OP JINDAL UNIVERSITY

Raigarh-Chhattisgarh

Scheme and Syllabus

Of

B. Tech. (01UG020)

Department of

Computer Science and Engineering

School of Engineering

Batch 2021-2025

Programme Outcome (PO)

1. **Engineering Knowledge and Problem Analysis** -- Apply the knowledge of engineering domain with adequate amalgamation of science, mathematics, and management to Identify, formulate, and critically analyze complex engineering problems.
2. **Modern tools and techniques for investigating complex problems** – Apply appropriate tools and techniques to analyze, predict and simulate the data for valid conclusion with clear understanding of limitations.
3. **Design and development of innovative systems**: design and develop system components or processes to provide solutions of complex engineering problems that meet the specified conditions of societal, health, safety, and environmental needs.
4. **Communication and Teamwork -** Develop skills to communicate effectively to diverse platforms and contribute meaningfully to different capacities as a leader, team member or individual.
5. **Project management and finance**: Develop and apply knowledge of engineering, management, and finance principles to handle a project in a multidisciplinary environment.
6. **Life-long learning**: Acquire fundamental knowledge for lifelong learning to participate in the extensive context of socio-technological change as a self-directed member and a leader.
7. **Ethics and citizenship**: Apply ethical principles and commit to professional ethics, norms, and responsibilities of the engineering practice; and act with informed awareness to participate in civic life activities.
8. **Society, Sustainability and Environment** -- Understand the impact of various solutions in the context of societal, economical, health, safety legal and environmental impact for sustainable development.

Programme Specific Outcome (PSO)

PSO_1: Inculcate strong fundamental knowledge and foundation skills of computer systems, hardware, software, networks, data structures, algorithms and different aspects of the core computing and allied domains.

PSO_2: Ability to analyze, design, develop and deploy elementary programs and projects, individually and collaboratively, in the areas related to web and app development, artificial intelligence and analytics, databases and cloud computing and for other IT / ITeS with proper structure and development methodologies.

PSO_3: Ability to analyze and think critically and apply emerging tools, technologies and computing knowledge under a multidisciplinary environment for creating innovative solutions and startups.

PSO_4: ability to adapt and quickly learn rapidly changing technologies and work environment to cater the contemporary needs of global IT industry and entrepreneurship.

Scheme for B. Tech (CSE) Programme

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester I

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE101	CSE	Calculus for Computer Science	3	1	0	30	20	50	100	4
2	SOE-B-CSE102	CSE	Introduction to Programming	3	1	0	30	20	50	100	4
3	SOE-B-CSE103	CSE	Elements of Computing	3	0	0	20	15	40	75	3
4	SOE-B-CSE104	CSE	Emerging Technologies-I	2	0	0	15	10	25	50	2
5	SOE-B-CSE105	EE	Digital System Design	2	1	0	20	15	40	75	3
6	SOE-B-CSE106	CSE	Programming Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE107	CSE	Digital System Design Lab	0	0	2	0	25	0	25	1
8	SOE-B-CSE108	CSE	Maths Lab-I	0	0	2	0	25	0	25	1
9	SOE-B-CSE109	CSE	IT workshop-I	0	0	4	0	30	20	50	2
10	SOE-B-CSE110	CSE	Emerging Technologies Lab	0	0	2	0	25	0	25	1
11	SOE-B-CSE111	Humanities	Professional Development I	0	0	2	0	25	0	25	1
			TOTAL	**13**	**3**	**16**	**115**	**240**	**245**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Computer Science and Engineering

L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester II

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE201	CSE	Linear Algebra and geometry	3	1	0	30	20	50	100	4
2	SOE-B-CSE202	CSE	Programming with C	2	1	0	20	15	40	75	3
3	SOE-B-CSE203	CSE	Database Management System	2	1	0	20	15	40	75	3
4	SOE-B-CSE204	CSE	Emerging Technologies-II	2	0	0	15	10	25	50	2
5	SOE-B-CSE205	CSE	Operating System	2	1	0	20	15	40	75	3
6	SOE-B-CSE206	CSE	Programming Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE207	CSE	DBMS Lab	0	0	4	0	30	20	50	2
8	SOE-B-CSE208	CSE	Maths Lab-II	0	0	2	0	25	0	25	1
9	SOE-B-CSE209	CSE	IT workshop-II	0	0	4	0	30	20	50	2
10	SOE-B-CSE210	CSE	Emerging Technologies Lab	0	0	2	0	25	0	25	1
11	SOE-B-CSE211	Humanities	Professional Development II	0	0	2	0	25	0	25	1
			TOTAL	**11**	**3**	**18**	**105**	**240**	**255**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Computer Science and Engineering

L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. code- 01UG020

Academic Semester III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+P+T)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE-21-301	CSE	Discrete Mathematics	3	1	0	30	20	50	100	4
2	SOE-B-CSE-21-302	CSE	Data Structure	3	1	0	30	20	50	100	4
3	SOE-B-CSE-21-303	CSE	Object Oriented Programming using JAVA	3	0	0	20	15	40	75	3
4	SOE-B-CSE-21-304	CSE	Formal Language and Automata Theory	3	0	0	20	15	40	75	3
5	SOE-B-CSE-21-305	CSE	Object Oriented Programming Lab	0	0	4	0	30	20	50	2
6	SOE-B-CSE-21-306	CSE	Data Structure Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE-21-307	CSE	Web Development Lab I	0	0	4	0	30	20	50	2
8	SOE-B-CSE-21-308	CSE	Data Visualization Lab	0	0	2	0	15	10	25	1
9	SOE-B-CSE-21-309	CSE	MOOCS/SWAYAM/Certification/Liberal Arts	_	_	_	_	30	20	50	2
10	SOE-B-CSE-21-310	CSE	Professional Development III	0	0	2	0	25	0	25	1
			Total	**12**	**2**	**16**	**100**	**230**	**270**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester IV

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/ 2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE-21-401	CSE	Probability and Statistics	3	1	0	30	20	50	100	4
2	SOE-B-CSE-21-402	CSE	Introduction to AI & Machine Learning	3	1	0	30	20	50	100	4
3	SOE-B-CSE-21-403	CSE	Analysis and Design of Algorithm	3	1	0	30	20	50	100	4
4	SOE-B-CSE-21-404	CSE	Compiler Design	3	0	0	20	15	40	75	3
5	SOE-B-CSE-21-405	CSE	Analysis and Design of Algorithm Lab	0	0	4	0	30	20	50	2
6	SOE-B-CSE-21-406	CSE	Web Development Lab II	0	0	4	0	30	20	50	2
7	SOE-B-CSE-21-407	CSE	AI &ML Lab	0	0	8	0	60	40	100	4
8	SOE-B-CSE-21-408	CSE	Professional Development IV	0	0	2	0	25	0	25	1
			Total	**12**	**3**	**18**	**110**	**220**	**270**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester V

Board of Study	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2
						PRE**		ESE*	Total Marks	
			L	T	P	Mid Sem	TA			(L+T+P)
CSE	SOE-B-CSE-21-501	Microrprocessor & Microcontroller	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-502	Computer Networks	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-503	Data Mining and Warehousing	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-504	Cloud Computing	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-505(X)	Professional Elective-I	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-506	Microrprocessor & Microcontroller Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-507	Computer Network lab	0	0	4	0	30	20	50	2
CSE	SOE-B-CSE-21-508	Data Mining and Warehousing Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-509(X)	Professional Elective Lab-I	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-510	Professional Development - V	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-511	Open Elective (MOOCS/SWAYAM/Certification/Liberal Arts)	_	_	_	_	30	20	50	2
		Total	**15**	**0**	**12**	**150**	**280**	**370**	**800**	**23**

