PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

INFORMATION TECHNOLOGY

Syllabus Structure for

F.Y. B.Tech. (All Branches) w.e.f. Academic Year 2018-19

S.Y. B.Tech. (Information Technology) w.e.f. Academic Year 2019-20

T.Y. B.Tech. (Information Technology) w.e.f. Academic Year 2020-21

Choice Based Credit System

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

FACULTY OF SCIENCE & TECHNOLOGY

Information Technology

Program Educational Objectives and Outcomes

A. Program Educational Objectives

1. Graduates will exhibit strong fundamental knowledge and skills in the field of Information Technology to pursue successful professional careers and higher studies and research.
2. Graduates will exhibit capabilities to understand and resolve the various societal issues through their problem solving skills.
3. Graduates will be sensitive to ethical, societal and environmental issues while serving at their professional work and society.

B. Program Outcomes

Engineering Graduate will be able to –

1. Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

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 the public health and safety, and the cultural, societal, and environmental considerations.

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.

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.

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.

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.

8. Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. Communication: Communicate effectively on complex engineering activities with the engineering community and with 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.

11. Project management and finance: Demonstrate knowledge and understanding of t h e 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.

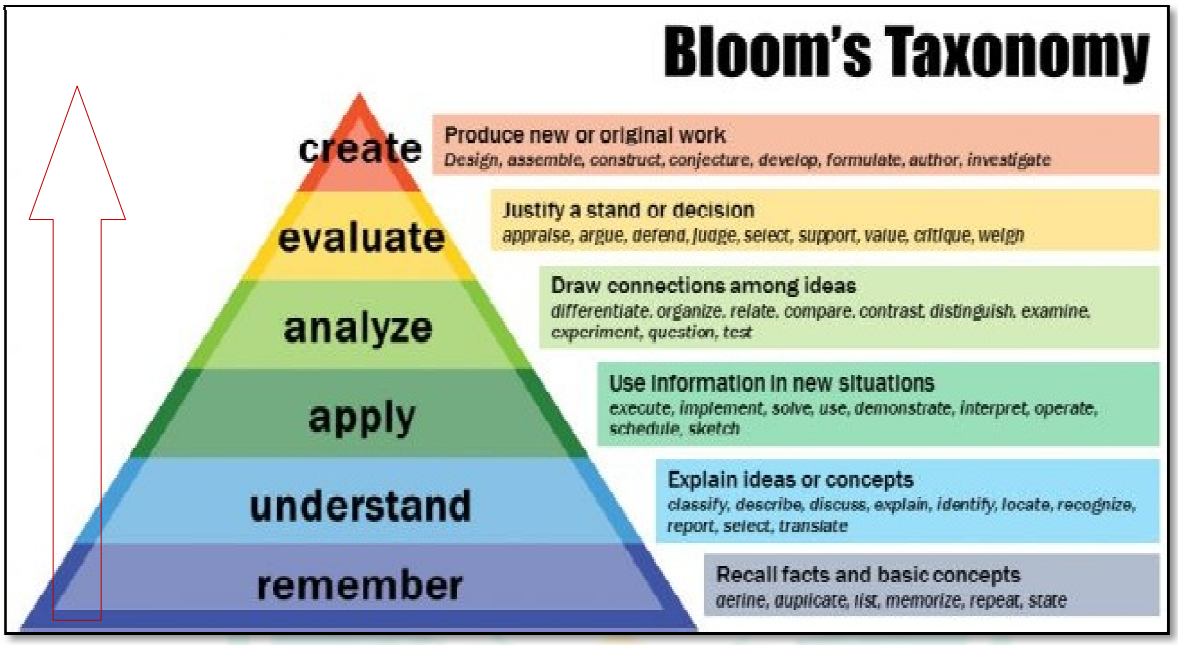
12. Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Specific Outcomes (PSOs)

PSO1: Student will be able to apply fundamentals of mathematics, algorithms and computational systems to Information Technology.

PSO2: Student will be able to provide a solution to the problem in the areas of Networking, Database management, System Software, Web Technology, Information Security and Thrust areas.

PSO3: Student will be able to design and develop IT solution for societal problem/s, while encouraging usage of Free Open Source Software (FOSS).



PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

CBCS Curriculum for First Year B.Tech. (All Branches)

WEF 2018-19

1. Semester I : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C112	Engineering Mathematics I	3			3	70	30		100
C113	Basic Electrical & Electronics Engineering	4			4	70	30		100
C114	Engineering Mechanics	3			3	70	30		100
C115	Basic Mechanical Engineering	3			3	70	30		100
C116	Communication Skills	1			1		25		25
	Total	**17**			**17**	**350**	**175**		**525**

- Semester I : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C112	Engineering Mathematics I		1		1			25	25
C113	Basic Electrical & Electronics Engineering			2	1			25	25
C114	Engineering Mechanics			2	1			25	25
C115	Basic Mechanical Engineering			2	1			25	25
C116	Communication Skills			2	1			25	25
C117	Workshop Practice			2	1			25	25
	Total		**1**	**12**	**7**			**175**	**175**
	Grand Total	**17**	**1**	**12**	**24**	**350**	**175**	**175**	**700**
C118	Induction Program	*# (Please see note below)*							

- Semester II : Theory Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$	3			3	70	30		100
C122	Engineering Mathematics II	3			3	70	30		100
C123	Engineering Graphics & Design	3			3	70	30		100
C124	Basic Civil Engineering	3			3	70	30		100
C125	Programming for Problem Solving	2			2		25		25
C126	Professional Communication	1			1		25		25
Total		**15**			**15**	**280**	**170**		**450**
C127	Democracy, Elections and Good Governance					30			30

- Semester II : Laboratory / Tutorial Courses

Course Code	*Name of the Course*	*Engagement Hours*			*Credits*	*FA*	*SA*		*Total*
		L	*T*	*P*		*ESE (POE)*	*ISE*	*ICA*	
C011/ C012	Engineering Physics / Engineering Chemistry$			2	1			25	25
C122	Engineering Mathematics II		1		1			25	25
C123	Engineering Graphics & Design			4	2			50	50
C124	Basic Civil Engineering			2	1			25	25
C125	Programming for Problem Solving			4	2	50#		50	100
C127	Professional Communication			2	1			25	25
	Total		1	14	8	50		200	250
	Grand Total	**15**	**1**	**14**	**23**	**330**	**170**	**200**	**700**
C128	Democracy, Elections and Good Governance							20	

1. Legends used –

L	Lecture	FA	Formative Assessment
T	Tutorial	SA	Summative Assessment
P	Lab Session	ESE	End Semester Examination
		ISE	In Semester Evaluation
		ICA	Internal Continuous Assessment

- **Notes-**

1. $ - Indicates approximately half of the total students at F.Y B.Tech. will enroll under Group A and remaining will enroll under Group B.

   Group A will take up course of Engineering Physics (theory & laboratory) in Semester I and will take up course of Engineering Chemistry (theory & laboratory) in semester II.

   Group B will take up course of Engineering Chemistry (theory & laboratory) in Semester I and will take up course of Engineering Physics (theory & laboratory) in semester II

2. # - Indicates the subject 'Programming for Problem Solving' shall have a University 'Practical and Oral Examination' at the end of the semester assessing student's programming skills.

3. In Semester Evaluation (ISE) marks shall be based upon student's performance in minimum two tests & mid-term written test conducted & evaluated at institute level

   Internal Continuous Assessment Marks (ICA) are calculated based upon student's performance during laboratory sessions / tutorial sessions

4. Democracy, Elections & Good Governance is mandatory course. The marks earned by student with this course shall not be considered for calculation of SGPA/CGPA. However student must complete ICA of 20 marks and End Semester Examination (ESE) of 30 marks (as prescribed by university, time to time) for fulfillment of this course. This course is not considered as a passing head for counting passing heads for ATKT. However, student must pass this subject for award of the degree

5. Student must complete induction program of minimum five days before commencement of the regular academic schedule at the first semester.

GUIDELINES FOR INDUCTION PROGRAM (C128)

New entrants into an Engineering program come with diverse thoughts, mind set and different social, economical, regional and cultural backgrounds. It is important to help them adjust to the new environment and inculcate in them the ethos of the institution with a sense of larger purpose.

An induction program for the new UG entrant students is proposed at the commencement ofthe first semester. It is expected to complete this induction program before commencement of the regular academic schedule.

Its purpose is to make new entrants comfortable in their new environment, open them up, set a healthy daily routine for them, create bonding amongst the peers as well as between faculty and students, develop awareness, sensitivity and understanding of the self, people around them, society at large, and nature.

The Induction Program shall encompass (but not limited to) below activity –

1. Physical Activities
2. Creative Arts
3. Exposure to Universal Human Values
4. Literary Activities
5. Proficiency Modules
6. Lectures by Experts / Eminent Persons
7. Visit to Local Establishments like Hospital / Orphanage
8. Familiarization to Department

Induction Program Course do not have any marks or credits however performance of students for Induction Program is assessed at institute level using below mandatory criteria –

1. Attendance and active participation
2. Report writing

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science& Technology (Revised from 2018-19)

Credit System structure of S.Y. B. Tech. Information Technology W.E.F. 2019-20

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
IT211	Applied Mathematics - I	3	1	--	4	30	70	25	125
IT212	Discrete Mathematical Structure	3	1	--	4	30	70	25	125
IT213	Data Communication	3	--	--	3	30	70	--	100
IT214	Digital Techniques	4	--	--	4	30	70	--	100
IT215	Computer Graphics	3	--	--	3	30	70	--	100
IT216	Advanced C Concepts	2	-	-	2	25	-	-	25
	Sub Total	**18**	**2**	**--**	**20**	**175**	**350**	**50**	**575**
ENV 21	Environmental Science - I	1	-	-	-	-	-	-	-
Course Code	***Laboratory Course Name***								
							ESE	***ICA***	
							POE	***OE***	
IT213	Data Communication	--	--	2	1	--	50	--	25	75
IT214	Digital Techniques	--	--	2	1	--	50	--	25	75
IT215	Computer Graphics	--	--	2	1	--		--	25	25
IT216	Advanced C Concepts	--	--	4	2	--	50	--	25	75
	Sub Total	**--**	**--**	**10**	**5**	**--**	**150**		**100**	**250**
	Grand Total	**18**	**2**	**10**	**25**	**175**	**500**		**150**	**825**

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam , ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science & Technology (Revised from 2018-19)

Credit System structure of S.Y. B.Tech. Information Technology W.E.F. 2019-20

Semester II

Course Code	*Theory Course Name*	*Hrs./week*			*Credits*	*Examination Scheme*			
		L	*T*	*P*		*ISE*	*ESE*	*ICA*	*Total*
IT221	Applied Mathematics – II	3	1	--	4	30	70	25	125
IT222	Theory of Computation	4	1	--	5	30	70	25	125
IT223	Microprocessor	3	--	--	3	30	70	--	100
IT224	Data Structures	3	--	--	3	30	70	--	100
IT225	Computer Networks	3	--	--	3	30	70	--	100
IT226	Object Oriented Programming Through C ++	2	--	--	2	25	--	--	25
	Sub Total	18	**2**	**--**	**20**	**175**	**350**	**50**	**575**
ENV22	Environmental Science - II	1	-	-	-	-	-	-	1
Course Code	*Laboratory Course Name*								
							ESE	*ICA*	
							POE	*OE*	
IT223	Microprocessor	--	--	2	1	--	50	--	25	75
IT224	Data Structures	--	--	4	2	--	50	--	25	75
IT225	Computer Networks	--	--	2	1	--	-	--	25	25
IT226	Object Oriented Programming Through C ++	--	--	2	1	--	50	--	25	75
	Sub Total		_	**10**	**5**		**150**		**100**	**250**
	Grand Total	**18**	**2**	**10**	**25**	**175**	**500**		**100**	**825**

