GOVERNMENT POLYTECHNIC, NAGPUR.
(An Autonomous Institute of Govt. of Maharashtra)

COURSE CURRICULUM

PROGRAMME   **: DIPLOMA IN IT/CM**

LEVEL NAME   **: PROFESSIONAL COURSES**

COURSE CODE   **: IT406E$^\$$**

COURSE TITLE   **: SOFTWARE ENGINEERING**

PREREQUISITE   **: NIL**

TEACHING SCHEME: TH: 04; TU: 00; PR: 02(CLOCK HRs.)

TOTAL CREDITS   **: 05 (1 TH/TU CREDIT = 1 CLOCK HR., 1 PR CREDIT = 2 CLOCK HR.)**

TH.TEE   **: 03 HRs**

PR.TEE   **: 02 HRs (External)**

PT.   **: 01 HRs**

❖ **RATIONALE:**

Today, in the world of technology computer software is the most imperative technology. When computer software succeeds ie, when it meets the needs of the people who use it, when it performs flawlessly over a long period of time, when it is easy to modify and even easier to use it can and does change things for the better. But when software fails ie, when its users are dissatisfied, when it is error prone, when it is difficult to change and even harder to use bad things can and do happen. To succeed, we need discipline when software is designed and built. We need an engineering approach.

Many decisions are required throughout the software development process. Software Engineering is the basis for Software development. Software Engineering helps to cover up a path towards easier, swift, and less expensive methods to build and maintain high quality software also build decision making power in students.

❖ **COURSE OUTCOMES:**

After completing this course students will be able to–

1. Identify risk in development process.

2. Plan and observe project estimation.

3. Apply requirement modeling strategies.

4. Use basic design principles, guidelines and process model to develop project.

5. Follow ISO 9000 Quality Standards.

6. Prepare/ design Software Requirement Specification (SRS).

❖ **COURSE DETAILS:**

A. THEORY :

Units	Specific Learning Outcomes (Cognitive Domain)	Topics and subtopics	Hrs.
1. Software Engineering, The Software Process	1. State Software Crises & Myths. 2. State the Software Engineering principles. 3. State features of different models. 4. Compare different models. 5. State the advantages and disadvantages of different models. 6. State WSHH principle. 7. Define 4P's terms.	1.1 The Nature of Software, Software Engineering, the Software Process, Software Engineering Practice, Software Crises & Myths. 1.2 Process Models: A Generic Process Model, Process Assessment and Improvement, Prescriptive Process Models: Waterfall, Incremental Model RAD, Prototyping, Spiral Model. 1.3 Agile Development: What Is Agility? Agility and the Cost of Change, Agile Process, Agility Principles, Human Factors. 1.4 Project management concepts: People, Product, Process, and Project. WSHH principle, critical practice.	10
2. Software Projects Management	1. Propose estimation for given project. 2. Identify risk and do refinement. 3. State the role of Repository. 4. State SCM Features. 5. Identify different objects in software configuration process. 6. State the need of risk management. 7. Apply the steps to mitigate the risk.	2.1 Metrics in the Process and Project Domains, Software Measurement, Metrics for Software Quality, Integrating Metrics within the Software Process, Metrics for Small Organizations 2.2 Observations on Estimation, The Project Planning Process, Software Scope and Feasibility, Resources, Software Project Estimation, Decomposition Techniques 2.3 Software risks: identification, risk Projection, Refinement, Risk Mitigation, Monitoring, and Management (RMMM) 2.4 Software Configuration Management: The SCM Repository, The Role of the Repository , General Features and Content, SCM Features, The SCM Process: Identification of Objects in the Software Configuration, Version Control, Change Control	10

3. Software Requirement and Scheduling	1. State requirements need & Characteristics. 2. State the components of and design SRS document. 3. Apply different project scheduling techniques. 4. Apply Project Scheduling Techniques for given scenario. 5. Draw Gantt chart.	3.1 Requirements Engineering, Need of SRS, Characteristics of SRS, Components of SRS 3.2 The structure of SRS document, SRS validation. 3.3 Establishing the Groundwork, Eliciting Requirements, Developing Use Cases, Validating Requirements. 3.4 Project Scheduling: Concepts. Peoples Efforts. Task set, Task network. 3.5 Project Scheduling Techniques- Need, Concept of Gantt chart, Programme Evaluation Review Technique (PERT), and Critical Path Method (CPM) and Earned Value (EV) analysis.	12
4. Requirements Modeling	1. Design Data Flow Model. 2. Use case diagram. 3. Design a Behavioral Model. 4. Draw state and sequence diagram. 5. Apply Requirements Modeling Strategies.	4.1 Requirements Modeling Strategies 4.2 Building the Analysis Model: Data Modeling Concepts. 4.3 Flow- Oriented Modeling: Creating a Data Flow Model: Creating a Control Flow Model, the Control Specification, and the Process Specification. 4.4 Creating a Behavioral Model: Identifying Events with the Use Case, State Representations. 4.5 Patterns for Requirements Modeling: Discovering Analysis Patterns, a Requirements Pattern Example: Actuator-Sensor. 4.6 Scenario- Based Modeling- Use Case Diagram.	10
5. Design Concepts	1. Apply design principles. 2. Apply Software Quality Guidelines and Attributes. 3. State different Design Elements.	5.1 Design within the Context of Software Engineering 5.2 The Design Process, Software Quality Guidelines and Attributes, The Evolution of Software Design 5.3 Design Concepts: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Refinement , Aspects, Refactoring, Object-Oriented Design Concepts, Design Classes 5.4 The Design Model, Data Design Elements, Architectural Design	12