Professional Elective - I

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-505(1)	CSE	Computer Graphics
2	SOE-B-CSE-21-505(2)	CSE	Cryptography and Information Security
3	SOE-B-CSE-21-505(3)	CSE	Optimization using Machine Learning
4	SOE-B-CSE-21-505(4)	CSE	Introduction to IoT
5	SOE-B-CSE-21-505(5)	CSE	Mobile Application Development

Professional Elective Lab - I

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-509(1)	CSE	Computer Graphics Lab
2	SOE-B-CSE-21-509(2)	CSE	Cryptography and Information Security Lab
3	SOE-B-CSE-21-509(3)	CSE	Optimization using Machine Learning Lab
4	SOE-B-CSE-21-509(4)	CSE	Introduction to IoT Lab
5	SOE-B-CSE-21-509(5)	CSE	Mobile Application Development Lab

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester VI

Board of Study	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2
						PRE**		ESE*	Total Marks	
			L	T	P	Mid Sem	TA			(L+T+P)
CSE	SOE-B-CSE-21-601	Software Engineering	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-602	Data Analytics and Visualization	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-603	Blockchain Technology	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-604	Management and Organizational Behavior	2	0	0	15	10	25	50	2
CSE	SOE-B-CSE-21-605 (X)	Professional Elective-II	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-606 (X)	Professional Elective-III	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-607	Software Engineering Lab	0	0	4	0	30	20	50	2
CSE	SOE-B-CSE-21-608	Data Analytics and Visualization Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-609	Blockchain Technology Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-610	Professional Development - VI	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-611	Open Elective (MOOCS/SWAYAM/Certification/Liberal Arts)	_	_	_	_	30	20	50	2
		Total	**17**	**0**	**10**	**165**	**260**	**375**	**800**	**24**

Professional Elective - II

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-605 (1)	CSE	Computer Vision
2	SOE-B-CSE-21-605 (2)	CSE	Industrial IoT
3	SOE-B-CSE-21-605 (3)	CSE	Soft Computing

Professional Elective - III

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-606 (1)	CSE	Digital Forensics
2	SOE-B-CSE-21-606 (2)	CSE	Wireless sensor network
3	SOE-B-CSE-21-606 (3)	CSE	Natural Language Processing

Detailed Syllabus

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

OPJU
UNIVERSITY OF STEEL TECHNOLOGY AND MANAGEMENT

Scheme for B. Tech (CSE) Programme

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)
Academic Semester I

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE101	CSE	Calculus for Computer Science	3	1	0	30	20	50	100	4
2	SOE-B-CSE102	CSE	Introduction to Programming	3	1	0	30	20	50	100	4
3	SOE-B-CSE103	CSE	Elements of Computing	3	0	0	20	15	40	75	3
4	SOE-B-CSE104	CSE	Emerging Technologies-I	2	0	0	15	10	25	50	2
5	SOE-B-CSE105	EE	Digital System Design	2	1	0	20	15	40	75	3
6	SOE-B-CSE106	CSE	Programming Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE107	CSE	Digital System Design Lab	0	0	2	0	25	0	25	1
8	SOE-B-CSE108	CSE	Maths Lab-I	0	0	2	0	25	0	25	1
9	SOE-B-CSE109	CSE	IT workshop-I	0	0	4	0	30	20	50	2
10	SOE-B-CSE110	CSE	Emerging Technologies Lab	0	0	2	0	25	0	25	1
11	SOE-B-CSE111	Humanities	Professional Development I	0	0	2	0	25	0	25	1
			TOTAL	**13**	**3**	**16**	**115**	**240**	**245**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**I**
Name of the Course:		**Calculus for Computer Science**	**Course Code:**		**SOE-B-CSE101**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs. / week**
Max Marks	**:**	**100**			

Course Description:

Calculus is the examination of continuous change and the rates change occurs. It handles the finding and properties of integrals and derivatives of functions. There are two types of calculus, differential calculus, and integral calculus. Differential calculus deals with the rate of change of a quantity. Integral calculus determines the quantity where the change rate is known. Calculus is used in an array of computer science areas, including creating graphs or visuals, simulations, problem-solving applications, coding in applications, creating statistic solvers, and the design and analysis of algorithms.

Course Outcomes:

CO Number	Course Outcome
CO1	To apply the concept of a series as the sum of terms of a sequence, and use different tests to determine convergence of a series.
CO2	To apply notion of continuity and differentiability to functions of several variables, and be able to interpret partial and directional derivatives as rates of change.
CO3	To apply partial differentiation to solve optimization problems. This includes being able to solve constrained optimization problems via Lagrange multipliers
CO4	To apply the notion of a definite integral from a one-dimensional to an n-dimensional space, and be able to describe and evaluate double and triple integrals.
CO5	To apply vector-valued functions of several variables (i.e., vector fields) and be able to compute line and surface integrals.

Syllabus:

Unit-I: Review of single variable calculus:

Review of Limit, continuity and differentiability of single variable functions, Indeterminate forms and L'Hospital rule, Mean Value theorem, Maclaurin and Taylor series expansions of functions of one variable.

Unit-II: Sequences and infinite series

Sequences, Limit of a sequence, Convergence and divergence of a sequence, Infinite series, Convergence of an infinite series, Integral test, Comparison test, Ratio and Root test, Alternating series, Leibniz's test, Absolute and conditional convergence, Power series.

Unit-III: Functions of Several variables

Functions of several variables, Limits and continuity, Partial derivatives and differentiability, Linearization and differentials, Chain rule, Gradient vector, Tangent planes, Directional derivatives, Extreme values and saddle points, Lagrange multipliers, Taylor's formula, Partial derivatives with constrained variables.

Unit-IV: Multiple integral

Multiple integral, Double integrals, Change of order of integration, Area and volume by double integral, Double integrals in polar form, Triple integrals in rectangular coordinates, Moments and center of mass, Triple integrals in cylindrical and spherical coordinates, Substitutions in multiple integrals

Unit-V: Vector Calculus:

Vector-valued functions, Vector fields and line integrals, Work, Circulation and flux, Path independence, Potential functions and conservative fields, Green's theorem in the plane, Surface and area, Surface integrals, Stokes' theorem, Divergence theorem and a unified theory.

Text Book

- M. D. Weir and J. Hass, "Thomas' Calculus," 12th edition, Pearson.
- G. B. Thomas and R. L. Finney, Calculus and Analytic Geometry, 9th Ed, Pearson.

Reference Book

- Huges-Hallett et al, Calculus: Single and Multivariable, 6th edition, John-Wiley & Sons (USA).
- J. Stewart, Multivariable Calculus, Hybrid Edition.
- Edwards and Penney, Multivariable Calculus with matrices, 6th edition.
- Tom M. Apostol, Calculus Vol. II, 2nd edition, Wiley.

