



University of Mumbai

Syllabus

B. Tech Computer Engineering

(Semester V and VI)

From

Academic Year 2016-17

(KJSCE 2014 CBGS Pattern)



K. J. Somaiya College of Engineering, Vidyavihar, Mumbai -77

(Autonomous College Affiliated to University of Mumbai)

Vision and Mission of Computer Engineering Department

Vision

To become a center of excellence in discipline of Computer Engineering for developing technically adept professionals with ethical and leadership qualities in service of society.

Mission

- Provide sound technical foundation in Computer Engineering through comprehensive curriculum and application oriented learning.
- Provide ambience for professional growth and lifelong learning for adapting to challenges in rapidly changing technology.
- Inculcate social and ethical values and leadership qualities.

Program Educational Objectives (PEOs)

A graduate of Computer Engineering will

PEO 1: Solve problems in diverse fields using knowledge of Computer Engineering.

PEO 2: Excel in professional career, exhibit leadership qualities with ethics & soft skills.

PEO 3: Pursue higher education, research or entrepreneurship, engage in professional development, adapt to emerging technologies.

Program Outcomes (POs)

After successful completion of the program a Computer Engineering Graduate will be able to:

PO1- Apply knowledge of mathematics, science and computer engineering fundamentals to the problems in computer systems.

PO2- Formulate and analyze computer engineering problems.

PO3- Design component(s) and module(s) (hardware/software) to develop solutions for computer engineering problems based on specifications and constraints.

PO4- Design and conduct experiments as well as to analyze and interpret the data.

PO5- Identify and apply modern tools to solve computer engineering problems.

PO6- Know the responsibility towards societal, health, safety, legal and cultural problems.

PO7- Understand the impact of computer engineering solutions on society and environment for sustainable development.

PO8- Apply knowledge of computer engineering in profession with ethical responsibility.

PO9- Function effectively as a leader or a member in diverse teams.

PO10- Communicate effectively in professional community and society at large.

PO11- Apply principles of engineering and management in projects as a member or leader of a team.

PO12- Pursue lifelong learning as a means of enhancing the knowledge in the context of technological change

Program Specific Outcomes (PSO)

After successful completion of the program a Computer Engineering Graduate will be able to:

- Apply acquired skills of Information Systems, Networking, Image processing in solving problems of varying complexities.
- Pursue higher studies in the field of Computer Science & Engineering and be employable in industries.

Semester V Credit Scheme

Sub Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW	Tutorial	Total
UCEC501	Operating Systems	03	-	-	03	-	-	03
UCEC502	DataNetworks	03	-	-	03	-	-	03
UCEC503	Theory of Computer Science	03	-	-	03	-	-	03
UCEC504	Advanced Database Management System	03	-	-	03	-	-	03
UCEC505	Software Engineering	03	-	-	03	-	-	03
UCEL501	Operating System Lab	-	02	-	-	01	-	01
UCEL502	DataNetworks Lab	-	02	-	-	01	-	01
UCET503	Theory of Computer science	-	-	01	-	-	01	01
UCEL504	Advanced Database Management System	-	02	-	-	01	-	01
UCEL505	Software Engineering Lab	-	02	-	-	01	-	01
UCEL506	Web Technology Lab	-	02	01	-	02	-	02
UCEA50X	Audit Course	02	-	-	-	-	-	00
Total		17	10	02	15	06	01	22

Semester V Examination Scheme

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		#Continuous Assessment (CA)			@ ESE				
		Te st	Test 2	IA					
UCEC501	Operating Systems	15	15	10	60	-	-	-	100
UCEC502	Data Networks	15	15	10	60	-	-	-	100
UCEC503	Theory of Computer Science	15	15	10	60	-	-	-	100
UCEC504	Advanced Database Management System	15	15	10	60	-	-	-	100
UCEC505	Software Engineering	15	15	10	60	-	-	-	100
UCEL501	Operating System Lab	-	-	-	-	25	25	-	50
UCEL502	Data Networks Lab	-	-	-	-	25	-	25	50
UCET503	Theory of Computer science	-	-	-	-	25	-	-	25
UCEL504	Advanced Database Management System Lab	-	-	-	-	25	25	-	50
UCEL505	Software Engineering Lab	-	-	-	-	25	25	-	50
UCEL506	Web Technology Lab	-	-	-	-	*25	25	-	25
Total		75	75	50	300	150	100	25	775

*TW assessment will be based on laboratory work

#There is no separate head of passing for individual component of CA.

@Examination will be of 100 marks and scaled down to 60 marks.

Semester VI Credit Scheme

Sub Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theo ry	Pract ical	Tutorial	Theo ry	TW/ Practical	Tutorial	Total
UCEC601	Artificial Intelligence	03	-	-	03	-	-	03
UCEC602	System Programming and Compiler Construction	03	-	-	03	-	-	03
UCEC603	Digital signal and Image Processing	03	-	-	03	-	-	03
UCEC604	Mobile Cellular & Ad Hoc Networks	03	-	-	03	-	-	03
UCEC605	Professional Communication skills	-	-	02	-	-	02	02
UCEI60X	Interdisciplinary Course	03	-		03	-	-	03
UCEL601	Artificial Intelligence	-	02	-	-	01	-	01
UCEL602	System Programming and Compiler Construction Lab	-	02	-	-	01	-	01
UCEL603	Digital signal and Image Processing Lab	-	02	-	-	01	-	01
UCEL604	Mobile Cellular & Ad Hoc Networks Lab	-	02	-	-	01	-	01
UCEL605	Open Source Lab	-	04	-	-	02	-	02
Total		15	12	02	15	06	02	23

Semester VI Examination Scheme

Subject Code	Subject Name	Examination Scheme							
		Theory Marks			@ ESE	Term Work	Practical and Oral	Oral	Total
		#Continuous Assessment (CA)							
		Test 1	Test 2	IA					
UCEC601	Artificial Intelligence	15	15	10	60	-	-	-	100
UCEC602	System Programming and Compiler Construction	15	15	10	60	-	-	-	100
UCEC603	Digital signal and Image Processing	15	15	10	60	-	-	-	100
UCEC604	Mobile Cellular & Ad Hoc Networks	15	15	10	60	-	-	-	100
UCEC605	Professional Communication skills	-	-	-	-	50	-	-	50
UCEI6XX	Interdisciplinary Course	15	15	10	60	-	-	-	100
UCEL601	Artificial Intelligence Lab	-	-	-	-	25	25	-	50
UCEL602	System Programming and Compiler Construction Lab	-	-	-	-	25	25	-	50
UCEL603	Digital signal and Image Processing Lab	-	-	-	-	25	25	-	50
UCEL604	Mobile Cellular & Ad Hoc Networks - Lab	-	-	-	-	25	-	25	50
UCEL605	Open Source Lab	-	-	-	-	50	-	25	75
Total		75	75	50	300	200	75	50	825

*TW assessment will be based on laboratory work

#There is no separate head of passing for individual component of CA.

