td>8 Ho</td><td>ours</td></td<>		-	-			-	-			-					8 Ho	ours		
MODULE - IV         MODULE - V         MODULE - V         MODULE - V         COURSE OUTCOMES         Powersk Architectures: Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       Bloom's Taxonomy Level         COURSE OUTCOMES         Jon completion of this course, the students will be able to:       CO       CO       Course Outcome Description       Taxonomy Level         CO1       Understand the fundamentals of Neural Networks and Deep Learning CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         CO2       Implement the Unsupervised algorithms like Convolutional Neural Networks (RNN).       CL3         CO3       Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks, Recursive Neural Networks, Restricted Boltzmann Machines, DBNs.       CL3         CO3       Implement tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Net				-				U				•	-					
NODULE - IV           Count, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation 'unctions, Applying Loss Functions, Understanding Learning Rates, How Sparsity Affects earning, Applying Methods of Optimization, Using Parallelization and GPUs for Faster 'raining.         8 Hours           COURSE OUTCOMES         Bloom's Taxonomy Level           COURSE OUTCOMES         CL2           Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).         CL3           CO3         Apply Deep Network to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.         CL3			-	-		-	-			-	-		-	-				
MODULE – IV           MODULE – IV           NUMODULE – IV           NUMODULE – IV           NUMODULE – IV           Superior Concepts in Tuning Deep Networks, Matching Input Data and Network Architectures, Relating Model Goal and Output Layers, Working with Layer Jount, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation functions, Applying Loss Functions, Understanding Learning Rates, How Sparsity Affects earning.         8 Hours           MODULE – V           COURE OUTCOMES           Bloom's Taxonomy Level           COURSE OUTCOMES           Jon completion of this course, the students will be able to: CO         Bloom's Taxonomy Level           Course Outcome Description         Bloom's Taxonomy Level           CO2         Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).         CL3           CO3           Applying of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.         CL3           CO4         Interpret Tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.         CL3           CO-PO-PSO MAPPING								rs for A	nomal	y Deteo	ction, U	Jsing V	ariati	onal				
Runing Deep Networks: Basic Concepts in Tuning Deep Networks, Matching Input Data and Network Architectures, Relating Model Goal and Output Layers, Working with Layer Count, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation and OPUs for Faster Training.       Note:	Autoen	coders	s to Re	constru	ict MN	IST Di	-											
nd Network Architectures, Relating Model Goal and Output Layers, Working with Layer Yount, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation functions, Applying Loss Functions, Understanding Learning Rates, How Sparsity Affects earning, Applying Methods of Optimization, Using Parallelization and GPUs for Faster Yaning. MODULE – V Yuning Deep Network Architectures: Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs. COURSE OUTCOMES Joon completion of this course, the students will be able to: COU COU COU COU COU COU COU COU															1			
Count, Parameter Count, and Memory, Weight Initialization Strategies, Using Activation Junctions, Applying Loss Functions, Understanding Learning Rates, How Sparsity Affects Learning, Applying Methods of Optimization, Using Parallelization and GPUs for Faster raining.       MODULE – V         MODULE – V         COURSE OUTCOMES         Bloom's Taxonomy Level         COURSE OUTCOMES         Jon completion of this course, the students will be able to:         COURSE OUTCOMES         Cluderstand the fundamentals of Neural Networks and Deep Learning (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         CL3         CO-PO-PSO MAPPING         CO-PO-PSO MAPPING         CL3         OPTO-PSO MAPPING         CL3         OPTO-PSO MAPPING         CL3         OPTO-PSO MAPPING         CL3         CL3         OPTO-PSO MAPPING         CL3         OPTO-PSO MAPPING         CL3         OPTO-PSO MAPPING         CO-PO-PSO MAPPING         CO-PO-PSO MAPPING         <	-	-				-		-	-			-	-		8 Ho	ours		
Numerican server in the servere servere in the server in the server in the server in	and Net	twork	Archit	tectures	s, Rela	ting Mo	odel Go	cal and	Outpu	it Laye	rs, Woi	king v	vith La	ayer				
MODULE – V         MODULE – V         MODULE – V         Struing Deep Network Architectures: Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       Bloom's Taxonomy Level         COURSE OUTCOMES         Joon completion of this course, the students will be able to:       Bloom's Taxonomy Level         COURSE OUTCOMES       Bloom's Taxonomy Level         COU       Understand the fundamentals of Neural Networks and Deep Learning       CL2         CO2       Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recurrent Neural Networks, Recurrent Neural Networks (RNN).       CL3         CO4       Prepret Tuning of Deep Networks using Activation Functions by applying optimization methods.       CL3         CO1       Interpret Tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       Programme Outcomes (PO)         Outcome (PSO)         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         Outcome (PSO)         Outcome (PSO)         Outcome (PSO)     <	Count,	Paran	neter C	Count, a	and Mo	emory,	Weigh	t Initia	lizatio	n Strate	egies, U	Jsing A	Activa	tion				
MODULE – V         MODULE – V         MODULE – V         Struing Deep Network Architectures: Convolutional Neural Networks (CNNs), Recurrent Neural Nachines, DBNs.         COURSE OUTCOMES         Joon completion of this course, the students will be able to:         COURSE OUTCOMES         Joon completion of this course, the students will be able to:         COURSE OUTCOMES         Joon completion of this course, the students will be able to:         COURSE OUTCOMES         Joon completion of this course, the students will be able to:         COURSE OUTCOMES         Joon completion of this course, the students will be able to:         COURSE OUTCOMES         COURSE OUTCOMES         COURSE OUTCOMES         COURSE OUTCOMES         CL2         COU         Inderstand the fundamentals of Neural Networks and Deep Learning       CL2         CL3         Mapping output       CL3         CL3         Interpret Tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines,		-						-		-		-	-					
MODULE – VMODULE – VFuning Deep Network Architectures: Convolutional Neural Networks (CNNs), Recurrent8 HoursCOURSE OUTCOMESJoon completion of this course, the students will be able to:Bloom's Taxonomy LevelCOURSE OUTCOMESBloom's Taxonomy LevelCOURSE OUTCOMESOUTCOMESJoon completion of this course, the students will be able to:COURSE OUTCOMESOUTCOMESCOURSE OUTCOMESOUTSOURSE OUTCOMESCourse Outcome DescriptionTaxonomy LevelCL2Implement the fundamentals of Neural Networks and Deep Learning (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).CL3CL3Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).CL3CO4Interpret Tuning of Deep Network Architectures for Convolutional Neural optimization methods.CO-PO-PSO MAPPINGCO-PO-PSO MAPPINGProgramme Outcomes (PO)Programme Specific Outcome (PSO)12CO32CO-PO-PSO MAPPINGCL3CO2 <th <="" colspan="2" td=""><td>Learnin</td><td>ig, Ap</td><td>plying</td><td>Metho</td><td>ods of</td><td>Optimi</td><td>zation,</td><td>Using</td><td>Parall</td><td>elizatio</td><td>n and</td><td>GPUs</td><td>for Fa</td><td>ster</td><td></td><td></td></th>	<td>Learnin</td> <td>ig, Ap</td> <td>plying</td> <td>Metho</td> <td>ods of</td> <td>Optimi</td> <td>zation,</td> <td>Using</td> <td>Parall</td> <td>elizatio</td> <td>n and</td> <td>GPUs</td> <td>for Fa</td> <td>ster</td> <td></td> <td></td>		Learnin	ig, Ap	plying	Metho	ods of	Optimi	zation,	Using	Parall	elizatio	n and	GPUs	for Fa	ster		
Runing Deep Network Architectures: Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.         8 Hours           COURSE OUTCOMES           Jpon completion of this course, the students will be able to:         Bloom's           CO         No.         Course Outcome Description         Bloom's           CO1         Understand the fundamentals of Neural Networks and Deep Learning         CL2           CO2         Implement the Unsupervised algorithms like Convolutional Neural Networks (RNN).         CL3           CO3         Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks         CL3           CO4         interpret Tuning of Deep Networks using Activation Functions by applying optimization methods.         CL3           Implement tuning of Deep Networks restricted Boltzmann Machines, DBNS.         CL3           CO4         Interpret Tuning of Deep Networks restricted Boltzmann Machines, DBNS.         CL3           CO5         Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNS.         CL3           CO5         Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNS.         CL3           CO6         Programme Outcomes (PO)         11         12         1         2         3           CO1         3         2         2	Trainin	g.																
Acural Networks, Restricted Boltzmann Machines, DBNs.         COURSE OUTCOMES         Jpon completion of this course, the students will be able to:         Course Outcome Description       Bloom's Taxonomy Level         COU         Course Outcome Description       CL2         CO       Manual Metworks and Deep Learning       CL2         CO       Implement the Unsupervised algorithms like Convolutional Neural Networks (RNN).       CL3         CO3       Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks       CL3         CO4       Preper Tuning of Deep Networks using Activation Functions by applying optimization methods.       CL3         CD-PO-PSO MAPPING         CL3         OC-PO-PSO MAPPING         CL3         Outcomes (PO)       Programme Outcomes (PO)         Networks       Specific Outcome (PSO)         OL 1       2       1         OL 1       2       CL3         CO3       Programme Outcomes							Μ	ODUL	$\mathbf{E} - \mathbf{V}$									
COURSE OUTCOMES         Jpon completion of this course, the students will be able to:       Bloom's         CO       Course Outcome Description       Bloom's         C01       Understand the fundamentals of Neural Networks and Deep Learning (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         C02       Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         C03       Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks       CL3         C04       Interpret Tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines.       CL3         C05       Implement tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines.       Programme Specific Outcome (PSO)         C04       Implement tuning of Deep Network Architectures (PO)       Programme Specific Outcome (PSO)         C03       3       2       2       3       2       1       2       3         C03       3       2       2       3       2       1       2       3       2       1         CO-PO-PSO MAPPING         CO1       3       2       2 <td>Tuning</td> <td>g Deep</td> <td>) Netw</td> <td>ork Ar</td> <td>chitec</td> <td>tures:</td> <td>Convol</td> <td>utional</td> <td>Neura</td> <td>l Netwo</td> <td>orks (C</td> <td>NNs),</td> <td>Recur</td> <td>rent</td> <td>8 Ho</td> <td>ours</td>	Tuning	g Deep	) Netw	ork Ar	chitec	tures:	Convol	utional	Neura	l Netwo	orks (C	NNs),	Recur	rent	8 Ho	ours		
