

**FABTECH EDUCATION SOCIETY'S
FABTECH TECHNICAL CAMPUS COLLEGE
OF ENGINEERING & RESEARCH, SANGOLA
(An Autonomous Institute)**

**Affiliated to Dr. Babasaheb Ambedkar Technological University
(BATU), Lonere**



In line with the
National Education Policy (NEP) 2020 Compliant
Curriculum
For

**Computer Science & Engineering
UNDER-GRADUATE PROGRAMME**

**B. Tech. (Sem.-III to VIII)
(w.e.f. A.Y. 2026-27)**


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Board of Studies (BoS)
Computer Science & Engineering
FTCCOER, Sangola
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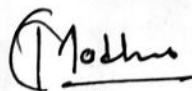




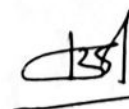
Semester-wise Credit Distribution:

Course Category	As per NEP GR 2020	FTCCOE Credits	CC	As per NEP GR 2020	FTCCOE Credits
BSC/ESC	30	30	BS	14-18	15
			ES	16--12	15
Program Courses	64-76	71	PC	44-56	51
			PE	20	20
Multidisciplinary Courses	22	22	MM	14	14
			OE	8	8
Skill Courses	8	7	VSE	8	7
Humanities, Social Science & Management (HSSM)	14	14	AE	4	4
			EM	4	4
			IKS	2	2
			VE	4	4
Experiential Courses	22	22	RM	4	4
			FP/CEP	2	2
			PR	4	4
			IN/OJT	12	12
Liberal Learning Courses	4	4	CC	4	4
Total Credits	160-176	170	-	160-176	170


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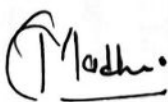




Semester-wise Credit Distribution:

SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
Basic Science Course (BSC)	7	8							15	14-18
Engineering Science Course (ESC)	9	6							15	16-12
Program Core Course (PCC)		2	11	12	10	10	6		51	44-56
Program Elective Course (PEC)					4	5	5	6	20	20
Multidisciplinary Minor Course (MDM)			3	3	3	3	2		14	14
Open Elective Course (OE)			3	3	2				8	8
Vocational & Skill Enhancement Course (VSEC)	2	2	1			1	1		7	8
Ability Enhancement Course (AEC)		2	1	1					4	4
Entrepreneurship / Management Courses (EMC)			2	2					4	4
Indian Knowledge System (IKS)	2								2	2
Value Education Course (VEC)			2	2					4	4
Research Methodology (RM)							4		4	4
Field Project (FP)					2				2	2
Project (PR/CEP)						2	2		4	4
Internship (IN)								12	12	12
Co-Curricular Course (CC)	2	2							4	4
Total Credits	22	22	23	23	21	21	20	18	170	160-176


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Semester III													
Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme			End Semester Evaluation Scheme			Total Marks
			L	T	P		MSE M	ICA M	Total M	ESE M	Evaluation Scheme		
											OE/POE	M	
PCC	26UCS21101	Discrete Mathematics	3	-	-	3	30	10	40	60	-	-	100
	26UCS21102	Computer Architecture & Organization	2	-	-	2	-	50	50	-	-	-	50
	26UCS21103	Design & Analysis of Algorithms	2	-	-	2	30	10	40	60	-	-	100
	26UCS21104	Design & Analysis of Algorithms Laboratory	-	-	2	1	-	50	50	-	-	-	50
	26UCS21105	Operating Systems	2	-	-	2	30	10	40	60	-	-	100
	26UCS21106	Operating System Laboratory	0	-	2	1	-	25	25	-	25	-	50
MDM	-	Multi-Disciplinary Minor -I	3	-	-	3	30	10	40	60	-	-	100
OE	-	Open Elective-I	3	-	-	3	30	10	40	60	-	-	100
VSEC	26UCS21601	Python Programming Laboratory	-	-	2	1	-	25	25	-	25	-	50
AEC	26UGS21403	Basic Quantitative Ability	1	-	-	1	-	50	50	-	-	-	50
EMC	26UET21806	Economics for Engineers	1	-	-	1	-	25	25	-	-	-	25
	26UET21807	Economics for Engineers Laboratory	-	-	2	1	-	25	25	-	-	-	25
VEC	26UGS21801	Universal Human Value	2	-	-	2	-	50	50	-	-	-	50
AUDIT	26UCE21901	Environmental Studies	1	-	-	-	-	50	50	-	-	-	50
	26UCS21901	Technical Aptitude -I	-	-	2	-	-	50	50	-	-	-	50
			20		10	23	150	450	600	300	50		

Note: A minimum of 40% marks is required to pass in the 'In Semester Evaluation Scheme Total', which is the sum of MSE and ICA scores.

Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks

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Curriculum for Second Year B. Tech. (Computer Science & Engineering) with effect from A.Y. 2026-27

Semester IV

Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme				End Semester Evaluation Scheme		Total Marks
							MSE M	ICA M	Total M	ESE M	OE/POE		
											M	M	
PCC	26UCS22107	Automata Theory	3	-	-	3	30	10	40	60	-	-	100
	26UCS22108	Computer Networks	3	-	-	3	30	10	40	60	-	-	100
	26UCS22109	Java Programming	3	-	-	3	30	10	40	60	-	-	100
	26UCS22110	Java Programming Laboratory	-	-	2	1	-	25	25	-	25	-	50
	26UCS22111	Software Project Management	1	-	-	1	-	50	50	-	-	-	50
	26UCS22112	Software Project Management Laboratory	-	-	2	1	-	25	25	-	25	-	50
MDM	-	Multi-Disciplinary Minor –II	3	-	-	3	30	10	40	60	-	-	100
OE	-	Open Elective-II	3	-	-	3	30	10	40	60	-	-	100
AEC	26UGS21404	Advanced Quantitative Ability	1	-	-	1	-	50	50	-	-	-	50
EMC	26UET22802	Start-up Ecosystem	1	-	-	1	-	25	25	-	-	-	25
	26UET22803	Start-up Ecosystem Laboratory	-	-	2	1	-	25	25	-	-	-	25
VEC	26UET22804	Professional Ethics	1	-	-	1	-	25	25	-	-	-	25
	26UET22805	Professional Ethics Laboratory	-	-	2	1	-	25	25	-	-	-	25
AUDIT	26UME22901	Constitution of India	1	-	-	-	-	50	50	-	-	-	50
	26UCS22902	Technical Aptitude-II	-	-	2	-	-	50	50	-	-	-	50
			20	0	10	23	150	400	550	300	50	-	900

Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks

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Curriculum for Third year B. Tech. (Computer Science & Engineering) with effect from A.Y. 2027-28

Semester V

Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme			End Semester Evaluation Scheme			Total Marks			
							MSE	ICA	Total	ESE	OE/PO					
											L	T		P	E	M
PCC	27UCS31113	Compiler Design	2	-	-	2	-	50	50	-	-	-	50			
	27UCS31114	Database Management System	3	-	-	3	30	10	40	60	-	-	100			
	27UCS31115	Database Management System Laboratory	-	-	2	1	-	25	25	-	25	-	50			
	27UCS31116	Machine Learning	3	-	-	3	30	10	40	60	-	-	100			
	27UCS31117	Machine Learning Laboratory	-	-	2	1	-	50	50	-	-	-	50			
PEC	-	Program Elective-I	3	-	-	3	30	10	40	60	-	-	100			
	-	Program Elective-I Laboratory	-	-	2	1	-	25	25	-	25	-	50			
MDM	-	Multi-Disciplinary Minor -III	3	-	-	3	30	10	40	60	-	-	100			
OE	-	Open Elective-III	2	-	-	2	30	10	40	60	-	-	100			
FP	27UCS31741	Seminar	-	-	4	2	-	100	100	-	-	-	100			
AUDIT	27UGS31901	Logical Reasoning	1	-	-	-	-	50	50	-	-	-	50			
	27UCS31903	Technical Aptitude-III	-	-	2	-	-	50	50	-	-	-	50			
			17	0	12	21	150	400	550	300	50		900			

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Curriculum for Third year B. Tech. (Computer Science & Engineering) with effect from A.Y. 2027-28													
Semester VI													
Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme			End Semester Evaluation Scheme		Total Mark s	
			L	T	P		MSE M	ICA M	Total M	ESE M	OE/POE M		
PCC	27UCS32118	Cloud Computing	3	-	-	3	30	10	40	60	-	100	
	27UCS32119	Cloud Computing Laboratory	-	-	2	1	-	25	25	-	25	50	
	27UCS32120	Network Security	3	-	-	3	30	10	40	60	-	100	
	27UCS32121	Advance Database Management System	3	-	-	3	30	10	40	60	-	100	
PEC	-	Program Elective-II	3	-	-	3	30	10	40	60	-	100	
	-	Program Elective Laboratory – II	-	-	4	2	-	50	50	-	50	100	
MDM	-	Multi-Disciplinary Minor -IV	3	-	-	3	30	10	40	60	-	100	
VSEC	27UCS32602	Advance Database Management System Laboratory	-	-	2	1	-	25	25	-	25	50	
PR	27UCS32751	Project Phase -I	-	-	4	2	-	100	100	-	-	100	
AUDIT	27UGS32902	Data Interpretation	1	-	-	-	-	50	50	-	-	50	
	27UCS32904	Technical Aptitude-IV	-	-	2	-	-	50	50	-	-	50	
			16	0	14	21	150	350	500	300	100	900	
Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks													

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Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks

Note: A minimum of 40% marks is required to pass in the 'In Semester Evaluation Scheme Total', which is the sum of MSE and ICA scores.


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Curriculum for Final Year B. Tech. (Computer Science & Engineering) with effect from A.Y. 2028-29

Semester VII

Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme			End Semester Evaluation Scheme			Total Marks
			L	T	P		MSE M	ICA M	Total M	ESE M	OE/POE M		
PCC	28UCS41122	Deep Learning	3	-	-	3	30	10	40	60	-	100	
	28UCS41123	Software Testing &Quality Assurance	3	-	-	3	30	10	40	60	-	100	
PEC		Program Elective-III	3	-	-	3	30	10	40	60	-	100	
		Program Elective Laboratory - III	-	-	4	2	-	25	25	-	25	50	
MDM		Multi-Disciplinary Minor -V	2	-	-	2	30	10	40	60	-	100	
VSEC	28UCS41603	Software Testing &Quality Assurance Laboratory	-	-	2	1	-	50	50	-	-	50	
RM	28UCS41701	Research Methodology	3	1	-	4	30	10	40	60	-	100	
PR	28UCS41752	Project Phase -II	-	-	4	2	-	50	50	-	50	100	
			14	1	10	18	150	175	325	300	75	700	

Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks

Note: A minimum of 40% marks is required to pass in the 'In Semester Evaluation Scheme Total', which is the sum of MSE and ICA scores

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Curriculum for Final Year B. Tech. (Computer Science & Engineering) with effect from A.Y. 2028-29												
Semester VIII												
Course Type	Course Code	Name of the Course	Engagement Hours			Credits	In Semester Evaluation Scheme			End Semester Evaluation Scheme		Total Marks
			L	T	P		MSE M	ICA M	Total M	ESE M	OE/POE M	
PEC	-	Program Elective –IV- Self Learning-I #	-	-	-	3	-	-	-	60	40	100
	-	Program Elective –V - Self Learning-II #	-	-	-	3	-	-	-	60	40	100
Internship / OJT	28UCS42761	Internship S	-	-	-	12	-	100@	-	-	100	200
			-	-	-	18	-	100	-	120	180	400
Abbreviations: L= Lecture, T= Tutorial, P= Practical, M= Marks												

These subjects are to be studied using SWAYAM/NPTEL (8 weeks)/(The list may alter and modify as per the availability of the subjects on the NPTEL/ SWYAM platform and usefulness, every year). Students who fail to satisfy the passing criteria of the course shall be required to appear for an offline examination for the same course and secure the minimum passing marks/grade as prescribed by the Institute.