- *Abbreviations: L- Lectures, P –Practical, T- Tutorial, ISE- In Semester Exam, ESE - End Semester Exam, ICA- Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*

Note

1. Student is required to study and pass Environmental Science subject in Second Year of Engineering to become eligible for award of degree.
2. Batch size for the practical/tutorial shall be of 20 students. On forming the batches, if the strength of remaining students exceeds 9, then a new batch shall be formed.
3. Vocational Training (evaluated at Final Year B. Tech. Part-I) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Part-II but before Final Year B.Tech. Part-I & the report shall be submitted and evaluated in Final Year B.Tech. Part-I

4. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable

PUNYASHLOK AHILYADEVI HOLKARSOLAPUR UNIVERSITY, SOLAPUR

Faculty of Science & Technology (Revised from 2018-19)

Credit System structure of T.Y. B.Tech. Information Technology W.E.F. 2020-21

Semester I

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
IT311	Operating System	3	--	--	3	30	70	--	100
IT312	System Software	3	--	--	3	30	70	--	100
IT313	Design and Analysis of Algorithms	3	1	--	4	30	70	25	125
IT314	$ Database Engineering	4	--	--	4	30	70	--	100
IT315	Computer Organization and Architecture	3	1	--	4	30	70	25	125
IT316	Python Programming	2	--	--	2	25	--	--	25
SL31	Self Learning Module-I (HSS)	--	--	--	2	--	50	--	50
	Sub Total	**18**	**2**	--	**22**	**175**	**400**	**50**	**625**
Course Code	***Laboratory Course Name***								
							ESE	***ICA***	
							POE	***OE***	
IT311	Operating System	--	--	2	1	--	--	25	25	50
IT312	System Software	--	--	2	1	--	--	--	25	25
IT314	Database Engineering	--	--	2	1	--	50	--	25	75
IT316	Python Programming	--	--	4	2	--	50	--	25	75
	Sub Total	--	--	**10**	**5**	--	**125**		**100**	**225**
	Grand Total	**18**	**2**	**10**	**27**	**175**	**525**		**150**	**850**

- *Abbreviations: L- Lectures, P –Practical, T-Tutorial, ISE-In Semester Exam,* ESE-End Semester Exam, *ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*
  $ - The theory courses for Computer Sci. & Engg. and Information Technology are same therefore paper for ESE will be common for both.

Note

1. Batch size for the practical/tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year B.Tech. Part-I) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Part-II but before Final Year B.Tech. Part-I & the report shall be submitted and evaluated in Final Year B. Tech Part-I.

3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. **Self-Learning Module I at T.Y. B.Tech. – I**

Curriculum for Humanities and Social Sciences, Self Learning Module - I is common for all under graduate engineering programs.

A. Student can select & enroll a Self Learning Module I Course from PAH Solapur University, Solapur HSS Course List (SL31-A) and appear for university examination.

SL31-A: P. A. H. Solapur University, Solapur: HSS Course List

1. Economics	4. Stress and Coping
2. Intellectual Property Rights for Technology Development and Management	5. Professional Ethics & Human Value
3. Introduction to Sociology	

OR

B. Student can select and enroll for university approved minimum eight weeks NPTEL HSS course (SL31-B), complete its assignments and appear for certificate examination conducted by NPTEL. The list of courses as shown in Table SL31-B will be updated from time to time by University authorities. Latest updated list will be valid for selection of self learning Module-I (HSS) courses.

More details about NPTEL are available at http://nptel.ac.in

SL31-B: University approved NPTEL- HSS course List

1. Soft skills	15. Management of Inventory Systems
2. Introduction to Modern India Political Thought	16. Economic Growth and Development
3. Intellectual Property	17. Ethic in Engineering Practice
4. Technical English for Engineers	18. Corporate Social Responsibility
5. Developing Soft Skills and Personality	19. Marketing Management –I
6. Educational Leadership	20. Marketing Research and Analysis
7. Microeconomics: Theory & Applications	21. Selected Topics in Decision Modeling
8. Engineering Economics	22. Innovation, Business Models and Entrepreneurship
9. Human Resource Development	23. Simulation of Business Systems: An Applied Approach
10. Project Management for managers	24. Sustainability through Green Manufacturing Systems: An Applied Approach
11. Data Analysis and Decision Making - I	25. Total Quality Management - I
12. E-Business	26. Introduction to Operations Research
13. Working Capital Management	27. Knowledge Management
14. Industrial Safety Engineering	

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR
Faculty of Science & Technology (Revised from 2018-19)
Credit System structure of T.Y. B.Tech. Information Technology W.E.F. 2020-21
Semester II

Course Code	***Theory Course Name***	***Hrs./week***			***Credits***	***Examination Scheme***			
		L	***T***	***P***		***ISE***	***ESE***	***ICA***	***Total***
IT321	Software Engineering	3	1	--	4	30	70	25	125
IT322	Object Oriented Modeling and Design	3	1	--	4	30	70	25	125
IT323	Artificial Intelligence	3	--	--	3	30	70	--	100
IT324A to IT324B	Elective - I	3	--	--	3	30	70	--	100
IT325	Mobile Application Development	2	--	--	2	25	--	--	25
IT326	Java Programming	2	--	--	2	25	--	--	25
SL32	Self Learning Module-II (Technical)	--	--	--	2	--	50	--	50
	Sub Total	**16**	**2**	**--**	**20**	**170**	**330**	**50**	**550**
Course Code	***Laboratory Course Name***								
							ESE	***ICA***	
							POE	***OE***	
IT323	Artificial Intelligence	--	--	2	1	--	--	--	25	25
IT324	Elective – I	--	--	2	1	--	--	--	25	25
IT325	Mobile Application Development	--	--	2	1	--	50	--	25	75
IT326	Java Programming	--	--	4	2	--	50	--	25	75
IT327	Mini Project	--	--	2	1	--	--	50	50	100
	Sub Total	**--**	**--**	**12**	**6**	**--**	**150**		**150**	**300**
	Grand Total	**16**	**2**	**12**	**26**	**170**	**480**		**200**	**850**

Elective – I
IT324A: $ Data Science
IT324B: $ Artificial Neural Network

*Abbreviations: L- Lectures, P –Practical, T-Tutorial, ISE-In Semester Exam,*ESE-End Semester Exam, *ICA-Internal Continuous Assessment, ESE - University Examination (Theory &/ POE &/Oral examination)*
$ - The theory courses for Computer Sci. and Engg. and Information Technology are same, therefore paper for ESE will be common to both.

Note

1. Batch size for the practical /tutorial shall be of 15 students. On forming the batches, if the strength of remaining student exceeds 7, then a new batch shall be formed.

2. Vocational Training (evaluated at Final Year B.Tech. Part-I) of minimum 15 days shall be completed in vacation/s after S.Y. B.Tech. Part-II but before Final Year B.Tech. Part-I & the report shall be submitted and evaluated in Final Year B. Tech Part-I.

3. ICA assessment shall be a continuous process based on student's performance in – class tests, assignments, homework, subject seminars, quizzes, laboratory books and their interaction and attendance for theory and lab sessions as applicable.

4. Mini Project shall consist of developing software, based on various tools &technologies.

5. Project groups shall not be of more than **five** students.

6. **Self-Learning Module II at T.Y. B.Tech. – II**

   A. Student can select a Self Learning Module II (Technical Course) from Course List (SL32) and appear for university examination.

   SL32: Self Learning Module II (Technical Course)

A. User Interface Technologies
B. Agile Project Management

OR

B. Student can select & enroll for university approved minimum eight week technical course from various NPTEL technical courses, complete its assignments and appear for certificate examination conducted by NPTEL.

BOS Chairman / Coordinator will announce the list of approved NPTEL online courses of minimum eight weeks duration for 'Self Learning Module-II (Technical)' on commencement of the Sem-II of respective academic year from the available NPTEL courses through university system and will make available to student through University / institute website.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T.Y. B.Tech. (Information Technology) Semester -I

IT311. OPERATING SYSTEM

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Practical: 2 Hours/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25 Marks
	OE: 25 Marks

Introduction:

An Operating System acts as an interface connecting a computer user with the hardware of the computer. The course covers fundamental tasks like file management, memory handling, process management, handling the input/output, and governing and managing the peripheral devices and their design and implementation. The course focuses on UNIX-based operating systems

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Course Prerequisite:
Prerequisite knowledge of data structure and 'C' programming language is needed.

Course Outcomes:
At the end of the course, students will be able to
1. Describe features of Operating Systems
2. Simulate algorithms for process scheduling, synchronization and Deadlock
3. Implement algorithms for memory management.
4. Demonstrate the structure of the UNIX operating system.

SECTION–I

Unit1: Introduction to Operating System **06 Hrs**

Operating System Objectives and Functions, The Evolution of Operating Systems, Modern Operating Systems, Virtual Machines. BASH Shell scripting: Basic shell commands, shell as a scripting language. Introduction to KERNEL, Architecture of UNIX OS

Unit 2: Process Concept **08 Hrs**

Process Concept, Process States, Process Control Block, Operations on Process, Inter-process Communication (IPC) – Shared memory systems and Message passing systems, Examples of IPC Systems, Threads – Processes and Threads, Concept of Multithreading, Multithreading Models, Thread Libraries – Win32 Threads and P-threads. Scheduling: Types of Scheduling, Scheduling Algorithms, and Thread Scheduling

Unit 3: Process Synchronization **08 Hrs**

Background, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Semaphores, Classical Problems of Synchronization, Monitors. System modes, Deadlock characterization, Methods for handling deadlocks, Deadlock, deadlock prevention, deadlock avoidance, deadlock detection, Recovery from deadlock.

SECTION-II

Unit 4: Memory Management **05 Hrs**

Background, Swapping, Contiguous Allocation, Paging, Structures of page table, Segmentation Virtual Memory: Demand paging, copy on write, Page replacement, Allocation of frames, Thrashing, Memory mapped files.

Unit 5: Input / Output and File Management **10 Hrs**

I/O Management and Disk Scheduling: I/O Devices, I/O Function, I/O Buffering, Disk Scheduling (FIFO, SSTF, SCAN, C-SCAN, LOOK, CLOOK), Disk Cache. Overview of File Management, File Organization and Access, File Directories, File Sharing, Record Blocking, Secondary Storage Management, Basic file management system **c**alls.

Unit 6: The UNIX Operating System **08 Hrs**

UNIX Booting Process, Kernel Modules, UNIX shell Programming, Process Management, file management, Scheduling, Memory, System calls.

Internal Continuous Assessment (ICA):

ICA should consist of 8-10 lab assignments from following list out of which minimum 6 experiments should be from 1 to 14.