@Examination will be of 100 marks and scaled down to 60 marks.

#There is no separate head of passing for individual component of CA.

@Examination will be of 100 marks and scaled down to 60 marks.

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC501	Operating System	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEC501	Operating System	15	15	10	60	--	--		100

Course Outcome	After successful completion of the course students should be able to
CO1	Explain the fundamental concepts of operating system with extension to Unix and Mobile OS
CO2	Elaborate the concepts of process and threads with state transitions.
CO3	Illustrate the working of process scheduling algorithms and compare their performance
CO4	Describe the problems related to process concurrency and the different synchronization mechanisms available to solve them.
CO5	Explain disk organization and file system structure with illustration of disk scheduling algorithms

Module No.	Unit No.	Details of Topic	Hrs.
Operating System			
1		Operating System Overview :	6
	1.1	Operating System Objectives and Functions. OS as resource manager	
	1.2	Evolution of Operating Systems, Layered structure v/s Monolithic Structure of Operating System.	
	1.3	Characteristics of Modern Operating Systems	
	1.4	Basic Concepts of UNIX: Shell, Processes, Files, System calls	
2		Process and Process Scheduling :	9
	2.1	Process description, PCB, Process Image	
	2.2	Process State and State Models, Modes	
	2.3	Process Scheduling: Types, comparative assessment of different scheduling algorithms.	
	2.4	Threads, Thread management; process and thread	
3		Process Concurrency:	10
	3.1	Mutual Exclusion- Hardware approaches; Mutual Exclusion- Software Support	
	3.2	Semaphores; Monitors, Message Passing; Producer Consumer Problem and Readers/Writers Problem	
	3.3	Deadlock and Starvation: Principles of Deadlock, Deadlock Prevention; Deadlock Avoidance, Deadlock Detection,	
	3.4	An Integrated Deadlock Strategy; Dining Philosophers Problem	
4		I/O and File Management	8
	4.1	I/O Devices. Organization of the I/O Function; Operating System Design Issues, I/O Buffering	
	4.2	Disk Scheduling and disk scheduling algorithms	
	4.3	Overview; File Organization	
	4.4	File Directories; File Sharing; Record Blocking;	
	4.5	Secondary Storage Management; UNIX File system	
5		Case Study :Unix Operating systems, Mobile OS (Android)	6
		Total	39

Recommended Books:

1. *William Stallings, “Operating System”, Pearson Education, 4th Edition.”, Pearson Education*
2. *Silberschatz A, Galvin P, Gagne G. “ Operating Systems Principles”,*
3. *Maurice J Bach, “The Design of the Unix Operating system”, Prentice Hall.*

Course Code	Course Title	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC502	Data Networks	03	-	--	03	--	--	03

Course Code	Course Title	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous assessment (CA)			End Sem. Exam (ESE)				
		Test 1	Test 2	In semester Assessment (IA)					
UCEC502	Data Networks	15	15	10	60	--	--	--	100

Course Outcome	After successful completion of the course students should be able to
CO1	Explain the basic concepts of wireless technology with respect to OSI reference model.
CO2	Elaborate various network layer services and protocols in wired and wireless technology
CO3	Illustrate Network routing protocol working principles in wired and wireless technology.
CO4	Describe Transport layer concepts like flow control, error control, congestion, sockets, QoS in wired and wireless technology.
CO5	Demonstrate various features and operations of application layer protocols such as Telnet, HTTP, DNS, SMTP and WAP

Module No.	Unit No.	Details of Topic	Hrs.
Data Networks			
1.0		Introduction to Wireless Mobile Networks	04
	1.1	Implications of wireless medium and Mobility on Protocol stack design	
	1.2	Motivation for specialized MAC	
	1.3	Need for specialized Network Layer	
	1.4	Need for specialized Transport Layer: Implications of mobility on TCP	
	1.5	Need of Specialized Application Layer	
2.0		Network Layer: Addressing	09
	2.1	Overview of DLL and MAC Layer Functionality of layers and protocols working in layers.	
	2.2	Network layer services, IPv4, strategies to bridge the limitations (IP sub netting, CIDR, NAT, Addressing, Options, Extension headers, Packet forwarding, Congestion Control)	
	2.3	ARP, RARP, DHCP	
	2.4	ICMP	
	2.5	Problems with IPv4, IPV6 Addressing	
	2.6	Mobile Network Layer: Mobile IP	
3.0		Routing Algorithms	08
	3.1	Shortest Path routing, DV, Link state Routing, Hierarchical Routing Protocol	
	3.2	Unicast protocols: RIP, OSPF, BGP	
	3.4	Multicast routing protocols –IGMP, MOSPF, DVMRP	
	3.5	MANETs, Routing Protocol (DSDV)	
4.0		Transport Layer: Protocols	10
	4.1	Services, Transport layer protocols, UDP, TCP: State Transition diagram, flow control, error control, TCP Timers, Queuing disciplines,	
	4.2	TCP Congestion control, SCTP	
	4.3	Quality of Service	
	4.4	Mobile Transport Layer: Improvements to classical TCP	

5.0		Application Protocols	08
	5.1	HTTP, WWW	
	5.2	FTP, Telnet, DNS	
	5.3	SMTP	
	5.4	Wireless Application Protocol WAP	
Total			39

Recommended Books:

1. *B.A.Forouzan,"Data Communication and Networking",Tata McGraw Hill edition, Third Edition*
2. *A.S.Tanenbaum,"Computer Networks", Pearson Education, Fourth Edition*
3. *J. Schiller, "Mobile Communications", Pearson Education, Second Edition*
4. *B. A. Forouzan, "TCP/IP Protocol Suite", Tata McGraw Hill edition, Third Edition.*
5. *KavehPahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education*

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theor y	Practic a l	Tutoria l	Theor y	Practica l	Tutoria l	Tota l
UCEC503	Theory of Computer Science	03		01	03		01	04

Subject Code	Subject Name		Examination Scheme						
			Theory Marks			Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEC503	Theory of Computer Science	15	15	10	60	25	--	--	125

Course Objective:

Aims to build concepts regarding the fundamental principles of Grammars, Automata Theory, Turing Machines, Push Down Automata, Undecidability and Intractable Problems. It aims to understand the design of computing machine that can perform complex computation.