Ipon completion of this course, the students will be able to:Course Outcome DescriptionBloom's Taxonomy LevelCO1Understand the fundamentals of Neural Networks and Deep LearningCL2CO2Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).CL3CO3Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural NetworksCL3CO4Interpret Tuning of Deep Networks using Activation Functions by applying optimization methods.CL3CO4Implement tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.CL3CO5123456789101112123CO332232112331123CO4322322211233CO532232221123CO432222221123CO53222222221221CO5322222222222122 <td>Neural</td> <td>Netwo</td> <td>orks, R</td> <td>estricte</td> <td>ed Bolt</td> <td>zmann</td> <td>Machir</td> <td>nes, DB</td> <td>Ns.</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>	Neural	Netwo	orks, R	estricte	ed Bolt	zmann	Machir	nes, DB	Ns.									
CO No.       Course Outcome Description       Bloom's Taxonomy Level         CO1       Understand the fundamentals of Neural Networks and Deep Learning       CL2         CO2       Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         CO3       Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks       CL3         CO4       Interpret Tuning of Deep Networks using Activation Functions by applying optimization methods.       CL3         CO5       Implement tuning of Deep Networks, Restricted Boltzmann Machines, DBNs.       CL3         CO-PO-PSO MAPPING         Programme Outcomes (PO)         1       2       3         CO3         Secord Programme Outcomes (PO)         11         CO4         OP-PSO MAPPING         CL3         OUT         1         OC-PO-PSO MAPPING         OUT         1         CO4         1         1         1         1       2							COUR	SE OU	JTCO	MES								
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CO2       Implement the Unsupervised algorithms like Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Recursive Neural Networks (RNN).       CL3         CO3       Apply Deep Networks to the Right Problem using the DL4J Suite of Tools by Using Recurrent Neural Networks       CL3         CO4       Interpret Tuning of Deep Networks using Activation Functions by applying optimization methods.       CL3         CO5       Implement tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       CL3         CO6       Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO2       3       2       2       3       2       2       1       1         CO3       3       2       2       3       2       2       1       1       2       3       1       2       1       1       2       2       1       1       2       2       1       1       2       2       1       1       2       2       1       1       2       2       1       1       2       2       1       1	110.																	
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CC3       CL3         CL3         Interpret Tuning of Deep Networks using Activation Functions by applying optimization methods.       CL3         CO4       Interpret Tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       CO-PO-PSO MAPPING         CO-PO-PSO MAPPING         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       2       2       3       2       1       2       3       2       1       2       3       2       1       2       3       2       1       2       3       2       1       1       2       2       1       2       3       2       1       1       2       3       2       1       1       2       3       2       1       1       2       3       2       1       1       2       2       1       1       1       2       2       1       1	02	(CN	Ns), Re	ecurren	t Neur	al Netw	orks, F	Recursiv	ve Neu	ral Net	works (	RNN)			CI	-3		
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CO4       optimization methods.       CL3         Implement tuning of Deep Network Architectures for Convolutional Neural Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       CL3         CO-PO-PSO MAPPING         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       2       2       3       2       1       2       3       1       2       3       1       2       3       1       2       3       2       1       2       3       2       1       2       3       1       1       2       3       3       2       2       1       1       2       3       3       2       2       1       1       2       3       3       2       2       1       1       2       3       1       1       2       3       1       1       2       2       1       1       2       2       1       1       2       2       1       1       2       2       1       1	COS	Recu	irrent N	Neural 1	Networ	ks									CI	20		
optimization methods.         Implement       tuning       of       Deep       Network       Architectures       for       Convolutional       Neural       CL3         CO       Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       CO-PO-PSO MAPPING         CO-PO-PSO MAPPING         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       2       2       3       2       0       11       12       1       2       3         CO2       3       2       2       3       2       1       2       3       2       1       2       3       3       2       1       2       3       3       2       1       2       3       3       2       1       1       12       1       2       3       3       3       2       2       1       1       1       1       1       1       1       1       1       1       1       1 <th1< td=""><td>CO4</td><td>Inter</td><td>pret T</td><td>uning</td><td>of De</td><td>ep Ne</td><td>tworks</td><td>using</td><td>Activ</td><td>ation 1</td><td>Functio</td><td>ns by</td><td>apply</td><td>ying</td><td>CI</td><td>2</td></th1<>	CO4	Inter	pret T	uning	of De	ep Ne	tworks	using	Activ	ation 1	Functio	ns by	apply	ying	CI	2		
CO5       Networks (CNNs), Recurrent Neural Networks, Restricted Boltzmann Machines, DBNs.       CL3         CO-PO-PSO MAPPING         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       -       -       -       -       2       -       1         CO2       3       2       2       3       2       -       1       2       3       -         CO3       3       2       2       3       2       2       -       1       1       2       2       1       1       2       3       1       1       1       2       3       1       1       1       2       3       1       1       1       2       3       1       1       1       2       3       1       1       1       2       1       1       1       2       2       1       1       1       2       2       1       1       1       2       2       1       1       1<	CO4	optir	nizatio	n meth	ods.										CI	20		
DBNs.         CO-PO-PSO MAPPING         Programme Outcomes (PO)       Programme Specific Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       -       -       -       -       -       2       -       1         CO2       3       2       2       3       2       -       -       1       2       3       -       1       2       3       -       1       2       3       -       1       1       2       3       -       1       1       2       1       1       2       3       -       1       1       2       3       -       1       1       1       1       1       2       3       -       1		Impl	ement	tuning	g of I	Deep N	Jetworl	k Arch	itectur	es for	Convo	olution	al Ne	ural				
CO-PO-PSO MAPPING           Programme Outcomes (PO)           1         2         3         4         5         6         7         8         9         10         11         12         1         2         3           CO1         3         4         5         6         7         8         9         10         11         12         1         2         3           CO1         3         4         5         6         7         8         9         10         11         12         1         2         3           CO1         3         2         2         3         2         1         2         3         2         1         2         3         2         1         2         3         2         1         2         3         3         2         2         1         2         3         3         2         2         1         2         2         1         2         2         1         2         2         1         2         3         3         2         2         2         2         1         2         2         2         1         2	CO5									nes,	CI	.3						
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No.       Outcome (PSO)         1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       -       -       -       -       -       2       1       2       1         CO2       3       2       2       3       2       -       -       1       2       1         CO2       3       2       2       3       2       -       -       1       2       2       1         CO3       3       2       2       3       2       -       -       2       2       1         CO4       3       2       2       2       2       -       1       2       2       1         CO5       3       2       2       2       2       2       2       1       1       2       2       1         CO5       3       2       2       2       2       2       1       1       2       2       1         ASSESSMENT STRATEGY														P	rogram	me		
1       2       3       4       5       6       7       8       9       10       11       12       1       2       3         CO1       3       -       -       -       -       -       -       2       1         CO2       3       2       2       3       2       -       -       -       2       2       1         CO3       3       2       2       3       2       -       -       -       2       2       -       1         CO4       3       2       2       2       2       -       -       2       2       -       -       -       2       2       -       -       -       -       2       2       -	CO				]	Progra	mme (	Outcom	nes (PC	))					Specifi	ic		
CO1       3       2       1         CO2       3       2       2       3       2       2       1         CO3       3       2       2       3       2       2       2       1         CO3       3       2       2       3       2       2       3       2       2       1         CO3       3       2       2       3       2       2       3       2       2       1         CO4       3       2       2       2       2       2       2       2       1         CO5       3       2       2       2       2       2       2       2       1         3: Substantial (High)       2: Moderate (Medium)       1: Poor (Low)         ASSESSMENT STRATEGY	No.													Ou	tcome (	PSO)		
CO2       3       2       2       3       2       2       2       2         CO3       3       2       2       3       2       2       2       2       2         CO4       3       2       2       2       2       2       2       2       2         CO4       3       2       2       2       2       2       2       2       2         CO5       3       2 <th2< th=""> <th2< th=""> <th2< th=""></th2<></th2<></th2<>		1	2	3	4	5	6	7	8	9	10	11	12	1	2	3		
CO3       3       2       2       3       2       2       2       2         CO4       3       2       2       2       2       2       2       2       2         CO5       3       2 <th< td=""><td>CO1</td><td>3</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td>2</td><td></td><td></td><td>1</td></th<>	CO1	3											2			1		
CO4       3       2       2       2       2       2       2       2         CO5       3       2 </td <td>CO2</td> <td>3</td> <td>2</td> <td>2</td> <td>3</td> <td>2</td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td>2</td> <td>2</td> <td></td> <td></td>	CO2	3	2	2	3	2							2	2				
CO5       3       2       2       2       2       2         3: Substantial (High)       2: Moderate (Medium)       1: Poor (Low)         ASSESSMENT STRATEGY         Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect	CO3	3	2	2	3	2							2	2				
CO5       3       2       2       2       2       2         3: Substantial (High)       2: Moderate (Medium)       1: Poor (Low)         ASSESSMENT STRATEGY         Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect	<b>CO4</b>	3	2	2	2	2							2	2				
3: Substantial (High)       2: Moderate (Medium)       1: Poor (Low)         ASSESSMENT STRATEGY         Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect	CO5	3	2	2	2	2							2	2				
ASSESSMENT STRATEGY Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect		Subs	tantial	(High	)	2	: Mode	erate (I	Mediu	<b>m</b> )		1	: Pool	r (Lo	w)	1		
Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect		_		. 0	-										,			
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# COLLEGE OF ENGINEERING & MANAGEMENT An Autonomous Institution MANGALURU

