Lingaya's Vidyapeeth

Deemed-to-be-University u/s 3 of UGC Act 1956, Government of India
NAAC ACCREDITED
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COURSE PLAN & COURSE DATA SHEET

PROGRAM: BSC	DEGREE: BSC
COURSE: Software Engineering	SEMESTER: 4th CREDITS: 4
COURSE CODE: BSC-212 REGULATION:	COURSE TYPE: CORE
COURSE AREA/DOMAIN: Computer Applications	CONTACT HOURS: 56
CORRESPONDING LAB COURSE CODE (IF ANY): -	LAB COURSE NAME (IF ANY): -

PROGRAM EDUCATIONAL OBJECTIVES:

Program Educational Objectives for a Software Engineering program are statements that describe the expected accomplishments of graduates within a few years after graduation. These objectives focus on the career and professional achievements of graduates.

1. **Continuous Learning and Adaptation:** Graduates will engage in lifelong learning, staying abreast of emerging technologies and methodologies in software engineering. They will adapt to evolving industry trends, allowing them to contribute effectively to the ever-changing landscape of software development.
2. **Ethical and Social Responsibility:** Graduates will uphold high ethical standards in their professional practices, considering the societal impact of their work. They will demonstrate an awareness of and commitment to addressing ethical considerations, such as privacy, security, and inclusivity in software development.
3. **Leadership and Entrepreneurship:** Graduates will exhibit leadership skills in software engineering projects, whether leading a team or taking initiative as an individual contributor. They may also demonstrate entrepreneurship by identifying opportunities, creating innovative solutions, and contributing to the growth of the software industry.

SYLLABUS:

UNIT	DETAILS	HOURS
I	**INTRODUCTION:** Introduction to Software Engineering, Definition of Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Engineering Processes, Similarity and Differences from Conventional Engineering Processes, Applications, Software Myths. Software Development Life Cycle Model: Water Fall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models.	12
II	**SOFTWARE REQUIREMENT SPECIFICATIONS:** Requirement Engineering Process: Elicitation, Analysis, Documentation, Review and Management of User Needs, Feasibility Study, Information Modeling, Data Flow Diagrams, Control Flow Model, SRS Document, IEEE Standards for SRS, Data Dictionary.	10
III	**SOFTWARE DESIGN:** Basic Concept of Software Design, Architectural Design, Low Level Design: Modularization, Design Structure Charts, Flow Charts, Coupling and Cohesion Measures, Design Strategies: Function Oriented Design, Top-Down and Bottom-Up Design.	12
IV	**CODING & SOFTWARE TESTING & MAINTENANCE:** Top-Down and Bottom –Up programming, structured programming, Code Inspection, Compliance with Design and Coding Standards. Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Top-Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Alpha and Beta Testing of Products. Need for Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.	11
V	**SOFTWARE MEASUREMENT & MATRICES:** Function Point (FP) Based Measures, Cyclomatic Complexity Measures: Control Flow Graphs. Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. Quality Assurance, Quality Control, Software Quality Attributes, Software Quality Assurance (SQA): Verification and Validation.	11
	TOTAL HOURS	56

Teacher Centric Approach **TC1: Chalk and Talk, TC2: PPT, TC3: Video Lectures TC4: Blended learning**
Learner Centric Approach: **LC1: Assignment. LC2: Mini project. LC3: Quiz/Class test. LC 4: Seminar on recent trends.** **LC5: Group Task. LC6: Others**

DETAILED SESSION PLAN

Lecture session/ Number	Topics to be covered	CO addressed	Teacher Centric Approach	Learner Centric Approach	References	Relevance with POs and PSOs
1	Introduction to Software Engineering, Definition of Software Engineering, Software Components		TC1, TC2	LC1,LC3	T1/T2/W1	PO1,PO2,PO3, PSO1,PSO2
2	Software Characteristics, Software Crisis, Software Engineering Processes		TC1,TC2	LC1,LC3	T1/R3/W1	PO1,PO3, PSO1,PSO2
3	Similarity and Differences from Conventional Engineering Processes, Applications		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2,PO3
4	Software Myths. Software Development Life Cycle Model		TC1,TC2	LC1,LC3	T2/W3	PO1,PO4,PO5, PSO1,PSO2
5	Water Fall Model		TC1,TC2	LC1,LC3	T1/R2/W3	PO2,PO3,PO4, PSO1,PSO3