Course Outcomes:

Course Outcome	After successful completion of the course students should be able to
CO1	describe languages using Regular Expressions, Finite Automata, Nondeterministic Finite Automata, Mealy Machines, Moore Machines
CO2	describe the formal relationships among machines, languages and grammars
CO3	write, simplify and normalize context free grammars.
CO4	design Push down automata and Turing Machines

Module No.	Unit No.	Details of Topic	Hrs.
1.0		Finite Automata	(14)
	1.1	Introduction: Alphabets, String, Language, Basic Operations on language, Concatenation, Kleene Star	
	1.2	Finite. Automata (FA) -its behavior; DFA -Formal definition,	

		simplified notations (state transition diagram, transition table)	
	1.3	Language of a DFA. NFA -Formal definition, Language of an NFA.	
	1.4	FA with epsilon-transitions, Eliminating epsilon-transitions	
	1.5	Equivalence of DFAs and NFAs, An Application.	
	1.6	Regular sets, Regular Expression, Some closure properties of Regular languages	
	1.7	Equivalence between FA and regular expressions	
	1.8	Pumping lemma for Regular languages, Equivalence and minimization of Finite Automata, Myhill-Nerode Theorem	
	1.9	DFA Minimization, Decision properties of Regular languages, Equivalence of two DFAs or REs, Finite automata with output	
2.0		Context Free Grammars	(07)
	2.1	Context-free Grammars (CFGs) -Formal definition, sentential forms, leftmost and rightmost derivations, the language of a CFG. Derivation tree or Parse tree-Definition, Simplification of CFGs -Removing useless symbols, epsilon-Productions, and unit productions	
	2.2	Relationship between parse trees and derivations. Parsing and ambiguity, Application of CFGs, Ambiguity in grammars and Languages.	
	2.3	Normal forms -CNF and GNF. Proving that some languages are not context free -Pumping lemma for CFLs, applications. Some closure properties of CFLs -Closure under union, concatenation, Kleene closure, substitution, Inverse homomorphism, reversal, intersection with regular set, etc. Some more decision properties of CFLs, . Chomsky hierarchy	
3.0		Push Down Automata	(07)
	3.1	Pushdown Automata (PDA) -Formal definition, behavior and graphical notation, Instantaneous descriptions (Ids),	
	3.2	The language of PDA (acceptance by final state and empty stack). Equivalence of acceptance by final state and empty stack, Equivalence of PDAs and CFGs,	
	3.3	Conversion: CFG to PDA, PDA to CFG.	
	3.4	DPDAs -Definition, DPDAs, Multistack DPDAs & NPDAs and CFLs. Languages of DPDAs, NPDAs, and ambiguous grammars.	
4.0		Turing Machine	(07)
	4.1	Turing Machines TM -Formal definition and behavior, Transition diagrams, Language of a TM, TM as accepters deciders and generators. TM as a computer of integer functions, Design of TMs, Programming techniques for TMs -Storage in state, multiple tracks,	

		subroutines, etc.	
	4.2	Universal TMs, Variants of TMs -Multitape TMs, Nondeterministic TMs. TMs with semi-infinite tapes, Multistack machines, Simulating TM by computer, Simulating a Computer by a TM	
	4.3	Equivalence of the various variants with the basic model.	
5.0		Un-decidability and Recursively Enumerable Languages:	(04)
	5.1	Recursive and Recursively Enumerable Languages. Properties of Recursive and Recursively Enumerable Languages.	
	5.2	Decidability and Un-decidability, Halting Problem, Rice's Theorem, Grebach's Theorem, Post Correspondence Problem, Context Sensitivity and Linear Bound Automata.	
		TOTAL	39

Recommended Books

- John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory, Languages and Computation", Pearson Education.
- J.C.Martin, "Introduction to languages and the Theory of Computation", TMH.
- Michael Sipser, "Theory of Computation", Cengage Learning.
- O.G.Kakde, "Theory of Computation", LP.

Course Code	Course Name	Teaching Scheme (Hrs)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC504	Advance Database Management System	03	-	--	03	-	--	03

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practic al	Oral	Tota l
		Continuous Assessment (CA)			End Sem Exam				
		Test 1	Test 2	In Semester Assessment					
UCEC504	Advance Database Management System	15	15	10	60	-	-	--	100

Course Outcome	After successful completion of the course students should be able to
CO1	Design and tune database
CO2	Identify the ways of storing data
CO3	Analyze the different ways of processing query
CO4	Design and process data in distributed , parallel databases ,Object Relational and Extended Relational Databases
CO5	Use internet with database

Module No.	Unit No.	Topics	Hrs.
Advance Database Management System			
1		Practical , physical Database Design and tuning Methodology	
	1.1	Role of information systems in organization , Database design and Implementation Process Use of database design tool –UML	06
	1.2	Physical database design	
	1.3	Database tuning in relational systems	
2		Database indexing and hashing	
	2.1	Single level, multilevel indexes , dynamic multilevel indexes using B-trees and B+ trees, Indexes on Multiple keys. Other types of indexes.	06
	2.2	Static and dynamic hashing .	
3		Query Processing and optimization	
	3.1	Overview Measures of Query cost Selection operation Sorting Join Operations Other Operations Evaluation of Expression	08
	3.2	Translations of SQL Queries into relational algebra Heuristic approach & cost base optimization	

4		Object Relational, Extended Relational, Parallel, Distributed Databases and Client Server Architecture	
	4.1	Overview of SQL and its object relational features	
	4.2	Implementation issues for extended type systems Nested relational model	
		Introduction to parallel databases	12
	4.3	Parallel : Query Evaluation Parallelizing, individual operations; sorting, joins, etc.,	
		Distributed databases,	
	4.4	Concepts, data fragmentation, Replication and allocation techniques Query Processing , concurrency control and recovery , An overview of Client Server Architecture.	
5		XML and Internet Databases	
	5.1	Structured ,unstructured and semi structured data.	07
		XML hierarchical Data Model	
		Total	39

Recommended Books:

1. Elmasri&Navathe “*fundamentals of Database Systems*” V edition. PEARSON Education.
2. Korth, Silberschatzsudarshan “*Database systems, concepts*” 5th edition McGraw Hill.
3. Raghu Ramkrishnan& Johannes Gehrke “*Database Management System*” Tata McGraw Hill. III edition.
4. Stefano Ceri, Hillseppe ,pelagatti “*Distributed Databases, Principles and Systems*” Tata McGraw Hill editions.
5. Dr. P.S. Deshpande, *SQL and PL/SQL for Oracle log*, Black Books Dreamtech Press.