SI. No.		Assessment De	scription	Weightage (%)	Max. Marks
1	Contin (CIA)	uous Internal A	Assessment	100 %	50
	Conti	nuous Internal E	valuation (CIE)	60 %	30
	As	signments		40 %	20
2	Semest	ter End Examir	nation (SEE)	100 %	50
			ASSESSN	IENT DETAILS	·
Continuous Internal Assessment (CI				(A) (50%)	Semester End Exam (SEE)
Contin	ontinuous Internal Evaluation (CIE) (60%)		Assignment/	(50%)	
]	I	II	III	Activities (40%)	
	S	yllabus Covera	ge	Syllabus Coverage	Syllabus Coverage
4(	0%	30%	30%	100%	100%
Ν	ΛI			MI	MI
Μ	111	MII		MII	MII
		MIII		MIII	MIII
			MIV	MIV	MIV
			MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES					
Sl.	Agaigmment Description	Max. Weightage	Max.		
No.	Assignment Description	(%)	Marks		
1	Written Assignments	25 %	05		
2	Quiz	10 %	02		
3	Case Studies	25 %	05		
4	Seminar/Presentation	15 %	03		
5	Peer - to - Peer Learning	10 %	02		
6	Activity Based Learning	50 %	10		
7	Project Based Learning	50 %	10		
8	Field Work + Report	50 %	10		
9	Industry Visit + Report	50 %	10		
	NPTEL/MOOC Courses – Registration and Assignment	50 %	10		
10	Submissions	JU 70	10		
	NPTEL Certification	75 %	15		
11	Any other Innovative Assignments (CL4 and above)	50 %	10		