Practical List:

1. Creation of a separate process using fork () system call
2. FCFS scheduling algorithm
3. SJF (pre-emptive & non-preemptive) scheduling algorithm
4. Priority scheduling algorithm
5. Round robin (RR) scheduling algorithm
6. Peterson‘s solution to critical section problem
7. Mutual Exclusion using semaphore (waits & signal)
8. Producer consumer problem (Bounded & Unbounded buffer)
9. Deadlocks with MUTEX
10. Banker‘s algorithm
11. File sharing & Record Blocking
12. getblk algorithm
13. ialloc&ifree algorithm
14. alloc and free algorithm
15. Basic Unix commands
16. KERNEL module programming

Text Books:

1. Operating System concepts – Silberschatz, Galvin, Gagane. (WILEY Publication).
2. The design of Unix Operating Systems- Maurice J. Bach(PHI)
3. Modern Operating System - Andrew S. Tanenbaum & Herbert Bos, Pearson, , 4th Edition

Reference Books:

1. Unix concepts and administration – 3rd Edition- Sumitabha Das (TMGH).
2. Operating System: Internals and Design Principles, William Stallings, Prentice Hall, 8th Edition

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I

IT312. SYSTEM SOFTWARE

Teaching Scheme
Lectures: 3 Hours/Week, 3 Credits
Practical: 2 Hours/Week, 1 Credit

Examination Scheme
ESE: 70 Marks
ISE: 30 Marks
ICA: 25Marks

Introduction:
This course introduces different language processors. It deals with methods used to analyze, synthesize, design and develop prototypes of language processors. It introduces some tools to be used to develop language processors.

Course Prerequisite:
Student shall have undergone a course on Discrete Mathematical Structures and Theory of Computation.

Course Outcomes:
At the end of the course, student will be able to
1. Describe various System Software and simulate them using a programming language.
2. Demonstrate and distinguish logical design perspective of System Software.
3. Use Language Processor Development Tools to build System software.

SECTION-I

Unit 1: Introduction of System Software **06 Hrs**
Introduction, language processing activities, Fundamentals of language processing, Fundamentals of language Specification, Language Processor Development Tools

Unit2: Compilation and Analysis **10 Hrs**
Aspects of compilation, Phases of Compiler, Lexical Analysis: Role of a Lexical analyzer, input buffering, specification and recognition of tokens, finite automata implications, designing a lexical analyzer generator. Syntax Analysis: Role of Parser, Writing grammars for context free environments, Top-down parsing, Recursive descent and predictive parsers (LL), Bottom-Up parsing, Operator precedence parsing, LR, SLR and LALR parsers.

Unit 3: Assemblers, Macros and Macro Processors **08 Hrs**
Elements of assembly language programming, A simple assembly scheme, Pass structure of assemblers, design of a two pass assembler. Macro definition and call, Macro Expansion, Nested macro calls

SECTION- II

Unit 4: Code Generation and Optimization **10 Hrs**
Code Generation: Issues in design of a code generator and target machine, Run time storage

management, Basic blocks and flow graphs, Next use information and simple code generator, Issues of register allocation, assignment and basic blocks, code generation from Dags and the dynamic code generation algorithm.
Code Optimization: Sources of optimization, Peephole optimization and basic blocks, loops in flow graphs, Data flow analysis and equations, code improving transformation and aliases, Data flow analysis and algorithms, symbolic debugging of optimized code.

Unit 5: Linkers **06 Hrs**
Relocation and linking concepts, design of a linker, Self-relocating programs, A Linker for MS DOS, Linking for overlays

Unit 6: Loaders **05 Hrs**
Function of loader, general loader scheme, Absolute loader, Subroutine Linkages, Relocating loader, Direct linking loader, Dynamic loading, Design of an Absolute Loader, Design of direct linking loader.

Internal Continuous Assessment (ICA):
ICA should consist of 8-10 lab assignments from following list –
1. Symbol table generation for given input *.c file.
2. Implementation of Macro and Nested macros.
3. Design and implementation of 1 pass assemblers.
4. Design and implementation of 2 pass assemblers.
5. Design Lex specifications for the tokens – keywords, identifiers, numbers, operators, white spaces.
6. Implement any one of the code optimization techniques.
7. Implementation of Toy-code generator.
8. Simulation of linkers.
9. Simulation of loaders

Text Books:
1. System Programming and operating systems – D.M. Dhamdhere2nd Edition (TMGH)
2. Compilers - Principles, Techniques and Tools - A.V. Aho, R. Shethi and J.D. Ullman (Pearson Education.)
3. System Programming - J. J. Donovan (Mc-Graw Hill)

Reference Books:
1. System Software- An Introduction to Systems Programming- 3rd Edition- Leland L. Beck(Pearson Education)
2. Compiler Construction - Dhamdere (Mc-Millan)
3. Compiler Construction – Principles & Practice – Ken Louden (Cengage Learning)
4. Compiler Design in C – Allen I. Holub (PHI / Pearson Education)
5. Compiler Construction - Barret, Bates, Couch (Galgotia)
6. Unix Programming - Pepkin Pike.
7. Crafting a compiler with C – Charls Fischer, Richard LeBlane (Pearson Education)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I

IT313. DESIGN AND ANALYSIS OF ALGORITHMS

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/week, 3 Credits	**ESE: 70 Marks**
Tutorial: 1 Hour/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25 Marks

Introduction:
This course introduces the algorithms, strategies of algorithm and analysis of algorithm which will help to compare and determine good algorithm.

Course Prerequisite:
Student should have knowledge of basic programming. They should also have basic knowledge of data structure and graph theory.

Course Outcomes:
At the end of the course, students will be able to

1. Compute space & time complexity of an algorithm in terms of asymptotic notations and compare algorithms to arrive at efficient one.
2. Use various standard algorithm design techniques for problem solving.
3. Select an appropriate design technique to develop an algorithm to a real world problem.

SECTION- I

Unit 1: Introduction **08 Hrs**
What is an algorithm? Algorithm Specifications, Recurrence relations, Performance Analysis

Unit 2: Divide and Conquer **09 Hrs**
The general method, Binary Search, Finding the maximum and minimum, Merge sort, Quick sort, Selection sort.

Unit 3: The Greedy Method **09 Hrs**
The general method, knapsack problem, Job sequencing with deadlines, minimum cost spanning trees- Prim's and Krushkal's Algorithms, Optimal storage on tapes, Optimal merge patterns. Single source shortest paths.

SECTION- II

Unit 4: Dynamic Programming **10Hrs**
The general method, multistage graphs, All pair shortest paths,graphs, All pair shortest paths, Optimal binary search tress, 0/1 knapsack problem, Reliability design, Traveling Sales person problem, Flow shop scheduling.

Unit 5: Backtracking **05 Hrs**
The general method, 8-queen problem, sum of subsets, Hamilton Cycle, Graph Coloring

Unit 6: Branch and Bound **04 Hrs**

The Method, 0/1 Knapsack, Travelling Salesperson (*), Efficiency Considerations, NP-Hard and NP-Complete Problems: Basic Concepts

Text Book:

1. Fundamentals of Computer Algorithms–Horowitz, Sahni & Rajasekaran (Galgotia Publications)
2. Fundamental of Algorithm. – Gilles Brassard, Paul Bratley (Pearson Publication)
3. Introduction to Algorithms – Thomas Cormen (Pearson Publication)

Reference Books:

1. Introduction to Design and Analysis of Algorithm –Goodman (McGrawhill)
2. Design and analysis of algorithms - Aho, Hopfcraft and Ullman (Addison wesley)
3. Design& Analysis of Algorithms, S. Sridhar, Oxford
4. Design & Analysis of Algorithms, Sharma, Khanna Publishing House, N.Delhi

Internal Continuous Assessment (ICA):

ICA should consist of minimum eight to ten tutorials based on above curriculum.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I

IT314. DATABASE ENGINEERING

Teaching Scheme	**Examination Scheme**
Lectures: 4 Hours/Week, 4 Credits	**ESE: 70 Marks**
Practical: 2 Hours/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25 Marks
	POE: 50 Marks

Introduction:

In today's data-driven economy, no computer science or business curriculum would be complete without a course in databases and data management system. This course emphasizes the understanding of the fundamentals of relational database system including data models, database architectures, normalization, data integrity, security and data manipulation.

It also provides students with theoretical knowledge and practical skills in the use of databases and database management systems with the help of Structured Query language (SQL).It ends with covering database transaction and recovery concepts. Upon completion, students should be able to design and implement normalized database structures by creating simple database.

Course Perquisites:

Math foundations: elementary set theory, concepts of relations and functions
Data structures: trees, B-trees, linear data structures, dictionaries, graphs.
Algorithms: Basic algorithm design methods and techniques for algorithm complexity analysis

Course Outcomes:

At the end of the course students will be able to,

1. Demonstrate basics of database systems and design database using Entity-relationship model for real world application.
2. Design database using relational model for real world application and Formulate SQL.
3. Analyze a database design & apply normalization.
4. Create indices for faster retrieval.
5. Apply transaction management for maintaining database consistency.

SECTION-I

Unit 1: Introduction **06 Hrs**

Database-System Applications, Purpose of Database Systems, View of Data, Database Languages, Relational Databases, Database Design, Data Storage and Querying, Transaction Management, Database Architecture, Data Mining and Information Retrieval, Specialty Databases, Database Users and Administrators, History of Database Systems.

Unit 2: Database Design and the E-R Model **08 Hrs**

Overview of Design Process, The Entity-Relationship Model, Constraints, Removing Redundant Attributes In Entity Sets, E-R Diagrams, Reduction to Relational Schemas, E-R Design Issues, Extended E-R Features.

Unit 3: Relational Model **08 Hrs**

Structure of Relational Databases, Database Schema, Keys, Schema Diagrams, Relational Query Languages, Relational Algebra, Tuple Relational Calculus, Domain Relational Calculus, Structured Query language (SQL)-Overview, SQL Data Definition, Basic Structure of SQL Queries, Additional Basic Operations, Set Operations, Null Values, Aggregate Functions, Nested Sub queries, Modification of the Database, Join Expressions, Views, Transactions, Integrity Constraints, SQL Data Types and Schemas, Authorization.

Unit 4: Relational Database design **07Hrs**

Features of Good Relational Designs, Atomic Domains and First Normal Form, Decomposition using Functional Dependencies, Functional Dependency Theory, Algorithms for Decomposition, Decomposition using Multi-valued Dependencies.

SECTION – II

Unit 5: Indexing and Hashing **07 Hrs**

Basic Concepts, Ordered Indices, B+-Tree Index Files, B+-Tree Extensions, B Tree Index Files, Multiple Key Access, Static Hashing, Dynamic Hashing, Comparison of Ordered Indexing and Hashing, Bitmap Indices, Index Definition in SQL.

Unit 6: Transactions **07 Hrs**

Transaction Concept, A Simple Transaction Model, Storage Structure, Transaction Atomicity and Durability, Transaction Isolation, Serializability, Transaction Isolation and Atomicity, Transaction Isolation Levels, Transactions as SQL Statements.

Unit 7: Concurrency Control **07 Hrs**

Lock-Based Protocols, Deadlock Handling, Multiple Granularity, Timestamp-Based Protocols, Validation-Based Protocols.

Unit 8: Recovery System **07 Hrs**

Failure Classification, Storage, Recovery and Atomicity, Recovery Algorithm, Buffer Management, Log-Based Recovery, Shadow Paging, Recovery with Concurrent Transactions, Buffer Management, Failure with Loss of Nonvolatile Storage.