6	Prototype Model, Spiral Model		TC1	LC3	T1/T3/W2	PO1,PO2,PSO2,PSO3
7	Evolutionary Development Models, Iterative Enhancement Models.		TC1,TC2	LC1,LC3	T1/R2	PO4,PO5, PSO1,PSO3
8	Requirement Engineering Process		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2
9	Elicitation, Analysis, Documentation, Review		TC1,TC2	LC1,LC3	T2/R2/W3	PO1,PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3
10	Management of User Needs, Feasibility Study		TC1,TC2	LC1,LC3	T1/R2/W1	PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3
11	Information Modeling, Data Flow Diagrams, Control Flow Model		TC1,TC2	LC1,LC3	T1/R1/W1	PO1,PO2,PO4,PO5, PSO1,PSO3
12	SRS Document, IEEE Standards for SRS		TC1,TC2	LC1,LC3	T2/W1	PO4,PO5, PSO2,PSO3
13	Data Dictionary.		TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO5, PSO1,PSO2
14	Basic Concept of Software Design, Architectural Design		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2,PO3,PO4,PO5,PSO1,PSO2,PSO3
15	Low Level Design: Modularization, Design Structure		TC1,TC3	LC1,LC3	T1/T2/W3	PO4,PO5,PSO2,PSO3
16	Flow Charts, Coupling and Cohesion Measures		TC1,TC2	LC1,LC3	T1/T2/W1	PO2,PO3,PO4,PO5,PSO1,PSO2,PSO3
17	Design Strategies: Function Oriented Design		TC1,TC2	LC1,LC3	T1/R2/W1	PO1,PO2,PO4,PSO1,PSO2,PSO3
18	Top-Down and Bottom-Up Design		TC1,TC2	LC1,LC3	T1/R1	PO1,PO2,PO4,PSO1,PSO2,PSO3

19	Top-Down and Bottom –Up programming, structured programming	TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO4,PSO1,PSO2,PSO3
20	Code Inspection, Compliance with Design and Coding Standards.	TC1,TC2	LC1,LC3	T2/W3	PO1,PO2,PO4,PSO1,PSO2,PSO3
21	Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing	TC1,TC2	LC1,LC3	T1/T2/W1	PO1,PO2,PO4,PSO1,PSO2,PSO3
22	Regression Testing, Top-Down and Bottom-Up Testing Strategies	TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO4,PSO1,PSO2,PSO3
23	Test Drivers and Test Stubs	TC1,TC2	LC1	T2/W3	PO1,PO2,PO4,PSO1,PSO2,PSO3
24	Structural Testing (White Box Testing), Functional Testing (Black Box Testing)	TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO4,PSO1,PSO2,PSO3
25	Alpha and Beta Testing of Products Need for Maintenance	TC1,TC2	LC1,LC3	T2/R1/W1	PO2,PO3,PO4,PSO2,PSO3
26	Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re-Engineering, Reverse Engineering.	TC1,TC2	LC1,LC3	T1/R1/W3	PO1,PO2,PO3,PO4 PSO1,PSO2
27	Function Point (FP) Based Measures	TC1,TC2	LC1,LC3	T1/R2	PO1,PO2