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

# SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.



- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

# **REFERENCE BOOKS:**

- 6. Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media, Inc.2017
- 7. Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress, 2018.
- 8. Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020.
- 9. Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND, 2017.
- 10. Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress, 2017.

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://www.youtube.com/watch?v=FbxTVRfQFuI
- 2. https://www.youtube.com/watch?v=uQ764z6twBo
- 3. https://www.youtube.com/watch?v=aircAruvnKk
- 4. https://www.youtube.com/watch?v=KBftoy0DPxI



# PROGRAMMING IN PYTHON (Effective from the Academic Year 2023 - 2024)

VII SEMESTER					
Course Code	21CS741	CIA Marks	50		
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50		
Total Hours of Pedagogy	<b>40L</b>	Exam Hours	03		
CREDITS – 3					

# **COURSE PREREQUISITES:**

- Programming Experience: A strong foundation in programming using languages like Java, Python, or C/C++ is essential.
- Understanding of Web Concepts
- Basic Security Concepts

#### **COURSE OBJECTIVES:**

- Learn Syntax and Semantics and create Functions in Python.
- Handle Strings and Files in Python.
- Understand Lists, Dictionaries and Regular expressions in Python.
- Implement Object Oriented Programming concepts in Python
- Build Web Services and introduction to Network and Database Programmingin Python..

# **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

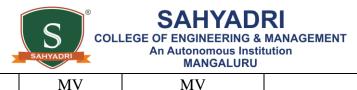
- Chalk and Talk Method/Blended Mode Method
- PowerPoint Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS MODULE - I				
execution, Functions				
MODULE - II	•			
Iteration, Strings, Files				
MODULE - III				
Lists, Dictionaries, Tuples, Regular Expressions				
MODULE - IV				
Classes and objects, Classes and functions, Classes and methods	8 Hours			
MODULE - V				
Networked programs, Using databases and SQL	8 Hours			