\$ Twelve weeks of Internship in the industry.

@ Student has to submit monthly internship activity report as per prescribed format to department internship coordinator.


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Program Elective Course

Third year Semester V

Course Category	Course Code	Course Title
Program Elective Course – I	27UCS31201-A	Web Technology
	27UCS31201-B	Computer Graphics
	27UCS31201-C	Introduction Mobile Application Development

Course Category	Course Code	Course Title
Program Elective Laboratory – I	27UCS31202-A	Web Technology
	27UCS31202-B	Computer Graphics
	27UCS31202-C	Introduction Mobile Application Development

Third year Semester VI

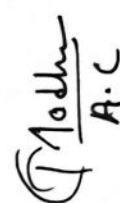
Course Category	Course Code	Course Title
Program Elective Course – II	27UCS32203-A	Data Mining & Warehouse
	27UCS32203-B	Ethical Hacking
	27UCS32203-C	Parallel & Distributed System

Course Category	Course Code	Course Title
Program Elective Laboratory – II	27UCS32204- A	Data Mining & Warehouse
	27UCS32204- B	Ethical Hacking
	27UCS32204- C	Parallel & Distributed System


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Final year Semester VII

Course Category	Course Code	Course Title
Program Elective Course - III	28UCS41205-A	Network Programming
	28UCS41205-B	Block chain Technology
	28UCS41205-C	Android app development

Course Category	Course Code	Course Title
Program Elective Laboratory - III	28UCS41206-A	Network Programming
	28UCS41206-B	Block chain Technology
	28UCS41206-C	Android app development

Final year Semester VIII

Course Category	Course Code	Course Title
Program Elective Course - IV	28UCS42207-A	NPTNL / Full Stack Development
	28UCS42207-B	NPTNL / Advanced Computer Architecture
	28UCS42207-C	NPTNL / Internet of Things (IoT)

Course Category	Course Code	Course Title
Program Elective Course - V	28UCS42208-A	NPTNL / Computer Vision
	28UCS42208-B	NPTNL / Natural Language Processing
	28UCS42208-C	NPTNL / Real-Time Systems


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LIST OF OPEN ELECTIVE COURSES

Sr.No	Elective Type	OE-I with 3 Credit Sem-III	OE-II with 3 Credit Sem-IV	OE-III with 2 Credit Sem-V	Course offered by Department
1	Health & Management	Emotional Intelligence (26UOE21501-A)	Leadership Skills (26UOE22502-A)	Stress Management (27UOE31503-A)	AI&DS
2	Environment & Sustainability	Climate Change & Mitigation (26UOE21501-B)	Waste Management & Recycling (26UOE22502-B)	Green Technology (27UOE31503-B)	Civil
3	Sustainable Development	Agriculture Systems and Digital Enablers (26UOE21501-C)	Data-Driven Decision Making in Agriculture (26UOE22502-C)	AI Applications for Sustainable Food Systems (27UOE31503-C)	CSE
4	Humanities & Arts	Fundamental of IPR (26UOE21501-D)	Legal Aspects of Innovation & Intellectual Property Rights (26UOE22502-D)	Patent search and Analytics (27UOE31503-D)	Electrical
5	Management & Commerce	Behavioral Economics (26UOE21501-E)	Financial Management for Engineers (26UOE22502-E)	Business Ethics (27UOE31503-E)	E&TC
6	Arts & Design	Design Thinking (26UOE21501-F)	Management Innovation & Entrepreneurship (26UOE22502-F)	Product Development (27UOE31503-F)	Mechanical



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Multi-Disciplinary Minor Courses Offered by Various Department

As per NEP guidelines, Semester-wise Credit Distribution for MDM are as below

SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
Multi-Disciplinary Minor (MDM)			02	02	04	02	02	02		14

As per institute guidelines, Semester-wise Credit Distribution for MDM are as below

SEM	I	II	III	IV	V	VI	VII	VIII	Total Credits	NEP Requirement
Multi-Disciplinary Minor (MDM)			03	03	03	03	02			14

1. MDM offered by Mechanical Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	Product Design Engineering	Engineering Product Drawing	26UME21401
		Computer Aided Product Design (CAD & Modeling)	26UME22402
		Rapid Prototyping and Additive Manufacturing (3D Printing)	27UME31403
		Ergonomics and Aesthetics in Product Design	27UME32404
		Product Lifecycle Management and Sustainability	28UME41405


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2. MDM offered by Civil Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	Construction Safety & Infrastructure Risk Management	Introduction to Construction Safety Engineering	26UCE21401
		Construction Site Safety and Labor Welfare Regulations	26UCE22403
		Infrastructure Risk Assessment and Hazard Management	27UCE31405
		Occupational Health and Safety in Construction Projects	27UCE32407
		Disaster-Resilient and Safe Infrastructure Planning	28UCE41409

3. MDM offered by Electrical Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	EV Technology	Basics of Electric Motors and Converters	26UEE21401
		Energy storage system for EV	26UEE22402
		Electric and Hybrid Vehicles	26UEE31403
		Electric Charging Systems for EVs	26UEE32404
		IoT in EV Applications	26UEE41405

4. MDM offered by Computer Science & Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	Machine Learning	Prompt Engineering	26UCS21401
		Computational Data Analytics	26UCS22402
		Machine Learning	27UCS31403
		Deep Learning	27UCS32404
		Agentic AI	28UCS41405

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5. MDM offered by Artificial Intelligence & Data Science Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	Web Engineering	Fundamentals of Web Technologies	26UAI21401
		Frontend Development using HTML, CSS & JS	26UAI22403
		Backend Web Development using Node.js / Django	27UAI31405
		Full Stack Development with MERN/MEAN Stack	27UAI32407
		UI/UX Design & Web Deployment (Cloud + DevOps)	28UAI41409

6. MDM offered by Electronics & Telecommunication Engineering

Sr No.	Name of Minor Domain	Courses Offered	Course Code
1	Sensor Technology	Sensors & Transducers	26UET31401
		Smart Sensors & MEMS Technology	26UET31402
		IoT Enables Sensors	27UET31403
		Automotive Sensor & Actuator Technology	27UET31404
		Biomedical Sensors	28UET31405

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Second Year B.Tech.

Semester-III (w.e.f.A.Y.2025-26)

Discrete Mathematics (26UCS21101)

Teaching B Scheme:

	No. of Hrs./week	No. of Credits
Lectures:	3	3
Tutorials:	-	-
Practical:	-	-
Total:	3	3

Evaluation Scheme:

MSE:	30 Marks
ICA:	10 Marks
ESE:	60 Marks
OE/POE:	-

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

CO 1	Explain principles of propositional and predicate logic equivalences, rules of inference, and normal forms to solve problems.	L2
CO 2	Describe concepts of set theory, cardinality, count ability, and power sets, and solve problems using set operations and mathematical induction.	L2
CO 3	Demonstrate relations and functions, properties, composition, inverse functions, and representations in problem solving.	L3
CO 4	Explain graph and tree concepts, graph representations, coloring, path finding, and spanning tree algorithms to solve problems.	L2
CO 5	Illustrate lattice theory, Boolean algebra, and algebraic structures, and operations in groups, homeomorphisms, and isomorphism's to computational problems.	L3

Unit	Course Contents	No. of lectures (hrs.)
Unit1	Mathematical Logic: Propositions, Application of Propositional Logic-Translating English Sentences, Connectives -negation, conjunction, disjunction, conditional, bi conditional, Truth Tables, Tautology, Contradiction, Logical Equivalences, Conjunctive and Disjunctive Normal Forms, Rules of Inference, Predicates and Quantifiers.	8
Unit 2	Set Theory: Introduction, Subsets, Set Operations, Cardinality of set, Ordered pairs, Cartesian product, Finite and Infinite Sets, Countable Infinite	7

	and Uncountable Infinite Sets, Power set, Proof by Mathematical Induction.	
Unit 3	Relations and Functions: Introduction, Relations on a Set, Properties of Relations, n-ary Relations Representing Relations, Equivalence Relations. Functions-types, Composition of functions, Inverse functions	7
Unit 4	Graphs and Trees: Graphs -Graph Terminology and Special Types of Graphs, Representing the Graphs, Graph Isomorphism, Euler and Hamilton Paths, Planar Graphs, Graph Coloring. Trees - Introduction to Trees, Applications of Trees, Spanning Trees, Minimum Spanning Trees(MST)- Prims's Algorithm, Kruskal's Algorithm	7
Unit 5	Lattices and Boolean algebra: POSET and Hasse diagram, Lattice as POSETs, definition, examples and Properties, Special Lattices, Boolean algebra definition and examples, Boolean functions Algebraic Structures Algebraic Systems, Groups, Semi Groups, Monoids, Subgroups, Codes and Group codes, Isomorphism and Automorphism, Homomorphism and Normal Subgroups.	7
Text Books:		
1)	Kenneth H. Rosen, -Discrete Mathematics and its Applications, Tata McGraw-Hill, ISBN 978-0-07288008-3, 7th Edition.	
2)	C. L. Liu, -Elements of Discrete Mathematics, TMH, ISBN 10:0-07-066913-9 3.Discrete mathematical structures with applications to computer science -- J. P. Tremblay & R. Manohar (MGH International)	
Reference Books:		
1)	R1. Logic and Discrete Mathematics, Grass Man & Trembley, Pearson Education.	
2)	Bernard Kolman, Robert C. Busby and Sharon Ross, —Discrete Mathematical Structures#, Prentice-Hall of India /Pearson, ISBN: 0132078457, 9780132078450	
3)	NarsinghDeo, -Graph with application to Engineering and Computer Science, Prentice Hall of India, 1990, 0-87692—145-4. 4.	

	FABTECH EDUCATION SOCIETY'S FABTECH TECHNICAL CAMPUS COLLEGE OF ENGINEERING & RESEARCH (An Autonomous Institute)			
	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2026-27)			
	Subject Name: Computer Architecture & Organization(26UCS21102)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	2	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	2	2	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Explain basic concepts of computer organization, functional units, CPU structure, and interconnections.			L2
CO 2	Describe instruction set characteristics, addressing modes, instruction formats, and execution flow, and summarize RISC and CISC architectures.			L2
CO 3	Apply principles of computer arithmetic for integer and floating-point representations and operations.			L3
CO 4	Apply concepts of internal and external memory organization, cache memory, virtual memory, and storage technologies to solve memory management-related problems.			L3
CO 5	Explain control unit operation, I/O organization, pipelining, and multiprocessor systems with cache coherence.			L2
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Introduction: Concept of computer organization and architecture, Functional units of digital system and their interconnections, buses, bus architecture, types of buses and bus arbitration, Register, CPU structure and function: VonNuemann architecture, Hardvard architecture.			5
Unit 2	Instruction Sets: Characteristics, Types of operands, Types of operations, Assembly language, Addressing modes, Instruction format, Types of instruction, Instruction execution, Introduction to RISC and CISC			5

	architecture.	
Unit 3	Computer Arithmetic: The arithmetic and logic Unit, Integer representation, Integer arithmetic, Floating point representation, Introduction of arithmetic co-processor.	5
Unit 4	Memory Organization Internal Memory: Semiconductor main memory, Error correction. External Memory: Organization and characteristics of magnetic disk, Magnetic tape, Optical memory, HDD, SSD, RAID, Memory controllers.	5
Unit 5	Control Unit and Input/output Organization Control Unit Operation: Micro-operations, Control of the processor, Hardwired implementation, Micro-programmed Control Unit, Basic concepts, Microinstruction sequencing, Microinstruction execution, Applications of micro-programming. Input / Output Organization: External devices, I/O module, Programmed I/O, Interrupt driven I/O, Direct memory access, I/O channels and processors, External interface. Instruction Pipe-lining and parallel processing: Multiple processor organization, Symmetric multiprocessor, Cache coherence and the MESI protocol.	5
Text Books:		
1.	William Stalling, Computer Organization and Architecture: Designing for Performance, Prentice Hall Publication, 8 th Edition, 2009.	
2.	David A. Paterson and John L. Hennessey, Computer Organization and Design , Fifth edition, Morgan Kauffman / Elsevier, 2014.	
3.	“Computer Organization and Design”, The Hardware/Software Interface”, 5th Edition by David A. Patterson and John L. Hennessy, Elsevier.	
Reference Books:		
1.	Hayes, Computer Architecture and Organization, McGraw-Hill Publication, 3 rd Edition, 2012.	
2.	Zaky, Computer Organization, McGraw-Hill Publication, 5 th Edition, 2011.	
3.	Hennessy and Patterson, Computer Architecture: A Quantitative Approach, Morgan and Kaufmann Publication, 4 th Edition, 2007.	

