

AMRUTVAHINI COLLEGE OF ENGINEERING, SANGAMNER

DEPARTMENT OF INFORMATION TECHNOLOGY

SAMPLE CO-PO AND CO-PSO MAPPING FOR COURSE OPERATING SYSTEMS 2019 PATTERN

Course Summary

Subject:		Operating Systems		Course Type:		Core		
Class/Sem.		TE (IT) / V		Syllabus Pattern:		2019		
Course Code:		314442		Credits:		03		
Teaching Scheme			University Examination Scheme					
Theory	Practical	Tutorial	Theory			Lab		
(hrs/week)	(hrs/week)	(hrs/week)	Online	Insem	Endsem	Term Work	Practical	Oral
3 hrs	4 hrs	----	---	30	70	25	25	--

Course Outcomes (CO)

After successfully completing the course students will be able to,

Co. No.	Description	Bloom's Taxonomy Level
C19-302.1	Discuss. Understanding the role of Modern Operating Systems.	2
C19-302.2	Justify and Apply the concepts of process and thread scheduling.	5
C19-302.3	Select and Apply the concept of process synchronization, mutual exclusion and the deadlock.	2
C19-302.4	Understand and apply the concepts of various memory management techniques.	2
C19-302.5	Understand Make use of concept of I/O management and File system.	2

C19-302.6	Design and Implement Important of System software.	2,4
-----------	---	-----

As per AICTE, Competencies and Performance indicator

PO 1: Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization for the solution of complex engineering problems.	
Competency	Performance Indicator
1.1 Demonstrate competence in mathematical modeling	1.1.1 Apply the knowledge of discrete structures, linear algebra, statistics and numerical techniques to solve problems
	1.1.2 Apply advanced mathematical techniques to model and solve Information Technology engineering problems.
1.2 Demonstrate competence in basic sciences and engineering fundamentals	1.2.1 Apply laws of natural science to an engineering problem.
	1.2.2 Apply fundamental engineering concepts to solve engineering problems.
1.3 Demonstrate competence in specialized engineering knowledge to the program	1.3.1 Apply theory and principles of Information Technology engineering to solve an engineering problem
PO 2: Problem analysis: Identify, formulate, research literature, and analyse complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.	

2.1 Demonstrate an ability to identify and formulate complex engineering problem	2.1.1 Evaluate problem statements and identify objectives.
	2.1.2 Identify processes/modules/algorithms of computer based system and parameters to solve a problem
	2.1.3 Identify mathematical algorithmic knowledge that applies to a given problem
2.2 Demonstrate an ability to formulate a solution plan, methodology for an engineering problem, and interpret a model	2.2.1 Reframe the computer based system into interconnected subsystems
	2.2.2 Identify functionalities and computing resources
	2.2.3 Identify existing solution/methods to solve the problem, including forming justified approximations and assumptions
	2.2.4 Compare and contrast alternative methods/solution to select the best methods/Process
	2.2.5 Able to apply Information Technology engineering principles to formulate modules of a system with required applicability and performance.
	2.2.6 Identify design constraints for required performance criteria.
2.3 Demonstrate an ability to execute a solution process and analyze results	2.3.1 Apply engineering mathematics/ natural sciences/ engineering sciences to implement the solutions.
	2.3.2 Analyze and interpret the results using appropriate tools.
	2.3.3 Identify the limitations of the solution and sources/causes.
	2.3.4 Draw conclusions with respect to the objectives and limitations of the analysis.
PO 3: Design/Development of Solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.	
3.1 Demonstrate an ability to define a complex/open-ended problem in engineering terms	3.1.1 Able to define a precise problem statement with objectives and scope.
	3.1.2 Able to identify and document system requirements from stake holders.
	3.1.3 Ability to review state of the art literature to synthesize system requirements.
	3.1.4 Ability to choose appropriate quality attributes as defined by ISO/IEEE standard.
	3.1.5 Explore and synthesize system requirements from larger social and professional concerns
	3.1.6 Ability to develop software requirement specifications (SRS).
3.2 Demonstrate an ability to generate a diverse set of alternative design solutions and select optimal design scheme for further development	3.2.1 Ability to explore design alternatives.
	3.2.2 Ability to produce a variety of potential design solutions suited to meet functional requirements
	3.2.3 Identify suitable non-functional requirements for evaluation of alternate design solutions.
	3.2.4 Ability to perform systematic evaluation of the degree to which several design concepts meet the criteria.
	3.2.5 Consult with domain experts and stakeholders to select candidate engineering design solution for further development
	3.3.1 Ability to refine architecture design into a detailed design within the existing constraints.