#### **COURSE OUTCOMES**

CO No.						luuulits	will 0	e able t	to:							
	Course Outcome Description												Bloom's axonomy Level			
CO1	and	Examine Python syntax and semantics and be fluent in the use of Python flow control and functions.												ol	CL3	
CO2	Der	Demonstrate proficiency in handling Strings and File Systems.														CL3
CO3	Dic	Create, run and manipulate Python Programs using core data structures like Lists, Dictionaries and use Regular Expressions.												s,	CL3	
CO4		_		-	-	ect-Orier		-	-							CL3
CO5	Imp	olemen	t exem	plary a	applica	ations re				_	amm	ing ar	nd Data	abases.		CL3
	1					CO	-PO-]	PSO M	IAPPI	NG				1		
CO No.		1				amme (	Outco	omes (F	<b>PO</b> )					Out		Specific (PSO)
	1	2	3	4	5	6	7	8	9	1	0	11	12	1	2	3
CO1	3	2	2		2				2				2	3		
CO2	3	2	2		2				2				2	3		
	_															
	-			 		Modor	oto (N	Modim						-	•)	
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		0	nment						) %					20		
2	Ser	nester	End E	Examir	nation	(SEE)			) %					50		
									DETA	ILS						
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		ous Int	ernal (60%					Assign: ctivitie:	ment/ s (40%	)						
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Ν			MII MIII					M M MI	Ι					MI MII MIII		
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MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIGNMENT TYPES WITH WEIGHTAGES									
Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks						
1	Written Assignments	25 %	05						
2	Quiz	10 %	02						
3	Case Studies	25 %	05						
4	Seminar/Presentation	15 %	03						
5	Peer - to - Peer Learning	10 %	02						
6	Activity Based Learning	50 %	10						
7	Project Based Learning	50 %	10						
8	Field Work + Report	50 %	10						
9	Industry Visit + Report	50 %	10						
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10						
	NPTEL Certification	75 %	15						
11	Any other Innovative Assignments (CL4 and above)	50 %	10						

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

#### **SEE QUESTION PAPER PATTERN:**

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

# **REFERENCE BOOKS:**

- 1. Charles R. Severance, 1st Edition, CreateSpace Independent Publishing Platform, 2016. (<u>http://do1.drchuck</u>. com/pythonlearn/EN\_us/pythonlearn.pdf)
- 2. Allen B. Downey, "Think Python: How to Think Like a Computer Scientist 2ndEdition, Green Tea Press, 2015. (http://greenteapress.com/thinkpython2/thinkpython2.pdf) (Download pdf files from the above links)
- Charles Dierbach, "Introduction to Computer Science Using Python", 1st Edition, Wiley India Pvt Ltd, 2015. ISBN-13: 978-8126556014
- Gowrishankar S, Veena A, 1st Edition, CRC Press/Taylor & Francis, 2018. ISBN-13: 978-0815394372
- 5. Mark Lutz, 4th 2011.ISBN-13: 978-9350232873
- Roberto Tamassia, Michael H Goldwasser, Michael T Goodrich, Algorithms in Python 1stEdition, Wiley India Pvt Ltd, 2016. ISBN-13: 978-8126562176
- 7. Reema Thareja, Oxford university press, 2017. ISBN-13: 978-0199480173



## **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://docs.python.org/3/
- 2. https://pandas.pydata.org/docs/
- 3. https://www.youtube.com/playlist?list=PL-osiE80TeTt2d9bfVyTiXJA-UTHn6WwU
- 4. https://www.youtube.com/playlist?list=PLQVvvaa0QuDeAams7fkdcwOGBpGdHpXln



# INTRODUCTION TO BIG DATA (Effective from the Academic Year 2023 - 2024)

VII SEMESTER									
Course Code21CS742CIA Marks50									
Number of Contact Hours/Week (L: T: P: S)3:0:0:0SEE Marks50									
Total Hours of Pedagogy40LExam Hours03									
	<b>CREDITS – 3</b>								

#### **COURSE PREREQUISITES:**

• NIL

#### **COURSE OBJECTIVES:**

- Understand Hadoop Distributed File system and examine MapReduce Programming
- Employ MapReduce programming model to process the big data
- Explore Hadoop tools and manage Hadoop with Sqoop.
- Appraise the role of data mining and its applications across industries
- Identify various Text Mining techniques

# **TEACHING - LEARNING STRATEGY:**

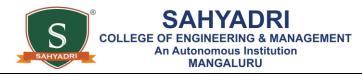
Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

COURSE CONTENTS							
MODULE - I							
Big Data: Introduction, Defining Big Data, Need of Big Data, Business Implications of Big	8 Hours						
Data, Big Data Analytics Applications and Case Studies.							
Hadoop Distributed file system: HDFS Design Features, HDFS Components, HDFS user							
commands, Hadoop.							
Hadoop MapReduce Framework: The MapReduce Model, Map-reduce Parallel Data Flow,							
Map Reduce Programming							
MODULE - II							
Essential Hadoop Tools: Using apache Pig, Using Apache Hive, Using Apache Sqoop, Using	8 Hours						
Apache Apache Flume, Apache H Base							
MODULE - III							

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Data W Archite		U	: Introd	duction	, Desig	n Cons	ideratio	on, DW	Devel	opmen	t Appro	oaches,	DW	8 H	ours
	<b>lining:</b> Introduction, Gathering, and Selection, data cleaning and preparation, outputs of lining, Data Mining Techniques.														
<b>Data V</b> Exampl	<b>Visualization:</b> Introduction, Excellence in Visualization, Types of Charts, Visualization pple														
	MODULE - IV														
from Co	<b>Decision Trees:</b> Introduction, Decision Tree Problem, Decision Tree Constructions, Lessons from Construction Trees. Decision Tree Algorithm.													8 H	ours
-	essions: Introduction, Correlations and Relationships, Non-Linear Regression, Logistic														
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Text M	ining	• Intro	duction	Text	Mining				Aining	Proces	s Tern	n Docui	nent	8 H	ours
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Web N Mining										red Mi	ning, '	Web U	sage		
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Upon c	omple	etion of	this co	ourse, th	ne stude	ents wi	ll be ab	le to:							
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CO2	Adm	ninistra	tion	1					-	1		asic Ha	1	C	L3
CO3							-			_		alizatio	on		L3
CO4							_		es for da	ata ana	lytics.				L3
CO5	Com	pare a	nd cont	rast dif			_	echniq						C	L3
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CO2	3	3	2	2	2	1			1			2	2	2	
CO3	3	3	2	2	3	1			2			2	2	2	1
CO4	•	3	2	2	2	1			1			2	2	2	1
	3										1				
CO5	3	3	3	3	2	1				2		2	2	2	
CO5	3	3	3 (High)	-	2	: Mode	-	Mediun	n) TEGY		1	2 l: <b>Poor</b>			



Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

Sl. No.		Assessment Des	scription	Weightage (%)	Max. Marks				
1	Contin (CIA)	nuous Internal A	ssessment	100 %	50				
	Cont	inuous Internal Ev	valuation (CIE)	60 %	30				
	A	ssignments		40 %	20				
2	Semes	ster End Examination	ation (SEE)	100 %	50				
			ASSESS	MENT DETAILS					
	Cor	tinuous Internal	Assessment (CI	A) (50%)	Semester End Exa	am (SEE)			
Contir	nuous Ir	ternal Evaluatio	n (CIE) (60%)	Assignment/	(50%)				
	I	II	III	Activities (40%)					
	5	Syllabus Coverag	ge	Syllabus Coverage	Syllabus C	overage			
4(	0%	30%	30%	100%	100%	/o			
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		MIII		MIII	MII	I			
			MIV	MIV	MIV				
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Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

**SEE QUESTION PAPER PATTERN:** 

• The question paper will have **TEN** full questions from **FIVE** Modules



- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- 1. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1<sup>st</sup> Edition, Pearson Education, 2016.
- 2. Anil Maheshwari, "Data Analytics", 1<sup>st</sup> Edition, McGraw Hill Education, 2017
- Tom White, "Hadoop: The Definitive Guide", 4th Edition, O"Reilly Media, 2015.ISBN-13: 978-935213067
- 4. Boris Lublinsky, Kevin T Smith, Alexey Yakubovich, "Professional Hadoop Solutions", 1stEdition, Wrox Press, 2014 ISBN-13: 978-8126551071
- 5. Eric Sammer, "Hadoop Operations: A Guide for Developers and Administrators",1stEdition, O'Reilly Media, 2012 ISBN-13: 978-9350239261
- 6. Arshdeep Bahga, Vijay Madisetti, "Big Data Analytics: A Hands-On Approach", 1st Edition, VPT Publications, 2018. ISBN-13: 978-0996025577

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E - RESOURCES):**

- 1. https://nptel.ac.in/courses/106/104/106104189/
- 2. https://www.youtube.com/watch?v=mNP44rZYiAU
- 3. https://www.youtube.com/watch?v=qr\_awo5vz0g
- 4. https://www.youtube.com/watch?v=rr17cbPGWGA
- 5. https://www.youtube.com/watch?v=G4NYQox4n2g
- 6. https://www.youtube.com/watch?v=owI7zxCqNY0
- 7. https://www.youtube.com/watch?v=FuJVLsZYkuE



INTRODUCTION TO DATA SCIENCE
(Effective from the Academic Year 2023 - 2024)
VII SEMESTER

VII SEIVIESTER									
Course Code	21CS743	CIA Marks	50						
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50						
Total Hours of Pedagogy	40L	Exam Hours	03						
	CREDITS – 3								

#### **COURSE PREREQUISITES:**

• Fundamental knowledge of Mathematics, Data Structures.

#### **COURSE OBJECTIVES:**

- To provide a foundation in data Science terminologies
- To familiarize data science process and steps
- To Demonstrate the data visualization tools
- To analyze the data science applicability in real time applications.

## **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

# COURSE CONTENTS MODULE - I

Preparing And Gathering Data And Knowledge: Philosophies Of Data Science, Data	8 Hours
science in a big data world - Benefits and uses of data science and big data - facts of data:	
Structured data, Unstructured data, Natural Language, Machine generated data, Audio, Image	
and video streaming data - The Big data Eco system: Distributed file system, Distributed	
Programming framework, Data Integration frame work, Machine learning Framework, NoSQL	
Databases, Scheduling tools, Benchmarking Tools, System Deployment, Service programming	
and Security.	

#### **MODULE - II**

The Data Science Process: Overview of the data science process- defining research goals and	8 Hours
creating project charter, retrieving data, cleansing, integrating and transforming data,	
exploratory data analysis, Build the models.	

#### **MODULE - III**

Machine Learning: Application for machine learning in data science- Tools used in machine8 Hourslearning Modeling Process – Training model – Validating model.8



					$\checkmark$	_	М	ODULE	ANGALU	RU							
Visual	lizatio	o <b>n</b> –In	troduct	tion to	o data	visuali				aliza	atio	n opt	ions –	Filters	- 8	Hours	
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1					-			ODULI	E - V								
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								SE OU		ES							
Upon o	comp	letion	of this	cours	e, the s	students	s will	be able	to:								
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No.	Course Outcome Description													xonomy Level			
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CO5	App	ly Da	ta stor	age an	d proc	essing v	vith 1	framewo	orks.							CL3	
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CO2 CO3	2	2			22				2	$\frac{2}{2}$		$\frac{2}{2}$	2	2 2	$\frac{2}{2}$	1	
C03	$\frac{2}{2}$	2			2				2	2		$\frac{2}{2}$	2	$\frac{2}{2}$	$\frac{2}{2}$	1	
C04	$\frac{2}{2}$	2			2				2	2		$\frac{2}{2}$	2	2	2	1	
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				,				SSMENT STRATEGY									
		will b	be both	CIA a	and SE	E. Stud	ents	learning	g will b	e ass	sesse	ed usi	ng Dir	rect and I	ndirect	-	
metho	ds:																
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#### COLLEGE OF ENGINEERING & MANAGEMENT An Autonomous Institution MANGALURU

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MII	MII		MII	MII
	MIII		MIII	MIII
		MIV	MIV	MIV
		MV	MV	MV

Note: For Examinations (both CIE and SEE), the question papers shall contain the questions mapped to the appropriate Bloom's Level. Any COs mapped with higher cognitive Bloom's Level may also be assessed through the assignments.