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	Internal assessment					
UCEC505	Software Engineering	15	15	10	60	-	--	--	100

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC505	Software Engineering	03	--	--	03	--	--	03

Course Outcome	After successful completion of the course students should be able to
CO1	Understand the software development process.
CO2	Estimate different types of resources for the given project.
CO3	Model the defined problem with the help of UML diagram.
CO4	Test the given software for different test cases with proper test planning
CO5	Identify and manage configuration items for the software.

Module No.	Unit No.	Details of Topic	Hrs.
Software Engineering			
1.0		The Product and the Process:	06
	1.1	Software life cycle models: Waterfall, RAD, Spiral, Open-source, Agile process.	
	1.2	Understanding software process, Process metric, CMM levels,	
	1.3	Planning & Estimation: Product metrics Estimation- LOC, FP, COCOMO models.	
	1.4	Project Management activities : Planning, Scheduling and Tracking	
2.0		Requirement Engineering	08
	2.1	Introduction to OO Methodologies :Booch,Ramberg and Jacobson	
	2.2	Requirements Engineering Tasks, Requirement Elicitation Techniques, Software Requirements: Functional, Non-Functional, Domain	
	2.3	Requirements Characteristics, Requirement qualities, Requirement Specification, Requirement Traceability, System Analysis Model Generation, Requirement Prioritization, Documentation : Use Case Diagram, Activity Diagram	
	2.4	Categorizing classes: entity, boundary and control ,Modeling associations and collections-Class Diagram,	
	2.5	Dynamic Analysis - Identifying Interaction – Sequence and Collaboration diagrams, State chart diagram	
3.0		System Design Engineering	07
	3.1	Design quality, Design Concepts, The Design Model, Introduction to Pattern-Based Software Design,	
	3.2	Software Architecture, Data Design, Design of Software Objects, Features and Methods, Cohesion and Coupling between Objects,	
	3.4	User Interface Design: Rules, User Interface Analysis and Steps in Interface Design, Design Evaluation	
	3.5	Software Reuse, Component-Based Software Engineering	

4.0		System Implementation & Configuration Management	10
	4.1	Packages and interfaces: Distinguishing between classes/interfaces, Exposing class and package interfaces	
	4.2	Mapping model to code , Mapping Object Model to Database Schema	
	4.3	Component and deployment diagrams: Describing dependencies	
	4.4	Managing and controlling Changes	
	4.5	Managing and controlling version	
5.0		Testing and Maintenance	08
	5.1	Testing Concepts: Purpose of Software Testing, Testing Principles, Goals of Testing, Testing aspects: Requirements, Test Scenarios, Test cases, Test scripts/procedures,	
	5.2	Strategies for Software Testing, Testing Activities: Planning Verification and Validation, Software Inspections,FTR	
	5.3	Levels of Testing : unit testing, integration testing, regression testing, product testing, acceptance testing and White-Box Testing	
	5.4	Black-Box Testing: Test Case Design Criteria, Requirement Based Testing, Boundary Value Analysis, Equivalence Partitioning	
	5.5	Object Oriented Testing: Review of OOA and OOD models, class testing, integration testing, validation testing	
	5.6	Reverse and re-engineering, types of maintenance	
		Total	39

Recommended Books:

1. Bernd Bruegge, “Object oriented software engineering”, Second Edition, Pearson Education.
2. Stephan R. Schach, “Object oriented software engineering”, Tata McGraw Hill.
3. Roger Pressman, “Software Engineering”, sixth edition, Tata McGraw Hill.
4. Timothy C. Lethbridge, Robert Laganier “ Object-Oriented Software Engineering -A practical software development using UML and Java”, Tata McGraw-Hill, New Delhi
5. Ian Sommerville, “Software Engineering” 6th Edition, Pearson Education

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL501	Operating System Lab		02			01	--	01

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEL501	Operating System Lab					25	25	--	50

Term Work:

At least **10** experiments will be conducted based on the course **UCEC501 Operating System**

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEC501 Operating System and UCEL501 Operating system

Code	Course Title	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL502	Data Networks Lab	--	02	--	--	01	--	01

Course Code	Course Title	Examination Scheme							
		Theory Marks				Term Work	Practical & Oral	Oral	Total
		Continuous Assessment (CA)							
		Test 1	Test 2	IA	End Sem. Exam (ESE)				
UCEL502	Data Networks Lab	--	--	--	--	25	--	25	50

Term Work:

At least **10** experiments will be conducted based on the course **UCEC502 Data Networks**.

Term work should consist of practical experiments and assignments based on the syllabus of the course.

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The oral examination will be based on UCEC502 Data Networks and UCEL502 Data Networks

Course Code	Course Name	Teaching Scheme (Hrs)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL504	Advance Database Management System Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical & Oral	Oral	Total
		Continuous Assessment (CA)			End Sem Exam				
		Test 1	Test 2	In Semester Assessment					
UCEL504	Advance Database Management System Lab	--	--	--	--	25	25	--	50

There is no separate head of passing @ Examination will be of 100 marks and scaled to 60 marks

Term Work:

At least **10** experiments will be conducted based on the course **UCEC504 Advance Database Management System**.

Term work should consist of practical experiments and assignments based on the syllabus of the course.

15 marks for experiments based on the course and 10 marks for mini project.

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEC504 Advance Database Management System and UCEL504 Advance Database Management System Lab

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL505	Software Engineering Lab	--	02	--	-	--	--	01

Subject Code	Subject Name		Examination Scheme						
			Theory Marks			Term Work	Practical and Oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	Internal assessment					
UCEL505	Software Engineering Lab	--	--	--	--	25	25	--	50

Term Work:

At least **8-10** experiments will be conducted based on the course **UCEC505 Software Engineering**.