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	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2026-27)			
	Subject Name: Design & Analysis of Algorithms(26UCS21103)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	3	3	ISE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Explain fundamental algorithm design, analysis, and performance evaluation concepts using asymptotic notations and recurrence solving techniques			L2
CO 2	Illustrate computational problems by applying algorithmic paradigms such as divide-and-conquer, greedy, dynamic programming, backtracking, and branch-and-bound.			L2
CO 3	Implement algorithms for searching, sorting, shortest path, matrix operations, and combinatorial optimization, and evaluate their time and space complexity			L3
CO 4	Design algorithmic strategies for problem-solving to select suitable techniques based on efficiency and problem constraints.			L4
CO 5	Apply concepts of complexity classes (P, NP, NP-complete) and polynomial-time reductions to solve and demonstrate computational problem classification.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Introduction to Algorithm: Definition, Properties of Algorithms, Expressing Algorithm, Flowchart, Algorithm Design Techniques, Performance Analysis of Algorithms, Types of Algorithms Analysis, Order of Growth, Asymptotic Notations, Recursion, Recurrences Relation, Substitution Method, Iterative Method, Recursion Tree, Master Theorem, Changing Variable, Heap Sort.			8

Unit 2	Divide and Conquer : Introduction, Binary Search, Merge Sort, Quick Sort, Strassen’s Matrix Multiplication.	7
Unit 3	Backtracking: Backtracking Concept, N–Queens Problem, Four–Queens Problem, Eight–Queen Problem, Hamiltonian Cycle, Sum of Subsets Problem, Graph Coloring Problem, Branch and Bound: Introduction, Traveling Salesperson Problem, 15-Puzzle Problem, Comparisons between Backtracking and Branch and Bound.	7
Unit 4	Greedy Algorithms: Introduction to Greedy Technique, Greedy Method, Optimal Merge Patterns, Huffman Coding, Knapsack Problem, Activity Selection Problem, Job Sequencing with Deadline, Minimum Spanning Tree, Single-Source Shortest Path Algorithm.	7
Unit 5	Dynamic Programming: Introduction, Characteristics of Dynamic Programming, Component of Dynamic Programming, Comparison of Divide-and-Conquer and Dynamic Programming Techniques, Longest Common Subsequence, matrix multiplication, shortest paths: Bellman-Ford, Floyd Warshall, Application of Dynamic Programming. NP Completeness: Introduction, the Complexity Class P, the Complexity Class NP, Polynomial-Time Reduction, the Complexity Class NP-Complete.	7
Text Books:		
1.	T. Cormen, Introduction to Algorithms, PHI Publication, 4 th Edition, 2022.	
Reference Books:		
1.	Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1 st Edition, 1983	
2.	Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2 nd Edition,2006..	
3.	George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2 nd Edition, 2016.	
4.	Ellise Horowitz, SartajSahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2 nd Edition, 2008.	
5.	Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2 nd Edition, 1988.	

	FABTECH EDUCATION SOCIETY'S FABTECH TECHNICAL CAMPUS COLLEGE OF ENGINEERING & RESEARCH (An Autonomous Institute)			
	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2025-26)			
	Subject Name: Design & Analysis of Algorithms Laboratory (26UCS21104)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	ISE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	25 Marks
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Implement fundamental searching, sorting, and divide-and-conquer algorithms to solve computational problems efficiently.			L3
CO 2	Implement greedy algorithmic techniques to solve optimization problems such as job sequencing, minimum spanning tree, and shortest path problems.			L3
CO 3	Develop programs for graph algorithms, including graph traversal and shortest path algorithms, to analyze connected data structures.			L3
CO 4	Implement tree traversal techniques and apply appropriate algorithmic strategies to solve real-world computational problems.			L3
Ex.	Experiment Details			No. of Ex. Sessions (hrs.)
Ex. 1	Implementation of Binary Search			2
Ex. 2	Implementation of finding maximum and minimum numbers using divide and conquer.			2
Ex. 3	Implementation of Merge / Quick sort.			2
Ex. 4	Implementation of Selection sort.			2
Ex. 5	Implementation of Job Sequencing with deadlines.			2
Ex. 6	Program for finding the minimum cost Spanning Tree.			2

Ex. 7	Implementation of single-source shortest path.	2
Ex. 8	Implementation of all-pairs shortest path.	2
Ex. 9	Program for Tree traversal techniques.	2
Ex. 10	Program for Graph Traversal Technique.	2
<i>Text Books:</i>		
1	T. Cormen, Introduction to Algorithms, PHI Publication, 4 th Edition, 2022.	
<i>Reference Books:</i>		
1.	Aho, Ullman, Data Structure and Algorithms, Addison-Wesley Publication, 1 st Edition, 1983	
2.	Michel Goodrich, Roberto Tamassia, Algorithm Design – Foundation, Analysis & Internet Examples, Wiley Publication, 2 nd Edition,2006..	
3.	George T. Heineman, Gary Pollice, Stanley Selkow, Algorithms in a Nutshell, A Practical Guide, O'Reilly Media, 2 nd Edition, 2016.	
4.	Ellise Horowitz, SartajSahni, S. Rajasekaran, Fundamentals of Computer Algorithms, University Press (India) Private Ltd, 2 nd Edition, 2008.	
5.	Sara Base, Computer algorithms: Introduction to Design and Analysis, Addison-Wesley Publication, 2 nd Edition, 1988.	

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	Second Year B. Tech.		
	Semester-III (w.e.f. A.Y. 2026-27)		
	Subject Name: Operating Systems (26UCS21104)		
Teaching Scheme:			Evaluation Scheme:
	No. of Hrs./week	No. of Credits	
Lectures:	2	2	ISE: 30 Marks
Tutorials:	-	-	ICA: 10 Marks
Practical:		-	ESE: 60 Marks
Total:	2	2	OE/POE:
Course Outcomes: At the end of this course, students shall be able to			
CO 1	Understand the fundamental concepts of operating systems and their role in system design and implementation.		L2
CO 2	Understand process management concepts, inter-process communication mechanisms.		L2
CO 3	Apply CPU scheduling algorithms and process management techniques to improve system performance.		L3
CO 4	Analyze deadlock conditions and appropriate strategies including prevention, avoidance, detection, and recovery.		L4
CO 5	Understand memory and file management concepts, and allocation methods for efficient system performance.		L3
Unit	Course Contents		No. of lectures (hrs.)
Unit 1	Introduction and Operating system structures: Definition, Types of Operating system, Real-Time operating system, System Components: System Services, Systems Calls, System Programs, System structure, System Design and Implementation.		5
Unit 2	Processes and CPU Scheduling: Process Concept, Process Scheduling, Operation on process, Inter-process Communication Threads, Multithreading model, Scheduling criteria, Scheduling Algorithms, Thread Scheduling.		5
Unit 3	Process Synchronization: The critical-section problem, Critical regions, Peterson's Solution, Semaphores, Monitors Deadlocks:		5

	Systems Model, Deadlock characterization, Methods for handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock.	
Unit 4	Memory Management: Virtual Memory: Basics of Virtual Memory – Hardware and control structures – Locality of reference, Page fault, , Dirty page / Dirty bit – Demand paging, Page Replacement algorithms: Optimal, First in First Out (FIFO), Second Chance (SC), and Least Recently used (LRU).	5
Unit 5	File Management: File Concept, Access methods, File types, File operation, Directory and disk structure, File System Structure, File System Implementation, Allocation methods (contiguous, linked, indexed).	5
Text Books:		
1.	Abraham Silberschatz, Peter B. Galvin and Greg Gagne, Operating System Concepts, Wiley Publication, 8th Edition, 2008.	
Reference Books:		
1.	Andrew S. Tanenbaum, Modern Operating System, PHI Publication, 4th Edition, 2015.	
2.	D. M. Dhamdhere, Systems Programming and Operating Systems, McGraw-Hill, 2nd Edition, 1996.	
3.	Garry Nutt, Operating Systems Concepts, Pearson Publication, 3rd Edition, 2003.	
4.	Harvey M. Deitel, An Introduction to Operating Systems, Addison Wesley Publication, 2nd Edition, 1990.	
5.	Thomas W. Doeppner, Operating System in Depth: Design and Programming, Wiley Publication, 2011.	

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	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2025-26)			
	Operating Systems Laboratory (26UCS21105)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	ISE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	25 Marks
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Apply UNIX/Linux commands and shell scripting techniques using file handling.			L3
CO 2	Implement operating system algorithms.			L3
CO 3	Apply concepts of processes, threads, and classical synchronization problems to develop concurrent and multithreaded programs.			L3
CO 4	Apply operating system configuration and administration tasks including kernel setup, device driver management, system administration, and performance tuning.			L3
Experiment Details				
Ex.	Experiment Details			No. of Ex. Sessions (hrs.)
Ex. 1	Hands on Unix Commands			2
Ex. 2	Shell programming for file handling.			2
Ex. 3	Shell Script programming using the commands grep, awk, and sed.			2
Ex. 4	Implementation of various CPU scheduling algorithms (FCFS, SJF, Priority).			2
Ex. 5	Implementation of various page replacement algorithms (FIFO, Optimal, LRU).			2
Ex. 6	Concurrent programming; use of threads and processes, system calls (fork and v-fork).			2

Ex. 7	Study threads and implement the following: Write a program which shows the performance.	2
Ex. 8	Improvement in using threads as compared with process. (Examples like Matrix Multiplication.	2
Text Books:		
1	Operating System Concepts – Operating System Concepts Authors: Abraham Silberschatz, Peter B. Galvin, Greg Gagne Publisher: Wiley Edition: Latest available edition <i>Covers process management, CPU scheduling, synchronization, deadlocks, memory management, file systems, and laboratory-oriented programming examples.</i>	
Reference Books:		
1.	UNIX Concepts and Applications – UNIX Concepts and Applications Author: Sumitabha Das Publisher: McGraw Hill <i>Useful for UNIX commands, shell scripting, grep, awk, sed, and system administration.</i>	
2.	Advanced Programming in the UNIX Environment – Advanced Programming in the UNIX Environment Authors: W. Richard Stevens, Stephen A. Rago Publisher: Addison-Wesley <i>Excellent reference for system calls, processes, threads, synchronization, and inter-process communication.</i>	
3.	Linux System Programming – Linux System Programming Author: Robert Love Publisher: O'Reilly Media <i>Provides practical coverage of Linux programming, pthreads, process creation, synchronization mechanisms, and performance tuning.</i>	



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(An Autonomous Institute)**

Second Year B. Tech.