ASSIC	GNMENT TYPES WITH WEIGHTAGES		
Sl. No.	Assignment Description	Max. Weightage (%)	Max. Marks
1	Written Assignments	25 %	05
2	Quiz	10 %	02
3	Case Studies	25 %	05
4	Seminar/Presentation	15 %	03
5	Peer - to - Peer Learning	10 %	02
6	Activity Based Learning	50 %	10
7	Project Based Learning	50 %	10
8	Field Work + Report	50 %	10
9	Industry Visit + Report	50 %	10
10	NPTEL/MOOC Courses – Registration and Assignment Submissions	50 %	10
	NPTEL Certification	75 %	15
11	Any other Innovative Assignments (CL4 and above)	50 %	10

Note: The assignments mentioned above may be provided appropriately to the students belonging to different bands

# SEE QUESTION PAPER PATTERN:

- The question paper will have **TEN** full questions from **FIVE** Modules
- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

#### **REFERENCE BOOKS:**

- 1. Introducing Data Science, Davy Cielen, Arno D. B. Meysman and Mohamed Ali,Manning Publications, 2016.
- 2. Doing Data Science, Straight Talk from the Frontline, Cathy O'Neil, Rachel Schutt, O' Reilly, 1st edition, 2013.
- 3. Mining of Massive Datasets, Jure Leskovec, Anand Rajaraman, Jeffrey David Ullman, Cambridge University Press, 2nd edition, 2014.
- 4. An Introduction to Statistical Learning: with Applications in R, Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani, Springer, 1st edition, 2013.
- 5. Think Like a Data Scientist, Brian Godsey, Manning Publications, 2017.



PROG	RAMMING	IN JAVA	
(Effective from t	the Academ	ic Year 2023 - 2024)	
N .	II SEMES	ΓER	
Course Code	21CS744	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	3:0:0:0	SEE Marks	50
Total Hours of Pedagogy	40L	Exam Hours	03
	CREDITS -	- 3	
COURSE PREREQUISITES:			
-			
• Fundamental of programming			
COURSE OBJECTIVES:			
• Loom fundamental factures of chiest	oriented lon-	ago and IAVA	
<ul> <li>Learn fundamental features of object</li> <li>Set up Java JDK environment to created</li> </ul>	-	-	
<ul> <li>Set up Java JDK environment to creat</li> <li>Learn object-oriented concepts using</li> </ul>	-		
<ul> <li>Learn object-oriented concepts using</li> <li>Study the concepts of importing of p</li> </ul>	01 0 0	L.	
<ul> <li>Discuss the String Handling example</li> </ul>	-		
TEACHING - LEARNING STRATEGY:	es with Object	Onemed concepts	
Following are some sample strategies that ca	n be incorpora	te for the Course Delivery	
Chalk and Talk Method/Blended Mod	de Method	-	
Power Point Presentation			
• Expert Talk/Webinar/Seminar			
• Video Streaming/Self-Study/Simulati	ions		
Peer-to-Peer Activities			
• Activity/Problem Based Learning			
Case Studies			
MOOC/NPTEL Courses			
• Any other innovative initiatives with	respect to the	Course contents	
CO	OURSE CONT	TENTS	
	MODULE	·I	
An Overview of Java: Object-Oriented Progr	amming, A Fi	rst Simple Program, A Second Short	8 Hours
Program, Two Control Statements, Using	Blocks of Co	de, Lexical Issues, The Java Class	
Libraries, Data Types, Variables, and Arrays			
Types, Integers, Floating-Point Types, Ch			
Variables, Type Conversion and Casting, Au	tomatic Type I	Promotion in Expressions, Arrays, A	
Few Words About Strings		-	
	MODULE -	II	
Operators: Arithmetic Operators, The Bitwise	e Operators, Re	elational Operators, Boolean Logical	8 Hours
Operators, The Assignment Operator, The ?	-		
Control Statements: Java"s Selection Stateme		_	
	<b>MODULE</b> -		



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CO2		elop a ments.		ecute	simple	e java	progra	ms us	ing ba	asic ope	rators a	and cor	ntrol	CI	.3
CO3										volving i		nce		CI	.3
CO4							-			ion progi				CI	.3
CO5		enume lems i		and St	ring co	-		-		programs	s to solv	e real w	orld	CI	.3
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CO4	3	3	3		2	2	1	1				2	2	2	2
CO5	3	3	3		2	2	1	2	2		2	2	2	2	2
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Assessment will be both CIA and SEE. Students learning will be assessed using Direct and Indirect methods:

No.	Α	ssessment De	scription	Weightage (%	Max. Marks			
1	Continue (CIA)	ous Internal A	Assessment	100 %	50	50		
	Continu	ous Internal E	valuation (CIE)	60 %	30			
	Assi	gnments		40 %	20			
2	Semester	r End Examir	nation (SEE)	100 %	50			
			ASSESS	SMENT DETAILS				
	Contin	uous Interna	l Assessment (C	IA) (50%)	Semester End Exa	m (SEE) (50%		
Con	ntinuous I	nternal Evalu (60%)	ation (CIE)	Assignment/ Activities (40%)				
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• The question paper will have **TEN** full questions from **FIVE** Modules



- There will be 2 full questions from each module. Every question will carry a maximum of 20 marks.
- Each full question may have a maximum of four sub-questions covering all the topics under a module.
- The students will have to answer FIVE full questions, selecting one full question from each module.

## **REFERENCE BOOKS:**

- 1. Herbert Schildt, Java the Complete Reference, 7th Edition, Tata McGraw Hill, 2007. (Chapters 2, 3, 4, 5, 6,7, 8, 9,10, 12,13,15)
- 2. Cay S Horstmann, "Core Java Vol. 1 Fundamentals", Pearson Education, 10th Edition, 2016.
- 3. Raoul-Gabriel Urma, Mario Fusco, Alan Mycroft, "Java 8 in Action", Dreamtech Press/Manning Press, 1st Edition, 2014.



# BIG DATA ANALYTICS LABORATORY (Effective from the Academic Year 2023 - 2024)

# VII SEMESTER

Course Code	21CSL75	CIA Marks	50
Number of Contact Hours/Week (L: T: P: S)	0:0:2:0	SEE Marks	50
Total Hours of Pedagogy	20P	Exam Hours	03
	<b>REDITS – 1</b>		

#### **COURSE PREREQUISITES:**

• Basic Knowledge of JAVA Programming Language, SQL

#### **COURSE OBJECTIVES:**

- Familiarize with Hadoop distributions, configuring Hadoop and performing File management tasks
- To implement MapReduce programs for processing big data.
- Implement MapReduce programs in variety applications
- To understand concepts of NoSQL using MongoDB, Hive.
- To analyze big data using machine learning techniques such as Decision tree classification and clustering.