Course will have experiments which are project based.

Term work should consist of practical experiments and assignments based on the syllabus of the course.

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEC505 Software Engineering and UCEL505 Software Engineering Lab

Subject Code	Subject Name	Teaching Scheme (Hrs.)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	TW/ Practical	Tutorial	Total
UCEL506	Web Technology Lab	-	02	01	-	02	-	02

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Continuous Assessment (CA)			End Sem Exam				
		Test 1	Test 2	IA					
UCEL506	Web Technology Laboratory	-	-	-	-	25	25	-	50

Course Outcome	After successful completion of the course students should be able to
CO1	Learn the fundamental concepts in HTML and web technologies.
CO2	Identify the need of CSS and JavaScript in web development
CO3	Build static web pages using HTML tags, CSS, and JavaScript.

CO4	Outline the role of various editors for development of web pages .		
CO5	Develop the application to store and manipulate data using XML.		
CO6	Design the application using server side programming and database connectivity.		
Module No.	Unit No.	Topics	Hrs. (Tut. + Lab)
1.0		Create HTML Forms. Use of various HTML Tag on Web Forms.	06
	1.1	Title: Create HTML Forms. Use of various HTML Tag on Web Forms. Concept: Designing of effective web site, Introduction of different Web Technologies : HTML and Different HTML Tag. Objective: objective of this module is to provide students an overview of the concepts Web Technologies, and HTML. Scope: Designing static client side web page using various HTML tags. Technology: HTML	
2.0		Use of CSS on HTML Form.	08
	2.1	Title: Use of CSS on HTML Form. Concept: Cascaded Style Sheets Objective: In this module student will learn, defining a CSS and unstaring its purpose different syntax and types of CSS. Scope: Creating web pages and use CSS to control the layout pages. Technology: HTML with Cascade Style Sheet.	
3.0		Use of Java Script functions on Web Forms and Use of Dynamic HTML Page	06
	3.1	Title: Use of Java Script functions on Web Forms and Use of Dynamic HTML Page. Concept: Scripting Languages, Dynamic web pages Objective: in this lab student will learn how to define client side scripting and understand its advantages and disadvantages. Embedding JavaScript code into HTML document using script tag, and will understand dynamic HTML. Scope: Create animation using JavaScript. Technology: HTML with JavaScript	

4.0		Creation of Web page with the help of Editor	06
	4.1	Title: Creation of Web page with the help of HTML Editor. Concept: Web development Environment Objective: This module students will learn how will introduce editors for development of web pages. Scope: Development of web pages using any web tool. Technology: Quanta Plus /Aptana /Kompozer	
5.0		Write an XML file marksheet.xml representing your semester mark sheet	04
	5.1	Title: Write an XML file marksheet.xml representing your semester mark sheet. Concept: Extensible Markup Language (XML) Objective: is to learn about basics of XML and how it can be used to store information away from the mechanism of processing or formatting of such data. Will also learn how to build simple XML files and be able to manipulate and refer to them. Scope: is to creating an XML file in that it must include basic syntax of an XML doc and DTD for the same.	
6.0		Server side scripting	06
	6.1	Title: Server side scripting. Use HTML form to accept the two numbers N1 and N2 and using PHP program display only prime numbers in between N1 and N2. Concept: Server side scripting, introduction to PHP Objective: this lab gives a basic introduction of to PHP and dynamic programming on the server side. Scope: creating a server side script using PHP, decisions, looping Technology: PHP, HTML	
		Total	36

Recommended Books

1. Ralph Moseley ,M.T. Savaliya “Developing Web Applications “, Willy India, Second Edition , ISBN:9788126538676
2. Kogent Learning Solutions Inc, “Web Technology Black Book ”, Dreamtech Press, First Edition, ISBN 9787722997

Term Work:

At least **10** experiments will be conducted based on the course **UCEL506 Web Technology Lab.**

15 marks for experiments based on the course and 10 marks for mini project.

Term work should consist of practical experiments and assignments based on the syllabus of the course.

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEL506 Web Technology Lab.

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC 601	Artificial Intelligence	03	--	--	03	--	--	03

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEC 601	Artificial Intelligence	15	15	10	60	--	--	-	100

Course Outcome	After successful completion of the course students should be able to
CO1	Conceptualize the basic & advanced ideas and techniques to develop intelligent systems
CO2	Solve various problems through searching & planning
CO3	Represent the knowledge and reason through inference
CO4	Deal with uncertain and incomplete information

Module No.	Unit No.	Details of Topic	Hrs.
1		Introduction to Artificial Intelligence	4
	1.1	Introduction, History of Artificial Intelligence	
	1.2	Intelligent Systems: Categorization of Intelligent System,	
	1.3	Components of AI Program, Foundations of AI, Sub-areas of AI,	
2		Intelligent Agents	8
	2.1	Agents and Environments	
	2.2	The concept of rationality	
	2.3	The nature of environment	
	2.4	The structure of Agents	
	2.5	Types of Agent architectures, Learning Agent.	

3		Problem solving	8
	3.1	Solving problem by Searching : Problem Solving Agent, Formulating Problems, Example Problems	
	3.2	Uninformed Search Methods: Breadth First Search (BFS), Depth First Search (DFS) , Depth Limited Search, Iterative Deepening(IDS),	
	3.3	Informed Search Methods: Greedy best first Search ,A* Search	
	3.4	Local Search Algorithms: Hill climbing search, Genetic algorithms	
4		Knowledge and Reasoning	9
	4.1	Knowledge based Agents, The Wumpus World, The Propositional logic, First Order Logic: Syntax and Semantic,	
		Inference in FOL, Forward chaining, backward Chaining.	
	4.2	Knowledge Engineering in First-Order Logic, Unification, Resolution, Introduction to logic programming (PROLOG).	
	4.3	Uncertainty, Representing knowledge in an uncertain domain, The semantics of belief network	
5		Planning, Learning and Application of AI	10
	5.1	The planning problem, Planning with state space search, Partial order planning, total order planning	
	5.2	Learning: Forms of Learning, Inductive Learning, Learning Decision Tree.	
	5.3	Natural Language Processing(NLP), Expert Systems.	
		Total	39

Recommended Books:

1. Stuart J. Russell and Peter Norvig, "Artificial Intelligence A Modern Approach "Second Edition" Pearson Education.
2. Elaine Rich and Kevin Knight "Artificial Intelligence "Third Edition
3. George F Luger "Artificial Intelligence" Low Price Edition , Pearson Education., Fourth edition
4. Davis E.Goldberg, "Genetic Algorithms: Search, Optimization and Machine Learning", Addison Wesley, N.Y., 1989.
5. Ivan Bratko "PROLOG Programming for Artificial Intelligence", Pearson Education, Third Edition.