Text Books:

1. Database system concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan (6^{th}edition, McGraw Hill International Edition).
2. Database system concepts by Peter Rob, Carlos Coronel (Cengage Learning).
3. Fundamentals of Database systems by Ramez ElMasri, S. B. Navathe (Pearson education)

Reference Books:

1. Database Management Systems by Ramkrishnan Gehreke (Tata McGraw Hill).
2. Principles of Database Systems by J. D. Ullman (Galgotia Publications)
3. Advanced Database Management System by Rini Chakrabarti, Shilbhadra Dasgupta (Dreamtech Press Publication).
4. SQL The Complete Reference, Third Edition (McGraw Hill International Edition)

Internal Continuous Assessment (ICA):

ICA shall consist of following laboratory assignments:

- For any real life application:
  - Draw an E-R diagram and create a data dictionary for the same.
  - Basic SQL DDL and DML commands
  - Nested sub queries, Joins and Set operations
  - Views, Integrity constraints and Authorization
  - Identify set of functional dependencies, find canonical cover and closure of functional dependency
  - Convert the created database into 1NF, 2NF, 3NF and BCNF
  - Program to create B+ tree index
  - Program to implement dynamic hashing on the database
- Program to simulate log based protocol using immediate or deferred database modification.
- Program to simulate any one concurrency control protocol.

Modalities for conducting End Semester Examination/Practical Oral Examination (POE):

- Practical and Oral Examination will be conducted by a panel of examiners assigned by university. A pair of examiners shall assess a batch @36 students in a day.
- The chairman shall prepare problem statements adhering to following guidelines:

1. At least Four Problem statements shall be set for a batch.
2. Problem statements shall be set in the context of course outcomes as defined in the course.
3. Problem Statements shall not be direct statements stating implement concept/topic etc.
4. Problem Statements shall be based on real word problem/use case/scenario etc.
5. Problem statement shall be at the minimum cognitive level of Apply & above
6. Problem Statements must be well described with no ambiguity and shall be of unseen nature.
7. Problem statements formulated shall be solvable by faculty in 2 hours and average students in 2.5 hrs in the examination duration.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I

IT315. COMPUTER ORGANIZATION & ARCHITECTURE

Teaching Scheme	Examination Scheme
Lectures: 3 Hours/Week, 3 Credits	ESE: 70 Marks
Tutorial: 1 Hour/Week, 1 Credit	ISE: 30 Marks
	ICA: 25 Marks

Introduction:

Computer Organization and Architecture (COA) course provide students with an understanding of the design of fundamental blocks used for building a computer system and interfacing techniques of these blocks to achieve different configurations of an "entire computer system". It introduces detailed understanding of various processor micro architectural designs, which include pipeline design, and multi-core processor design.

Course Prerequisite:

Student shall have undergone a course on Digital Logic Design and Operating system.

Course Outcomes:

At the end of the course students will be able to

1. Describe the functional architecture of computing systems.
2. Analyze various algorithms for arithmetic computation and arrive at fastest one.
3. Use ARC Processor based instructions to write assembly language program.
4. Demonstrate the design aspects of memory, instruction level parallelism and multiprocessors.

SECTION-I

Unit1: Introduction **02 Hrs**

A Brief History of Computing, The Von Neumann Model, Generations of Computers, The System Bus Model, Levels of Machines: Upward Compatibility, The Levels of computer, A Typical Computer System.

Unit2: Data Representation and Arithmetic **06 Hrs**

Introduction, Fixed Point Numbers, Floating Point Numbers, Fixed Point Addition and Subtraction, Fixed Point Multiplication and Division, Floating Point Arithmetic, High Performance Arithmetic: High Performance Addition, High Performance Multiplication.

Unit 3: The Instruction Set Architecture and Memory **05 Hrs**

Hardware Components of the Instruction Set Architecture, ARC - A RISC Computer, Pseudo-Operations, Synthetic Instructions, Examples of Assembly Language Programs, Accessing Data in Memory-Addressing Modes, The Memory Hierarchy, Cache Memory.

Unit 4: Fundamentals of Computer Design **03 Hrs**

Introduction, Classes of Computers, Defining Computer Architecture, Trends in Technology, Power in Integrated Circuits and cost, Dependability, Measuring, Reporting and Summarizing Performance, Quantitative Principles of computer design

SECTION-II

Unit 5: Fundamentals of Pipeline: **07 Hrs**

Introduction to Pipelining, The Major Hurdle of Pipelining: Pipeline Hazards, linear pipeline and Non linear pipeline.

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Unit 6: Instructions –Level Parallelism -1: **08 Hrs**

ILP: Concepts and challenges, Basic Compiler Techniques for exposing ILP, Reducing Branch costs with prediction, Overcoming Data hazards with Dynamic scheduling, Hardware based Speculation.

Unit 7: Instructions –Level Parallelism -2: **07 Hrs**

Exploiting ILPusing multiple issues and static scheduling, Exploiting ILP using dynamic scheduling, multiple issue and speculation, Advanced Techniques for instruction delivery and Speculation

Unit 8: Multiprocessors and Thread –Level Parallelism: **07 Hrs**

Introduction, Symmetric Shared-Memory architectures, Performance of symmetric shared–memory multiprocessors, distributed shared memory and Directory-based coherence.

Text Books:

1. Computer Architecture and Organization An Integrated Approach –Miles Murdocca and Vincent Heuring (WILEY).
2. Computer Architecture, A Quantitative Approach - John L. Hennessey and David A. Patterson: 4th Edition, Elsevier, 2007.
3. Computer Organization and Architecture - William Stallings

Reference Books:

1. Computer Organization – Hamacher Zaky(MGH)
2. Computer Architecture and Organization - John P. Hayes
3. Digital Logic and Computer Design - M. Morris Mano. Pearson Education - Prentice Hall.
4. Computer Organization & Architecture, Rajaraman, PHI Learning
5. http://virtual-labs.ac.in/labs/cse10/cla_design.html or http://192.168.1.7:8080/vlab/

Internal Continuous Assessment (ICA):

Student shall carry on 8 - 10 assignments on the following:

1. What Happened to Supercomputers?
2. Patriot Missile Defense Failure Caused by Loss of Precision
3. Multiplication using Booth's Algorithm.
4. Division using Restoring & non restoring method
5. The Java Virtual Machine
6. The Intel Pentium 4 Memory System
7. Graphics Processing Unit
8. Use the simulator to perform following experiment on computer organization and architecture.
   I. Ripple Carry Adder
   II. Carry-look-ahead adder
9. Use the simulator to perform following experiment on computer organization and architecture

I. Booth's Multiplier

II. Arithmetic Logic Unit

10. Use the simulator to perform following experiment on computer organization and architecture

I. Memory Design

II. Associative cache Design

III. Direct Mapped cache Design

IV. CPU Design

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I

IT316. PYTHON PROGRAMMING

Teaching Scheme
Lectures: 2 Hours/Week, 2 Credits
Practical: 4 Hours/Week, 2 Credits

Examination Scheme
ISE: 25 Marks
ICA: 25 Marks
POE: 50 Marks

Introduction:

Python is a popular, general-purpose, multi-paradigm, open-source, scripting language. It is designed to emphasize code readability – has a clean syntax with high level data types. It is suited for interactive work and quick prototyping, while being powerful enough to write large applications. This course introduces the python language which has simple syntax, powerful set of libraries and robust debugger and profiler.

Course Prerequisite:

Student should have knowledge of basic programming.

Course Outcomes:

At the end of the course students will be able to

1. Apply procedural programming features and object oriented programming basics for problem solving
2. Incorporate standard library packages in python for problem solving.
3. Design and develop Python Script which interfaces with network and Database.
4. Handle bugs using exceptions, debugging and testing the program

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Unit1: Introduction to Python: 02 Hrs

Introducing the Python Interpreter, Program Execution, Execution Model Variations, The Interactive Prompt, System Command Lines and Files

Unit 2: Introduction to Python Programming Constructs: 06 Hrs

Data types and variables, Collection data types, Control structures, loops and functions, Lambdas, Generators, Exception Handling, String handling, Scope of variables, Modules, Packages, Command line arguments. Built-in: Functions, Constants, Types, Exceptions.

Unit 3: Introduction to Object Oriented Programming in Python: 04 Hrs

Classes, Instance Objects, Method Objects, Class and Instance Variables, Attributes and methods, Inheritance and polymorphism

Unit 4: Python Standard Library Modules and Packages -1: 06 Hrs

Common string operations, Regular expression operations, Basic date and time types, General calendar-related functions, Container datatypes, Efficient arrays of numeric values, Dynamic type

creation and names for built-in types, Shallow and deep copy operations, Mathematical functions, Generate pseudo-random numbers, Functional Programming Modules, File and Directory Access

Unit 5: Python Standard Library Modules and Packages -2: 08 Hrs

Data Persistence: Python object serialization, DB-API 2.0 interface for SQLite databases. Work with ZIP archives, CSV File Reading and Writing, Configuration file parser, Logging facility for Python. Concurrent Execution: Thread-based parallelism, Process-based parallelism, Context Variables, Asynchronous I/O.

Low-level networking interface, JSON encoder and decoder, URL handling modules, urlib, HTTP modules, HTTP protocol client,

Unit 6: Testing, Debugging and Profiling: 04 Hrs

Testing output, Unit tests in Python, Handling Multiple exceptions, Creating custom exceptions, Debugging programs, Unit testing, Measure execution time of small code snippets, Creation of virtual environments, System-specific parameters and functions and profiling Python scripts.

Text Books:

1. Programming in Python 3, Second Edition, Mark Summerfield
2. Introduction to Computing and Problem Solving with Python, J. Jose, Khanna Publications
3. Python Programming, Seema Thareja, Pearson
4. Testing Python, David Sale, Wiley India (P) Ltd., ISBN :978-81-265-5277-1

Reference Books:

1. Taming Python by Programming, Jeeva Jose, Khanna Publishing House
2. Python Cookbook, Third Edition, David Beazley and Brian K. Jones, Shroff Publishers & Distributors Pvt. Ltd., ISBN :978-93-5110-140-6
3. Learning Python Fifth Edition, Mark Lutz
4. Programming Python (English) 4th Edition Mark Lutz

E-Resource:

1. Python 3.7.3 documentationhttps://docs.python.org/3/

Internal Continuous Assessment (ICA):

It consists of minimum eight to ten experiments based upon above curriculum.

In Semester Evaluation (ISE):

For this course ISE will consist of conducting three programming (hands on) tests based on topics mentioned in curriculum.

Modalities for conducting End Semester Examination/Practical Oral Examination (POE):

- Practical and Oral Examination will be conducted by a panel of examiners assigned by university. A pair of examiners shall assess a batch @36 students in a day.

- The chairman shall prepare problem statements adhering to following guidelines:
    1. At least Four Problem statements shall be set for a batch.
    2. Problem statements shall be set in the context of course outcomes as defined in the course.
    3. Problem Statements shall not be direct statements stating implement concept/topic etc.
    4. Problem Statements shall be based on real word problem/use case/scenario etc.
    5. Problem statement shall be at the minimum cognitive level of Apply & above.
    6. Problem Statements must be well described with no ambiguity and shall be of unseen nature.
    7. Problem statements formulated shall be solvable by faculty in 2 hours and average students in 2.5 hrs in the examination duration.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I
Self Learning Module-I (HSS)
SL31-A1. ECONOMICS

Teaching Scheme
Self Learning - 2 Credits

Examination Scheme
ESE: 50 Marks

Course Outcomes:

At the end of this course, students will be able to

1. Identify the Basic Economic problems, Resource Constraints
2. Apply various theories of economics for economic growth
3. Identify causes of Inflation consequence and remedies
4. To assess the impact of International Trade, foreign exchange on Indian economy

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Unit 1: Introduction
History of Economic thought, Basic Economic problems, Resource Constraints and Welfare maximization,
Nature of Economics: Positive and Normative Economics, Micro and Macro Economics, Basic concepts in Economics, The role of State in economic activity, Market and Government failures, New economic Policy in India.