28	Function Point (FP) Based Measures		TC1,TC2	LC1,LC3	T1/R1/W3	PO1,PO2,PO3,PO4 PSO1,PSO2
29	Function Point (FP) Based Measures		TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO3,PO4 PSO1,PSO2
30	Cyclomatic Complexity Measures: Control Flow Graphs.		TC1, TC2	LC1,LC3	T1/T2/W1	PO1,PO2,PO3, PSO1,PSO2
31	Cyclomatic Complexity		TC1,TC2	LC1,LC3	T1/R3/W1	PO1,PO3, PSO1,PSO2
32	Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2
33	Estimation of Various Parameters		TC1,TC2	LC1,LC3	T2/W3	PO1,PO4,PO5, PSO1,PSO2
34	Constructive Cost Models (COCOMO), Resource Allocation Models		TC1,TC2	LC1,LC3	T1/R2/W3	PO2,PO3,PO4, PSO1,PSO3
35	Constructive Cost Models		TC1	LC3	T1/T3/W2	PO1,PO2,PSO2,PSO3
36	Software Risk Analysis and Management. , Quality Assurance, Quality Control, Software Quality Attributes		TC1,TC2	LC1,LC3	T1/R2	PO4,PO5, PSO1,PSO3
37	Software Quality Assurance (SQA): Verification and Validation		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2,PO3,PO4,PO5,PSO1
38	SDLC implications		TC1,TC2	LC1,LC3	T2/R2/W3	PO1,PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3
39	Characteristics and significance of software engineering in recent times		TC1,TC2	LC1,LC3	T1/R2/W1	PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3

40	Agile software development		TC1,TC2	LC1,LC3	T1/R1/W1	PO1,PO2,PO4,PO5, PSO1,PSO3
41	Design pattern		TC1,TC2	LC1,LC3	T2/W1	PO4,PO5, PSO2,PSO3
42	Software development		TC1,TC2	LC1,LC3	T1/W1	PO1,PO2,PO5, PSO1,PSO2
43	Software architecture		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2,PO3,PO4,PO5,PSO1,PSO2,PSO3
44	Object oriented programming and SDLC		TC1,TC3	LC1,LC3	T1/T2/W3	PO4,PO5,PSO2,PSO3
45	Algorithms and data structures		TC1, TC2	LC1,LC3	T1/T2/W1	PO1,PO2,PO3, PSO1,PSO2
46	Implication of database management systems		TC1,TC2	LC1,LC3	T1/R3/W1	PO1,PO3, PSO1,PSO2
47	Web development		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2,PO3
48	Mobile application development		TC1,TC2	LC1,LC3	T2/W3	PO1,PO4,PO5, PSO1,PSO2
49	Software testing		TC1,TC2	LC1,LC3	T1/R2/W3	PO2,PO3,PO4, PSO1,PSO3
50	Quality assurance		TC1	LC3	T1/T3/W2	PO1,PO2,PSO2,PSO3
51	Continuous integration		TC1,TC2	LC1,LC3	T1/R2	PO4,PO5, PSO1,PSO3
52	Continuous development		TC1,TC2	LC1,LC3	T1/R2	PO1,PO2
53	Cloud computing and its structure		TC1,TC2	LC1,LC3	T2/R2/W3	PO1,PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3
54	Cyber ethics and security		TC1,TC2	LC1,LC3	T1/R2/W1	PO2,PO3,PO4,PO5, PSO1,PSO2,PSO3
55	Revision class		-	-	-	-
56	Final assessment		-	-	-	-

TEXT/REFERENCE BOOKS:

T/R	BOOK TITLE/AUTHORS/PUBLICATION
1	Pressman Roger S., "Software Engineering – A Practitioner's Approach", 6th Edition, McGraw Hill, 2004.
2	K.K Agarwat, "Software Engineering", 3rd Edition, New Age International Publishers, 2008
3	Aggarwal KK, Singh, Yogesh, "Software Engineering", New Age International, 2000.
4	Jalote Pankaj,"An Integrated Approach to Software Engineering", 3rd edition, Narosa, 2005.
5	Sommerville Ian, Pearson Education, "Software Engineering", 5th edition, Addison Wesley, 1999

 # WEB SOURCE REFERENCES (W):

1	Geeksforgeeks
2	www.coursera.com
3	www.simplilearn.com

COURSE PRE-REQUISITES:

C.CODE	COURSE NAME	DESCRIPTION	SEM
-	Knowledge of computer programming	-	-
-	Principles of management	-	-

COURSE OBJECTIVES:

1. **Ethical and Social Responsibility:** Graduates will recognize the ethical implications of IoT technologies and demonstrate a commitment to responsible and ethical practices in the design, implementation, and use of IoT systems. They will also consider the societal impact of IoT applications.
2. **Lifelong Learning:** Graduates will have a foundation for continuous learning and professional development in the rapidly evolving field of IoT. They will stay informed about emerging technologies, standards, and best practices throughout their careers.
3. **Entrepreneurship and Leadership:** Graduates will have the skills and mindset to explore entrepreneurial opportunities in the IoT ecosystem. They will also exhibit leadership qualities, capable of guiding teams and making informed decisions in the dynamic IoT landscape.
4. **Global and Cultural Awareness:** Graduates will understand the global implications of IoT technologies and be aware of cultural considerations when developing and deploying IoT solutions in diverse international settings.
5. **Environmental Sustainability:** Graduates will consider environmental sustainability in IoT design and implementation. They will be conscious of energy efficiency, resource utilization, and the environmental impact of IoT solutions.

COURSE OUTCOMES:

S.NO	DESCRIPTION	PO(1..12) MAPPING	PSO(1..3) MAPPING
CO1	To learn the basic concepts of software engineering.	PO1,PO2,PO3,PO11	PSO1
CO2	To know about the requirements and process to engineer the software.	PO1,PO2,PO3,PO11	POS1,PSO2
CO3	To learn how to design a software & what are its strategies.	PO1,PO2,PO11	PSO2,PSO3
CO4	To aware about the coding, testing & maintenance of software	PO1,PO2 ,PO11	PSO1,PSO3
CO5	To know about different metrics used for software evaluation.	PO1,PO2,PO11	PSO3
COURSE OVERALL PO/PSO MAPPING:			

COURSE OUTCOMES VS POs MAPPING (DETAILED; HIGH:3; MEDIUM:2; LOW:1)**:**

S.NO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2	PSO3
CO1	1	1	1	-	-	-	-	-	-	-	2	-	2	-	-
CO2	1	1	1	-	-	-	-	-	-	-	1	-	1	2	-
CO3	2	1	-	-	-	-	-	-	-	-	1	-	-	1	1
CO4	1	1	-	-	-	-	-	-	-	-	1	-	1	-	1
CO5	1	1	-	-	-	-	-	-	-	-	1	-	-	-	1

** For Entire Course, PO & PSO Mapping*

POs & PSO REFERENCE:

PO1	Engineering Knowledge	PO7	Environment & Sustainability	PSO1	To equip the students with theoretical and implementation knowledgebase in all the latest areas of Computer Science & Engineering for a successful career in software industries, pursuing higher studies, or entrepreneurial establishments.
PO2	Problem Analysis	PO8	Ethics	PSO2	To nurture the students with the critical thinking abilities for better decision making by offering them a socially acceptable solutions to real life problems through computing paradigm.
PO3	Design & Development	PO9	Individual & Team Work	PSO3	To nurture the students with the comprehensive analytical and design abilities by offering them techno-commercially feasible solutions of real business problems through computing.
PO4	Investigations	PO10	Communication Skills		
PO5	Modern Tools	PO11	Project Mgt. & Finance		
PO6	Engineer & Society	PO12	Life Long Learning		

COs VS POs MAPPING JUSTIFICATION:

S.NO	PO/PSO MAPPED	LEVEL OF MAPPING	JUSTIFICATION
Cxxx.1			
Cxxx.2			
Cxxx.3			
Cxxx.4			
Cxxx.5			
Cxxx*			

GAPS IN THE SYLLABUS - TO MEET INDUSTRY/PROFESSION REQUIREMENTS, POs & PSOs:

SNO	DESCRIPTION	PROPOSED ACTIONS
1	**Edge Computing:** Explore edge computing concepts and the role of edge devices in processing and analyzing data locally, reducing latency and bandwidth usage in IoT applications.	Need to be Covered in extra session
2	**Fog Computing:** Understand fog computing as an extension of cloud computing that brings computation closer to the data source, enabling real-time processing and analysis in distributed IoT environments.	Need to be Covered in extra session
3	**Blockchain and IoT Security:** Investigate how blockchain technology can enhance security in IoT applications, ensuring data integrity, authentication, and secure transactions in decentralized IoT networks.	Need to be Covered in extra session
4	**5G and IoT Connectivity:** Study the impact of 5G networks on IoT connectivity, including increased data rates, low latency, and the ability to connect a massive number of devices	Need to be Covered

	simultaneously.	in extra session
5	**Digital Twins:** Explore the concept of digital twins, which involves creating virtual models of physical objects or systems in the IoT, enabling monitoring, analysis, and simulation for improved decision-making.	Need to be Covered in extra session