Course Code	Course Name	Teaching Scheme (Hrs)			Credits Assigned				
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total	
UCEC602	System Programming and Compiler Construction	03	--	--	03	--	--	03	
Course Code	Course Name	Examination Scheme							
		Theory Marks			End Sem Exam (ESE)	Term Work	Practical	Oral	Total
		Continuous Assessment (CA)							
		Test 1	Test 2	Internal Assessment (IA)					
UCEC602	System Programming and Compiler Construction	15	15	10	60	-	-	-	100

Course Outcome	After successful completion of the course students should be able to
CO1	Identify the different system programs and their utility.
CO2	Design and implement the system programs like Assembler and Macro Pre-Processor, Linker. Loader etc.
CO3	Design various phases of Compiler and demonstrate the programs on various phases of Compiler
CO4	Utilize and demonstrate various tools used in language processing

Module No.	Unit No.	Details of Topic	Hrs.
1.0		System Software	01
	1.1	Concept, introduction to various system programs such as assemblers, loaders, linkers, macro processors, compilers, interpreters, operating systems, device drivers	
2.0		Assemblers, Macro processors, Linker and Loader	14
	2.1	Elements of Assembly language programming	
	2.2	Overview of Assembly Process.	
	2.3	Design of single pass assembler for IBM PC	
	2.4	Design of two pass assembler for IBM PC Processor	
		Introduction Macro Definition and call	
	2.5	Macro Instructions	
	2.6	Features of Macro Facility	
	2.7	Design of two-pass Macro-processor.	
	2.8	Implementation with an assembler	
	2.9	Loader schemes, Dynamic binders, Overlays	
	2.10	Design of Absolute loader	
	2.11	Design of Direct linking loader	
3.0		Compiler and Lexical Analyzer	03
	3.1	Introduction to Compilers: Phases of a compiler	
	3.2	Role of a Lexical analyzer:input buffering, specification and recognition of tokens,	
	3.3	Designing a lexical analyzer generator,	
	3.4	Pattern matching based on NFA's.	
	3.5	Lexical Analyzer tool: Lex	
4.0		Syntax Analysis ,Syntax Directed Translation, Run time storage Allocation	13
	4.1	Syntax Analysis : Role of Parser	
	4.2	Top-down parsing Techniques: Recursive descent and predictive parsers (LL)	
	4.3	Bottom-Up parsing Techniques: Operator precedence parsing, LR, SLR and LALR parsers	
	4.4	Parser Generator tool: YACC, JAVACC	
	4.5	Syntax Directed Translation : Syntax directed definitions	
	4.6	Inherited and Synthesized attributes	
	4.7	Evaluation order for SDDs , S attributed Definitions , L	
	4.8	attributed Definitions	
	4.9	Storage Organization , storage allocation strategies introduction to garbage collection and compaction	
5.0		Intermediate code generation, Code Generation and	08

		Optimization	
	5.1	Types of Intermediate codes	
	5.2	Intermediate code for : declarations , Assignment statements, case statements	
	5.3	Issues in the design of Code Generator	
	5.4	Basic Blocks and Flow graphs	
	5.5	Code generation algorithm	
	5.6	DAG representation of Basic Block	
	5.7	Principal sources of Optimization	
	5.8	Optimization of Basic Blocks	
	5.9	Loops in Flow graph	
	5.10	Peephole Optimization	
		Total	39

Recommended Books:

1. *D. M. Dhamdhere: Systems programming ,Tata McGraw Hill*
2. *A.V. Aho, R. Shethi and J.D. Ullman; Compilers - Principles, Techniques and Tools, Pearson Education*
3. *Lex &yacc, 2nd Edition by John R. Levine, Tony Mason & Doug Brown O'Reilly*
4. *J.J Donovan: Systems Programming Tata McGraw Hill Publishing Company*
5. *A.V. Aho, R. Shethi, Monica Lam , J.D. Ulman : Compilers - Principles, Techniques and Tools , Pearson Education , Second Edition.*

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC603	Digital Signal & Image Processing	03	-	--	03	-	-	03

Subject Code	Subject Name		Examination Scheme						
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	Assignment/Quiz/Presentation (IA)					
UCEC603	Digital Signal & Image Processing	15	15	10	60	-	-	-	100

Course Outcome	After successful completion of the course students should be able to
CO1	Identify various discrete time signals and systems and perform signal manipulation
CO2	Analyze signals in frequency domain through various image transforms
CO3	Explain the techniques of image enhancement and Segmentation
CO4	Apply image compression techniques for efficient storage and transmission

Module No.	Details of Topic	Hrs.
1.0	Discrete Time Signal and System Introduction: Signals, Systems and Signal processing, classification of signals, system, LTI system, Convolution in time domain (linear & circular), Correlation.	06
2.0	Digital Image Fundamental and Enhancement Digital image Representation, Elements of digital image processing systems, sampling and quantization, basic relationships between pixels, mathematical operations on images. Spatial domain methods, point processing, Neighborhood processing, spatial domain filtering, zooming, enhancement based on Histogram modeling. Homomorphic filter.	10
3.0	Image Transform: Introduction , DFT and its properties, FFT algorithms – direct, divide and conquer approach, radix-2 algorithm(Decimation In Time), 2-D DFT & FFT, Walsh Transform, Hadamard Transform, Haar transform, Discrete cosine transform, wavelet transform.	09
4.0	Image Segmentation Image segmentation based on discontinuities (point, line & edge detection), edge linking, Thresholding (Global, local, optimum), region based segmentation, boundary descriptors – chain codes.	06
5.0	Image Compression Introduction, redundancy, fidelity criteria. Lossless compression techniques: Run length coding, Arithmetic coding, Huffman coding, Differential PCM. Lossy Compression techniques: Improved grey scale quantization, Vector quantization, JPEG.	08
	Total	39