Semester-III(w. e .f. A.Y. 2026-27)

Subject Name: Prompt Engineering (MDM)(26UCS21401)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	3	3	ISE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	2	1	ESE:	60 Marks
Total:	5	4	OE/POE:	-

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

CO 1	Understand fundamentals of Generative AI, Large Language Models, and prompt engineering concepts.	L2
CO 2	Apply structured and effective prompting techniques to develop prompts for various tasks.	L3
CO 3	Apply prompt engineering for real-world tasks such as content creation, coding, and data analysis.	L3
CO 4	Apply prompt engineering for real-world tasks such as content creation, coding, and data analysis.	L3
CO 5	Demonstrate ethical, secure, and responsible use of AI systems.	L3

Unit	Course Contents	No. of lectures (hrs.)
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Unit 1	Introduction to Generative AI & Prompt Engineering Evolution: AI → ML → Deep Learning → Generative AI, Overview of Large Language Models (LLMs), Transformer architecture (conceptual view), Definition, scope, and importance of Prompt Engineering, Types of prompts: instructional, contextual, role-based Components of a prompt: context, task, constraints, examples, Overview of AI tools: ChatGPT, Gemini, Claude, Perplexity etc.	8
Unit 2	Prompt Design Techniques Zero-shot and Few-shot prompting, Chain-of-Thought prompting, Role prompting and persona creation, Prompt templates and reusable patterns, controlling tone, style, format, and output length, Structured outputs: tables, JSON, formatted text, Prompt design for summarization, translation, and drafting.	7
Unit 3	Prompt Optimization & Advanced Strategies Prompt refinement and iterative improvement, Prompt chaining and multi-step workflows Retrieval-Augmented Generation (RAG) – concept, Model parameters: temperature, tokens (conceptual), Prompt debugging and hallucination handling, Output evaluation: relevance, accuracy, coherence, Performance comparison and benchmarking.	7
Unit 4	Applications of Prompt Engineering Content creation and digital marketing, programming assistance and debugging, Data analysis and automated report generation, Chatbots and virtual assistants, Education and personalized learning systems, Integration concepts with APIs and productivity tools Prompt-based automation workflows.	7
Unit 5	Ethics, Security & Future Trends Bias in AI outputs and mitigation strategies, Prompt injection and adversarial attacks Privacy, data protection, and responsible AI use, AI hallucinations and verification techniques, Legal and ethical considerations in AI use, Career opportunities in Generative AI & Prompt Engineering, Future trends in human-AI collaboration.	7
Text Books:		
1)	Prompt Engineering for Generative AI – James Phoenix & Mike Taylor	
2)	Generative AI with Large Language Models – DeepLearning.AI	
3)	Artificial Intelligence: A Modern Approach – Stuart Russell & Peter Norvig	
Reference Books:		

1)	OpenAI, Google, and Anthropic official documentation & best practices
2)	Building LLM Applications with Python – Ankur Patel
3)	Latest IEEE/ACM research papers on Prompt Engineering and LLMs



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Second Year B. Tech.

Semester-III (w.e.f. A.Y. 2026-27)

**Subject Name: Agriculture Systems and Digital Enablers
(26UOE21503)**

Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	3	3	ISE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Describe the structure of agriculture systems and identify critical touch points where digital technologies can intervene.			L2
CO 2	Classify sensors, actuators, and IoT development platforms used specifically in agricultural contexts.			L2
CO 3	Explain a given agricultural problem and identify appropriate digital enablers as a solution framework.			L2
CO 4	Apply cloud and connectivity solutions to determine their suitability for rural agri-IoT deployments.			L3
CO 5	Design a technology intervention proposal for a real local farming challenge observed during field visits.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Agriculture as a System - Farming system components: soil, water, crop, market; Value chain in Indian agriculture; Digital disruption in agri-sector; Role of government schemes — PM-KISAN, e-NAM, Agristack; Maharashtra's agri economy — key crops and challenges in Sangola-Solapur belt; Technology intervention mapping at each value chain node			8

Unit 2	Sensing the Farm - Sensors in agriculture — soil moisture, temperature, humidity, pH, NPK; Sensor types and selection criteria; Actuators — irrigation valves, drone sprayers; IoT platforms — Arduino IDE, Raspberry Pi, NodeMCU, ESP32; Agriculture-specific development boards and kits; Comparison of platforms for farm deployment.	7
Unit 3	Connectivity for Rural Farms -IoT access technologies — LoRa, LoRaWAN, NB-IoT for rural range; ZigBee, BLE for in-field networks; IP Layer and MQTT protocol for farm data; Challenges of rural connectivity — power, range, cost; Case studies of connectivity in Indian farm IoT deployments.	7
Unit 4	Cloud and Data Management for Agriculture - Cloud fundamentals — AWS, Azure services for IoT; Adafruit IO and ThingSpeak for agri-data visualisation; Data dashboards for farm monitoring; Challenges in cloud adoption for small farmers; Open datasets — ICAR, IMD, Agmarknet APIs	7
Unit 5	Digital Solution Design for Farms -Problem statement formulation from farm visits; Solution architecture design; Technology selection framework; Cost-benefit analysis for small farmer contexts; Proposal presentation skills; Case studies — successful agri-tech startups from Maharashtra	7
Reference Books:		
1.	Internet of Things: A Hands-On Approach Authors: Arshdeep Bahga & Vijay Madisetti	
2.	Internet of Things: Principles and Paradigms Editor: Rajkumar Buyya	
3.	Designing the Internet of Things Authors: Adrian McEwen & Hakim Cassimally	

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	(An Autonomous Institute)			
	Semester-III (w.e.f. A.Y. 2026-27)			
Python programming Laboratory (26UCS21601)				
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	ISE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	25 Marks
Course Outcomes: At the end of this course, students shall be able to				BL Level
CO 1	Demonstrate the use of Python fundamentals, including variables, operators, and control structures, to solve basic problems			L2
CO 2	Apply functions and looping constructs to develop simple Python programs.			L3
CO 3	Utilize Python data structures such as lists, tuples, sets, and dictionaries for data manipulation.			L3
CO 4	Develop object-oriented programs using classes and objects to model real-world entities.			L3
CO 5	Use Python libraries to perform basic data handling and visualization tasks.			L3
Unit	Course Contents			No. of lectures (hrs.)

Unit 1	Python Fundamentals History of Python, Python variables and data types, Strings and operators, Conditional statements and expressions, Looping constructs (for and while loops).	2
Unit 2	Python Data Types Lists and list operations, Tuples and tuple operations, Sets and set operations, Dictionaries and dictionary operations, Indexing and formatting, Python collections.	3
Unit 3	Functions and Object-Oriented Programming User-defined functions, Function arguments and return values, Classes and objects, Methods and constructors, Modules and packages.	3
Unit 4	Python Libraries and Data Preparation Introduction to Python libraries, Working with commonly used libraries, Data preprocessing techniques, Data cleaning and preparation using Python.	2
Unit 5	Data visualization and Applications Introduction to data visualization, Creating charts and plots using Python, Interpretation of visual data, Case studies using real-world datasets.	2

Text Books:

1)	R. NageswaraRao, <i>Core Python Programming</i> , Dreamtech Press, 2nd Edition.
2)	Yashavant Kanetkar and Aditya Kanetkar, <i>Let Us Python</i> , BPB Publications, Latest Edition.

Reference Books:

1)	Wes McKinney, <i>Python for Data Analysis: Data Wrangling with Pandas, NumPy, and Jupyter</i> , 3rd Edition, O'Reilly Media, 2022
2)	Kenneth A. Lambert, "The Fundamentals of Python: First Programs", Cengage Learning

Experiment List

1)	Write a Python program to perform basic arithmetic operations (addition, subtraction, multiplication, and division) on two numbers.
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2)	Write a Python program to find whether a number is even or odd using conditional statements.
3)	Write a Python program to find the largest among three numbers.
4)	Write a Python program to print the multiplication table of a given number using a for loop.
5)	Write a Python program to calculate the factorial of a number using a function.
6)	Write a Python program to perform basic operations on a list such as append, insert, remove, and display elements.
7)	Write a Python program to demonstrate tuple, set, and dictionary operations.
8)	Write a Python program to count the number of vowels in a given string.
9)	Write a Python program to create a class Student with attributes name and roll_no, and display student details using an object.
10)	Write a Python program to read data from a CSV file using Pandas and display the first five records.

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	(An Autonomous Institute)			
	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2026-27)			
	Basic Quantitative Ability (26UHS21803)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	1	1	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	1	1	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				BL
CO 1	Apply basic arithmetic operations, surds, indices, and progressions to solve quantitative problems efficiently.			L3
CO 2	Use concepts of HCF, LCM, divisibility, remainders, unit digits, and number Properties in problem-solving.			L3
CO 3	Solve real-life problems involving percentages, successive changes, and proportional increase/decrease.			L3
CO 4	Apply concepts of averages, weighted averages, mixtures, and alligations in quantitative applications.			L3
CO 5	Use ratio, proportion, variation, and scaling concepts to solve aptitude and application-based problems.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Basic Calculation Techniques Squares (1–30), Cubes (1 to 15), Square roots, Cube roots, BODMAS rule, Surds & Indices: Fundamental laws of indices, basic rules of surds, Progressions: Arithmetic Progressions, Geometric Progressions, Harmonic Progressions, Useful results.			3
Unit 2	Number System GCD/HCF and LCM, Rules of divisibility, properties involving fractions, co-			3

	primes, and application-based word problems, Unit digit and Power Cycle, Remainder Theorem, Types of Numbers and their Properties, Useful results.	
Unit 3	Percentage Concept of percentages, fraction-to-percentage equivalence, successive percentage changes, increase and decrease based on universally proportional, real-world applications.	3
Unit 4	Average Concept of arithmetic mean, weighted averages, inclusion/exclusion of elements, and replacement problems, Mixture and Alligations.	3
Unit 5	Ratio and Proportion Ratio and Proportion, Direct proportion, Inverse proportion, Mean proportion, Joint proportion, Scaling Concept, • Problems on Ages Useful results.	3
Text Books:		
1)	Quantitative Aptitude by R. S. Aggarwal, S. Chand Publishing.	
2)	Quantitative Aptitude for Competitive Examinations: AbhijitGuha, McGraw Hill India	
Reference Books:		
1)	Fast Track Objective Arithmetic: Rajesh Verma, Arihant Publications.	
2)	Magical Book on Quicker Maths: M. Tyra, BSC Publishing Co. Pvt. Ltd.	
3)	Quantitative Aptitude Quantum CAT: Sarvesh Kumar Verma, Arihant Publications.	
4)	Objective Arithmetic: R. S. Aggarwal, S. Chand Publishing.	
5)	How to Prepare for Quantitative Aptitude for CAT: Arun Sharma, McGraw Hill India.	

