Government of Maharashtra
GOVERNMENT POLYTECHNIC, NAGPUR
(An Autonomous Institute of Govt. of Maharashtra)
Near Mangalwari Bazar, Sadar, Nagpur-440001

COURSE CURRICULUM

Program	:	Diploma in IT
Course Category	:	DSC
Course Code	:	IT301H
Course Title	:	Software Engineering

I   Rationale:

Software engineering serves as the foundation for professional processes, encompassing the principles, techniques, and practices essential for software development. This course offers a comprehensive framework that guides software professionals in building high-quality, reliable products. It empowers students to combine domain-specific knowledge with strong programming skills to create robust software solutions. Additionally, the course focuses on developing scalable methods and procedures that can be applied consistently to produce efficient, high-quality software for large systems.

II   Industry Identified Competency:

The Student will be able to do in Industry at entry level:

Use the principles and administration of Software Engineering for software development in AIML

III   Course Outcomes (COs):

After completing this course students will be able to:

CO1: **Identify** suitable software model for software development

CO2: **Prepare** software requirement specifications

CO3: **Develop** Software schedule and model with realistic constraints

CO4: **Apply** software modeling and data design concepts in software development

CO5: **Estimate** time, size and cost for software product

CO6: **Identify** project management and quality assurance techniques in software development.

IV   Learning Scheme:

Classroom Learning (CL)	Tutorial Learning (TL)	Laboratory Learning (LL)	Self-Study Learning (SL)	Notional Learning Hours (NLH)	Credits
3	-	2	1	6	3

V   Assessment Scheme:

Classroom Learning				Tutorial/Laboratory Learning				Self-Study Learning	
FA	SA	Total		FA		SA		SA	
Max	Max	Max	Min	Max	Min	Max	Min	Max	Min
30	70	100	40	25	10	25+	10	25	10

VI   Classroom Learning Content:

Unit No	Specific Learning Outcomes (SLO) (In Cognitive Domain)		Topics and Sub-topics		Aligned Cos
I: Software and Its Development Process	1a	Justify features of given Software process model.	1.1	Software Engineering – Definition of Software, Types of software, Nature of Software, Software engineering, software engineering as layered approach, Software Myth.	CO1
	1b	Use given Software process framework activity for given scenario.	1.2	General process Model-Software process framework activity.	
	1c	Apply Selection criterion for given software process model.	1.3	Process Model- Waterfall Model, Incremental Model Spiral Model, Prototype Model, RAD Model.	
	1d	Apply concepts of Agile Model for given scenario.	1.4	Agile Software Development: Agility, cost of change, Principles, Human Factors.	

UNIT					
UNIT	1e	Identify Selection criterion for given software process model.	1.5	Selection criterion for software process model, Project Management Concepts :4P's, W5HH principles.	
UNIT II: Requirement Engineering	2a	Use given software principles for software development.	2.1	Software engineering practices, Core Principles , Software crisis, Software Process,	CO2
	2b	Apply suitable software process for given scenario.	2.2	Software Process-Communication Practice, Planning Practice, Modeling Practice, Construction Practice, Deployment Practice (Statement and the meaning of each principle)	
	2c	Apply Requirement engineering technique for given scenario.	2.3	Requirement Engineering-Requirement gathering and analysis, Types of requirements (Functional Products, organizational, External Requirements) Eliciting requirements	
	2d	Prepare SRS document for given scenario.	2.4	SRS- Software Requirement Specification, Needs of SRS, Format , Characteristics	
I: Scheduling and Modeling	3a	Solve given scheduling Problem.	3.1	Project Scheduling, Task set and Task network, Project Tracking-GANTT chart, Scheduling Techniques- PERT (Project Evaluation review Technique) CPM	CO3
	3b	Develop given requirement modeling diagram for given scenario.	3.2	Requirement Modeling Strategies, Data Modeling, Entity Relationship Diagrams (ER Diagram)	
	3c	Develop given Flow Oriented Modeling diagram for given scenario.	3.3	Flow Oriented Modeling – Data Flow Diagrams (DFD), Behavioral Modeling- Use case diagram, State Transition DIAGRAM	