Recommended Books

1. *Digital Signal Processing* by A. NagoorKani, 2nd edition, Mcgraw Hill Publications.
2. R. C.GonsalesR.E.Woods, “*Digital Image Processing*”, Second edition, Pearson Education.
3. S.Jayaraman, S Esakkirajan, T Veerakumar “*Digital Image Processing* “McGraw Hill.
4. *Introduction to Digital signal processing* – John G. Proakis, D.G. Manolakis (Maxwell Macmillan Int.)
5. A.K. Jain, *Fundamentals of Image processing*, Prentice Hall of India Publication,

Course Code	Course Title	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC604	Mobile Cellular and Ad Hoc Networks	03	-	--	03	--	--	03

Course Code	Course Title	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam (ESE)				
		Test 1	Test 2	In semester Assessment (IA)					
UCEC604	Mobile Cellular and Ad Hoc Networks	15	15	10	60	--	--	--	100

Course Outcome	After successful completion of the course students should be able to
CO1	Explain the basic concepts of various wireless networks and their working characteristics with respect to mobile network generation such as 2G, 3G and beyond
CO2	Differentiate infrastructure based and Ad hoc networks elaborating characteristics and features of Ad hoc Networks
CO3	Explain the basics and working of various types of wireless ad hoc and mesh networks like sensor networks, VANETs etc.
CO4	Appreciate the designing of MAC and Routing protocols for Ad hoc networks; and the working principle of different IEEE standards.
CO5	Identify challenges and issues in provisioning Quality of service in Ad hoc wireless Networks and suggest solutions.

Module No.	Unit No.	Details of Topic	Hrs.
Mobile Cellular and Ad Hoc Networks			
1.0		Cellular Mobile Networks	08
	1.1	Cellular networks: Basic cellular system, Frequency allocation, Frequency re-use	
	1.2	GSM System Architecture: GSM Radio subsystem, Interfaces, Network and switching subsystem, Operation subsystem	
	1.3	GSM channels: Traffic Channel multiframe, Control (Signalling) Channel Multiframe, Frames, Multi-frames, Super-frames and Hyper-frames	
	1.4	GSM Call Set up Procedure	
	1.5	CDMA Networks	
	1.5	Handoff: Hard and soft	
2.0		2.5 G, 3 G Networks and beyond	08
	2.1	2.5G Networks: GPRS Architecture, GPRS Network Nodes: Mobile Station, Base Station System, GPRS Support Node, HLR and VLR, GPRS Interfaces	
	2.2	3G Networks: The Universal Mobile Telecommunication System (UMTS) - UMTS Network Architecture, UMTS FDD and TDD	
	2.3	Next generation networks; 3GPP LTE and beyond	
3.0		Ad hoc Networks	08
	3.1	Ad hoc Networks: Introduction to ad hoc networks – definition, characteristics features, Mesh networks	
	3.2	MAC Protocols for Ad hoc wireless Networks: Issues in designing a MAC protocol for Ad hoc wireless Networks, Design goals and Classification of MAC protocols, Contention based protocols with reservation mechanisms.	
	3.3	IEEE standards: 802.11a, 802.11b, 802.11g, 802.11e, 802.11n; IEEE 802.16.	
4.0		Multi-hop Ad hoc Networks: Routing Protocols	08
	4.1	Routing protocols for Ad hoc wireless Networks: Introduction, Issues in designing a routing protocol for Ad hoc wireless Networks, Classification of routing protocols, Proactive Vs reactive routing protocols, Hybrid routing Algorithm.	
	4.2	Unicast routing algorithms and Hierarchical Routing : DSR, AODV, OLSR, ZRP	
	4.3	Routing Optimization: Energy aware routing, QoS aware routing and Location aware routing.	
5.0		Application domains of Multi-hop Ad hoc and Mesh	07

		Networks	
	5.1	Vehicular Ad hoc networks (VANETs)	
	5.2	Sensor Networks	
	5.3	Internet of Things (IoT)	
Total			39

Recommended Books:

1. *J. Schiller, "Mobile Communications", Pearson Education, Second Edition*
2. *KavehPahlavan, Prashant Krishnamurthy, "Principles of Wireless Networks", Pearson Education*
3. *Emerging Wireless Technologies and the Future Mobile Internet, DipankarRaychaudhuri, Mario Gerla, Cambridge University Press.*
4. *Mobile Broadband Including Wi Max and LTE, MustafeErgen, Springer.*
5. *Advanced Wireless Comm& Internet, Savoy G.Glisic, Wiely Publication (3rd Edition)*

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEC605	Professional Communication Skills	--	--	2	--	--	2	02

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEC605	Professional Communication Skills	--	--	--	--	50	--	--	50

Course Outcome	After successful completion of the course students should be able to
CO1	Prepare and present technical documents like formal report and technical paper effectively.
CO2	Prepare the documents needed for business meetings and proposals.
CO3	Apply the knowledge of interpersonal skills and corporate ethics in business communication.
CO4	Apply the knowledge of employment skills.
CO5	Explain the types of IPR.

Module No.	Unit No.	Details of Topic	Hrs.
Professional Communication Skills			
1		Formal Report Writing:	2
	1.1	Mechanics of writing a formal report	
	1.2	Language and Style in a report	
2		Introduction to Technical Paper Writing and Business Proposal :	4
	2.1	Concept, parts of a technical paper and strategies for writing a good technical paper	
	2.2	Business proposal: parts / layout of a business proposal and ways of writing a good business proposal	
3		Introduction to Interpersonal Skills:	4
	3.1	Emotional Intelligence	
	3.2	Leadership	
	3.3	Team Building	
	3.4	Time Management	
		# Self Learning Topics: 1. Assertiveness 2. Conflict Resolution 3. Negotiation Skills 4. Motivation	
4		Business Meetings and Documentation:	2
	4.1	Strategies for conducting effective meetings	
	4.2	Notice, Agenda & Minutes of the meeting	
5		Introduction to Intellectual Property Rights (IPR) and Professional Ethics:	4
	5.1	Concept, importance of Intellectual Property Rights and major forms of intellectual property rights: Patent, Trademark, Copyright and Geographical Indications	
	5.2	Business ethics and etiquettes	

6		Employment Skills:	10
	6.1	Cover letter & Resume Writing (Job Application)	
	6.2	Group Discussion: Strategies for successful participation in GD	
	6.3	Presentation Skills: Preparatory stages for preparing presentations.	
	6.4	Interview Skills: Preparing for verbal and non-verbal communication, interview questionnaire and presentation	
		Total	26