		Elements Interface Design Elements, Component-Level Design Elements, Deployment-Level Design Elements. 5.5 Designing Class-Based Components: Basic Design Principles, Component-Level Design Guidelines, Cohesion, Coupling	
6. Software Quality Management	1. State different McCall's Quality Factors. 2. Apply project Management Techniques. 3. State different Elements of Software Quality Assurance. 4. State measures of s/w Reliability and Availability 5. State ISO 9000 Quality Standards.	6.1.6.1.Software Quality: Garvin's Quality Dimensions, McCall's Quality Factors, ISO 9126 Quality Factors 6.2.Achieving Software Quality, Software Engineering Methods, Project Management Techniques, Quality Control, Quality Assurance. 6.3.Software Quality Assurance (SQA): Background Issues, Elements of Software Quality Assurance, SQA Tasks, Goals, and Metrics. 6.4.Formal Approaches to SQA. 6.5. Statistical Software Quality Assurance: A Generic Example, Six Sigma for Software Engineering. 6.6. Software Reliability: Measures of Reliability and Availability, Software Safety, The ISO 9000 Quality Standards, The SQA Plan. 6.7.Introduction- Reengineering & Reverse Engineering.	10
		Total Hrs.	**64**

B. LIST OF PRACTICALS/LABORATORY EXPERIENCES/ASSIGNMENTS:

Practical	Specific Learning Outcomes (Psychomotor Domain)	Units	Hrs.
1	Apply suitable software development model for the given scenario.	Software Engineering, The Software Process	02
2	Identify the objectives and summaries outcomes for given scenario, for each SDLC phase.	Software Projects Management	02
3	Design Software Requirement Specification (SRS) document for the project. Consider any project to be developed in any technology as a Software Architect or Project Manager.		04
4	Classify above identified requirement into functional and non-functional requirements.	Software Requirement and Scheduling	04
5	Design USE case diagrams for given scenario.		04
6	Create sequence diagram, state diagram for given scenario.	Requirements Modeling	04
7	Draw E-R diagram, DFD and create data dictionary for above system.		02
8	Draw Activity diagram from above system.		02
9	Identify the design principle that is being violated in relation to the given scenario. (Give any scenario)	Design Concepts	02
10	Develop three different levels of procedural abstractions for one or more of the following programs by applying a "stepwise refinement approach" to: (a) Develop a check writer that, given a numeric dollar amount, will print the amount in words normally required on a check. (b) Iteratively solve for the roots of a transcendental equation. (c) Develop a simple task scheduling algorithm for an operating system.		04
	Skill Assessment		**02**
	Total HRs		**32**

❖ **SPECIFICATION TABLE FOR THEORY PAPER:**

Unit No.	Units	Levels from Cognition Process Dimension			Total Marks
		R	**U**	**A**	
01	Software Engineering The Software Process	02(00)	04(04)	00(00)	06(04)
02	Software Projects Management	00(00)	04(04)	06(00)	10(04)
03	Software Requirement and Scheduling	02(02)	04(04)	06(00)	12(06)
04	Requirements Modeling	02(00)	08(04)	06(06)	16(10)
05	Design Concepts	02(00)	08(04)	06(06)	16(10)
06	Software Quality Management	02(02)	08(04)	00(00)	10(06)
	Total	**10(04)**	**36(24)**	**24 (12)**	**70 (40)**

R – Remember   U – Understand   A – Analyze / Apply

❖ **QUESTION PAPER PROFILE FOR THEORY PAPER:**

Q. No	Bit 1			Bit 2			Bit 3			Bit 4			Bit 5			Bit 6			option
	T	**L**	**M**	**T**	**L**	**M**	**T**	**L**	**M**	**T**	**L**	**M**	**T**	**L**	**M**	**T**	**L**	**M**	
01	1	R	2	3	R	2	4	R	2	5	R	2	6	R	2	3	R	2	5/7
	6	R	2																
02	1	U	4	2	U	4	3	U	4	1	U	4	2	U	4				3/5
03	4	U	4	4	U	4	5	U	4	3	U	4	4	U	4				3/5
04	5	U	4	6	U	4	6	U	4	5	U	4	6	U	4				3/5
05	2	A	6	3	A	6	4	A	6										2/3
06	4	A	6	5	A	6	5	A	6										2/3