CO-PO & PSO Correlation

Course Name: Calculus for Computer Science												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2		2						2		1	2
CO2:	1	3	3						1		1	2
CO3:	1		3						1		1	2
CO4:	1	2	3						1		1	2
CO5:		2		1					1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**I**
Name of the Course	**:**	**Introduction to Programming**	**Course Code:**		**SOE-B-CSE102**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

Python is a next generation multi-purpose programming language that allows different users to create applications of various domains. Students will be able to learn primary fundamentals of python programming and the potential of python is to achieve modern computing requirements.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Apply python for problem solving
CO2	Develop console application in python
CO3	Develop basic machine learning application
CO4	Implement deferent data suture

Syllabus:

Unit-I:

Flowchart and Algorithm; Introduction: Variables, Basic Operators, Blocks, Data Types, Flow Control, String, List, Set, Dictionary

Unit-II:

Functions: Argument, pass by value vs pass by reference, return, etc.; Exceptions Handling

Unit-III:

Python packages; GUI Programming

Unit-IV:

Case study, small project

Text Books:

- Wesley J. Chun, "Core Python Applications Programming".
- Charles Dierbach, "Introduction to Computer Science using Python".

Reference Books:

- Mark Lutz, "Learning Python", 5th edition, O'reilly Publication
- John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications.

CO-PO & PSO Correlation

Course Name: Introduction to Programming												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3	2						2		1	2
CO2:	3	2	3						2		1	2
CO3:	1	2	3						1		1	2
CO4:	1		3						1		1	2
CO5:		2		1					1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**I**
Name of the Course:		**Elements of Computing**	**Course Code:**		**SOE-B-CSE103**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs./week**
Max Marks	**:**	**75**			

Course Description:

The course will expose the students to basics of computing and it will further help them to understand the workings of a modern computer. Course contents Basics of computer and number representation, various hardware like CPU, Memory, Bus etc. and Operating system, programming languages and their evolution.

Course Outcomes:

At the end of this course, the student will be able:

CO Number	Course Outcome
CO1	To develop an understanding on computer architecture.
CO2	To introduce the topics related to operating system and software.
CO3	To solve number system problems and its conversion.
CO4	To understand the recent trends in computing.
CO5	To relate the societal impact of computing technology.

Syllabus:

Unit-I: Introduction to Information Technology and Number representations:

basic concepts of computer and its evolution, computer components: hardware and software concepts, data processing - data and information, applications of computer, number conversions: binary, octal, hexadecimal, signed and unsigned integer, floating point representation, ASCII, ISCII, UNICODE representation.

Unit -II: Processor and Memory Architecture

elements computer architecture: Von-Neumann architecture, elementary computer architecture, elementary processor architecture, evaluation of processors, registers, program execution steps, instruction encoding evaluation of memory management, evolution of memory, memory: hierarchy, cache L1and L2, ram, rom, SSD devices, fetch and execution cycle the evolution of programming languages, case study of

contemporary processors and speed and their comparison, bus concepts: data bus, address bus, control bus.

Unit-III Fundamentals of OS and Software

system software, application software, operating system: functionalities, resource management: device management, file management, memory management, process management, security, virtual machine, embedded system, case study: Linux OS.

Unit-IV: **Recent Trends in Computing**

Cloud computing, Grid computing, green computing, Edge computing, Natural Language Processing.

Societal Impact: Cyber Bullying, Digital Forgery, data protection, Intellectual Property Rights (IPR) and their violation, plagiarism and copyrights, Free and Open-Source Software (FOSS).

Text Books:

- Raja Raman V., "Fundamental of Computers" (4th edit, Prentice Hall of India, New Delhi.
- Sanders D.H., "Computer Today ", Mc-Graw Hill.
- Noam Nisan and Shimon Schocken, “Elements of Computing Systems”, MIT Press, 2012.

Reference Books:

- Norton, Peter, “Introduction to Computers”, Mc-Graw-Hill.
- B. Ram, “Computer Fundamentals”, New Age International Pvt. Ltd.
- S. Jaiswal, “Fundamental of Computer & IT”, Wiley dreamtech India.

CO-PO & PSO Correlation

Course Name: Elements of Computing												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3	2						2		1	2
CO2:	3	2	3						2		1	2
CO3:	2	2	3						2		1	2
CO4:	1		3						1		1	2
CO5:		2		1					1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course	**:**	**Emerging Technologies-I**	**Course Code:**		**SOE-B-CSE104**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks	**:**	**50**			

Course Description:

This course offers lecture, laboratory, workshop, case studies and expert talk to impart teaching and learning to develop sound understanding of technology disruption in changing business environment through invention of new technologies or advancement of existing technologies. This course covers introduction of solving critical technical problems using emerging technologies like Cloud Computing, Edge Computing, Big Data and Data Analytics, Artificial Intelligence and Machine Learning (AI/ML), Virtual Reality and Augmented Reality (VR/AR), 5G and 3D Printing.

Course Outcome:

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

CO1	Understand the role of business needs and distributive nature of emerging technologies
CO2	Differentiate between Cloud, Edge and Quantum Computing and justify its adoption for a given real life scenario.
CO3	Justify the need of Big Data and Data Analytics, Artificial Intelligence and Machine Learning (AI/ML)
CO4	Explain features of Virtual Reality and Augmented Reality (VR/AR), 5G
CO5	Select a 3D printing process for an application to solve Additive Manufacturing challenges.

Syllabus:

Unit-I: Data, Analytics and Intelligence

Big Data: Processing and Issues, Introduction to Big Data, Data Analytics, Introduction to AI and ML, Current Status and Future

Unit-II: Future Computing Technologies

Introduction to Cloud and Its features, Deployment and Service model, Edge Computing, Future of Edge Computing, Introduction to Quantum Computing, Pre and Post Quantum Encryption, Cybersecurity, Current state and Future scope

Unit-III: Virtual Reality, Augmentation and 5G

Virtual Reality and Augmented Reality (VR/AR), VR/AR Features and Applications, Latency and Bandwidth issues, 5G: Introduction, Design, Features and Application, Current state and Future scope

Unit IV: 3D Printing

3D Printing, Additive Manufacturing Techniques and Equipment, CAD, Materials

Text Books:

- Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
- CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.
- Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi, "Cloud Computing Master the Concepts, Architecture and Applications with Real-world Examples and Case Studies", BPB Publications, 2019
- Rajkumar Buyya, Satish Narayana Srirama, "Fog and Edge Computing Principles and Paradigms", Wiley, 2019
- Chris Bernhardt, "Quantum Computing for Everyone", MIT Press, 2019
- Jesse Glover and Jonathan Linowes, "Complete Virtual Reality and Augmented Reality Development with Unity Leverage the Power of Unity and Become a Pro at Creating Mixed Reality Applications", Packt Publishing, 2019
- Saad Asif, "5G Mobile Communications: Concepts and Technologies", CRC Press, 2018

References Books:

- Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
- Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
- Boualem Benatallah, Jinjun Chen, Lizhe Wang, Rajiv Ranja, "Cloud Computing Methodology, Systems, and Applications", CRC Press, 2017.
- Nawaz Mohamudally, "State of the Art Virtual Reality and Augmented Reality Knowhow", IntechOpen, 2018.
- Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer International Publishing, 2019

- Stefan Rommer, Peter Hedman, Magnus Olsson, Lars Frid, Shabnam Sultana, Catherine Mulligan, "Powering Digitalization", Elsevier Science, 2019

CO-PO & PSO Correlation

Course Name: Emerging Technologies-I												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	2						3	2	1	1
CO2:	2	1	3						2			
CO3:	2	2	2						2	2		
CO4:	1		3						1		1	
CO5:		2		1					1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course	**:**	**Digital System Design**	**Course Code:**		**SOE-B-CSE105**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs./week**
Max Marks	**:**	**70**			

Course Description:

Digital circuits are the basic blocks of modern electronic devices like mobile phones, digital cameras, microprocessors and several other devices. In this course, we will learn the fundamentals of digital circuits and how to engineer the building blocks that go into digital subsystems. We will learn the basics of combinational as well as sequential logic. We will also have a thorough treatment of sequential circuits and state machines. We will also learn how to analyze the performance of digital circuits. The course will emphasize on the design philosophy as well as good design practices used. Students will also get an exposure to Verilog, a popular hardware modeling language.