PROPOSED ACTIONS: TOPICS BEYOND SYLLABUS/ASSIGNMENT/INDUSTRY VISIT/GUEST LECTURER/NPTEL ETC

 # TOPICS BEYOND SYLLABUS/ADVANCED TOPICS/DESIGN:

1	Explore edge computing concepts and the role of edge devices in processing and analyzing data locally, reducing latency and bandwidth usage in IoT applications.
2	Understand fog computing as an extension of cloud computing that brings computation closer to the data source, enabling real-time processing and analysis in distributed IoT environments.
3	Investigate how blockchain technology can enhance security in IoT applications, ensuring data integrity, authentication, and secure transactions in decentralized IoT networks.
4	Study the impact of 5G networks on IoT connectivity, including increased data rates, low latency, and the ability to connect a massive number of devices simultaneously.
5	Explore the concept of digital twins, which involves creating virtual models of physical objects or systems in the IoT, enabling monitoring, analysis, and simulation for improved decision-making.

DELIVERY/INSTRUCTIONAL METHODOLOGIES:

☐ CHALK & TALK	☐ STUD. ASSIGNMENT	☐ WEB RESOURCES	☐ NPTEL/OTHERS
☐ LCD/SMART BOARDS	☐ STUD. SEMINARS	☐ ADD-ON COURSES	☐ WEBNIARS

ASSESSMENT METHODOLOGIES-DIRECT

☐ ASSIGNMENTS	☐ STUD. SEMINARS	☐ TESTS/MODEL EXAMS	☐ UNIV. EXAMINATION
☐ STUD. LAB PRACTICES	☐ STUD. VIVA	☐ MINI/MAJOR PROJECTS	☐ CERTIFICATIONS
☐ ADD-ON COURSES	☐ OTHERS		

ASSESSMENT METHODOLOGIES-INDIRECT

☐ ASSESSMENT OF COURSE OUTCOMES (BY FEEDBACK, ONCE)	☐ STUDENT FEEDBACK ON FACULTY (TWICE)
☐ ASSESSMENT OF MINI/MAJOR PROJECTS BY EXT. EXPERTS	☐ OTHERS

 # INNOVATIONS IN TEACHING/LEARNING/EVALUATION PROCESSES:

1. **Technology Integration:** Embrace and integrate technology tools in the classroom to enhance the learning experience. This can include interactive whiteboards, educational apps, virtual reality, and online collaboration platforms. Utilizing technology allows for more dynamic and interactive lessons, catering to diverse learning styles.

2. **Personalized Learning Paths:** Implement personalized learning approaches that cater to individual student needs and pace of learning. Adaptive learning platforms and data analytics can help tailor educational content, assignments, and assessments based on the strengths and weaknesses of each student, promoting a more customized learning experience.
3. **Active Learning Strategies:** Move away from traditional lecture-based approaches and incorporate active learning strategies. This involves engaging students in hands-on activities, group discussions, problem-solving exercises, and real-world projects. Active learning fosters critical thinking, collaboration, and practical application of knowledge.
4. **Blended Learning Models:** Adopt blended learning models that combine face-to-face instruction with online resources. This allows for flexibility in learning, enabling students to access materials at their own pace outside the classroom. Flipped classrooms, where students learn new concepts online and engage in discussions and activities during class, are an example of a blended learning approach.
5. **Assessment Innovation:** Rethink assessment methods to go beyond traditional exams and quizzes. Explore alternative forms of assessment, such as project-based assessments, portfolios, presentations, and peer assessments. Additionally, incorporate formative assessments and feedback throughout the learning process to help students track their progress and make improvements.

Prepared by
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Approved by
(HOD)