Unit 2: Theories of Economics
Theory of utility and consumer's choice, Theories of Demand, supply and market equilibrium, Theories of firm, production and costs, Market structures, Perfect and imperfect competitions, oligopoly, monopoly

Unit 3: Macroeconomics
An overview of Macroeconomics, measurement and determination of national income, Consumption, saving and investment

Unit 4: Banking & Inflation
Commercial and Central Banking, Relationship between money, output and prices, Inflation causes, consequences and remedies

Unit 5: International Influences on Economics
International Trade, foreign exchange and balance payments, stabilization policies, Monetary, Fiscal and exchange rate policies.

Assignments:

Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books:

1. Economics: P.A. Samuelson & W.D Nordhaus (McGraw Hill, New York, 1995.)
2. Modern Microeconomics : A. Koutsoyiannis (Macmillan,1975)

Reference Books:

1. Microeconomics: R. Pindyck and D.L. Rubinfield. (Macmillan New York, 1989
2. Microeconomics: Gordon, 4th edition, Little Brown & Co., Boston,1987.
3. The Organization of Industry: William F. Shughart II, Richard D. Irwin, Illinois, 1990.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I
Self Learning Module-I (HSS)

SL31-A2. INTELLECTUAL PROPERTY RIGHTS FOR TECHNOLOGY DEVELOPMENT AND MANAGEMENT

Teaching Scheme	**Examination Scheme**
Self Learning - 2 Credits	**ESE: 50 Marks**

Course Outcomes:

At the end of this course, students will be able to

1. Appreciate the intellectual property rights coming out of research and intellectual works
2. Demonstrate their knowledge about the process of acquiring the patents and copyrights for the innovative works.
3. Elaborate the role of Indian IPR system and role of WTO in protecting Intellectual Property Rights
4. Avoid the plagiarism in their thesis, research papers etc. which can be questioned legally

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Unit 1:
Dynamics of Knowledge evolution, creation of ownership domains in the knowledge space using various instruments of IPR

Unit 2:
Outlines concepts of confidentiality and information security, explores their role in technology development and transfer integrating Intellectual Property in project planning, execution & commercialization

Unit 3:
Discussion on the shifting paradigms of R&D and their linkage to IPR, Introduction to concepts of Valuation of IP & Value Realization

Unit 4:
Comparison the Indian IPR system with international IPR frameworks especially in the context of WTO, followed by a few sessions on IPR litigations both for the enforcement of rights and business strategy

Unit 5:
Discussion on contentious issues of current interest such as Biotechnology and Intellectual Property, Protection of Traditional Knowledge, IPR and Electronic Commerce, TRIPS and Access to Medicines, Copyright issues in creative works, etc

Assignments:
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)

In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books:

1. Prabuddha Ganguli: Intellectual Property Rights Unleashing the Knowledge Economy. Tata McGraw Hill, New Delhi, 2001.
2. Prabuddha Ganguli: Gearing Up for Patents The Indian Scenario. Universities Press India Ltd., Hyderabad, 1998.
3. P. Narayan: Patent Law. Eastern Law Co., Calcutta.

Reference Books:

1. Global Dimensions of Intellectual Property Rights in Science and Technology, Author: National Research Council , National Academies Press, 1993.
2. Technology Transfer: Intellectual Property Rights, C Sri Krishna, ICFAI University press (2008)

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T. Y. B.Tech. (Information Technology) Semester– I
Self Learning Module-I (HSS)
SL31-A3. INTRODUCTION TO SOCIOLOGY

Teaching Scheme
Self Learning - 2 Credits

Examination Scheme
ESE: 50 Marks

Course Outcomes:

At the end of this course, students will be able to

1. Interpret the effect of various social phenomena on sociology
2. Elaborate the role of urbanization on the society
3. Appreciate the need of social institutions for better society.
4. Assess the role of modernization, industrialization, environmental/ecological changes in the development of society.

Unit 1:
What is sociology, some sociological concepts: social structure, status, role, norms, values etc., Socialization, and culture and change
Social stratification - various approaches and concept of social mobility

Unit 2:
Population and society - Trends of demographic change in India and the world, Human Ecology, Trends of Urbanization in the developing countries and the world.

Unit 3:
Major social institutions - Family and marriage, caste and tribe and organizations:

i. Formal organization (bureaucracy)
ii. Informal Organization

Unit 4:
Processes of social change- Modernization (including Sanskritization), industrialization, environmental/ecological changes and development

Unit 5:
Social movements - protest movements, reformist movement and radical movements in India

Assignments:
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books:

1. Sociology, L. Broom, P. Selznick and D. Dorrock, 11th Edn. 1990 (Harper International).
2. Sociology: Themes and Perspectives, M. Haralambos, Oxford University Press, 1980.
3. General Introduction to Sociology, Guy Rocher, A. , MacMillan, 1982.

Reference Books:

1. Social movements in India, vols. 1-2, 1984, M.S.A. Rao, Manohar Publications.
2. Society in India, David Mandelbaum, 1990, Popular Publications.
3. Social change in modern India, M.N. Srinivas, 1991, Orient Longman Publications.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I
Self Learning Module-I (HSS)
SL31-A4. STRESS AND COPING

Teaching Scheme
Self Learning - 2 Credits

Examination Scheme
ESE: 50 Marks

Course Outcomes:

At the end of this course, students will be able to

1. Identify various sources and nature of a stress.
2. Elaborate the effects of medical, psychological and behavioral stress.
3. Appreciate the social support to mitigate the stress.
4. Adopt various stress management techniques.

Unit 1:
Concept of stress-current and historical status, The nature of the stress response

Unit 2:
Common sources of stress biological, personality and environmental

Unit 3:
Coping styles defensive behaviors and problem-solving. Consequences of stress- medical, psychological and behavioral

Unit 4:
The role of social support in mitigating stress

Unit 5:
Stress management techniques-relaxation, meditation, cognitive restructuring, self-control, bio-feedback and time management, Preparing stress profile of a student.

Assignments:
Students shall complete five assignments, based on syllabus. (One assignment for every unit of the syllabus)
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books:

1. Walt, S. "Stress Management for Wellness". Harcourt Brace & Jovanovich, N.York, 1994.
2. D. Girdano and G. Everly., "Controlling Stress and Tension", Prentice-Hall, 1986.
3. Monat and R. Lazarus, "Stress and Coping: An Anthology", Columbia Univ. Press, 1985.

Reference Books:

1. Weisman, "The Coping Capacity", Human Services Press, 1984.
2. Stress and Coping: The Indian Experience, D.M. Pestonjee, SAGE India; Second edition (1998)

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– I
Self Learning Module-I (HSS)
SL31-A5. PROFESSIONAL ETHICS & HUMAN VALUES

Teaching Scheme
Self Learning - 2 Credits

Examination Scheme
ESE: 50 Marks

Course Outcomes:
At the end of this course, students will be able to

1. Inculcate the human values in their behavior.
2. Demonstrate the Engineering ethics in their professional practice.
3. Practice the safety and responsibility and professional rights in their professional practice.
4. Incorporate the code of ethics of Global organizations such as ASME, ASCE, and IEEE

Unit 1: Human Values
Morals, Values and Ethics, Integrity, Work Ethics, Service Learning, Civic Virtue, Respect for others, Living Peacefully, Caring, sharing, Honesty, Courage, Valuing Time, Cooperation , Commitment, Empathy, Self-Confidence, Character, spirituality

Unit 2: Engineering Ethics
Senses of engineering ethics, Variety of Moral Issues, Types of inquiry, Moral Dilemmas Moral Autonomy, Kohlberg's Theory, Gilligan's Theory, Consensus and Controversy, Models of Professional Roles, Theories about Right Action, Self Interest, Customs and Religion

Unit 3: Safety, Responsibilities and Rights
Safety and Risk, Assessment of safety and Risk, Risk Benefit Analysis and Reducing Risk, The Three Mile Island and Chernobyl Case Studies.
Collegiality and Loyalty, Respect for Authority, Collective Bargaining, Confidentiality, Conflicts of Interest, Occupational Crime, Whistle Blowing, Professional Rights – Employee Rights, Intellectual Property Rights (IPR) – Discrimination

Unit 4: Global Issues
Multinational Corporations, Environmental Ethics, Computer Ethics, Weapons Development, Engineers as Managers, Consulting Engineers, Engineers as Expert Witnesses and Advisors, Sample Code of Ethics of ASME, ASCE, IEEE, Institution of Engineers (India), etc.

Assignments:
Students shall complete to do four assignments, based on syllabus (One assignment for every unit of the syllabus).
In addition to the above, the institute may prescribe additional modes of assessment such as Unit test, Quiz, Presentation, Course seminar etc. for ensuring continuous assessment of the students.

Text Books:

1. Bayles, M.D.: Professional Ethics, California: Wadsworth Publishing Company, 1981.
2. Koehn, D.: The Ground of Professional Ethics, Routledge, 1995.
3. R.S. Naagarazan, A Text Book of Professional Ethics & Human Values, New Age International, 2006

Reference Books:

1. Camenisch, P.F.: Grounding Professional Ethics in a Pluralistic Society, N.Y.: Haven Publications, 1983.
2. Wuest, D.E.: Professional Ethics and Social Responsibility, Rowman & Littlefield, 1994.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– II

IT321. SOFTWARE ENGINEERING

Teaching Scheme	**Examination Scheme**
Lecture: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Tutorial: 1 Hour/Week, 1Credit	**ISE: 30 Marks**
	ICA: 25 marks

Introduction:
Software Engineering focuses on the principles and knowledge of software engineering. It covers the approaches taken in developing software projects, including requirements analysis and specification, design, coding, testing, maintenance and thorough documentation as illustrated by examples. This course will prepare students for working in teams to build quality software, and it provides the necessary hands-on practice for those who wish to enhance their knowledge base.

Course Prerequisite:
Student shall have undergone a course on Object Oriented Programming through C++. An understanding of Object Oriented Analysis and Design and Programming Skills

Course outcomes:
At the end of the course, students will be able to
1. Describe various software life cycle models and select appropriate model for development of Project.
2. Arrive at Software Requirement Specification document (SRS) and Design document for a given problem.
3. Apply software design techniques, testing methods and project planning for software development.

SECTION-I

Unit 1: Introduction to Software Engineering **11 Hrs**
Introduction, The Problem Domain, Software Engineering Challenges and Approach, Software Process, Characteristics of Software Process, Software Development Process Models: Water fall model, Iterative development model, Spiral model, Rational unified Process model, Prototype model, Time Boxing model, Agile process model.

Unit 2: Software Requirement Analysis & Specification **06 Hrs**
Value of Good SRS, Requirement Process, Requirements specification, Functional Specification with Use Cases, Other Approaches for Analysis: Data Flow Diagram, Entity Relationship Diagram.

Unit 3: Software Architecture and Design **08 Hrs**
Software Architecture: Role of Software Architecture, Architecture Views, Component & Connector View, Architecture Style for Component & Connector view, Documenting Architecture Design.
Design Concepts: Coupling, Cohesion, Open Closed Principle, Function-Oriented Design, Object Oriented Design, Detailed Design, Verification, Metrics.

SECTION-II

Unit 4: Testing **04 Hrs**

Testing Fundamentals, Testing Process, Black-Box Testing, White-Box Testing, Object Oriented Software tests methods, Functional testing, Unit testing, System testing, User satisfaction testing.