Course Outcomes:

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

CO1	Understand the basics of any digital systems such as logic gates, Boolean logic simplification, FFs etc.
CO2	Get familiarized with simulation tools like Xilinx /Vivado and design using Verilog HDL.
CO3	Perform simple course projects using above design techniques.
CO4	Understand, analyze and design various combinational and sequential circuits.
CO5	Identify basic requirements for a design application and propose a cost effective solution.

Syllabus:

Unit-I:

Number system and Logic Gates: Binary number system, Octal, Hexa decimal, base conversions, signed and unsigned numbers, complements, addition, subtraction using complements, Different Binary codes, operation, Truth tables of different logic gates.

Unit-II:

Boolean Algebra and K-maps: Basic Theorems and postulates, properties of Boolean algebra, Boolean functions, standard and canonical forms, 2,3,4- variable K-map methods of simplification, NAND/NOR implementations, other two level implementations, Multi-level implementations, 2-3 variable XOR function, Logic Simplification using Tabular method, etc.

Unit-III:

Combinational Circuit Design: Design procedure, Different Adders and Subtractors-Half Adder, Full Adder, Half Subtractor, Full Subtractor, 4-bit Ripple Carry Adder, Carry Look Ahead Adder, Decoder, Encoders, Multiplexers, De-Multiplexers, Magnitude Comparator, etc.

Unit-IV:

Sequential Circuit Design: Basics, Latches and Flip-flops, conversion from one FF to another, Designing of serial and Parallel Registers, Synchronous and Asynchronous Counter Designing, Mealy and Moore Machine.

Unit-V:

Programmable Logic Devices: Simple and Complex PLDs (SPLD and CPLD), Field-programmable gate array (FPGA), Programmable array logic (PAL), Programmable logic array (PLA), Generic array logic (GAL) Designing. Logic Families: Basic concept, designing of basic logic families like Resistor Transistor Logic (RTL), Direct Coupled Transistor Logic (DCTL), Transistor Transistor Logic (TTL), Emitter Coupled Logic (ECL), etc. M OS Logic families like NAND and NOR using NMOSFET and PMOSFET, CMOS Logic family, etc.

Text Books:

- R.P. Jain, “Modern Digital Electronics”, 3rd Edition, Tata McGraw Hill.
- T.L. Floyd, “Digital Fundamentals”, 10th Edition, Pearson education.
- M. Morris Mano, Michael D. Ciletti, "Digital Design- with an Introduction to the Verilog HDL", 5th Ed, Pearson.

Reference Books:

- Jimmie, “Schaum's Outline of Digital Electronics”, Second Edition (Schaum's Outline Series).
- Brian Holdsworth, Clive Woods, "Digital Logic Design", Elsevier India Pvt. Ltd., 2005.
- A.P. Malvino and D.P. Leach, “Digital Principles and Applications”, 6th Edition, Tata McGraw-Hill, 2008.

- Taub and Schilling, "Digital Integrated Electronics", McGraw Hill, International Edition.
- R.J. Tocci, N.S. Widmer and G.L. Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson, 2011.

CO-PO & PSO Correlation

Course Name: Digital System Design												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**3**	**1**	**2**						**2**	**3**	**1**	**1**
CO2:		**2**	**3**						**2**			
CO3:	**2**	**2**	**2**						**2**			
CO4:	**1**		**3**						**1**		**1**	
CO5:		**2**		**1**					**1**	**2**	**1**	

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech.**	**Semester :**	**I Sem**
Name of the Course:	**Programming Lab**	**Course Code:**	**SOE-B-CSE106**
Credits:	**2**	**No of Hours :**	**2 Hrs./week**
Max Marks:	**50**		

Course Descriptions:

Introduction to programming basics (what it is and how it works), problem-solving methods and algorithm development will be covered in this lab. This lab includes procedural and data abstractions, program design, debugging, testing, and documentation. Covers data types, control structures, functions, parameter passing, library functions, arrays, inheritance and object oriented design.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Write python programs for various applications.
CO2	Write Database programs to create, access, modify and update data.
CO3	Write network programs for sending emails, ftp, sockets etc.

The following concepts will be covered in the lab:

- Introduction to python programming and python datatypes.
- Python program to find the union of two lists.
- Python program to find the intersection of two lists.
- Python program to remove the “i” th occurrence of the given word in a list where words repeat 7 5. Python program to count the occurrences of each word in a given string sentence.
- Python program to check if a substring is present in a given string.
- Python program to map two lists into a dictionary.
- Python program to count the frequency of words appearing in a string using a dictionary.

- Python program to create a dictionary with key as first character and value as words starting with that character.
- Python program to find the length of a list using recursion.
- Python program to read a file and capitalize the first letter of every word in the file.
- Python program to read the contents of a file in reverse order.
- Python program to create a class in which one method accepts a string from the user and another prints it.
- Study and Implementation of Database, Structured Query Language and database connectivity.

CO-PO & PSO Correlation

Course Name: Programming Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**	**3**		**2**					**2**			
CO2:		**1**								**1**	**1**	
CO3:		**3**	**3**		**3**				**2**	**2**	**2**	

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.**	**Semester :**	**I**
Name of the Course:		**Digital System Design Lab**	**Course Code:**	**SOE-B-CSE107**
Credits	**:**	**2**	**No of Hours :**	**2 Hrs./week**
Max Marks	**:**	**25**		

Course Descriptions:

Digital circuits are the basic blocks of modern electronic devices like mobile phones, digital cameras, microprocessors and several other devices. In this course, we will learn the fundamentals of digital circuits and how to engineer the building blocks that go into digital subsystems. We will learn the basics of combinational as well as sequential logic. We will also have a thorough treatment of sequential circuits and state machines. We will also learn how to analyze the performance of digital circuits. The course will emphasize on the design philosophy as well as good design practices used. Students will also get an exposure to Verilog, a popular hardware modeling language.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the basics of any digital systems such as logic gates, Boolean logic simplification, FFs etc.
CO2	Analyze and design combinational and sequential circuits using above concepts.
CO3	Get familiarized with simulation tools like Xilinx /Vivado and design using Verilog HDL
CO4	Perform simple course projects using above design techniques.

The following concepts will be covered in the lab:

- To study the NOT, OR, AND, NOR, and NAND gates using ICs.
- To study NAND gate as a universal logic.
- To study NOR gate as a universal logic.
- To study and prove Demorgan's Theorem.
- To design Half adder circuits using logic gates.
- To design Full adder circuits using logic gates.
- To design half subtractors using logic gates.
- To design Encoder & Decoder.
- To design Multiplexer & De-Multiplexer.
- To study the 7-segment decoder.
- To study various types of flip flops using logic gates and ICs.
  Optional topics (If the time permits)
- To design Parity Checker.
- To study Logic Family
- To study Field-programmable gate array (FPGA).