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	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2026-27)			
	Subject Name:- Economics for Engineers(26UHS21807)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	2	ISE:	
Tutorials:	-	-	ICA:	25 Marks
Practical:	-	-	ESE:	
Total:	2	2	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				BL
CO 1	Understand the fundamental concepts of economics and their relevance to engineering and technology.			L2
CO 2	Develop awareness of economic factors affecting engineering projects, industries, and society.			L4
CO 3	Apply basic economic principles in decision-making related to cost, resources, productivity, and efficiency.			L3
CO 4	Understand personal finance and financial planning, including saving, investment, and budgeting.			L4
CO 5	Recognize the importance of sustainable economic development and the role of engineers in contributing to economic growth and societal well-being.			L5
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Introduction to Economics Basic Economic Concepts ,Scarcity, Choice, and Opportunity Cost, Microeconomics and Macroeconomics,Role of Engineers in Economic Development.			7

Unit 2	Demand, Supply, and Market Demand and Supply Concepts ,Market Equilibrium ,Consumer Behavior ,Market Structures (Overview)	6
Unit 3	Personal Finance and Financial Awareness Saving and Investment ,Banking System ,Digital Payments ,Financial Planning for Young Professionals	6
Unit 4	Economics in Engineering Practice Cost Concepts ,Cost-Benefit Analysis ,Productivity and Efficiency ,Sustainable Development and Green Economy	7
Text Books:		
1. <i>Engineering Economics</i> – R. Panneerselvam 2. <i>Engineering Economics</i> – S. C. Sharma 3. <i>Engineering Economics, Estimation and Costing</i> by S. K. Bhattacharya 4. <i>Engineering Economics</i> by S. C. Ahuja and Robert Walsh		
Reference Books:		
1. <i>Engineering Economy</i> – William G. Sullivan et al. 2. <i>Principles of Economics</i> – N. Gregory Mankiw 3. <i>Fundamentals of Engineering Economics</i> is a textbook by Chan S. Park 4. <i>Engineering Economy</i> by Leland Blank and Anthony Tarquin		

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	Teaching Scheme:		Evaluation Scheme:	
		No. of Hrs./week	No. of Credits	
	Lectures:	-	-	ISE: -
	Tutorials:	-	-	ICA: 25 Marks
	Practical:	1	1	ESE: -
	Total:	1	1	OE/POE: -
Course Outcomes : At the end of this course, students shall be able to				BL Level
CO1	Explain fundamental economic concepts such as scarcity, opportunity cost, demand, supply, and market equilibrium through laboratory Activities and case studies.			L2
CO2	Analyze consumer behavior, market trends, and financial planning Using basic economic tools and real-life data.			L4
CO3	Apply economic principles to evaluate engineering projects using cost-Benefit analysis and financial decision-making techniques.			L3
CO4	Assess sustainable development practices and the role of engineering economics in promoting efficient resource utilization and economic growth.			L5
Ex.	Experiment(Any Six)			No. of Ex. Sessions(hrs.)
Ex. 1	Understanding Scarcity and Opportunity Cost			2
Ex. 2	Micro economics vs Macro economics Case Analysis			2
Ex. 3	Engineers and Economic Development			2
Ex. 4	Demand Survey and Demand Curve Preparation			2
Ex. 5	Market Equilibrium Simulation			2

Ex. 6	Consumer Behavior Analysis	2
Ex. 7	Personal Budget and Financial Planning	2
Ex. 8	Comparative Study of Banking and Digital Payments	2
Ex. 9	Cost-Benefit Analysis of an Engineering Project	2
Ex.	Sustainable Development and Green Economy Assessment	2

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	Semester-III (w.e.f. A.Y. 2026-27)			
	Universal Human Values(26UHS22808)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	2	ISE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	2	2	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				BL Level
CO 1	Understand the need for value education and self-exploration in achieving human aspirations of happiness and prosperity.			L2

CO 2	Analyze the harmony between self and body and identify methods for self-regulation and health.	L4
CO 3	Analyze human relationships and social values to promote harmony in family and society.	L4
CO 4	Evaluate the interconnectedness and mutual fulfillment among different orders of nature and existence.	L5
CO 5	Apply universal human values and professional ethics in engineering practice and societal development.	L3

Unit	Course Contents	No. of lectures (hrs.)
Unit 1	Introduction to Value Education Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity – the Basic Human Aspirations, Right Understanding, Relationship and Physical Facility, Happiness and Prosperity – Current Scenario, Method to Fulfill the Basic Human Aspirations	5
Unit 2	Harmony in the Human Being Understanding Human being as the Co-existence of the Self and the Body, Distinguishing between the Needs of the Self and the Body, The Body as an Instrument of the Self, Understanding Harmony in the Self, Harmony of the Self with the Body, Programme to Ensure self-regulation and Health.	5
Unit 3	Harmony in the Family and Society Harmony in the Family – the Basic Unit of Human Interaction, Values in Human-to-Human Relationship, 'Trust' – the Foundational Value in Relationship, 'Respect' – as the Right Evaluation, Understanding Harmony in the Society, Vision for the Universal Human Order	5
Unit 4	Harmony in the Nature (Existence) Understanding Harmony in the Nature, Interconnectedness, self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing Existence as Co-existence at All Levels, The Holistic Perception of Harmony in Existence	4
Unit 5	Implications of the Holistic Understanding – a Look at Professional Ethics	5

	Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models-Typical Case Studies, Strategies for Transition towards Value-based Life and Profession	
5 Text Books:		
1)	1. A Foundation Course in Human Values and Professional Ethics, R R Gaur, R Asthana, GP Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-47-1	
2)	Teachers' Manual for A Foundation Course in Human Values and Professional Ethics, RR Gaur, R Asthana, G P Bagaria, 2nd Revised Edition, Excel Books, New Delhi, 2019. ISBN 978-93-87034-53-2	
Reference Books:		
1)	Jeevan Vidya: Ek Parichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak, 1999.	
2)	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.	
3)	The Story of Stuff (Book).	
4)	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi	
5)	Small is Beautiful - E. F Schumacher.	
6)	Slow is Beautiful - Cecile Andrews	
7)	Economy of Permanence - J C Kumarappa	
8)	Bharat Mein Angreji Raj – Pandit Sunderlal	
9)	Rediscovering India - by Dharampal	
10)	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi	
11)	India Wins Freedom - Maulana Abdul Kalam Azad	
12)	Vivekananda - Romain Rolland (English)	
13)	Gandhi - Romain Rolland (English)	



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Second Year B. Tech.

Semester-III (w.e.f. A.Y. 2026-27)

Environmental Studies(26UCS21901)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	1	-	ISE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	1	-	OE/POE:	-

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

BL Level

CO 1	Understand the concepts of environmental studies, sustainability, and sustainable development.	L2
CO 2	Analyze ecosystem structure, energy flow, ecological succession, and biodiversity in different ecosystems.	L4
CO 3	Assess the availability, utilization, and conservation of natural resources and their environmental implications.	L4
CO 4	Apply knowledge of environmental pollution and waste management techniques to minimize environmental degradation.	L3
CO 5	Evaluate environmental assets, ecosystems, biodiversity, and pollution problems through field investigations and case studies.	L5

Unit	Course Contents	No. of lectures (hrs.)
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Unit 1	Introduction to environmental studies Multidisciplinary nature of environmental studies, Scope and importance; Concept of sustainability and sustainable development.	5
Unit 2	Ecosystems What is an ecosystem? Structure and function of ecosystem; Energy flow in an ecosystem: food chains, food webs and ecological succession. Any two Case studies of the following ecosystems : a) Forest ecosystem b) Grassland ecosystem c) Desert ecosystem d) Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)	5
Unit 3	Natural Resources : Renewable and Non-renewable Resources Land resources and land use change; Land degradation, soil erosion and desertification. Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Water: Use and over-exploitation of surface and ground water, floods, droughts, conflicts over water (international & inter-state).Energy resources : Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.	5
Unit 4	Environmental Pollution Types, causes, effects and controls; Air, water, soil and noise pollution,Nuclear hazards and human health risks, Solid waste management : Control measures of urban and industrial waste.	5
Unit 5	Field work -Visit to an area to document environmental assets: river/ forest/ flora/fauna,etc.Visit to a local polluted site-Urban/Rural/Industrial/Agricultural.Study of common plants, insects, birds and basic principles of identification. Study of simple ecosystems-pond, river, dam, pond, ocean/marine etc.	5
Text Books:		
1.	Environmental Studies E - Text Book (Marathi and English Medium) Solapur University Solapur (2017).	
2.	Gadgil, M., &Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. ofCalifornia Press.	
3.	Grumbine, R. Edward, and Pandit, M.K. 2013. Threats from India's Himalaya dams. Science, 339: 36---37.	
4.	Pepper, I.L., Gerba, C.P. &Brusseau, M.L. 2011. Environmental and Pollution Science. Academic Press	



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Second Year B. Tech.

Semester-III (w.e.f. A.Y. 2026-27)

Technical Aptitude-I (26UCS21902)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	2	-	ISE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	2	-	OE/POE:	-

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

BL Level

CO 1	Apply the concepts of propositional logic, predicate logic, sets, relations, functions, partial orders, and lattices to analyze and solve mathematical and engineering problems.	L3
CO 2	Apply the concepts of calculus, probability, and statistics to analyze functions, solve optimization problems, evaluate probabilities, and interpret statistical data in engineering applications.	L3
CO 3	Apply probability distributions and statistical measures to analyze uncertainty, interpret data, and solve engineering and real-world decision-making problems.	L3
CO 4	Apply the principles of Boolean algebra, digital circuits, number systems, and computer arithmetic to analyze, design, and optimize digital systems.	L3
CO 5	Analyze the organization and architecture of computer systems, including instruction execution, processor design, memory hierarchy, and I/O mechanisms for efficient system performance.	L3

Unit	Course Contents	No. of lectures
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		(hrs.)
Unit 1	Engineering Mathematics Discrete Mathematics: Propositional and first order logic. Sets, relations, functions, partial orders and lattices. Graphs, Combinatory: counting, recurrence relations, generating functions, Linear Algebra: Matrices, determinants, system of linear equations,.	5
Unit 2	Calculus: Limits, continuity and differentiability, Maxima and minima, Mean value theorem, Integration, Probability and Statistics: Random variables, Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem	5
Unit 3	Probability and Statistics: Random variables, Uniform, normal, exponential, Poisson and binomial distributions. Mean, median, mode and standard deviation. Conditional probability and Bayes theorem.	5
Unit 4	Digital Logic Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).	5
Unit 5	Computer Organization and Architecture Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining, pipeline hazards. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).	5
Text Books:		
1.	Discrete Mathematics and Its Applications – McGraw-Hill Education.	
2.	Digital Principles and Applications – McGraw-Hill.	
Reference Books:		
1.	Advanced Engineering Mathematics – Wiley India.	
2.	Fundamentals of Digital Logic with Verilog Design – McGraw-Hill.	
3.	Computer Organization and Design – Morgan Kaufmann.	



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Second Year B.Tech.

Semester-IV (w.e.f.A.Y.2026-27)

Automata Theory (26UCS22107)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week		No. of Hrs./week	
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-

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

CO 1	Understand DFA and NFA for given regular languages, convert NFA to DFA, minimize DFA, and apply Kleen's theorem to regular language problems.	L2
CO 2	Apply the Pumping Lemma to prove or disprove membership of a language in the class of regular and context-free languages.	L3
CO 3	Understand simplify CFGs, convert to CNF/GNF, and construct Pushdown Automata equivalent to a given context-free language.	L2
CO 4	Illustrate Turing Machines for language acceptance and function computation, and explain the implications of decidability and the Halting Problem.	L2
CO 5	Explain the basic relationship between TOC concepts & modern AI System such as RNNs, LLMs & NLP pipelines.	L2