3.3 Demonstrate an ability to advance an engineering design to define end state	3.3.2 Ability to implement and integrate the modules.
	3.3.3 Ability to verify the functionalities and validate the design.
PO 4: Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.	
4.1 Demonstrate an ability to conduct investigations of technical issues consistent with their level of knowledge and understanding	4.1.1 Define a problem for purposes of investigation, its scope and importance
	4.1.2 Ability to choose appropriate procedure/algorithm, data set and test cases.
	4.1.3 Ability to choose appropriate hardware/software tools to conduct the experiment.
4.2 Demonstrate an ability to design experiments to solve open ended problems	4.2.1 Design and develop appropriate procedures/ methodologies based on the study objectives
4.3 Demonstrate an ability to analyze data and reach a valid conclusion	4.3.1 Use appropriate procedures, tools and techniques to collect and analyze data
	4.3.2 Critically analyze data for trends and correlations, stating possible errors and limitations
	4.3.3 Represent data (in tabular and/or graphical forms) so as to facilitate analysis and explanation of the data, and drawing of conclusions
	4.3.4 Synthesize information and knowledge about the problem from the raw data to reach appropriate conclusions
PO 5: Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	
5.1 Demonstrate an ability to identify / create modern engineering tools, techniques and resources	5.1.1 Identify modern engineering tools, techniques and resources for engineering activities
	5.1.2 Create/adapt/modify/extend tools and techniques to solve engineering problems
5.2 Demonstrate an ability to select and apply discipline specific tools, techniques and resources	5.2.1 Identify the strengths and limitations of tools for (i) acquiring information, (ii) modeling and simulating, (iii) monitoring system performance, and (iv) creating engineering designs.
	5.2.2 Demonstrate proficiency in using discipline specific tools
5.3 Demonstrate an ability to evaluate the suitability and limitations of tools used to solve an engineering problem	5.3.1 Discuss limitations and validate tools, techniques and resources
	5.3.2 Verify the credibility of results from tool use with reference to the accuracy and limitations, and the assumptions inherent in their use.
PO 6: The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice	
6.1 Demonstrate an ability to describe engineering roles in a broader context e.g. pertaining to the environment, health, safety, legal and public welfare	6.1.1 Identify and describe various engineering roles for public interest at global, regional and local level