Text Books :

● R.P. Jain, "Modern Digital Electronics", 3rd Edition, Tata McGraw Hill, 2003.
● T.L. Floyd, "Digital Fundamentals", 10th Edition, Pearson education, 2011.
● M. Morris Mano, Michael D. Ciletti, "Digital Design- with an Introduction to the Verilog HDL", 5th Ed, 2013, Pearson.

Reference Books:

● Jimmie., "Schaum's Outline of Digital Electronics", Second Edition (Schaum's Outline Series).
● Brian Holdsworth, Clive Woods, "Digital Logic Design", Elsevier India Pvt. Ltd., 2005.
● A.P. Malvino and D.P. Leach, "Digital Principles and Applications", 6th Edition, Tata McGraw-Hill, 2008.
● Taub and Schilling, "Digital Integrated Electronics", McGraw Hill, International Edition.
● R.J. Tocci, N.S. Widmer and G.L. Moss, "Digital Systems Principles and Applications", 10th Edition, Pearson, 2011

CO-PO & PSO Correlation

Course Name: Digital System Design Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2		2					2			
CO2:	1									1	1	
CO3:		3	3		3				2	1	2	
CO4:	2		2								1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course:		**Math Lab I**	**Course Code:**		**SOE-B-CSE108**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks	**:**	**25**			

Course Descriptions:

This course is designed as a programming lab to introduce python package SciPy to the students. Students will be solving real life problems using functionalities of SciPy.

Course Outcomes:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the functionality of SciPy
CO2	Implement mathematical problems related to interpolation.
CO3	Implement mathematical problems related to Numerical Integration.
CO4	Implement mathematical problems related to File input/output.

The following concepts will be covered in the lab:

Introduction to SciPy

- Implement real life problems related to Interpolation.
- Implement real life problems related to Numerical Integration.
- Implement real life problems related to File input/output.

Text Books:

- Wesley J. Chun, “Core Python Applications Programming”.
- Charles Dierbach, “Introduction to Computer Science using Python”.

Reference Books:

- Mark Lutz, “Learning Python”, 5th edition, O'reilly Publication

- John Zelle, "Python Programming: An Introduction to Computer Science", Second edition, Course Technology Cengage Learning Publications.

CO-PO & PSO Correlation

Course Name: Math Lab I												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2		2						2		1	2
CO2:	1		3						1		1	2
CO3:	1		3						1		1	2
CO4:	1		3						1		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course:		**IT Workshop - I**	**Course Code:**		**SOE-B-CSE109**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks:	**:**	**50**			

Course Descriptions:

This course gives exposure on develop working knowledge of Information and Communication Technology (ICT) to students. This workshop also introduces how to effectively use and work with Microsoft office tools, office 365, and Google Workspace, Social Media sites.in

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Students will be able to understand the basic tools and shortcuts of Microsoft word and excel and OS.
CO2	Students will be able to understand how to format the file.
CO3	Students will be able to understand advance tools for solve complex task.
CO4	Students will be able to show data in graphics form. Etc.

The following concepts will be covered in the lab:

- Operating System and software Installation.
- Execution of various tool for formatting files.
- Advance tools of Word, Excel and Power point
- Mail merge and Table Formatting and style
- Excel advanced tools (Chart, graph, pivot table etc.)
- Understand Different power point tools

Text Books:

1. Microsoft Word, Excel, and PowerPoint: Just for Beginners Paperback

2. Microsoft Office Live For Dummies

References:

1. Office 2019 All-in-One For Dummies

2. Office 365 User Guide: A comprehensive guide to increase collaboration and productivity with Microsoft Office 365

CO-PO & PSO Correlation

Course Name: IT Workshop-I												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3		2					2			
CO2:		1								1	1	
CO3:		3	3		3				2	2	2	
CO4:	2	2							1	1		

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course:		**Emerging Technologies-I lab**	**Course Code:**		**SOE-B-CSE110**
Credits	**:**	**2**	**No of Hours**	**:**	**2 Hrs./week**
Max Marks:	**:**	**25**			

Course Description:

In this course students will learn to understand the problem domain and how to design and implement solutions using some emerging technologies like Cloud Computing, Edge Computing, Big Data and Data Analytics, Artificial Intelligence and Machine Learning (AI/ML), Virtual Reality and Augmented Reality (VR/AR), 5G and 3D printing

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Use basic enterprise level tools and deploy simple application using Cloud, Edge and Quantum Computing
CO2	Designing and developing basic level VR/AR based applications
CO3	Analyze and visualize data in the graphical format using data analytics
CO4	Visualize the working principles of 3D Printing and 5G
CO5	Formulate Industrial solutions by using mixture of emerging technologies.

The following concepts will be covered in the lab:

- Detailed discussion on Cloud and edge computing.
- Study the current state of Quantum Computing and its platforms.
- Study different applications of VR/AR based technologies.
- Explore the application areas of IoT.
- Discussion on robotic process automation.

- Study the current and future application areas of 5G.
- Study the current and future application areas of 3D printing

Text Books:

- Lan Gibson, David W. Rosen and Brent Stucker, "Additive Manufacturing Technologies: Rapid Prototyping to Direct Digital Manufacturing", Springer, 2010.
- CK Chua, Kah Fai Leong, "3D Printing and Rapid Prototyping- Principles and Applications", World Scientific, 2017.
- Ruchi Doshi, Temitayo Fagbola, Mehul Mahrishi, "Cloud Computing Master the Concepts, Architecture and Applications with Real-world Examples and Case Studies", BPB Publications, 2019
- Rajkumar Buyya, Satish Narayana Srirama, "Fog and Edge Computing Principles and Paradigms", Wiley, 2019
- Chris Bernhardt, "Quantum Computing for Everyone", MIT Press, 2019

References Books:

- Andreas Gebhardt, "Understanding Additive Manufacturing: Rapid Prototyping, Rapid Tooling, Rapid Manufacturing", Hanser Publisher, 2011.
- Khanna Editorial, "3D Printing and Design", Khanna Publishing House, Delhi.
- Boualem Benatallah, Jinjun Chen, Lizhe Wang, Rajiv Ranja, "Cloud Computing Methodology, Systems, and Applications", CRC Press, 2017.
- Nawaz Mohamudally, "State of the Art Virtual Reality and Augmented Reality Know how", IntechOpen, 2018.
- Ameet V Joshi, "Machine Learning and Artificial Intelligence", Springer International Publishing, 2019

CO-PO & PSO Correlation

Course Name: Emerging Technologies-I lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3		2					2	2		
CO2:	1	1								1	1	
CO3:		3	3		3				2	2	2	
CO4:	2	2							1	1		
CO5:	1		2						2		1	

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**I**
Name of the Course:		**Professional Development-I**	**Course Code:**		**SOE-B-CSE111**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks:	**:**	**25**			

Course Descriptions:

This course is designed to learn techniques that will increase the abilities in different key areas including setting and achieving goals, communication skills, self-motivation and positive mental attitude and also students will build upon and strengthen their skills to further distinguish themselves in academia and in their careers.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Students are able to distinguish between various learning patterns (auditory, visual and kinaesthetic)
CO2	Students will be able to know and apply the learning style by which they learn fast.
CO3	The participant should be able to distinguish between responsibility and accountability
CO4	Participants should be able to define different types of team in their own words
CO5	Participants will be able to overcome their anxiety and fear while facing an interview.