T= Unit/Topic Number   L= Level of Question   M= Marks

R-Remember   U-Understand   A-Analyze/ Apply

❖ **ASSESSMENT AND EVALUATION SCHEME:**

		What	To Whom	Frequency	Max Marks	Min Marks	Evidence Collected	Course Outcomes
Direct Assessment Theory	**CA (Continuous Assessment)**	Progressive Test (PT)	Students	Two PT (average of two tests will be computed)	20	--	Test Answer Sheets	1, 2, 3
		Assignments		Continuous	10	--	Assignment Book / Sheet	1, 2, 3
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**70**	**28**	Theory Answer Sheets	1, 2, 3
				Total	**100**	**40**		
Direct Assessment Practical	**CA (Continuous Assessment)**	Skill Assessment	Students	Continuous	20	--	Rubrics & Assessment Sheets	4,5,6
		Journal Writing		Continuous	05	--	Journal	4,5,6
				TOTAL	**25**	**10**		
	TEE (Term End Examination)	End Exam	Students	End Of the Course	**50**	**20**	Rubrics & Practical Answer Sheets	4,5,6
Indirect Assessment		Student Feedback on course	Students	After First Progressive Test	Student Feedback Form			1, 2, 3, 4,5,6
		End Of Course		End Of The Course	Questionnaires			

❖ **SCHEME OF PRACTICAL EVALUATION:**

S.N.	Description	Max. Marks
1	Identify the suitable software development model, Classify the requirement into functional and non-functional requirements.	20
2	Performance	10
3	Identify the various elicitation techniques, identify design principles, Draw sequence, state, E-R diagram, DFD, Sequence and Activity diagram.	10
4	Viva voce	10
	TOTAL	**50**

❖ **MAPPING COURSE OUTCOMES WITH PROGRAM OUTCOMES:**

❖ **Computer Engineering :**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
1	-	3		-	-	-	-	-	-	3	3	3
2	-	3		-	-	-	-	-	-	3	3	3
3	-	3		-	-	-	-	-	-	3	3	3
4	-	3	2	2	-	-	-	2	2	3	3	3
5	-	3	2	2	1	-	-	2	2	3	3	3
6	-	3	2	2	-	-	-	2	2	3	3	3

❖ **Information Technology :-**

Course Outcomes	Program Outcomes (POs)										PSOs	
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**1**	**2**
1	-	3	-	-	-	-	-	-	-	3	-	3
2	-	3	-	-	-	-	-	-	-	3	-	3
3	-	3	-	-	-	-	-	-	-	3	-	3
4	-	3	2	2	-	-	-	2	2	3	-	3
5	-	3	2	2	1	-	-	2	2	3	-	3
6	-	3	2	2	-	-	-	2	2	3	-	3

1: Slight (Low) 2: Moderate (Medium) 3: Substantial (High)

❖ **REFERENCE & TEXT BOOKS:**

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,	0-13-102765-4
2.	Software Engineering – a practitioner's approach	Roger S. Pressman, Tata McGraw Hill Publication, Seventh, 2010	978–0–07–337597–7
3.	Software Engineering – Principles and Practice	Waman S. Jawadekar, Tata McGraw Hill Publication, 2004	10: 0070583714 13: 9780070583719

❖ **E-REFERENCES:**

- **http://www.tutorialspoint.com/software_engineering/software_engineering_tutorial.pdf, assessed on 04ᵗʰ August 2016**
- **http://www.resource.mitfiles.com/IT/II%20year/IV%20sem/Software%20Engineering/books/Pressman__Software_Engineering.pdf, assessed on 04ᵗʰ August 2016**
- **https://www.tutorialspoint.com/software_engineering/software_project_management.htm assessed on 14ᵗʰ October 2016**

❖ **LIST OF MAJOR EQUIPMENTS/INSTRUMENTS WITH SPECIFICATION**

NIL

❖ **LIST OF EXPERTS & TEACHERS WHO CONTRIBUTED FOR THIS CURRICULUM:**

S.N.	Name	Designation	Institute / Industry
1.	Dr. A. R. Mahajan	HOD, Information Technology	Government Polytechnic, Nagpur.
2	Mr. S.P. Lambhade	Head of Computer Engineering	Government Polytechnic, Nagpur.
3.	Ms. S. N. Chaudhari	Lecturer in Computer Engineering	Government Polytechnic, Nagpur.
4.	Ms. D. M. Shirkey	Lecturer in Computer Engineering	Government Polytechnic, Nagpur.
5.	Ms. G. B. Chavan	Lecturer in Computer Engineering	Government Polytechnic, Nagpur.
6.	Prof. Manoj Jethawa	HOD Computer Science	Shri Datta Meghe Polytechnic, Nagpur
7.	Prof. N.V.Chaudhari	Asst. Professor (CSE)	DBACEO, Wanadongari, Nagpur
8.	Mr. Atul Upadhay	CEO	Vista Computers,Ram Nagar,Nagur

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(Member Secretary PBOS)   **(Chairman PBOS)**