6.2 Demonstrate an understanding of professional engineering regulations, legislation and standards	6.2.1 Interpret legislation, regulations, codes, and standards relevant to your discipline and explain its contribution to the protection of the public
6.3 Demonstrate the ability to recognize the impacts of engineering within a global society (the broader public interest)	6.3.1 Recognize impact on societal, health, safety, legal, and cultural issues while performing engineering design and analysis in a global context
PO 7: Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.	
7.1 Demonstrate an understanding of the impact of engineering and industrial practices on social, environmental and in economic contexts	7.1.1 Identify risks/impacts in the life-cycle of an engineering product or activity
	7.2.1 Understand the relationship between the technical, socio economic and environmental dimensions of sustainability
7.2 Demonstrate an ability to apply principles of sustainable design and development	7.2.1 Describe management techniques for sustainable development
7.3 Demonstrate an ability apply alternative ways to prevent or mitigate adverse social, human health, safety and environmental, impacts	7.3.1 Apply principle of preventive engineering and sustainable development to an engineering activity or product relevant to the student's discipline
PO 8: Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.	
8.1 Demonstrate an ability to recognize ethical dilemmas	8.1.1 Identify situations of unethical professional conduct and propose ethical alternatives.
8.2 Demonstrate an ability to apply the Code of Ethics	8.2.1 Identify tenets of the professional code of ethics.
	8.2.2 Examine and apply moral & ethical principles to known case studies.
8.3 Demonstrate the ability to act ethically and demonstrate individual accountability	8.3.1 Demonstrate the ability to behave in accordance with code of behavior on academic matters.
PO 9: Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.	
9.1 Demonstrate an ability to form a team and define a role for each member	9.1.1 Recognize a variety of working and learning preferences; appreciate the value of diversity on a team.
	9.1.2 Implement the norms of practice (e.g. rules, roles, charters, agendas, etc.) of effective team work, to accomplish a goal.
9.2 Demonstrate effective individual and team operations-communication, problem solving, conflict resolution and leadership skills	9.2.1 Demonstrate effective communication, problem solving, conflict resolution and leadership skills.
	9.2.2 Treat other team members respectfully.
	9.2.3 Listen to other members. Maintain composure in difficult situations.

9.3 Demonstrate success in a team based project	9.3.1 Present results as a team, with smooth integration of contributions from all individual efforts.
PO 10: Communication: Communicate effectively on complex engineering activities with the engineering community and with the society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions	
10.1 Demonstrate an ability to comprehend technical literature and document project work	10.1.1 Read, understand and interpret technical and non-technical information.
	10.1.2 Produce clear, well-constructed, and well-supported written engineering documents.
	10.1.3 Create flow in a document or presentation - a logical progression of ideas so that the main point is clear.
10.2 Demonstrate competence in listening, speaking, and presentation	10.2.1 Listen to and comprehend information, instructions, and viewpoints of others.
	10.2.2 Deliver effective oral presentations to technical and nontechnical audiences.
10.3 Demonstrate the ability to integrate different modes of communication	10.3.1 Create engineering-standard figures, reports and drawings to complement writing and presentations.
	10.3.2 Use a variety of media effectively to convey a message in a document or a presentation.
PO 11: Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.	
11.1 Demonstrate an ability to evaluate the economic and financial performance of an engineering activity	11.1.1 Describe various economic and financial costs/benefits of an engineering activity.
	11.1.2 Analyze different forms of financial statements to evaluate the financial status of an engineering project.
11.2 Demonstrate an ability to compare and contrast the costs/benefits of alternate proposals for an engineering activity	11.2.1 Analyze and select the most appropriate proposal based on economic and financial considerations.
11.3 Demonstrate an ability to plan/ manage an engineering activity within time and budget constraints	11.3.1 Identify the tasks required to complete an engineering activity, and the resources required to complete the tasks.
	11.3.2 Use project management tools to schedule an engineering project so it is completed on time and on budget.
PO 12: Life-long learning: Recognise the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.	
12.1 Demonstrate an ability to identify gaps in knowledge and a strategy to close these gaps	12.1.1 Describe the rationale for requirement for continuing professional development.
	12.1.2 Identify deficiencies or gaps in knowledge and demonstrate an ability to source information to close this gap.
12.2 Demonstrate an ability to identify changing trends in engineering knowledge and practice	12.2.1 Identify historic points of technological advance in engineering that required practitioners to seek education in order to stay current.
	12.2.2 Recognize the need and be able to clearly explain why it is vitally important to keep current regarding new developments in your field.
12.3 Demonstrate an ability to identify and access sources for new information	12.3.1 Source and comprehend technical literature and other credible sources of information.
	12.3.2 Analyze sourced technical and popular information for feasibility, viability, sustainability, etc.