Unit	Course Contents	No. of lectures (hrs.)
Unit1	Alphabet, Strings, and Formal Languages; Operations on Languages (Union, Concatenation, Kleene Star), Regular Expressions (RE) - definition, construction, examples; Equivalence of RE and FA, Deterministic Finite Automata (DFA): formal definition, transition diagram, language acceptance, Non-Deterministic Finite Automata (NFA) :formal definition; NFA with ϵ -	8

	transitions, Subset Construction: NFA $\rightarrow$ DFA conversion, DFA Minimisation: Table-Filling (Equivalence Class) method, Kleen's Theorem-statement, proof sketch, and applications, Closure properties of Regular Languages	
Unit 2	Context-Free Languages — definition and examples; Relationship with Regular Languages Closure properties of CFLs (Union, Concatenation, Kleene Star; NOT intersection/complement)Pumping Lemma for Regular Languages — statement, proof, and examples Pumping Lemma for CFLs — statement and applications Using Pumping Lemma to prove languages are NOT regular / NOT context-free Non-Context-Free Languages — examples and proofs	7
Unit 3	Chomsky Hierarchy — Type 0, 1, 2, 3 grammars and corresponding automata Context-Free Grammar (CFG) — formal definition, production rules, derivation, derivation trees Ambiguity in CFG — detection and removal; Unambiguous grammars Simplification of CFG — elimination of ϵ -productions, unit productions, and useless symbols,Chomsky Normal Form (CNF) — conversion procedure with examples Greibach Normal Form (GNF) — conversion procedurePushdown Automata (PDA) — formal definition; acceptance by final state and empty stack Design of PDA for standard CFLs; Equivalence of CFG and PDA	7
Unit 4	Turing Machine (TM) — formal model, components, and operation TM as a Language Acceptor — designing TMs for simple languages TM as a Function Computer — computing arithmetic functions using TM Variants of Turing Machines — multi-tape TM, non-deterministic TM Church-Turing Thesis — statement and significance Decidability — decidable and undecidable problems; definition and examples Halting Problem — statement and proof of undecidability	7
Unit 5	Finite Automata and Recurrent Neural Networks (RNNs) — state analogy, transition function vs weight matrix, NFA and Attention Mechanism in Transformers — parallel state exploration, DFA Minimisation and Neural Network Pruning/Compression, Regular Grammars in Tokenization — how LLMs (GPT, BERT) tokenize input using FSM-based tokenizers CFG in Syntax Parsing — role in compiler front-ends and Neural Parsers in NLP Formal Grammar hierarchies and Large Language Models — where LLMs sit in Chomsky Hierarchy Turing Machines and AI Computability — what AI systems can and cannot compute Halting Problem and AI Safety / Formal Verification of AI programs Finite State Machines in Robotics, PLCs, and Autonomous Systems	7
Text Books:		

1)	Introduction to Languages and the Theory of Computation — John C. Martin (McGraw Hill Education)
2)	Formal Languages and Automata Theory — Basavraj S. Anami, Karibasappa K. G. (Wiley Precise Textbook, Wiley India)
3)	Introduction to Automata Theory, Languages and Computations — Hopcroft, Motwani, Ullman (Pearson)
<i>Reference Books:</i>	
1)	Theory of Computation — Rajesh K. Shukla (CENGAGE Learning)
2)	Theory of Computer Science: Automata, Languages and Computation — Mishra, PHI
3)	Theory of Computation — R. B. Patel & PremNath (Khanna Publications)
4)	Introduction to the Theory of Computation — Michael Sipser (CENGAGE, 3rd Ed.)



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Second Year B.Tech.

Semester-IV (w.e.f.A.Y.2026-27)

Computer Networks (26UCS22108)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week		No. of Hrs./week	
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-

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

CO 1	Understand the fundamental concepts of computer networks, network hardware and software, protocol hierarchy, design issues, and reference models.	L2
CO 2	Describe the characteristics and applications of wired and wireless LAN technologies, error control codes, and routing concepts.	L2
CO 3	Apply error control coding methods and routing algorithms to solve basic networking problems.	L3
CO 4	Apply Network Layer and Congestion Control policies.	L3
CO 5	Apply the knowledge of Application Layer Protocols and Identify Various Network security principles such as Authentication, firewalls.	L3

Unit	Course Contents	No. of lectures (hrs.)
Unit1	Introduction Applications of computer networks, Network hardware, Network software: Protocol Hierarchy, Design Issue, connection oriented vs. connectionless, Service Primitives, Reference models: OSI and TCP/IP, Example networks: Internet, Network standardization, Performance: Bandwidth and Latency, Delay and bandwidth product, High- Speed Network, Application Performance Needs	8
Unit 2	LAN Technologies X5, Frame relay, ATM, Ethernet (802.3), FDDI, Token Rings, Resilient	7

	Packet Rings, Wireless LANs: Wi-Fi (802.11), Cell Phone Technologies, Broadband Wireless: Wi-MAX (802.16), Bluetooth (802.15.1), RFID.	
Unit 3	Data Link Layer Data Link Layer Design Issues: Service provided to network layer Framing, Error Control, Flow Control, Error Detection and Correction: error correcting codes, error detecting codes.	7
Unit 4	Network Layer and Congestion Control IPv4/IPv6, Routers and Routing Algorithms distance vector link state. TCP UDP and sockets, General principles, Congestion prevention policies, Load shading, Jitter control, Quality of service: Packet scheduling, Traffic shaping, integrated Services.	7
Unit 5	Application Layer Protocols DNS, SMTP, POP, FTP, HTTP. Network Security: Authentication, Basics of public key and private key cryptography, digital signatures and certificates, firewalls.	7
Text Books:		
1)	A. Tanenbaum, Computer Networks, PHI Publication, 5th Edition, 2011.	
Reference Books:		
1)	B. Forouzan, Data Communications and Networking, McGraw Hill Publication, 5th	
2	Larry Peterson and Bruce Davie, Computer Networks: A Systems Approach, Morgan	

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	Second Year B. Tech.			
	Semester-III (w.e.f. A.Y. 2026-27)			
	Subject Name: Java Programming (26UCS22109)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Explain the fundamentals of Java programming, Java development environment, data types, classes, objects, methods, constructors, and memory concepts.			L2
CO 2	Apply core Java programming concepts and API packages to develop solutions for computational problems.			L3
CO 3	Implement programs using arrays, command-line arguments, and variable-length argument lists to address computational requirements			L3
CO 4	Apply object-oriented programming principles such as inheritance, polymorphism, abstract classes, interfaces, and constructor chaining in Java applications.			L3
CO 5	Analyze and handle runtime errors using exception handling mechanisms, including exception hierarchy, try-catch blocks, and finally blocks.			L4
Unit	Course Contents			No. of lectures (hrs.)

Unit 1	Introduction to Java Applications Introduction, Java Class Libraries, Typical Java Development Environment, Memory Concepts, Arithmetic. Introduction to Classes and Objects: Introduction, Classes, Objects, Methods and Instance Variables, Declaring a Class with a Method and Instantiating an Object of a Class, Declaring a Method, Instance variables, set Methods and get Methods, Primitive Types vs. Reference type double Types ,Initializing Objects with Constructors, floating point numbers.	8
Unit 2	Control Statements Control structures if single-selection statement, if....else double-selection statement, while repetition statement, do....while repetition statement, switch multi-selection statement, break and continue statements, logical operators. Methods :Introduction, Program modules in Java, static methods, static Fields and Class Math, declaring methods with multiple parameters, scope of declaration, method overloading and Java API packages.	7
Unit 3	Arrays Arrays, declaring and creating arrays in java, examples using arrays, passing arrays to methods, multidimensional arrays, variable-length argument lists, using command-line arguments	7
Unit 4	Inheritance and Polymorphism in Java Inheritance: Super classes and Subclasses, protected members, relationship between super classes and subclasses, constructors in subclasses, objectclass. Polymorphism: Abstract classes and methods, final methods and classes, polymorphism examples and Interfaces.	7
Unit 5	Exception-handling and Java script Exception-handling overview, handling Arithmetic Exceptions and Input Mismatch Exceptions, when to use exception handling, java exception hierarchy, finally block. Introduction to Java Applets. Java script: Introduction to client side scripting, Syntax basics, Operators, Comparisons, Statements, Loops, Events, Objects, and User defined functions, Validations using object functions, Validations using regular expressions, JS document object model, popovers, windows	7
Text Books:		
1	Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9th Edition.	
Reference Books:		

1	Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition, 2014
2	Herbert Schildt, Java The Complete Reference, McGraw-Hill Publication, 9th Edition.
3	Patrick Niemeyer, Daniel Leuck, Learning Java, O'Reilly Media, 4th Edition, 2013.
4	JavaScript: The Good Parts, Douglas Crockford, O'Reilly, ISBN: 9782744055973. —Microsoft® .NET: Architecting Applications for the Enterprise, Microsoft Press; 1st edition, ISBN: 978-0735626096

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	Second Year B. Tech.			
	Semester-IV (w.e.f. A.Y. 2026-27)			
	Java programming Laboratory (26UCS22110)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	MSE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	25 Marks
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Develop and execute programs using basic programming constructs.			L3
CO 2	Apply control structures to solve computational problems.			L3
CO 3	Implement object-oriented solutions using classes and objects.			L3
CO 4	Analyze program behavior and debug errors effectively.			L4
Ex.	Experiment Details			No. of Ex. Sessions (hrs.)
1.	Programs on Operators, Arithmetic Promotion, Method Calling.			2
2.	Programs on Classes: String and Math.			2
3.	Write a program to demonstrate following Function concepts i) Function overloading ii) Constructors of all types iii) Default parameters, returning by reference			2
4.	Programs on dealing with Arrays.			2
5.	Programs on Inheritance and Polymorphism.			2
6.	Programs on Interfaces block initializers, final Modifier, as well as static and dynamic binding.			2
7.	Programs on Exception Handling.			2
8.	Programs on Java script client side scripting.			2

9.	Programs on Java script Operators, Comparisons, Statements, Loops, Events, Objects.	2
10.	Programs on Java script User defined functions.	2
11.	Programs on Java script Validations using object functions.	2
12.	Programs on Java script Validations using regular expressions.	2
Text Books:		
1	Paul Deitel and Harvey Detail, Java: How to Program, Pearson's Publication, 9thEdition.	
Reference Books:		
1	Joel Murach and Michael Urban, Murach's Beginning Java with Eclipse, Murach's Publication, 1st Edition, 2016. Doug Lowe, Java All-in-One For Dummies, Wiley Publication, 4th Edition,2014	
2	Herbert Schildt, Java The Complete Reference, McGraw-Hill Publication, 9thEdition.	
3	Patrick Niemeyer, Daniel Leuck, Learning Java, O'Reilly Media, 4th Edition,2013.	
4	JavaScript: The Good Parts, Douglas Crockford, O'Reilly, ISBN: 9782744055973. —Microsoft® .NET: Architecting Applications for the Enterprise, Microsoft Press; 1st edition, ISBN:978-0735626096	

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	Second Year B.Tech.			
	Semester-IV(w.e.f.A.Y.2026-27)			
	Software Project Management(26UCS22111)			
Teaching B Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	1	1	MSE:	-
Tutorials:	-	-	ICA:	50Marks
Practical:	-	-	ESE:	-
Total:	1	1	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Understand fundamentals and importance of managing software projects.			L2
CO 2	Ability to plan and estimate software projects effectively.			L3
CO 3	Learn scheduling, resource planning, and team management			L3
CO 4	Identify and manage risks while ensuring software quality.			L4
CO 5	Apply project monitoring and control techniques, including EVA, change management, Agile methods, and project closure practices.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit1	Introduction to Software Project Management & Tools Introduction to Software Project Management (SPM), Project Life Cycle , Role of Project Manager , Project Selection and Feasibility Analysis			3

Unit 2	Project Planning & Estimation Project planning fundamentals ,Work Breakdown Structure (WBS) , Cost estimation techniques: COCOMO Model ,Function Point Analysis	2
Unit 3	Project Scheduling Techniques Gantt Chart creation using MS Project / Excel ,PERT (Program Evaluation Review Technique) ,CPM (Critical Path Method), Network diagram creation	2
Unit 4	Project Execution, Monitoring & Risk Management Project Execution Process ,Progress Tracking, Earned Value Management (EVM) Basics,Risk Management and Quality Assurance	3
Unit 5	Case Study & Mini Project Implementation Software Project Case Study ,SRS Preparation, WBS and Gantt Chart Documentation, Risk Analysis Report	2
Text Books:		
1	Software Project Management – Bob Hughes & Mike Cotterell (McGraw Hill)	
2	Software Project Management in Practice – PankajJalote (Addison-Wesley)	
Reference Books:		
1	Roger S. Pressman, Software Engineering: A Practitioner’s Approach	
2	Agile Project Management: Creating Innovative Products – Jim Highsmith	
3	Effective Software Project Management – Robert K. Wysocki (Wiley)	
4	Software Project Management – Walker Royce (Addison-Wesley)	
5	Managing Global Software Projects – Gopalaswamy Ramesh (McGraw Hill)	
6	Software Engineering Project Management – Richard H. Thayer & Edward Yourdon (Wiley)	
7	The Mythical Man-Month: Essays on Software Engineering – Fred P. Brooks Jr.	