Recommended Books:

1. Raman, Minakshi and Prakash Singh, "Business Communication", Oxford University Press, 7th Edition, 2008.
2. Murphy, Herta and Herbert William, "Effective Business Communication", Mc Graw Hill, 6th edition, 1991.
3. Luthans, Fred, "Organizational Behavior", Boston, Mass.: Mc Graw Hill, 11th Edition, 2008.
4. Lesiker, Reymond and Petit, "Report Writing for Business", Mc Graw Hill, 9th Edition, 1995.
5. Huckin, Thomas and Olsen, "Technical Writing and Professional Communication", McGraw Hill, 1991.
6. Sharma, R.C and Krishna Mohan, "Business Correspondence and Report Writing", New Delhi: Tata McGraw-Hill, 4th Edition, 2011.
7. Ghosh, B. N., "Managing Soft Skills for Personality Development", Tata McGraw Hill, 1st Edition, 2012.
8. Raman, Minakshi, and Sangeeta Sharma, "Technical Communication: Principles and Practice", Oxford University Press, 4th Edition, 2011.

Term Work:

The term work of this course includes 08 assignments and oral activities. Eight assignments will be given to students on all modules of syllabus for assessing their understanding of the course during their batch-wise tutorials. The students will be graded from time to time based on their performance in the assignment work and oral presentations. The grades, awarded for their term work, will be converted into marks at the end of the semester.

The distribution of 50 marks for term work shall be as follows:

1. Assignments : 25marks
2. Group Discussion: 10 marks
3. Project Report Presentation: 15 marks

Suggested List of Assignments:

1. Report Writing (Elements / structure of formal report)
2. Technical Paper Writing (Outline of technical paper)
3. Meetings and Documentation (Written notice, agenda, minutes and mock meetings)
4. Cover Letter and Resume (Written document)
5. IPR (Written document of group work)
6. Interpersonal Skills (#Assignment on self-learning topics)
7. Case studies on Business Ethics and Interpersonal Skills
8. Quiz on IPR

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL601	Artificial Intelligence Lab	-	02	-	-	01	-	01

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	IA					
UCEL601	Artificial Intelligence Lab	-	-	-	-	25	25	-	50

Term Work:

At least **8-10** experiments will be conducted based on the course **UCEC601 Artificial Intelligence**

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEC601 Artificial Intelligence and UCEL601 Artificial Intelligence Lab

Course Code	Course Name	Teaching Scheme (Hrs)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL602	System Programming and Compiler Construction Lab	--	02	--	--	01	--	01

Course Code	Course Name	Examination Scheme							
		Theory Marks				Term Work	Practical and Oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	In Semester Assessment (IA)					
UCEL602	System Programming and Compiler Construction Lab	--	--	--	--	25	25	--	50

Term Work:

At least **10** experiments will be conducted based on the course **UCEC602 System Programming and Compiler Construction**

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The oral & practical examination will be based on UCEC602 System Programming and Compiler Construction and UCEL602 System Programming and Compiler Construction Lab

Subject Code	Subject Name	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL603	Digital Signal & Image Processing Lab	--	02	--	--	01	--	01

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	Internal Assessment (IA)					
UCEL603	Digital Signal & Image Processing Lab	--	--	--	--	25	25	--	50

Term Work:

At least **10** experiments will be conducted based on the course **UCEC603 Digital Signal & Image Processing**

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The practical & oral examination will be based on UCEC603 Digital Signal & Image Processing and UCEL603 Digital Signal & Image Processing Lab

Code	Course Title	Teaching Scheme			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL604	Mobile Cellular and Ad Hoc Networks Lab	--	02	--	--	01	--	01

Subject Code	Subject Name	Examination Scheme							
		Theory Marks				Term Work	Practical and oral	Oral	Total
		Continuous Assessment (CA)			End Sem. Exam				
		Test 1	Test 2	Internal Assessment (IA)					
UCEL604	Mobile Cellular and Ad Hoc Networks Lab	--	--	--	--	25	--	25	50

Term Work:

At least **10** experiments will be conducted based on the course **UCEC604 Mobile Cellular and Ad Hoc Networks**

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The oral examination will be based on UCEC604 Mobile Cellular and Ad Hoc Networks and UCEL604 Mobile Cellular and Ad Hoc Networks Lab

	Course Name	Teaching Scheme (Hrs)			Credits Assigned			
		Theory	Practical	Tutorial	Theory	Practical	Tutorial	Total
UCEL 605	Open Source Lab	--	04	--	--	02	--	02

Course Code	Course Title	Examination Scheme						
		Theory Marks			Term Work	Practical & Oral	Oral	Total
		Test 1	Test 2	End Sem. Exam(ESE)				
UCEL605	Open Source Lab	--	--	--	50	--	25	75

Course Outcome	After successful completion of the course students should be able to
CO1	Understand the fundamentals of Open Source environment
CO2	Configure & install open source Operating systems
CO3	Execute different scripting commands
CO4	Manage the configurations of network administrative tools
CO5	Identify & explore open source content management & security
CO6	Use open source programming language.

Suggested List of Experiments but not limited to:

1. Study & execution of basic open source commands.
2. Introduction & installation of Linux OS in Dual boot Environment.
3. Configuring Open Source System administration.
4. Introduction to shell programming,
5. To configure, compile & install latest kernel source code.
6. Network Administration - LAN Card configuration, DHCP, DNS, FTP, Telnet, SSH, NFS, Web Server, SQUID Proxy configuration
7. Content Management using DRUPAL.
8. Vulnerability management using OpenVAS.
9. Setting virtualization environment using open source tools.
10. Open Source Programming Mobile Programming - Android.

Recommended Books

1. *Linux Shell scripting Cookbook: SarathLakshman PACKT 3.*
2. *Linux Lab - Open source Technology : Ambavade –Dreamtech*
3. *Android Programming - Hellman E, Wiley India Pvt Ltd.*
4. *Drupal guide to Planning and Building Web Site: Wrox Press*

Term Work:

At least **10** experiments will be conducted based on the course **UCEL605 Open Source Lab.**

The term-work shall comprise of successful completion of above mentioned experiments.

Term work assessment will be based on the overall performance of the student during practical with every experiment graded from time to time. The grades converted into marks as per Grade Table will be added and averaged as final TW marks.

The oral examination will be based on UCEL605 Open Source Lab