PSO-1: Apply principles of science, mathematics along with programming paradigms and problem solving skills using appropriate tools, techniques to expedite solution in I.T. domain.	
1.1 Apply principles of science and mathematics to expedite solution in I.T. domain.	1.1.1 Apply concepts of basic science such as laws of physics, chemistry and mathematical techniques such as linear algebra (matrices, vectors), statistics, differentiation, integration to solve problems.
1.2 Apply programming paradigms and problem solving skills to expedite solution in I.T. domain.	1.2.1 Use of programming languages such as C/C++, SQL, PL-SQL, HTML, ,PHP, Python, Java etc and problem solving skills to find the solution
1.3 Apply appropriate tools and techniques to expedite solution in I.T. domain.	1.3.1 Create/adapt/modify/extend tools and techniques to solve engineering problems in I.T. domain
PSO-2: Demonstrate core competencies related to I.T. in domain of Data structures & algorithms, Software Engineering & Modeling, Hardware, Distributed Computing, Networking & security, Databases, Discrete mathematics & algebra, Machine Learning, Operating System.	
2.1 Demonstrate core competencies related to I.T. in domain of Data structures & algorithms, Software Engineering & Modeling, Hardware	2.1.1 Ability to demonstrate concepts and fundamentals of one or more subjects of I.T. in domain of Data structures & algorithms, Software Engineering & Modeling, Hardware.
2.2 Demonstrate core competencies related to I.T. in domain of Distributed Computing, Networking & security, Databases	2.2.1 Ability to demonstrate concepts and fundamentals of one or more subjects of I.T. in domain of Distributed Computing, Networking & security, Databases
2.3 Demonstrate core competencies related to I.T. in domain of Discrete mathematics & algebra, Machine Learning, Operating System.	2.3.1 Ability to demonstrate concepts and fundamentals of one or more subjects of I.T. in domain of Discrete mathematics & algebra, Machine Learning, Operating System.
PSO-3: Demonstrate leadership qualities and professional skills in modern I.T. platform for creating innovative carrier paths in placements, entrepreneurship and higher studies	
3.1 Demonstrate leadership qualities and professional skills for creating innovative carrier paths in placements	3.1.1 Able to create innovative carrier with placements in reputed domestic, national or multinational companies in I.T. domain.
3.2 Demonstrate leadership qualities and professional skills for creating innovative carrier paths entrepreneurship	3.2.1 Initiate/ prepare/participate supporting activities for innovative carrier path for startups/entrepreneurship including small scale/medium scale or large scale companies related to I.T. domain
3.3 Demonstrate leadership qualities and professional skills for creating innovative carrier paths in higher studies	3.3.1 Initiate/ prepare/participate supporting activities for innovative carrier path towards higher studies in MTech/ MS/ MBA etc after completion of graduation in I.T.