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	Second Year B. Tech.			
	Semester-IV (w.e.f. A.Y. 2026-27)			
	Software Project Management Laboratory (26UCS22112)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	-	-	MSE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	25 Marks
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Understand fundamentals and importance of managing software projects, including modern life cycles.			L2
CO 2	Ability to plan and estimate software projects effectively using traditional and agile techniques.			L3
CO 3	Learn scheduling, resource planning, and team management for collocated and distributed teams.			L3
CO 4	Identify and manage risks while ensuring software quality using industry-standard metrics.			L3
CO 5	Apply project monitoring and control techniques, including EVA, modern Agile execution methods, and project closure practices.			L3
Ex.				
Experiment Details			No. of Ex. Sessions (hrs.)	
1	Project Identification & Scope Definition To identify a software project, define its scope, and evaluate its feasibility.			2
2	Software Requirement Specification (SRS) & DFD To draft a formal SRS document and visually map the system using Data Flow Diagrams.			2

3	Project Estimation (Size, Effort, and Cost) To estimate the size of the project using Function Point Analysis (FPA) and calculate effort/cost using the COCOMO model.	2
4	Project Scheduling & Critical Path To schedule project tasks, identify dependencies, and find the critical path	2
5	Agile Project Setup (Modern PM Tools) To initialize an Agile project and create a product backlog.	2
6	Configuration & Version Management To understand distributed version control and configuration management.	2
7	Risk Management Plan To identify potential project risks and formulate mitigation strategies.	2
8	Project Tracking using Earned Value Analysis (EVA) To analyse project health (schedule and budget) using EVA metrics.	2
<i>Text Books:</i>		
1	Software Project Management – Bob Hughes & Mike Cotterell (McGraw Hill)	
2	Software Project Management in Practice – PankajJalote (Addison-Wesley)	
<i>Reference Books:</i>		
1	Roger S. Pressman, Software Engineering: A Practitioner’s Approach	
2	Agile Project Management: Creating Innovative Products – Jim Highsmith	
3	Effective Software Project Management – Robert K. Wysocki (Wiley)	
4	Software Project Management – Walker Royce (Addison-Wesley)	
5	Managing Global Software Projects – Gopalaswamy Ramesh (McGraw Hill)	

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	Second Year B.Tech.			
	Semester-IV (w.e.f.A.Y.2026-27)			
	Computational Data Analytics (MDM-II)(26UCS22402)			
Teaching B Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:		3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:		-	ESE:	60 Marks
Total:		3	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Understand fundamentals of data analytics and data science lifecycle.			L2
CO 2	Clean and preprocess raw datasets.			L3
CO 3	Apply statistical methods for data interpretation.			L3
CO 4	Understand basic machine learning concepts.			L2
CO 5	Develop end-to-end data analytics solutions.			L6
Unit	Course Contents			No. of lectures (hrs.)
Unit1	Introduction to Data Analytics : Introduction to Data Analytics: Concepts, Importance, and Applications Types of Data: Structured, Semi-Structured, and Unstructured Data Data Science Lifecycle and Analytics Process Data Analytics vs. Data Science Introduction to Business Intelligence and Decision Support Systems			5
Unit 2	Data Preprocessing & Visualization: Data cleaning techniques ,Handling missing values ,Data transformation Normalization ,Exploratory Data Analysis (EDA) ,Data visualization ,(Matplotlib / Seaborn) , Outlier Detection, Feature Engineering basics, Data Quality Assessment			5

Unit 3	Statistics for Data Analytics: Descriptive statistics ,Mean, median, mode ,Variance & standard deviation ,Probability basics ,Correlation & regression, Hypothesis Testing, Confidence Intervals	6
Unit 4	Business Intelligence and Data Visualization: Introduction to Business Intelligence (BI) ,Data-driven decision making Data visualization principles ,Creating charts, dashboards, and reports Introduction to Power BI ,Data storytelling techniques KPI (Key Performance Indicator) analysis Case studies in business analytics	7
Unit 5	Applied Data Analytics and Mini Project: Introduction to Real-World Data Analytics Applications ,Data Analytics Workflow: Problem Definition, Data Collection, Data Preparation, Analysis, Visualization, and Reporting Case Studies using Real-World Datasets ,Data Collection Techniques and Data Sources ,Data Cleaning and Data Preprocessing Mini Project Development: Problem Identification ,Dataset Selection ,Data Cleaning and Transformation ,Data Analysis and Visualization ,Report Preparation and Presentation	7
Text Books:		
1)	“Data Science and Analytics with Python” – J. John D. Kelleher, Brian Mac Namee, Aoife D’Arcy (CRC Press)	
2)	“Python for Data Analysis” – Wes McKinney (O’Reilly Media)	
Reference Books:		
1)	“Introduction to Data Mining” – Pang-Ning Tan, Michael Steinbach, Vipin Kumar (Pearson)	
2)	“Hands-On Machine Learning with Scikit-Learn, Keras&TensorFlow” – AurélienGéron (O’Reilly Media)	
3)	Fundamentals of Data Science” – Avrim Blum, John Hopcroft, Ravindran Kannan	



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Second Year B.Tech.

Semester-IV (w.e.f.A.Y.2026-27)

Data-Driven Decision Making in Agriculture (OE-II) (26UOE22509)

Teaching B Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	3	3	MSE:	30 Marks
Tutorials:	-	-	ICA:	10 Marks
Practical:	-	-	ESE:	60 Marks
Total:	3	3	OE/POE:	-

Evaluation Scheme:

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

CO 1	Explain key agricultural data sources — sensor feeds, weather APIs, market price datasets, and satellite indices.	L2
CO 2	Apply data preprocessing and statistical techniques to clean and prepare agriculture datasets for analysis.	L3
CO 3	Explain the information presented in farm monitoring dashboards and its significance for crop management.	L2
CO 4	Demonstrate the use of crop yield, soil, and weather data to determine factors influencing agricultural productivity..	L3
CO 5	Apply a data-driven farm decision report using field-collected data and open government agricultural datasets.	L3

Unit	Course Contents	No. of lectures (hrs.)
Unit 1	Agricultural Data Landscape: Types of farm data — sensor, weather, satellite, market; Government open datasets — Agmarknet, IMD, ICAR, Fasal portal; Remote sensing indices — NDVI, EVI and their interpretation	7
Unit 2	Data Preprocessing for Agriculture Data quality	8

	issues in farm datasets — missing, noisy, inconsistent; Handling sensor failure data; Normalisation and scaling for heterogeneous farm variables; Time-series structuring for crop season data; Feature engineering from agricultural raw data; Tools — Python (Pandas, NumPy) applied to agri datasets.	
Unit 3	Visualisation for Farm Decisions Principles of data visualisation for non-technical stakeholders; Dashboard design — ThingSpeak, Grafana, Google Data Studio; Crop yield trend charts; Soil health heat maps; Rainfall-yield correlation plots.	7
Unit 4	Pattern Analysis and Insights Descriptive statistics for farm data; Correlation analysis — rainfall vs yield, temperature vs pest incidence; Seasonal decomposition of crop data; Introduction to regression for yield prediction; Market price trend analysis.	7
Unit 5	Data-Driven Farm Decision Reports Structure of a farm decision report; Field data collection methodology; Integrating multiple data sources; Writing recommendations for farmers from data; Ethics of data use in agriculture — farmer privacy, data ownership; Case study analysis.	7
Text Books:		
1	Data Analytics for Agriculture and Environment Authors: S. Misra, R. Kumar and H. Agarwal Publisher: Wiley India ISBN: 978-8126563894	
2	Practical Data Science for Agriculture Authors: J. R. Scherer and A. K. Singh Publisher: CRC Press	
Reference Books:		
1	Precision Agriculture Technology for Crop Farming Authors: Qin Zhang Publisher: CRC Press	
2	Remote Sensing of Vegetation Authors: Hamlyn G. Jones and Robin A. Vaughan Publisher: Oxford University Press	
3	Data Science for Business Authors: Foster Provost and Tom Fawcett Publisher: O'Reilly Media	



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(An Autonomous Institute)

Second Year B. Tech.

Semester-IV (w.e.f. A.Y. 2026-27)

Advanced Quantitative Ability (26UHS22806)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	1	1	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	1	1	OE/POE:	-

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

CO 1	Apply concepts of work efficiency, time rates, team work, and pipes & cisterns to solve practical work-based problems.	L3
CO 2	Solve problems involving speed, distance, relative motion, trains, boats & streams, and escalators.	L3
CO 3	Solve commercial mathematics problems involving profit-loss, discounts, partnerships, MRP, and faulty weights.	L3
CO 4	Apply simple and compound interest concepts in financial calculations, population growth, and installment-based applications.	L3
CO 5	Understand Use counting techniques, arrangements, selections, and probability concepts to solve analytical and real-life problems involving dice, cards, balls, and coins.	L2

Unit

Course Contents

**No. of
lecture
s (hrs.)**

Unit 1	Time and Work Time and Work, concept of work efficiency, individual vs. team work, alternate days work schedules, Problems based on number of persons, combinations of two or more different types of persons, Useful results, Pipes and Cisterns.	2
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Unit 2	Speed, Time and Distance Unit conversion, Average speed, Inter relation, Relative speed, Useful results, Problems on Trains, Problems on Boats and Streams.	3
Unit 3	Profit and Loss Definitions of cost price and selling price, calculation of markup and discount, successive discounts, and problems involving faulty weights, Partnership.	2
Unit 4	Simple Interest and Compound Interest Simple interest and compound interest, finding the difference between them over multiple years, population growth models, and installment schemes.	2
Unit 5	Permutation and Combinations, Probability Fundamental principle of counting, linear and circular arrangements, selection methods, permutations, combinations and distribution problems, Useful results, basic problems of probability based on Dice, Balls, Playing Cards, Coin.	3

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	Second Year B. Tech.			
	Semester-IV (w.e.f. A.Y. 2026-27)			
	Start-up Ecosystem (26UHS22809)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	1	1	MSE:	-
Tutorials:	-	-	ICA:	25 Marks
Practical:	-	-	ESE:	-
Total:	1	1	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Explain the fundamental concepts, characteristics, and importance of entrepreneurship in economic and social development			L2
CO 2	Understand business opportunities and generate innovative ideas to address real-world problems.			L2
CO 3	Understand the process of establishing and managing a new venture, including basic business planning concepts			L2
CO4	Demonstrate awareness of government schemes, startup support systems, incubation centers, and funding opportunities available for entrepreneurs.			L2
CO5	Develop an entrepreneurial mindset with skills related to creativity, innovation, leadership, teamwork, and risk-taking			L6
Unit	Course Contents			No. of Lectur es (hrs.)
Unit 1	Introduction to Entrepreneurship Entrepreneur vs Employee, Characteristics of Entrepreneurs ,Success Stories of Indian Entrepreneurs ,Start-up Ecosystem in India			6
Unit 2	Business Opportunities Identifying Problems and Opportunities ,Idea Generation Techniques Local Business Opportunities ,Innovation and Creativity			6

Unit 3	Basics of Business Planning What is a Business Model? ,Cost and Revenue Concepts ,Value Proposition, Simple Business Plan	6
Unit 4	Unit IV: Government Support & Funding Startup India , MSME Schemes ,Mudra Loan ,Incubation Centers	6
Text Book		
1. Entrepreneurship Development by S. S. Khanka 2. Entrepreneurship Development and Small Business Enterprises by Poornima M. Charantimath. 3. Entrepreneurship Development by C. B. Gupta and N. P. Srinivasan 4. Entrepreneurship by Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd.		
Reference Book		
1. Innovation and Entrepreneurship is a 1985 book by management thinker Peter F. Drucker 2. The Lean Startup by Eric Ries 3. Zero to One by Peter Thiel with Blake Masters. 4. Business Model Generation by Alexander Osterwalder and Yves Pigneur 5. Start With Why: How Great Leaders Inspire Everyone to Take Action by leadership expert Simon Sinek.		