Course Detail:

- Introduction: The participant will be able to introduce himself/herself before a small group for 2 minutes using correct words and phrases.

- Self Esteem: This would help to assess the level of self-esteem and goal clarity of the participants

• Setting the goals: Participants should be able to speak about their career plan for 2 minutes using SMART criterion.

• Inspiration: Having a positive outlook on life.

• Communication: Effective communication and tools of effective communication.

• Importance of communication: Barriers of communication, ways to overcome barriers.

• Reading and comprehension: Participants should be able to identify their processing speed (WPM) while reading a context.

• Vocabulary Building: How to use dictionary, Techniques to improve vocabulary.

• Writing skills: Participants will be able to write a simple paragraph on any given topic using basic rules of writing a paragraph.

• Punctuation: Participants will be able to use appropriate punctuation in passages.

• Public speaking skills: Participants will be able to overcome their anxiety or stage fear and should be ready to face audience

• Body language during public speaking: Participants will be able to use correct body language during speech.

• Conversational English: Correct Usage of Auxiliary verbs, conditional If. • Conversational English: Correct Usage of Modals.

• Conversational English: Correct Usage of Pronouns, different ways to say "I like"

• Improved learning skills: Participants should be able to distinguish between various learning patterns (auditory, visual and kinaesthetic)

• Learning tips: Participants will be able to know and apply the learning style by which they learn fast.

• Responsibility and accountability: The participant should be able to distinguish between responsibility and accountability.

• Responsibility and accountability: The participant should be able to give suitable example of responsibility and accountability which they hold in their own life.• Team and project management: Participants should be able to define different types of team in their own words.

• Characteristics of Effective Teams: Participants should be able to list the characteristics of a good team member and a team leader.

• Creativity: Participants will be able to develop creative thinking.

• Interview Skill: Participants will be able to overcome their anxiety and fear while facing an interview.

• Interview Introduction: Participants should be able to tell the interviewer something about themselves in an effective manner

• Career growth & job readiness: Participants will be able to list the common skill sets required to work at any industry and write a statement of purpose for the career path they aspire to choose.

Reference Books:

- Oxford Dictionary & Thesaurus (South Asia Edition)
- One-minute manager by Spencer Johnson
- The present by Spencer Johnson
- You can win by Shiv Kheda

CO-PO & PSO Correlation

Course Name: Professional Development -I												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:				2	1		2	1	2	2		
CO2:						1				1	1	
CO3:											2	
CO4:					1		2		1	1		
CO5:					1				2		1	

Note: 1.: Low 2.: Moderate 3.: High

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering)

Academic Semester II

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE201	CSE	Linear Algebra and geometry	3	1	0	30	20	50	100	4
2	SOE-B-CSE202	CSE	Programming with C	2	1	0	20	15	40	75	3
3	SOE-B-CSE203	CSE	Database Management System	2	1	0	20	15	40	75	3
4	SOE-B-CSE204	CSE	Emerging Technologies-II	2	0	0	15	10	25	50	2
5	SOE-B-CSE205	CSE	Operating System	2	1	0	20	15	40	75	3
6	SOE-B-CSE206	CSE	Programming Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE207	CSE	DBMS Lab	0	0	4	0	30	20	50	2
8	SOE-B-CSE208	CSE	Maths Lab-II	0	0	2	0	25	0	25	1
9	SOE-B-CSE209	CSE	IT workshop-II	0	0	4	0	30	20	50	2
10	SOE-B-CSE210	CSE	Emerging Technologies II	0	0	2	0	25	0	25	1
11	SOE-B-CSE211	Humanities	Professional Development II	0	0	2	0	25	0	25	1
			TOTAL	**11**	**3**	**18**	**105**	**240**	**255**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Linear Algebra and geometry**	**Course Code:**		**SOE-B-CSE201**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks:	**:**	**100**			

Course Description:

The course will introduce basic concepts and techniques from linear algebra that will be required in later courses in areas such as machine learning, computer graphics, quantum computing. The theoretical results covered in this course will be proved using mathematically rigorous proofs, and illustrated using suitable examples.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Apply the concept of vector space over real and complex fields
CO2	apply inverse and rank of a matrix by using elementary transformations
CO3	Test consistency of a system of linear equations
CO4	Find Eigen values and Eigen vectors of a matrix
CO5	Apply the basic ideas of linear dependence, independence and spanning

Syllabus:

Unit-I: Vectors

Vectors and geometry in two and three space dimensions. Algebraic properties. Dot products and the norm of a vector. Important inequalities. Vector spaces, subspaces and vector space axioms. Complex vector spaces, Eigenvalues and eigenvectors.

Unit-II: Independence and orthogonality

Linear independence of vectors. Basis and dimension of a vector space. Orthogonal vectors and subspaces. The Gram-Schmidt orthogonalisation.

Unit-III: Matrices

Matrix operations. Column, row and null space. Rank of a matrix. Inverse and transpose. Elementary matrices. The Gauss-Jordan method.

Unit-IV: Systems of linear equations and Transformation

Examples of linear systems. Geometry of linear equations. Gaussian elimination. Row echelon form. Homogeneous and nonhomogeneous systems of linear equations. Application to the intersection of lines and planes, Properties and composition of linear transformations. Rotations, reflections and stretches. Translations using homogeneous coordinates. One-to-one and onto transformations.

Unit-V: Elementary matrix factorisations and determinants

LU factorisation, related algorithms and operation count. PLU factorisation. Calculating the determinant of a matrix. Properties of the determinant of a matrix. Application examples: area, volume and cross product.

Text Book

- Gilbert Strang, "Introduction to Linear Algebra", Wellesley-Cambridge press.
- J. Defranza and D. Gagliardi, "Introduction to Linear Algebra with Applications", McGraw-Hill

Reference Book

- Serge Lang, "Introduction to Linear Algebra", (2nd edition), Springer
- Seymour Lipschutz, Marc Lipson,"Schaum's outlines of Linear Algebra" ,McGraw-Hill Education (India) Private Limited, New Delhi
- K. Hoffman and R. Kunze, "Linear Algebra", Prentice Hall

CO-PO & PSO Correlation

Course Name: Linear Algebra and geometry												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2		1						2		2	
CO2:		1								1		2
CO3:			2						2			
CO4:	2	2								1		1
CO5:			1									

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Programming with C**	**Course Code:**		**SOE-B-CSE202**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks:	**:**	**75**			

Course Description:

This course offers lecture, laboratory, and case studies to impart teaching and learning to develop problem solving approaches to systematic represent identified problem into design using flowcharts, algorithms and pseudocode leading towards programming through systemic refinements. This course focus on writing various c programs in Linux environment. This course covers fundamental concepts of elementary c programming including Arrays, Strings, Pointers, Functions, Structures, Unions, Enum, Storage classes, Dynamic memory allocation, File Handling.

Course Outcome:

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

CO Number	Course Outcome
CO1	Write, debug, resolve syntax & logical errors and execute the programs.
CO2	Make the comparisons and limitations of the various programming constructs and choose the right one for the task in hand.
CO3	Use the concepts of functions and dynamic memory allocations for better and cleaner programs
CO4	Develop programs using various features like control statements, Functions, Arrays Strings, File, Pointer, Structure etc.
CO5	Implement solutions of various practical problems using C Programming.

Syllabus:

Unit-I: Introduction to Problem Solving Techniques and Linux commands

Problem solving techniques using flowcharts and pseudocode, Introduction to Linux and basic commands

Unit-2: Introduction C Programming

Introduction to C programming, Structure of c program. Elements of C: C character set, identifiers and keywords, data types, Constants and variables, C Compilers, Linkers and development environment.