Unit 5: Project Planning and Management **08 Hrs**

Project management process, The Inspection Process, software configuration management process, Effort estimation, Project Schedule and Staffing, Quality planning: Quality Concepts, Qualitative quality management planning. CMM project management process, Risk Management Planning, Project Monitoring Plan, Detailed Scheduling

Unit 6: Agile Project Management **08 Hrs**

Introduction to APM, Implementation, Iterative Project Management Life Cycle, Adaptive Project Management Life Cycle, Adaptive & Integrating the APM toolkit,The Science of Scrum, New Management Responsibilities.

Text Books:

1. An Integrated Approach to Software Engineering- 3rdedition: Pankaj Jalote (Narosa Publishers)
2. Effective Project Management Traditional, Agile, Extreme: Robert K. Wysocki WILEY INDIA, 6th edition.
3. Project Management with Scrum: Ken Schwaber.

Reference Books:

1. Software engineering: Ian Sommerville, Pearson education Asia, 6th edition
2. Software Engineering Fundamentals: Ali Behforooz and Frederick j. Hudson (Oxford University Press)

Internal Continuous Assessment (ICA):

ICA should consist of implementing one case study. Students of Different Batches should be assigned Different Case Studies to Design & Implement. Samples of case studies are as below:

1: Library Book Circulation System
2: Online Railway Reservation System

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T. Y. B.Tech. (Information Technology) Semester– II

IT322. OBJECT ORIENTED MODELING AND DESIGN

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Tutorial: 1 Hour/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25Marks

Introduction:

This course presents Object Oriented approaches to software development based on modeling objects from the real world and then using the model to build a language independent design organized around those objects. These techniques promote better understanding of requirements, cleaner designs and more maintainable systems.

Course Prerequisite:

Student shall have undergone an introductory course on Object oriented Design and Programming.

Course Outcomes:

At the end of the course students will be able to

1. Demonstrate basics of Object Oriented Modeling.
2. Design models for real world problems using Object Modeling Technique.
3. Design UML Diagrams for real world problems.

SECTION-I

Unit 1: Introduction to Object oriented approach and Object Modeling 10 Hrs

Object oriented development and themes, evidence for usefulness, modeling as a Design Technique. Objects, classes, links and associations, generalization and inheritance, grouping constructs, aggregation, abstract classes, generalization as extension and restriction, multiple inheritance, metadata, candidate keys and inheritance.

Unit 2: Dynamic and Functional Modeling 06 Hrs

Events, states, operations, concurrency, nested state diagrams, advanced dynamic modeling concepts, relation of object and dynamic models, DFD, relation of functional to object and dynamic models

Unit 3: Implementation of OMT 06 Hrs

Use of programming language and database system, Object oriented style, feature of object-oriented languages, Applications of OMT like object diagram compiler, Computer animation

SECTION-II

Unit 4: Structural Modeling using UML **08 Hrs**

Classes, Relationships, Common mechanisms, Diagrams, Class Diagrams, Interfaces, Types and Roles, Packages, Instances and Object Diagram

Unit 5: Behavioral Modeling using UML **08 Hrs**

Interactions, Use cases, Use case diagram, Interaction Diagrams and Activity diagrams, Events and signals, State Machines, Processes and Threads, Time and space, State chart diagrams.

Unit 6: Architectural Modeling using UML **07 Hrs**

Components, Deployment, Collaboration, Patterns and Frame works, Component diagrams and Deployment Diagrams

Text Books:

1. Object oriented Modeling and Design: Rambaugh, Premerlani, Eddy, Lorenson (PHI)
2. The Unified Modeling Language User Guide: Grady Booch, Jeams Rambaugh, Ivar Jacobson (Addison Wesley)
3. Object Oriented Modeling and Design with UML, 2nd Edition, Micheal R.Blaha, Pearson

Reference Books:

1. Practical Object Oriented Design with UML – Mark Priestley.
2. UML-In a Nut Shell – Sinon Alhair

Internal Continuous Assessment (ICA):

ICA should consist of the following

1. Prepare a list of objects that you would expect each of the following system to handle also draw the class and object diagram for the same.

   a) Hospital Management System

   b) Air transportation system.

   c) Banking System

   d) Library Information System

   e) Railway Reservation System

   f) Water Management System

   g) Supermarket Information System

2. Dynamic and Functional Modeling

   a. Draw the state diagram for telephone answering machine. The machine should answer after five rings. If the telephone is answered before five rings, the machine should do nothing.

   b. Design functional model for flight simulator.

3. Draw Object Model with attributes and inheritance for Water Management System

4. Draw Use case Diagram for Railway Reservation System.
5. Draw Sequence and collaboration diagram for Banking System.
6. Draw Deployment diagram for Home Network. (Hint: Modern homes usually have a network of interconnected devices of different kinds and with various types of connections and communication protocols. It contains cable modem, wireless router, various computers and devices).
7. Draw Component diagram for online examination system.

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T. Y. B.Tech. (Information Technology) Semester– II

IT323. ARTIFICIAL INTELLIGENCE

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Practical: 2 Hours/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25Marks

Introduction:
This course presents a basic introduction to the techniques used in developing Artificial Intelligent systems. It is a walkthrough to problem spaces and search algorithms, Knowledge representation, reasoning, logic programming and applications of Artificial Intelligence

Course Prerequisite:

Student shall have some exposure to algorithms and programming.

Course Outcomes:
At the end of the course students will be able to

1. Demonstrate fundamentals of Artificial Intelligence and their probable applications.
2. Select an appropriate problem solving method and knowledge representation technique for a given problem.
3. Analyze the advantages and limitations of various search algorithms for problem solving.
4. Design models for reasoning with uncertainty as well as the use of unreliable information.
5. Develop applications for real world problems using artificial intelligence.

SECTION-I

Unit 1: Introduction to Artificial Intelligence **06 Hrs**
Definition of AI, The AI problems, the understanding Assumption, AI Technique, the level of the model, criteria for success

Unit2: Problem spaces and Search **10 Hrs**
Definition of a problem as a state space search, Problem characteristics, Issues in the design of search programs
State Space Search: Depth First Search, Breadth First Search, DFID. Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search.
Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony Optimization.
Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search.
Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net.

Unit 3: Knowledge Representation **06 Hrs**
Representation and Mappings, Approaches to Knowledge representation, Issues in knowledge representation, The frame problem. Representing simple facts in predicate logic, Representing instances and Isa Relationships, computable functions & Predicates, Resolution, Natural deduction, Procedural versus declarative knowledge, logic programming, forward versus backward reasoning, matching, control knowledge.

SECTION-II

Unit 4: Symbolic Reasoning under uncertainty and Statistical Reasoning **08 Hrs**

Introduction to non monotonic reasoning, logic for non monotonic reasoning, implementation issues, probability and Baye's Theorem in certainty factor and Rule – Based systems, Bayesian Networks, Demster Shafer Theory, Fuzzy logic.

Unit 5: Logic Programming with Prolog **08 Hrs**

Backward Chaining, Logic Programming, Prolog, Search in Prolog, Controlling Search, The Cut Operator in Prolog.

Unit 6: Applications of AI **07 Hrs**

Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graph plan, Constraint Propagation.

Natural Language Understanding: Natural Language Semantics, CD Theory, English to CD Theory

Game Playing: Min-max Algorithm, Alpha-Beta Algorithm, SSS*.

Expert System: Introduction, Rule Based System Architectures, Knowledge Acquisition and validation, Knowledge system building tools.

Text Books:

1. A First Course in Artificial Intelligence - Deepak Khemani., McGraw Hill Education (India), 2013.
2. Artificial Intelligence - Elaine Rich, Kevin Knight, Shivashankar B. Nair (Third Edition) , Tata McGraw Hill, 2009.
3. Heuristic Search: Theory and Applications - Stefan Edelkamp and Stefan Schroedl, Morgan Kaufmann, 2011.

Reference Books:

1. A classical approach to Artificial Intelligence, Munesh Chandra Trivedi, Khanna Publications
2. Artificial Intelligence and Machine Learning, Chandra S.S. & H.S. Anand, PHI Publications
3. Artificial Intelligence: The Very Idea -John Haugeland, A Bradford Book, The MIT Press, 1985.
4. Artificial Intelligence: A Modern Approach - Stuart Russell and Peter Norvig, 3rd Edition, Prentice Hall, 2009.
5. Introduction to Artificial Intelligence - Eugene Charniak, Drew McDermott., Addison-Wesley, 1985.
6. Artificial Intelligence - Patrick Henry Winston., Addison-Wesley, 1992.

Internal Continuous Assessment (ICA):

Student should implement the following:

1. Breadth first search, Depth first search and Best first search algorithms.
2. A simple Genetic Algorithm.
3. Heuristic algorithms: A* and AO* algorithms.
4. An application using PROLOG.
5. Min-Max and Alpha Beta Algorithm.

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T. Y. B.Tech. (Information Technology) Semester– II

IT324A. Elective – I DATA SCIENCE

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Practical: 2 Hours/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25Marks

Introduction:
Data science is a field of study and application that has been growing rapidly for the past several decades. As a growing field, it is gaining a lot of attention in both the media as well as in the job market. This course introduces the basic terminology used by data scientists and a look at the types of problem.

Course Prerequisite:
Introduction to Programming, Probability

Course Outcome:
At end of this course, the students will be able to:
1. Demonstrate understanding of the mathematical foundations needed for data science.
2. Collect, explore, clean and manipulate data to convert it into an appropriate form.
3. Implement models such as k-nearest Neighbors, Naive Bayes, linear and logistic regression, decision trees, neural networks and clustering.
4. Build data science applications using Python based toolkits.

SECTION – I

Unit 1:Introduction to Data Science **04 Hrs**
Concept of Data Science, Traits of Big data, Web Scraping, Analysis vs Reporting

Unit 2:Introduction to Programming Tools for Data Science **06 Hrs**
Toolkits using Python: Matplotlib, NumPy, Scikit-learn, NLTK, Visualizing Data: Bar Charts, Line Charts, Scatterplot'sworking with data: Reading Files, Scraping the Web, Using APIs (Example: Using the Twitter APIs), Cleaning and Munging, Manipulating Data, Rescaling, Dimensionality Reduction

Unit 3:Mathematical Foundations **12 Hrs**
Linear Algebra: Vectors, Matrices, Statistics: Describing a Single Set of Data, Correlation, Simpson's Paradox, Correlation and Causation, Probability: Dependence and Independence, Conditional Probability, Bayes's Theorem, Random Variables, Continuous Distributions, The Normal Distribution, The Central Limit Theorem Hypothesis and Inference: Statistical Hypothesis Testing, Confidence Intervals, P- hacking, Bayesian Inference

SECTION – II

Unit 4:Machine Learning **06 Hrs**

Overview of Machine learning concepts – Over fitting and train/test splits, Types of Machine learning – Supervised, Unsupervised, Reinforced learning, Introduction to Bayes Theorem, Linear Regression-model assumptions, regularization (lasso, ridge, elastic net),

Unit 5: Machine Learning Algorithms **10 Hrs**

Classification and Regression algorithms- Naïve Bayes, K-Nearest Neighbors, logistic regression, support vector machines (SVM), decision trees, and random forest, Classification Errors, Analysis of Time Series- Linear Systems Analysis, Nonlinear Dynamics, Rule Induction, Neural Networks-Learning and Generalization, Overview of Deep Learning.