UNIT II:	3d	Use given patterns for software development.	3.4	Patterns - Patterns of requirement Modeling, Discovering analysis pattern, Requirement Pattern Example: Actuator-Sensor	
	3e	Develop given diagram for given scenario	3.5	Sequence diagram, Activity Diagram	
UNIT IV: Modeling and Design	4a	Use given software quality guidelines for software development	4.1	Design Process, Software quality guidelines for design, Software quality attributes, Evolution of software design, Design concepts	CO4
	4b	Identify design modeling concepts for given scenario	4.2	Design Modeling: Fundamental Design concepts (Abstraction, Information hiding, Structure, Modularity, Functional Independence, Architecture)	
	4c	Identify Object Oriented Design Concepts for given scenario.	4.3	Object Oriented Design Concepts-Design Classes and Characteristics of design classes, Design Model	
	4d	Design software for given Problem statement.	4.4	Data design elements: Architectural Design Elements, Interface Design Elements, Component-Level Design elements, Deployment- Level Design Elements	
V: Project Metrics and Estimation	5a	Analyse given terms.	5.1	Metrics –Process Metrics, Project Metric	CO5
	5b	Compare given metrics on given points.	5.2	Software Measurements- Size oriented Metric, Function oriented Metric,	
	5c	Identify Metrics for given given scenario.	5.3	Metric for software quality, Metrics for small organizations	
	5d	Apply given Risk concept for given problem statement.	5.4	Software Risks-Risk Identification, Risk Projection, Risk Refinement, RMMM (Mitigation Monitoring, Management)	

UNIT \	5e	Estimate the cost of given software product	5.5	Estimation – Software scope, software feasibility, Resources, Software projects estimation, Decomposition techniques	
UNIT VI: Software Quality Assurance	6a	Use given quality dimension for software development.	6.1	Quality Dimensions-Garvin's Quality Dimensions, Quality Factors- McCall's Quality Factors, ISO 9126 QUALITY FACTORS	CO6
	6b	Justify the given terms of Software Quality Assurance	6.2	Software quality Assurance (SQA)-Elements of SQA, Tasks of SQA, Goals of SQA, Formal Approach, Statistical Software quality assurance	
	6c	Identify need of given term for given scenario	6.3	Six Sigma For software engineering,Software reliability, Software safety THE ISO 9000 QUALITY STANDARDS.	
	6d	Identify the role of given phases of Software Quality Assurance in given scenario.	6.4	Phases of Software Quality Assurance- Planning, Phase, Activities Phase, Audit phase, review phase	

VII   Laboratory Learning Content:

Unit No		Specific Learning Outcomes (SLO) (In Psychomotor Domain)	Hours	Aligned COs
I	1	Identify suitable software development model for the various scenario.	2#	CO1
I	2	Identify number functional and non-functional requirements for various scenario.	2	CO1
II	3	Prepare Software Requirement Specification (SRS) document for the project management system.	2#	CO2
III	4	Develop USE case diagrams for various scenario.	2#	CO3
III	5	Develop E-R (Entity Relationship) diagram.	2#	CO3
III	6	Develop DFD (Data Flow Diagram) .	2#	CO3
III	7	Develop a Sequence diagram for various problem statement.	2	CO3
III	8	Develop project scheduling for system using GANTT chart and PERT chart.	2#	CO3
IV	9	Apply software modeling and data design concepts in software development.	2#	CO4
V	10	Estimate time, size and cost for software product.	2#	CO5
V	11	Estimate risk and Perform RMMM (Risk Monitoring Mitigation and Management).	2#	CO5
V	12	Estimate scope and feasibility of a various system in terms of technical aspects.	2	CO5
V	13	Estimate risk and impact factor for a various system.	2#	CO5
VI	14	Identify Software Quality Assurance techniques performed during different phases of a project for various system.	2#	CO6
VI	15	Perform Mini project, considering AI and ML problems for software engineering .	2#	CO6

Note: # Compulsory

VIII Self-Study Learning (SLO in Cognitive/Psychomotor/Affective Domain)

1. Apply concept of RAD model and incremental model on Library Information Management System to develop software within 2-3 months and submit report.

2. Apply concept of RAD model and incremental model on Online shopping system to develop software within 2-3 months and submit report.

3. Prepare SRS document for ATM System and submit report.

4. Prepare SRS document for Water vending   System and submit report.

5. Prepare SRS document for Online Pharmacy System and submit report.

6. Prepare GANTT chart and PERT chart , for any social media system considering own data.

7. Prepare GANTT chart and PERT chart , for online food delivery system considering own data.

8. Prepare GANTT chart and PERT chart , for online banking system delivery system considering own data.

9. Use concept of RMMM for management of late delivery softwares risk by identifying, forecasting risks, submit report.

10. Use concept of RMMM for management of out of budget risk by identifying, forecasting risks, submit report.

11. Prepare any microproject based on curriculum content and submit report.

IX Specification Table for Classroom Learning Assessment:

Unit No.	Units	Classroom Learning Hours	C/O	Levels from Cognition Process Dimension			Total Marks
				R	U	A	
1	Software and Its Development Process	6	C	2	4	00	6
			O	0	0	4	4
2	Requirement Engineering	6	C	2	0	12	14
			O	4	0	4	8
3	Scheduling and Modeling	10	C	4	4	10	18
			O	2	4	0	6
4	Modeling and Design	7	C	02	4	10	16
			O	00	04	6	10
5	Project Metrics and Estimation	10	C	2	04	04	10
			O	00	00	06	6
6	Software Quality Assurance	6	C	02	4	00	6
			O	2	4	0	6
Total		45	C	14	20	36	70
			O	8	12	20	40

*C - Compulsory   O - Optional
*R – Remember   U – Understand   A – Analyze / Apply

X Question Paper Format for Summative Assessment (SA):

Q. No.	Bit 1	Bit 2	Bit 3	Bit 4	Bit 5	Bit 6	Bit 7	Options	
	TLM	TLM	TLM	TLM	TLM	TLM	TLM	C	O
1	1R2	2R2	4R2	5R2	6R2	3R2	6R2	5	7
2	1U4	5U4	3R4	2R4	4U4			3	5
3	3A4	4A4	4U4	1A4	2A4			3	5
4	5A4	3U4	6U4	6U4	3U4			3	5
5	2A6	3A6	4A6					2	3
6	2A6	4A6	5A6					2	3

*T- Unit/Topic Number   L- Level of Question   M- Marks
*R – Remember   U – Understand   A – Analyze / Apply
*1R2 means Unit Number No- 1, Level of Question –Remember, Marks – 2 Marks

XI Scheme of Laboratory Formative Assessment (FA):

S.N.	Criteria	Max. Marks
1	Drawing diagram/flowchart,Selection of suitable developmental model	5
2	Performance	10
3	Use of techniques ,design, guidelines, principles	5
4	Viva Voce	5
	TOTAL	25

XII Scheme of Self-Learning Summative Assessment (SA):

S.N.	Criteria	Max. Marks
1	Selection of Topic	5
2	Design/ Architect/ flowchart/Process	5
3	Imlementation	10
4	Documentation & Reporting	5
	TOTAL	25

XIII COs-POs/PSOs Mapping Matrix:

Course Outcomes	Program Outcomes							Program Specific	
	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PSO1	PSO2
CO1	3	-	-	3	-	3	3	3	-
CO2	3	-	-	3	-	3	3	3	-
CO3	3	-	2	3	-	3	3	3	-
CO4	3	-	2	3	-	3	3	3	-
CO5	3	-	-	3	-	3	3	3	-
CO6	3	-	2	3	-	3	3	3	-

XIV Textbooks, BIS Codes References:

S.N.	Title	Author, Publisher, Edition and Year of Publication	ISBN Number
1	Project Management: Engineering, Technology and Implementation	Shtub, A. Bard, J. F. and Globerson, S, Prentice Hall.	10:0131027654
2	Software Engineering – a practitioner's approach	Roger S. Pressman, Tata McGraw Hill Publication, Seventh, 2010	13:9780073375977
3	Software Engineering –Principles and Practice	Waman S. Jawadekar, Tata McGraw Hill Publication, 2004	10: 0070583714

XV e-References:

1. https://www.youtube.com/watch?v=Ln_LP7c23WM&list=PLbRMhDVUMngf8oZR3DpKMvYhZKga90JVt assesed on 20th August 2024
2. http://www.tutorialspoint.com/software_engineering/software_engineering_tutor assesed on 20th August 2024
3. http://www.resource.mitfiles.com/IT/II%20year/IV%20sem/Software%20Engin assesed on 20th August 2024
4. https://www.tutorialspoint.com/software_engineering/software_project_manage assesed on 20th August 2024

XVI List of Major Equipment/Machineries with Specification:

1.   COMPUTER SYSTEM
2.   i3/256GB/4GB/windows10

XVII List of Industry Experts and Faculties who contributed for this curriculum:

S.N.	Name	Designation	Institute / Industry
1	Dr. A. R.Mahajan	HOD, Information Technology	Govenment Polytechnic,Nagpur
2	Mr Deepak Dhote	Operations Manager	IT Networkz Pvt. Ltd. Nagpur
3	DR Rakesh Kadu	Assistant Professor	Ramdeobaba College of Engineering and Management , Nagpur
4	Mrs V A Raje	System Analyst	MSBTE, RO, Nagpur
5	Mr Lokesh L Bhadekar	Lecturer in Information Technology	Govenment Polytechnic,Nagpur

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