#### **TEACHING - LEARNING STRATEGY:**

Following are some sample strategies that can be incorporate for the Course Delivery

- Chalk and Talk Method/Blended Mode Method
- Power Point Presentation
- Expert Talk/Webinar/Seminar
- Video Streaming/Self-Study/Simulations
- Peer-to-Peer Activities
- Activity/Problem Based Learning
- Case Studies
- MOOC/NPTEL Courses
- Any other innovative initiatives with respect to the Course contents

#### LIST OF EXPERIMENTS

Sl. No.	Description								
	Install, configure and run Hadoop and HDFS.								
1	Visualize data using basic plotting techniques in Python.								
2	Implement word count program using Map Reduce.								
3	Implement a Map Reduce program to find the maximum temperature in each year.								
	Implement a Map Reduce program to								
4	• Find the grades of student's.								
	Matrix Multiplication Using One Map-Reduce Step.								
5	Implement NoSQL Database Operations: CRUD operations, Arrays using MongoDB & Cassandra.								
6	Implement Functions: Count – Sort – Limit – Skip – Aggregate using MongoDB.								
7	Implement database operations on Hive.								
8	Write queries to sort and aggregate the data in a table using HiveQL.								
9	Implement clustering techniques using SPARK.								



#### **COURSE OUTCOMES**

Upon c	ompl	etion of	f this co	ourse, tl	ne stude	ents wi	ll be ab	ole to:							
CO No.					Cou	rse Ou	tcome	Descri	ption					Bloom's Taxonom y Level	
CO1			te the H l File sy	-	framev	work ar	ıd unde	erstand	the con	cepts o	f Hado	oop		CL3	
CO2	Apply MapReduce programming model to understand Map Reduce Paradigm and processing of big data												d	CL3	
CO3	Demonstrate the concepts of NoSQL using MongoDB and Cassandra for Big Data												ta	CL	_3
CO4	To analyze big data using machine learning techniques													CL	.3
	_					CO-PC	)-PSO	MAPP	ING						
CO No.	Programme Outcomes (PO)											Programme Specific Outcome (PSO)			
	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3
CO1	3	3	2	2	1	1			2			2	2	2	1
CO2	3	3	2	2	2	1			2		1	2	2	2	1
CO3	3	3	2	2	3	1			2		1	2	2	2	1
<b>CO4</b>	3	3	2	2	2	1			2		1	2	2	2	1
3:	Sub	stantia	l (High	)				Mediur			1	: Poor	(Low	)	
Assessi method Sl. No.			both C		SEE. S	Students	s learni	' STRA ng will Veighta	be asse	essed u	sing Di	irect an Max.			
1	Continuous Internal Assessment (CIA)							100 %			50				
	Lab	oratory	Work	(A)				50 % 2			25	.5			
	Lab	oratory	Test (I	3)				3	0 %				15		
	Ope	en Ende	ed Expe	riments	s /Mini			20 % 10			10				
	-	jects (C	<b>'</b> )						, .	100 % 5					

I. In Laboratory Courses where (B) and (C) are not the components of the assessment pattern, then (A) will have 100% weightage (50 Marks).

**Assessment Mode:** Weekly Assessment of Laboratory Work (50 Marks) - the marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment, each of 25 marks) of the students in each laboratory session. The average of all the marks obtained across the sessions will be the Final CIA marks.

II. In Laboratory Courses where (C) is not a component of the assessment pattern, then (A) will have 50% weightage (25 Marks), and (B) will have 50% weightage (25 Marks).



**Assessment Mode:** The marks will be awarded based on the Continuous Internal Assessment (Weekly Assessment) (A) and One Laboratory Test (B).

- In Weekly Assessment, the student will be evaluated in each laboratory session for 25 marks. The average marks obtained across all the experiments will be the marks obtained for (A).
- A Laboratory Test, similar to the SEE exam is conducted towards the end of the Semester/Course, whichever is earlier. The obtained marks are scaled down to 25 Marks (B) The Sum of marks obtained across (A) and (B) will be the Final CIA marks.
- III. In Laboratory Courses where (C) is a component of the assessment pattern, then assessment will be done by considering the weightages given above, i.e. (A) – 25 Marks (Weekly Assessment), (B) – 15 Marks (Laboratory Examination), (C) – 10 marks (Open Ended Experiments/Mini Projects)
  - The respective course instructor will design the assessment criteria for the said assessment components.
  - The assessment components will be made known to the students by the respective Course Coordinators prior to the commencement of the Laboratory Work.

In all the cases, the assessments will be done based on the criteria designed by the Course Coordinator.

# SEE QUESTION PAPER PATTERN:

- 1. All laboratory experiments should be included for practical examination, from which students are allowed to pick one experiment from the lot.
- 2. SEE shall be conducted for 100 Marks and the marks will be scaled down to 50.
- 3. General Marks Distribution: Procedure + Conduction + Viva = 20% + 50% + 30%.
- 4. Change of experiment is allowed only once and 20% of the marks allotted to the Procedure will be made ZERO (if a question carries two experiments, both should be changed). The evaluation will be done for 80% of the total maximum marks.

# **REFERENCE BOOKS:**

- 1. Douglas Eadline, "Hadoop 2 Quick-Start Guide: Learn the Essentials of Big Data Computing in the Apache Hadoop 2 Ecosystem", 1<sup>st</sup> Edition, Pearson Education, 2016.
- 2. Raj Kamal and Preeti Saxena, "Big Data Analytics Introduction to Hadoop, Spark, and Machine-Learning", McGraw Hill Education, 2018 ISBN: 9789353164966, 9353164966

# **REFERENCE WEB LINKS AND VIDEO LECTURES (E – RESOURCES):**

- 1. https://youtu.be/r5k-\_RLIpuA?si=zmHcoLvpBxhmc09U
- 2. https://youtu.be/-hdx-P5Xoxs?si=2l\_SOCKF2w9htHgd
- 3. https://youtu.be/pWbMrx5rVBE?si=ZOui3AUi1NJMJmJS