Unit 6: Case Studies of Data Science Application **06 Hrs**

Weather forecasting, Stock market prediction, Object recognition, Real Time Sentiment Analysis

Text Books:

1. Data Science from Scratch: First Principles with Python - Joel Grus, O'Reilly Media
2. Data Sciences Jain V.K.Khanna Publishing House, Delhi.
3. Machine Learning - Jeeva Jose - Khanna Publishing House, Delhi.

Reference Books:

1. Hands-On Machine Learning with Scikit-Learn and Tensor Flow: Concepts, Tools, and Techniques to Build Intelligent Systems - Aurélien Géron, 1st Edition, O'Reilly Media
2. Big Data and Hadoop- Jain V.K., Khanna Publishing House, Delhi.
3. Machine Learning - Chopra Rajiv, Khanna Publishing House, Delhi.
4. Deep Learning - Ian Goodfellow, YoshuaBengio and Aaron Courville - MIT Press http://www.deeplearningbook.org
5. Data Mining Concepts and Techniques - Jiawei Han and Jian Pei Third Edition, Morgan Kaufmann Publisher

Internal Continuous Assessment (ICA) :

ICA should consist of writing programs in Python for the following

1. To predict the class of the flower based on available attributes.
2. To predict if a loan will get approved or not.
3. To predict the traffic on a new mode of transport.
4. To predict the class of user.
5. To indentify the tweets which are hate tweets and which are not.
6. To predict the age of the actors.
7. To predict the time taken to solve a problem given the current status of the user.

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T. Y. B.Tech. (Information Technology) Semester– II

IT324B. Elective – I ARTIFICIAL NEURAL NETWORK

Teaching Scheme	**Examination Scheme**
Lectures: 3 Hours/Week, 3 Credits	**ESE: 70 Marks**
Practical: 2 Hours/Week, 1 Credit	**ISE: 30 Marks**
	ICA: 25Marks

Introduction:
This course introduces the basic models, learning algorithms and some applications of neural networks which will help to know how to use neural networks for solving various problems related to real world applications.

Course Prerequisite:
Student shall have undergone a course on basic computational mathematics including matrices and probability.

Course Outcomes:
At the end of the course student will be able to

1. Demonstrate fundamentals of Artificial Neural Networks and their probable applications.
2. Select an appropriate configuration of neural network from those available to solve problems in a specific contest.
3. Demonstrate activation and synaptic dynamic models to understand stability and convergence in Artificial Neural Networks.
4. Develop applications of real world using Artificial Neural Networks.

SECTION - I

Unit 1: Introduction to ANN **06 Hrs**
Features, structure and working of Biological Neural Network, Trends in Computing Comparison of BNN and ANN

Unit 2: Basics of Artificial Neural Networks **08 Hrs**
History of neural network research, characteristics of neural networks terminology, models of neuron McCulloch – Pitts' model, Perceptron, Adaline model, Basic learning laws, Topology of neural network architecture

Unit 3: Back-propagation Networks (BPN) **08 Hrs**
Architecture of feed forward network, single layer ANN, multilayer perceptron, backpropagation learning, input - hidden and output layer computation, back-propagation algorithm, applications, selection of tuning parameters in BPN, Numbers of hidden nodes, learning

SECTION – II

Unit 4: Activation & Synaptic Dynamics **06 Hrs**

Introduction, Activation Dynamics models, synaptic Dynamics models, stability and convergence, recall in neural networks.

Unit 5: Basic functional units of ANN for pattern recognition tasks **08 Hrs**

Basic feed-forward, Basic feedback and basic competitive learning neural network, Pattern association, pattern classification and pattern mapping tasks

Unit 6: Applications of ANN **08 Hrs**

Pattern classification – Recognition of Olympic games symbols, Recognition of printed Characters. Neo-cognitron – Recognition of handwritten characters.

NET Talk: to convert English text to speech, Recognition of Consonant Vowel (CV)segments, texture classification and segmentation.

Text Books:

1. Artificial neural Networks- B. Yegnanarayana-PHI
2. Neural Networks, Fuzzy logic and Genetic Algorithms- S.Rajsekaran, Vijayalakshmi Pari-PHI
3. Neural Networks- Satish Kumar, Nymedia Press.

Reference Books:

1. Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.
2. Neural Networks in Computer Intelligence, Li Min Fu TMH 2003
3. Neural Networks -James A Freeman David M S Kapura Pearson Education 2004.
4. Introduction to Artificial Neural Systems Jacek M. Zurada, JAICO Publishing House Ed. 2006

Internal Continuous Assessment (ICA):

ICA should consist of following laboratory assignments

1. Introduction to Tensorflow, Graph-based computation
2. Training Neural Networks : Training Example Networks, Perceptrons, Shallow/Deep Networks
3. Constructing and Training Neural Networks : Working with Operators, Designing various training procedures
4. Convolutional Neural Networks : Training CNN, Examples from Computer Vision : Classification examples (AlexNet), Segmentation examples
5. Recurrent Neural Networks : Training RNNs Examples from NLP, Examples from Robotics

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T. Y. B.Tech. (Information Technology) Semester– II

IT325. MOBILE APPLICATION DEVELOPMENT

Teaching Scheme	**Examination Scheme**
Lectures: 2 Hours/Week, 2 Credits	**ISE: 25 Marks**
Practical: 2 Hours/Week, 1 Credit	**ICA: 25 Marks**
	POE: 50 Marks

Introduction:

Mobile application development course will build your skills in creating mobile apps for Android platform as well as for Cross platform. This course includes Android application development and Xamarin Application development with basic User Interface design, basic building blocks, data handling, Testing mobile apps and how to take app to the market.

Course Prerequisite:

Knowledge of programming paradigms and object-oriented programming principles

Course Outcomes:

At the end of the course students will be able to

1. Select suitable development practices for a mobile application
2. Build cross platform mobile application for a given problem scenario.
3. Choose suitable method of testing, signing, packaging and distribution for a mobile application.

Section I: Mobile application development for Android using Java/Kotlin

Unit 1 - User Interface Design **04 Hrs**

Activity, Activity states, Activity Life Cycle, UI Resources, Layout Resources, String Resources, Image Resources, UI Elements and Events, Interaction between Activities, Exchanging data among activity, Fragments, Life Cycle of Fragments, Interaction between Fragments

Unit 2 - Mobile Application Functionality **04 Hrs**

Beyond UI, App functionality beyond user interface - Threads, Asynchronous Tasks, Services – states and life cycle, Intent and Bound Service, Notifications, Intents and Intent Resolution, Broadcast receivers, Telephony and SMS APIs

Unit 3 - Native Data Handling **04 Hrs**

Native data handling On-device File I/O, data persistent and access using shared preferences, mobile databases such as SQLite and implementation for CRUD, and enterprise data access (via Internet/Intranet)

Unit 4 - Testing & Distribution Of Mobile Apps **02 Hrs**

Debugging mobile apps, White box testing, Black box testing, and Unit testing for Android. Versioning, signing and packaging mobile apps, distributing apps on mobile market place, Google play store

Section II: Cross platform mobile application development using Xamarin

Unit 5 - C# Programming Guide **04 Hrs**

Inside a C# Program, Main() and Command-Line Arguments, Statements, Expressions, and Operators, Types, Classes and Structs, Interfaces, Inheritance and Polymorphism in C#, Delegates, Arrays, Strings, Properties, Indexers, Events, Generics, Iterators, Namespaces, Assemblies in .NET, Attributes, Collections, Exceptions and Exception Handling, Multi-threading.

Unit 6 - Getting Started With Xamarin **04 Hrs**

Introducing native cross-platform applications with Xamarin, Hello MVVM—creating a simple cross-platform app using MVVM, MVVM—the model-view–view model design pattern, Hello again, MVVM—understanding and enhancing our simple MVVM app, An introduction to multithreading for Xamarin apps.

Unit 7 - Building APPs **04 Hrs**

Designing MVVM cross-platform apps, Building cross-platform models, Building cross-platform view models, Building simple Android views, Building more advanced Android views, Building simple iOS views, Building more advanced iOS views

Unit 8 - From Working Code To The Store **04 Hrs**

Running mobile apps on physical devices, Testing mobile apps using Xamarin UITest, Using App Center to build, test, and monitor apps, Deploying apps to beta testers and the stores.

Text Books:

1. Android Application Development - All in one for Dummies, Barry Burd
2. Mobile Apps Development, Anubhav Pradhan, Anil V Deshpande
3. Xamarin in Action: Creating native cross-platform mobile apps by Jim Bennett, Manning Publications; 1st edition.

Reference Books:

1. Android Developer Tools Essentials by Mike Wolfson (O'Reilly Media)
2. Embedded Android-Porting, Extending, and Customizing, Karim Yaghmour, (O'Reilly Media)

E-resources:

1. Android Developer Resources: http://developer.android.com
2. Xamarin documentation - Xamarin | Microsoft Docs: https://docs.microsoft.com/en-gb/xamarin/

Internal Continuous Assessment (ICA):

ICA should consist of Minimum 10 assignments requiring students to design, develop and test cross platform mobile applications for real world problem/use-case/scenario.

In Semester Evaluation (ISE):
ISE for the course will consist of three programming (hands on) tests based on the topics mentioned in the curriculum.

Modalities for conducting End Semester Examination/Practical Oral Examination (POE):

- Practical and Oral Examination will be conducted by a panel of examiners assigned by university. A pair of examiners shall assess a batch @36 students in a day.
- The chairman shall prepare problem statements adhering to following guidelines:
    1. At least Four Problem statements shall be set for a batch.
    2. Problem statements shall be set in the context of course outcomes as defined in the course.
    3. Problem Statements shall not be direct statements stating implement concept/topic etc.
    4. Problem Statements shall be based on real word problem/use case/scenario etc.
    5. Problem statement shall be at the minimum cognitive level of Apply & above.
    6. Problem Statements must be well described with no ambiguity and shall be of unseen nature.
    7. Problem statements formulated shall be solvable by faculty in 2 hours and average students in 2.5 hrs in the examination duration.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– II

IT326. JAVA PROGRAMMING

Teaching Scheme
Lectures: 2 Hours/Week, 2 Credits
Practical: 4 Hours/Week, 2 Credits

Examination Scheme
ISE: 25 Marks
ICA: 25 Marks
POE: 50 marks

Introduction:
This course introduces Java Programming from basics to advanced Java concepts. The importance of Java language cannot be denied as it has already started ruling over the entire Software Industry. The aim of this course is to provide students with an understanding of the object-oriented design and programming techniques. Java, a prime object-oriented programming language, is used to illustrate this programming paradigm

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Course Prerequisite:

Students must be familiar with basic programming languages like C

Course Outcomes:
At the end of the course students will be able to
1. Implement Object Oriented features and server-side programming..
2. Use Java runtime library APIs for implementing functionality of various applications.
3. Select appropriate Java runtime library APIs to create GUI and web application using Java language

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SECTION-I

Unit 1: Basics of Java and Strings in Java **02 Hrs**
Basics: Java Runtime Environment, Naming Conventions, Language Basics: Variables, Operators, Expressions, Statements, Blocks, Control flow Statements, Input and Output, Data Types, Arrays, Type Casting.

Fundamentals: String Class and Methods, Immutability of Strings, String Buffer Class and Methods, String Builder class and Methods.

Unit 2: Introduction to OOPs **04 Hrs**
Objects and Classes, Fields and Methods, Abstraction, Encapsulation, Inheritance, Polymorphism, Type Compatibility and Conversion, Overriding Methods, Access control, Modifiers, Constructors, Abstract classes, Nested classes, Packages, Wrapper classes, Interfaces, Object Life time & Garbage Collection.