Justification for CO-PO-PSO mapping

CO/PO	PO1 EK	PO2 PA	PO3 DD	PO4 CPI	PO5 MTU	PO6 E&S	PO7 ES	PO 8 Eth	PO9 TW	PO10 Com.	PO 11 PM F	PO12 LL	PSO 1	PSO 2	PSO3
C302.1	1.1.1 1.2.1 1.2.2 1.3.1	2.1.2 2.2.2 2.2.3 2.2.5 2.3.2	3.1.1 3.2.1 3.2.2 3.3.1 3.3.2 3.3.3	4.1.1 4.1.3 4.2.3 4.3.1 4.3.3 4.3.4	5.1.1 5.1.2 5.2.1 5.2.2 5.3.1 5.3.2	6.1.1	-	-	-	-	-	12.1.1	1.1.1 1.2.1 1.3.1	2.1.1 2.2.1 2.3.1	3.1.1 3.2.1 3.3.1
C302.2	1.1.1 1.2.2 1.3.1	2.1.2 2.2.2 2.2.4 2.2.6 2.3.1 2.3.2 2.3.3	3.1.1 3.2.1 3.2.2 3.3.1	4.1.1 4.1.2 4.1.3 4.2.1	5.1.1 5.2.1	-	-	-	-	-	-	-	1.1.1 1.2.1 1.3.1	2.1.1 2.3.1	3.1.1 3.3.1
C302.3	1.1.1 1.2.2 1.3.1	2.2.2 2.3.1 2.3.2	3.1.1 3.2.1 3.2.4	4.1.1 4.1.2 4.1.3	5.1.1 5.1.2	-	-	-	9.1.1 9.1.2 9.2.1 9.2.2 9.3.1	-	-	-	1.1.1 1.2.1 1.3.1	2.1.1 2.3.1	3.1.1 3.3.1
C302.4	1.1.1 1.2.2	2.2.2	3.2.1 3.2.2	4.1.1 4.1.3	5.1.1 5.3.1	-	-	-	-	-	-	-	1.1.1 1.3.1	2.1.1 2.3.1	3.1.1 3.3.1
C302..5	1.1.1 1.2.2	2.2.2	3.2.1 3.2.2	4.1.1 4.1.3	5.1.1 5.3.1	-	-	-	-	-	-	-	1.1.1 1.3.1	2.1.1 2.3.1	3.1.1 3.3.1
C302.6	1.1.1 1.2.1 1.2.2 1.3.1	2.1.2 2.2.2 2.2.3 2.2.5 2.3.2	3.1.1 3.2.1 3.2.2 3.3.1 3.3.2 3.3.3	4.1.1 4.1.3 4.2.3 4.3.1 4.3.3 4.3.4	5.1.1 5.1.2 5.2.1 5.2.2 5.3.1 5.3.2	6.1.1	-	-	-	-	-	12.1.1	1.1.1 1.2.1 1.3.1	2.1.1 2.2.1 2.3.1	3.1.1 3.2.1 3.3.1
C302.7	1.1.1 1.2.1 1.2.2 1.3.1	2.1.2 2.1.3 2.2.1 2.2.2	3.1.1 3.2.1 3.2.2 3.3.2 3.3.3	4.1.1 4.1.2 4.1.3 4.3.1	5.1.1 5.1.2 5.2.1 5.2.2	6.1.1	-	-	9.1.1 9.1.2	-	-	-	1.1.1 1.2.1 1.3.1	2.1.1 2.2.1 2.3.1	3.1.1 3.2.1 3.3.1

Justification for CO-PO-PSO mapping

		2.2.3		4.3.3	5.3.1				9.2.1						
		2.2.4		4.3.4											
		2.3.1							9.2.2						
		2.2.4							9.3.1						

Mapping of Course Outcome with Program Outcome (CO-PO Matrices)

CO/PO	PO1 EK	PO2 PA	PO3 DD	PO4 CPI	PO5 MTU	PO6 E&S	PO7 ES	PO8 Eth	PO9 TW	PO10 Com.	PO11 PMF	PO12 LL
C19-C302.1	3	1	1	2	3	1	-	-	-	-	-	1
C19-C302.2	2	2	1	2	1	-	-	-	-	-	-	-
C19-C302.3	2	1	1	1	1	-	-	-	3	-	-	-
C19-C302.4	1	1	1	1	1	-	-	-	-	-	-	-
C19-C302.5	1	1	1	1	1	-	-	-	-	-	-	-
C19-C302.6	3	1	1	2	3	1	-	-	-	-	-	1
C302	2	1	1	2	2	1	-	-	3	-	-	1

Mapping of Course Outcome with Program Specific Outcomes (CO-PSO Matrices)

CO/PSO	PSO1	PSO2	PSO3
C19-C302.1	3	3	3
C19-C302.2	3	3	2
C19-C302.3	3	2	2
C19-C302.4	2	2	2
C19-C302.5	2	2	2
C19-C302.6	3	3	3
C19-C302.7	3	3	3
C302	3	3	2