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	(An Autonomous Institute)			
	Second Year B. Tech.			
	Semester-IV(w.e.f.A.Y.2026-27)			
	Start-up for Eco system Lab(26UHS2280L)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs ./week	No. of Credits		
Lectures:	-	-	ISE:	-
Tutorials:	-	-	ICA:	25Marks
Practical:	2	1	ESE:	-
Total:	2	1	OE/POE:	-
Course Outcomes :At the end of this course, students shall be able to				BL Level
CO1	Understand the mindset and responsibilities of both roles and evaluate their entrepreneurial potential			L2
CO2	Understand entrepreneurial journeys, success factors.			L3
CO3	Learn opportunity recognition and start up support structures			L3
CO4	Understand local market opportunities ,business model design and aware of government support available for startups.			L3
Any Eight experiments from the following list				
Ex.	Experiment Details			No.ofEx.Sessions(hrs.)
Ex.1	Entrepreneur vs. Employee Comparison			2
Ex.2	Identifying Entrepreneurial Characteristics			2
Ex.3	Case Study of an Indian Entrepreneur			2
Ex.4	Study of the Indian Startup Ecosystem			2
Ex.5	Problem Identification Survey			2
Ex.6	Idea Generation Workshop			2
Ex.7	Local Business Opportunity Analysis			2
Ex.8	Business Model Canvas Preparation			2
Ex.9	Cost, Revenue and Profit Estimation			2
Ex.10	Government Scheme and Funding Study			2

<i>Text Books:</i>	
1)	Entrepreneurship Development by S. S. Khanka
2)	Entrepreneurship Development and Small Business Enterprises by Poornima M. Charantimath
3)	Entrepreneurship Development by C. B. Gupta and N.P. Srinivasan
4)	Entrepreneurship by Robert D. Hisrich, Michael P. Peters, and Dean A. Shepherd.
<i>Reference Book</i>	
1)	Innovation and Entrepreneurship is a 1985 book by management thinker Peter F. Drucker
2)	Business Model Generation by Alexander Osterwalder and Yves Pigneur
3)	Start With Why: How Great Leaders Inspire Every one to Take Action by leadership expert Simon Sinek.
4)	Disciplined Entrepreneurship by Bill Aulet

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	Second Year B. Tech.			
	Semester-IV (w.e.f. A.Y. 2026-27)			
	Professional Ethics (26UHS22810)			
Teaching Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	2	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	2	2	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Explain the basic concepts of ethics and professional responsibility			L2
CO 2	Identify ethical issues and apply ethical principles in decision-making.			L3
CO 3	Demonstrate professional behavior, integrity, and accountability in workplace situations			L3
CO4	Understand the social, environmental, and professional responsibilities of engineers			L2
CO5	Apply ethical principles and sustainable engineering practices in professional decision-making and problem-solving.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit 1	Introduction to Ethics Meaning and Importance of Ethics ,Values, Morals, and Ethics ,Personal and Professional Ethics ,Ethical Decision-Making			6
Unit 2	Engineering Profession and Responsibilities Role of Engineers in Society ,Professional Responsibilities ,Accountability and Integrity ,Code of Professional Conduct			6

Unit 3	Workplace Ethics Teamwork and Professional Relationships Workplace Discipline and Etiquette ,Conflict of Interest ,Respect, Diversity, and Inclusion	6
Unit 4	Ethics, Society, and Sustainability Social Responsibility ,Environmental Ethics ,Sustainable Development ,Case Studies on Ethical Issues in Engineering	6
Text Books		
1. Professional Ethics and Human Values by R. S. Naagarazan 2. Professional Ethics by R. Subramanian 3. Engineering Ethics: Concepts and Cases by Charles E. Harris Jr., Michael S. Pritchard, and Michael J. Rabins		
Reference Book		
1. Ethics in Engineering is a textbook by Mike W. Martin and Roland Schinzinger 2. Human Values and Professional Ethics by A. Alavudeen, R. KalilRahman, and M. Jayakumaran 3. The Seven Habits of Highly Effective People is a self-help and leadership book by Stephen R. Covey, 4. Professional Ethics and Human Values by M. Govindarajan, S. Natarajan, and V. S. Senthil Kumar		



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Second Year B. Tech.

Semester-IV (w.e.f. A.Y. 2026-27)

Constitution of India (26USC22903)

Teaching Scheme:

Evaluation Scheme:

	No. of Hrs./week	No. of Credits		
Lectures:	2	-	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:	-	-	ESE:	-
Total:	2	-	OE/POE:	-

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

BL Level

CO 1	Identify and explore the basic features and modalities about Indian constitution.	L2
CO 2	Differentiate and relate the functioning of Indian parliamentary system at the center and state level.	L4
CO 3	Differentiate different aspects of Indian Legal System and its related bodies.	L4
CO 4	Discover and apply different laws and regulations related to engineering practices.	L3
CO 5	Correlate role of engineers with different organizations and governance models	L3

Unit	Course Contents	No. of lectures (hrs.)
Unit 1	Unit 1: Introduction and Basic Information about Indian Constitution Meaning of the constitution law and constitutionalism, Historical	6

	Background of the Constituent Assembly, Government of India Act of 1935 and Indian Independence Act of 1947, Enforcement of the Constitution, Indian Constitution and its Salient Features, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System, Centre-State Relations, Amendment of the Constitutional Powers and Procedure, The historical perspectives of the constitutional amendments in India, Emergency Provisions: National Emergency, President Rule, Financial Emergency, and Local Self Government – Constitutional Scheme in India.	
Unit 2	Unit 2: Union Executive and State Executive Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Comparison of powers of Indian President with the United States, Powers and Functions of the Prime Minister, Judiciary – The Independence of the Supreme Court, Appointment of Judges, Judicial Review, Public Interest Litigation, Judicial Activism, Lokpal, Lok-Ayukta, The Lokpal and Lok-Ayuktas Act 2013, State Executives – Powers and Functions of the Governor, Powers and Functions of the Chief Minister, Functions of State Cabinet, Functions of State Legislature, Functions of High Court and Subordinate Courts.	6
Unit 3	Unit 3: Introduction and Basic Information about Legal System The Legal System: Sources of Law and the Court Structure: Enacted law - Acts of Parliament are of primary legislation, Common Law or Case law, Principles taken from decisions of judges constitute binding legal rules. The Court System in India and Foreign Courts (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court). Arbitration: As an alternative to resolving disputes in the normal courts, parties who are in dispute can agree that this will instead be referred to arbitration. Contract law, Tort, Law at work place.	6
Unit 4	Unit 4: Intellectual Property Laws and Regulation to Information Intellectual Property Laws- Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright and its Ownership, Infringement of Copyright, Civil Remedies for Infringement, Regulation to Information-Introduction, Right to Information Act, 2005, Information Technology Act, 2000, Electronic Governance, Secure Electronic Records and Digital Signatures, Digital Signature Certificates, Cyber Regulations Appellate Tribunal, Offences, Limitations of the Information Technology Act.	6
Unit 5	Unit 5: Business Organizations and E-Governance Sole Traders, Partnerships: Companies: The Company's Act: Introduction, Formation of a Company, Memorandum of Association, Articles of Association, Prospectus, Shares, Directors, General Meetings and	6

	Proceedings, Auditor, Winding up. E-Governance and role of engineers in E-Governance, Need for reformed engineering serving at the Union and State level, Role of I.T. professionals in Judiciary, Problem of Alienation and Secessionism in few states creating hurdles in Industrial development.	
Reference Books:		
1	Brij Kishore Sharma; Introduction to the Indian Constitution, PHI, New Delhi, latest edition.	
2	Granville Austin; The Indian Constitution: Corner stone of a Nation. 1966, Oxford Clarendon Press.	
3	Subhash C. Kashyap; Our Constitution: An Introduction to India's Constitution and constitutional Law, NBT, 2018.	
4	P. M. Bakshi; The Constitution of India, Latest Edition, Universal Law Publishing.	
5	V. K. Ahuja; Law Relating to Intellectual Property Rights (2007)	
6	Suresh T. Viswanathan: The Indian Cyber Laws, Bharat Law House, New Delhi-88	
7	P. Narayan; Intellectual Property Law, Eastern Law House, New Delhi	
8	Prabudh Ganguli; Gearing up for Patents: The Indian Scenario, Orient Longman	
9	B. L. Wadehra; Patents, Trademarks, Designs and Geographical Indications. Universal Law Publishing-Lexis Nexis.	
10	Intellectual Property Rights: Law and Practice, Module III by ICSI (only relevant sections)	
11	Executive programme study material Company Law, Module II, by ICSI (The Institute of Companies Secretaries of India) (Only relevant sections i.e., Study 1, 4 and 36). https://www.icsi.edu/media/webmodules/publications/Company%20Law.pdf	
12	Handbook on e-Governance Project Lifecycle, Department of Electronics & Information Technology, Government of India, https://www.meity.gov.in/writereaddata/files/e-Governance Project Lifecycle Participant Handbook-5Day CourseV1 20412.pdf	
13	Companies Act, 2013 Key highlights and analysis by PWC. https://www.pwc.in/assets/pdfs/publications/2013/companies-act-2013-keyhighlights-and-analysis.pdf	

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	Second Year B.Tech.			
	Semester-IV (w.e.f.A.Y.2026-27)			
	Technical Aptitude-II(26UCS22904)			
Teaching B Scheme:			Evaluation Scheme:	
	No. of Hrs./week	No. of Credits		
Lectures:	2	-	MSE:	-
Tutorials:	-	-	ICA:	50 Marks
Practical:		-	ESE:	-
Total:	2	-	OE/POE:	-
Course Outcomes: At the end of this course, students shall be able to				
CO 1	Apply programming concepts and data structures to develop efficient solutions for computational problems using the C programming language			L3
CO 2	Explain different searching, sorting, and hashing techniques used in algorithm design and their computational complexities..			L2
CO 3	Apply algorithm design paradigms and graph algorithms to develop efficient solutions for complex computational problems and network-based applications.			L3
CO 4	Discuss the role of operating system concepts in managing processes, resources, memory, and file systems.			L4
CO 5	Apply database design principles, relational query techniques, normalization, indexing, and transaction management concepts to develop efficient and reliable database systems.			L3
Unit	Course Contents			No. of lectures (hrs.)
Unit1	Programming and Data Structures Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search trees, binary heaps, graphs.			6
Unit 2	Algorithms: Searching, sorting, hashing. Asymptotic worst case time and space complexity.			6
Unit 3	Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Graph traversals, minimum spanning trees, shortes			6

	paths	
Unit 4	Operating System System calls, processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU and I/O scheduling. Memory management and virtual memory. File systems.	6
Unit 5	Databases ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.	6
Text Books:		
1	Data Structures Using C	
2	Introduction to Algorithms	
3	Fundamentals of Database Systems	
4	Operating System Concepts	
Reference Books:		
1	Data Structures and Algorithm Analysis in C	
2	An Introduction to Database Systems	
3	Patterson & Hennessy – Computer Organization and Design	