Unit 3: Exceptions, Error Handling and Basic IO **06 Hrs**
Exceptions and Error Handling: Exceptions and Errors, Catching and Handling Exceptions, The try Block, The catch Blocks, The finally Block, Throwing Exceptions, Chained Exceptions, Custom Exceptions. JUnitTesting Framework.

Basic I/O: I/O Streams, Byte Streams, Character Streams, Buffered Streams, Scanning and Formatting, Data Streams, Object Streams , File I/O Classes: Reading, Writing, and Creating Files and Directories.

Unit 4: Java Collections Framework **06 Hrs**

Introduction, The Arrays Class, Searching and sorting arrays of primitive data types, Sorting Arrays of Objects, The Comparable and Comparator Interfaces, Sorting using Comparable & Comparator, Collections: Lists, Sets, Maps, Trees, Iterators and Collections, The Collection Class.

Unit 5: Multithreading and Networking **06 Hrs**

Multithreading: Creating Threads, Thread scheduling and priority, Thread interruptions and synchronization.

Network Programming: InetAddress, URLs, Socket (TCP & UDP) communication in Java, Servlet Programming

Unit 6: GUI Programming using Swing 0**3 Hrs**

Swing package, Layouts, Events, Listeners and Event handling, and Swing Components.

Unit 7: JDBC 0**3 Hrs**

Introduction to JDBC, JDBC Drivers & Architecture, CRUD operations Using JDBC API

Text books:

1. Head First Java – Kathy Sierra, Bert Bates, O'Reily Publication
2. The JavaTM Programming Language By Ken Arnold, James Gosling, David Holmes, Pearson Publication
3. Core Java for Beginners- Rashmi Kanta Das, Vikas Publishing House Pvt. Ltd
4. Programming with Java, Balaguruswamy, TMH 5. Internet and Java Programming, Tanweer Alam, Khanna Publishing House

Reference Books:

1. The Java Language Specification, Java SE 8 Edition Book by James Gosling, Oracle Inc. (e-Resource: http://docs.oracle.com/javase/specs/)
2. Java: The Complete Reference 8 Edition - Herbert Schildt , Tata McGraw - Hill Education
3. Head First Servlets and JSP – Bryan Bosham, Kathy Sierra, Bert Bates, O'Reily Publication
4. The JavaTM Tutorials. Oracle Inc. (e-Resource: http://docs.oracle.com/javase/tutorial/)
5. Java Server Programming for Professionals - Ivan Bayross, Sharanam Shah, Cynthia Bayross and Vaishali Shah, Shroff Publishers and Distributors Pvt. Ltd, 2nd Edition

Internal Continuous Assessment (ICA):

Students should undertake minimum 15 practical assignments based on each above topic. The assignments should test and develop student's practical proficiency and ability to use Java API Classes correctly for writing code for varied applications scenarios & use case requirements.

Use of IDEs like BlueJ, Eclipse, Netbeans or any other FOSS alternative for Interactive development and debugging of Java applications is highly recommend to enhance hands on

In Semester Evaluation (ISE):

ISE for the course will consist of three programming (hands on) tests based on the topics mentioned in the syllabus.

Modalities for conducting End Semester Examination/Practical Oral Examination (POE):

- Practical and Oral Examination will be conducted by a panel of examiners assigned by university. A pair of examiners shall assess a batch @36 students in a day.
- The chairman shall prepare problem statements adhering to following guidelines:

1. At least Four Problem statements shall be set for a batch.
2. Problem statements shall be set in the context of course outcomes as defined in the course.
3. Problem Statements shall not be direct statements stating implement concept/topic etc.
4. Problem Statements shall be based on real word problem/use case/scenario etc.
5. Problem statement shall be at the minimum cognitive level of Apply & above
6. Problem Statements must be well described with no ambiguity and shall be of unseen nature.
7. Problem statements formulated shall be solvable by faculty in 2 hours and average students in 2.5 hrs in the examination duration.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T.Y. B.Tech. (Information Technology) Semester-II

IT327. MINI PROJECT

Teaching Scheme
Practical: 2 Hours/Week, 1 Credit

Examination Scheme
ICA: 50 Marks
OE: 50 Marks

Course Outcomes:

At the end of the course, student will be able to

1. Identify and select problem of societal relevance in selected domain.
2. Design system architecture with due consideration of environment, sustainability and ethics.
3. Develop the solution to the problem using tools, resources and frameworks.
4. Engage in teamwork and communicate effectively, while observing professional ethics.
5. Inculcate habit of self study and lifelong learning.

Note:

1. A group shall be formed of preferably 4 students.
2. Students shall be given projects in Hardware, Software, Embedded or any contemporary topic.
3. A guide will be allotted to each group.

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T. Y. B.Tech. (Information Technology) Semester– II
Self Learning Module-II (Technical)
SL32A.USER INTERFACE TECHNOLOGIES

Teaching Scheme
Self learning: 2 Credits

Examination Scheme
ESE: 50 Marks

Introduction:
The main objective of UI Technology is to make the user's interaction as very simple and most efficient. UI helps us to decrease the gap between requirements and implementation over structured systems associated with the programming language.

Course Prerequisites:

1. **Basic HTML**: Structure and HTML Tags, Images, List, Tables, Anchors and Form Elements
2. **CSS** : Inline, Internal and External Style sheet, Borders, Backgrounds, text and margin properties

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Course Outcomes:
At the end of course, students will be able to:
1. Demonstrate functionalities of World Wide Web
2. Explore markup languages features and create interactive web pages using them
3. Design Client-side validation using scripting languages
4. Demonstrate Open source JavaScript libraries
5. Design Front-end web page.

Unit 1: Introduction to WWW

Introduction to Computer networks - Internet Standards – Introduction to WWW – WWW Architecture – SMTP – POP3 – File Transfer Protocol - Overview of HTTP, HTTP request – response — Generation of dynamic web pages.

Unit 2: UI Design

HTML5: What is HTML5 - Features of HTML5 – Semantic Tags – New Input Elements and tags - Media tags (audio and video tags) – Designing Graphics using Canvas API - Drag and Drop features – Geo location API - Web storage (Session and local storage).

CSS3: What is CSS3 –Features of CSS3 – Implementation of border radius, box shadow, image border, custom web font, backgrounds - Advanced text effects(shadow) - 2D and 3D Transformations - Transitions to elements - Animations to text and elements

Unit 3: Responsive Web Design (RWD)

Responsive Design: What is RWD – Introduction to RWD Techniques – Fluid Layout, Fluid Images and Media queries- Introduction to RWD Frame work

Twitter Bootstrap – Bootstrap Background and Features - Getting Started with Bootstrap - Demystifying Grids – Off Canvas - Bootstrap Components - JS Plugins - Customization

Unit 4: Introduction to JavaScript

Introduction - Core features - Data types and Variables - Operators, Expressions and Statements - Functions & Scope - Objects - Array, Date and Math related Objects - Document Object Model - Event Handling –Browser Object Model - Windows and Documents - Form handling and validations.

Object-Oriented Techniques in JavaScript - Classes – Constructors and Prototyping (Sub classes and Super classes) – JSON –Introduction to AJAX.

Unit 5: Introduction to jQuery

Introduction – jQuery Selectors – jQuery HTML - Animations – Effects – Event Handling – DOM – jQuery DOM Traversing, DOM Manipulation – jQuery AJAX

Text books:

1. Internet and World Wide Web - How To Program - Harvey & Paul Deitel & Associates, Harvey Deitel and Abbey Deitel, Fifth Edition, Pearson Education, 2011.
2. Web Technologies - Achyut S Godbole and Atul Kahate, Second Edition, Tata McGraw Hill, 2012.
3. JavaScript: The Complete Reference -Thomas A Powell, Fritz Schneider, Third Edition, Tata McGraw Hill, 2013.

Reference books:

1. JavaScript: The Definitive Guide - David Flanagan, Sixth Edition, O'Reilly Media, 2011
2. jQuery in Action - Bear Bibeault and Yehuda Katz, January 2008

E- Recourses:

1. Responsive Web Design - https://bradfrost.github.io/this-is-responsive/
2. JavaScript - https://github.com/jasonzhuang/tech_books/tree/master/js

PUNYASHLOK AHILYADEVI HOLKAR SOLAPUR UNIVERSITY, SOLAPUR

T.Y. B.Tech. (Information Technology) Semester-II
Self Learning Module-II (Technical)
SL32 B. AGILE PROJECT MANAGEMENT

Teaching Scheme
Self learning: 2 Credits

Examination Scheme
ESE: 50 Marks

Introduction:
Agile Project Management course exposes students to Agile Software Development methodology. This course includes agile fundamentals, scrum framework, agile testing, agile software design & programming and industry trends.

Course Prerequisite:
Awareness of basics of software engineering concepts and waterfall methodology and exposure to any object oriented programming language such as Java, C#.

Course Outcomes:
At the end of the course, student will be able to
1. Describe the business value of adopting Agile approaches and the Agile development practices.
2. Apply design principles and refactoring to achieve Agility in developing real world projects.
3. Use automated build tools, version control and continuous integration for developing projects.
4. Perform testing activities within an Agile project.

Unit 1: Fundamentals of Agile
The Genesis of Agile, Introduction and background, Agile Manifesto and Principles, Overview of Scrum, Extreme Programming, Feature Driven development, Lean Software Development, Agile project management, Design and development practices in Agile projects, Test Driven Development, Continuous Integration, Refactoring, Pair Programming, Simple Design, User Stories, Agile Testing, Agile Tools

Unit 2: Agile Scrum Framework
Introduction to Scrum, Project phases, Agile Estimation, Planning game, Product backlog, Sprint backlog, Iteration planning, User story definition, Characteristics and content of user stories, Acceptance tests and Verifying stories, Project velocity, Burn down chart, Sprint planning and retrospective, Daily scrum, Scrum roles – Product Owner, Scrum Master, Scrum Team, Scrum case study, Tools for Agile project management

Unit 3: Agile Testing
The Agile lifecycle and its impact on testing, Test-Driven Development (TDD), xUnit framework and tools for TDD, Testing user stories - acceptance tests and scenarios, Planning and managing testing cycle, Exploratory testing, Risk based testing, Regression tests, Test Automation, Tools to support the Agile tester

Unit 4: Agile Software Design and Development
Agile design practices, Role of design Principles including Single Responsibility Principle, Open Closed Principle, Liskov Substitution Principle, Interface Segregation Principles, Dependency Inversion Principle in Agile Design, Need and significance of Refactoring, Refactoring Techniques, Continuous Integration, Automated build tools, Version control (SVN tool)

Unit 5: Industry Trends

Market scenario and adoption of Agile, Agile ALM, Roles in an Agile project, Agile applicability, Agile in Distributed teams, Business benefits, Challenges in Agile, Risks and Mitigation, Agile rapid development technologies

Text Books:

1. Agile Software Development, Principles, Patterns and Practices, By Robert C. Martin, Publisher: Prentice Hall, Published: 25 Oct 2002
2. Agile Software Development with Scrum, By Ken Schawber, Mike Beedle, Publisher: Pearson, Published: 21 Mar 2008
3. Agile Testing: A Practical Guide for Testers and Agile Teams, By Lisa Crispin, Janet Gregory, Publisher: Addison Wesley Published: 30 Dec 2008

Reference Book:

1. Succeeding with Agile Software Development using Scrum by Mike Cohn, Addison-Wesley Signature Series, January 2010.

E-Resources:

1. www.it-ebooks.info/tag/agile
2. http://martinfowler.com/agile.html