Unit-3: C Programming Constructs

Operator and expressions, decision making constructs, iterative construct, Arrays and Strings.

Unit-4: Functions and Pointers

Introduction to Functions, User defined functions, build-in/library functions, Recursion, pointers, header files.

Unit-5: Dynamic Memory Allocation and File Handing

Structures, unions, enum, Storage classes, dynamic memory allocation, file management using c programming.

Text Books:

- A. B. Chaudhuri, "Flowchart and Algorithm Basics: The Art of Programming", Mercury Learning & Information, 2020.
- William Shotts, "The Linux Command Line: A Complete Introduction, 2nd Edition, No Starch Pres, 2019.
- Herbert Schildt, "C: The Complete Reference", Fourth Edition, McGraw Hill Education, 2017.
- E Balagurusamy, "Programming in ANSI C", 8/e, McGraw-Hill India, 2019.

References Books:

- Brajendra Singh, Jignesh Rawal, Pathik Rawal, "Algorithm, Pseudocode and Flowchart: Learn Algorithm in Simple Steps",BeITReady, 2015
- Anil Bikas Chaudhuri, "The Art of Programming Through Flowcharts & Algorithms" (First edition), 2018, Laxmi Publications,.
- Richard Blum & Christine Bresnahan,"Linux Command Line and Shell Scripting Bible",(3rd ed.), Wiley, 2015.
- Kamthane, Ashok N., "Programming in C," 2/e. Pearson Education India, 2011.
- Sumitabha Das, "Computer Fundamental and C Programming," McGraw Hill Education, 1st edition.

CO-PO & PSO Correlation

Course Name: Programming with C												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**								**3**			
CO2:		**2**	**3**							**2**	**2**	
CO3:	**2**								**2**			
CO4:		**3**	**2**									**1**
CO5:	**2**									**2**		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Database Management System**	**Course Code:**		**SOE-B-CSE203**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs./week**
Max Marks:	**:**	**75**			

Course Description:

This course offers lecture, laboratory, and online interaction to provide a foundation in data management concepts and database systems. It includes representing information with the relational database model, manipulating data with an interactive query language (SQL). It also includes database applications, security, and integrity and privacy issues.

Course Outcomes:

The objective of this course is to enable the students to:

CO Number	Course Outcome
CO1	Learn and practice data modeling using the entity-relationship and developing database designs.
CO2	Understand and use of Structured Query Language (SQL).
CO3	Apply normalization techniques to normalize the database.
CO4	Develop an understanding of essential DBMS concepts such as: database security, integrity, concurrency.

Syllabus:

Unit-1: DBMS concepts and architecture

Database approach v/s Traditional file system, Data models, Schemas and instances, Data independence, Data models, ER data model: Entitles and attributes, Entity types, Concept of Generalization, Aggregation and Specialization. transforming ER diagram into the tables.

Unit-2: Relational Data Models

Introduction to the Relational Model, Integrity Constraints, Querying on relational database, Relational Algebra and Relational calculus. SQL Queries, Nested subqueries, Aggregate functions, Set operations, Joins, SQL Triggers and Active Data bases**.**

Unit-3: Database Design

Normal forms, Functional dependency, Decomposition, Dependency preservation and lossless join, multivalued dependencies, Query Optimization.

Unit-4: Transaction management and Concurrency control
Transaction management: ACID properties, Serializability and concurrency control, Lock based concurrency control (2PL, Deadlocks), Time stamping methods, optimistic methods, database recovery management.

Unit-5: File indexing techniques and current trends in Database
File Organization and Indexing, Clusters, Indexes, Hashing and Tree Base Indexing. Database Security, current trends in Databases, case study on MongoDB.

Text Books:

- Silberschatz, Korth, "Data base System Concepts", McGraw Hill, 6th edition.
- Elmasri Navathe, "Fundamentals of Database Systems", Pearson Education.
- C J Date, "An Introduction to Database Systems", 8th Edition

Reference Books:

- Rini Chakrabarti, Shilbhadra Dasgupta, "Advanced Database Management System", Wiley India Pvt. Limited
- Peter Rob & Carlos Coronel, "Data base Systems design, Implementation and Management", 7th Edition.
- Raghurama Krishnan & Johannes Gehrke, "Data base Management Systems", TATA McGraw Hill, 3rd Edition.

CO-PO & PSO Correlation

Course Name: Database Management System												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:		3							2	1	2	2
CO2:	2		3						2			
CO3:		1								3	2	
CO4:			2						1		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech. (01UG020)**	**Semester :**	**II**
Name of the Course:	**Emerging Technologies-II**	**Course Code:**	**SOE-B-CSE204**
Credits :	**2**	**No of Hours :**	**2 Hrs./week**
Max Marks: :	**50**		

Course Description:

This course offers lecture, laboratory, workshop, case studies and expert talk to impart teaching and learning to develop sound understanding of technology disruption in changing business environment through invention of new technologies or advancement of existing technologies. This course covers introduction of solving critical technical problems using emerging technologies like Mobile Technologies, Automation using Robotics, IoT, Blockchain Technologies and Cybersecurity.

Course Outcome:

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

CO Number	Course Outcome
CO1	Understand the role of business needs and distributive nature of emerging technologies.
CO2	Get familiar with emerging technologies like Mobile Technologies, Automation using Robotics, IoT, Blockchain, Quantum Computing and Cybersecurity
CO3	Understand the path of innovative technological inventions and enhancement
CO4	Formulate solutions for various enterprise and industry problems using emerging technologies.
CO5	To apply strategies and techniques used in emerging technologies to solve real life/case studies problems

Syllabus:

Unit - I: Mobile Tech

Introduction to Mobile Innovations, Mobile Devices, Mobile Operating Systems and Mobile Apps, Apps for multiple devices and platforms, Wearable Technology, Mobile Technologies in Space and Defense, Current state and Future scope

Unit - I: Automation and IoT

Internet of Things (IoT), IoT Devices and Components, Needs of Automation, Introduction to Robotic, Robotic Process Automation (RPA), RPA and 5G, Current state and Future scope

Unit - III: Blockchain

Blockchain: Introduction, Types and Use Cases, Blockchain Platforms and Its Architecture, Decentralized finance (DeFi), Central Bank Digital Currency (CBDC), Current state and Future scope

Unit - IV: Cybersecurity

Introduction Cyber Threats, Cybersecurity principles and approaches, Cybersecurity tools and solutions, Advance Cyber warfare

Text Books:

- Chellammal Surianarayanan, Kavita Saini, Pethuru Raj, "Blockchain Technology and Applications", CRC Press, 2020
- Abhishek Kumar, Ashutosh Kumar Dubey, N. Gayathri, Prasenjit Das and S. Rakesh Kumar, "AI and IoT-Based Intelligent Automation in Robotics", Wiley, 2021
- Lauren Collins, Scott R. Ellis, "Mobile Devices Tools and Technologies", CRC Press, 2015
- Mohammad Razani, "Information, Communication, and Space Technology", CRC Press, 2012
- Joseph Steinberg, "Cybersecurity for Dummies", Wiley, 2019

References Books:

- Tiana Laurence, "Introduction to Blockchain Technology: The Many Faces of Blockchain Technology in the 21st Century", Van Haren Publishing
- Dharm Singh Jat, Dinesh Goyal, S. Balamurugan, Sheng-Lung Peng, "The IoT and the Next Revolutions Automating the World, Engineering Science Referenc"e, 2019
- Bharat Rao, Adam Jay Harrison, Balashankar Mulloth, "Defense Technological Innovation: Issues and Challenges in an Era of Converging Technologies", Edward Elgar Publishing, 2020
- Malcolm Macdonald, Viorel Badescu,"The International Handbook of Space Technology", Springer Berlin Heidelberg, 2014
- Mayank Bhushan, Rajkumar Singh Rathore, Aatif Jamshed, "Fundamentals of Cyber Security", BPB Publications, 2017

CO-PO & PSO Correlation

Course Name: Emerging Technologies-II												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**3**	**2**	**2**						**2**		**1**	**2**
CO2:	**3**		**3**						**2**		**1**	**2**
CO3:	**1**	**1**							**1**		**1**	**2**
CO4:		**1**										
CO5:	**1**	**2**										

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Operating System**	**Course Code:**		**SOE-B-CSE205**
Credits	**:**	**03**	**No of Hours :**		**3 Hrs./week**
Max Marks:	**:**	**75**			

Course Descriptions:

The purpose of this course is to provide an overview of computer operating systems. Topics to be discussed include a brief history of OS's and their design and development. The course will cover major components the and the algorithms and implementation techniques used to create them. The class will have presented using a both a mix of theory and hands-on exercises. Some/most of the programming assignments will be done on Linux machines using C.

Course Outcomes:

At the end of the course students will:

CO Number	Course Outcome
CO1	Gain an insight into how programming languages, operating systems, and architectures interact and provide an environment to the user.
CO2	Get an idea regarding tradeoffs that can be made between performance and functionality during the design and implementation of an operating system.
CO3	Get knowledge about different functions of operating system i.e. Process Management, resource management.
CO4	Be able to conceptualize the components involved in designing a contemporary Operating system.
CO5	Be able to understand the theoretical approaches and practical implementations of OS functionalities.

Syllabus:

Unit – I: Operating System Introduction

Operating systems objectives, functions, architecture, structures, operations, Evolution, services, Design and Implementation issues, System calls, System programs, Virtual machine. History of UNIX.

Unit - II: Process Scheduling and Threads

Processes: Process Concept, Process States, Process State Transition Diagram, Process Control Block (PCB), Process Scheduling Concepts. Scheduling: Performance criteria, Scheduling algorithms, Multiprocessor scheduling. Process management in Linux: Boot process, Scheduling of processes at command

Unit – III: Process Coordination:

Process Synchronization: Critical section problem, semaphores, monitors, atomic transactions, classical synchronization problems. Deadlock: characterization, Prevention, Avoidance and Detection, Recovery, combined approach to handle deadlocks.

Unit – IV: Memory and File Systems:

Memory Management: Virtual Memory Concepts, Partitioning, Cache memory. File System: File organization and access mechanism, File directories, File allocation methods, Free space management.

Unit – V: Security, Protection and Networking Tools

Introduction, Threats and attacks, Security violation through parameters, Computer virus and worms Security design principle, Authentication, Protection mechanisms, Data encryptions, Digital signature.

Text Books:

- Silberschatz and Galvin , “Operating System Concepts”, Wiley India, 8th edition.
- William Stalling, “Operating System”, Pearson Education, 6th edition.
- SumitabhaDas, “Unix Concepts and Applications” TMH,4th Edition.

Reference Books:

- Andrew S. Tanenbaum, “Modern Operating Systems “, Pearson Education, 4th Edition.
- Achyut S Godbole and Atul Kahate, “Operating System”, TMH, 3rd edition.
- Rosen and Kenneth, “UNIX :The Complete Reference”, McGraw Hill,2nd Edition.

CO-PO & PSO Correlation

Course Name: Operating System												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2	2						3		1	2
CO2:	3	2	1						2		1	2
CO3:	1	1							1		1	2
CO4:		1										
CO5:	1	2										

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Programming Lab**	**Course Code:**		**SOE-B-CSE206**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks:	**:**	**50**			

Course Description:

This course provides a technical foundation for the better understanding and implementation of programming aspects including data types, iterative statements, jump control statements, selective statements, arrays, pointers, function, recursion, structure, string operation, and file handling. It introduces various important library files for efficient programming. The course focuses on overall learning towards development of effective and efficient computer programs.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Read, understand and trace the execution of programs written in C language.
CO2	Write the C code for a given algorithm.
CO3	Implement Programs with pointers and arrays, functions, recursion, perform pointer arithmetic, and use the pre-processor.
CO4	Write programs that perform operations using derived data types.
CO5	Write programs that perform read/write operations on any existing or new file.

Syllabus:

Topics to be Covered

- Topics Introduction to the course. Brief summary of the concepts and models presented in the course “Introduction to Programming”. Programming vs. software development revisited. Major stages of software production. Comment to learning process organization: “orthogonality” of lectures/hands-on/exercise tracks.
- Data types, Characters and strings. String library. Other elements of standard library. Importance to use standard library functionality.
- Iterative, selection and jump control statements. Operator precedence and associativity. Functions and recursion.

- Arrays of structural objects. Dynamic memory allocation. Advanced introduction to scope and memory classes. Functions dealing with complex types. C program organization revisited: attention to focus on data types.
- Introduction to other containing structures. Pointers advanced. Why pointers might be dangerous. Safe and unsafe code.
- What if the program objects are more complex against elementary types? From subject domain to data models. Structures. Functional hierarchical code organization with respect to structural types.
- Input/output revisited. Working with files.

Text Books:

- E.Balaguruswamy, "Programming in ANSI C", 5th Edition McGraw-Hill
- Brain W.Kernighan & Dennis Ritchie, "C Programming Language", 2nd edition, PHI
- Greg Perry, Dean Miller. "C Programming Absolute Beginner's Guide", 3rd ed., Que Publishing, 2013

Reference Books:

- Herb Schild, "C: The Complete Reference", McGraw-Hill, 4th edition
- Yashavant Kanetkar," Let Us C",15th edition

CO-PO & PSO Correlation

Course Name: Programming Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	2						2	1	1	2
CO2:	2	2	1						2		1	2
CO3:	1	2							1		1	2
CO4:		1										
CO5:	1	2										

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech. (01UG020)**	**Semester :**	**II**
Name of the Course:	**DBMS Lab**	**Course Code:**	**SOE-B-CSE207**
Credits :	**2**	**No of Hours :**	**2 Hrs./week**
Max Marks:	**50**		

Course Descriptions:

This course offers a foundation in data management concepts and database systems. It includes implementation of DDL, DML and DCL with an interactive query language (SQL).

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Infer database language commands to create simple database.
CO2	Analyse the database using queries to retrieve records.
CO3	Apply PL/SQL for processing database
CO4	Analyse front end tools to design forms, reports and menus
CO5	Develop solutions using database concepts for real time requirements.

The following concepts will be covered in the lab:

- Implementation of DDL commands - overview of using sql tool, data types in sql, creating tables (along with primary and foreign keys), altering tables and dropping tables.
- Implementation of DML commands- insert, select, update, delete etc.
- Implementation of queries using any, all, in, exists, not exists, union, intersect, constraints etc.
- Implementation of sub queries (nested, correlated) and joins (inner, outer and equi).
- Implementation of queries using count, sum, avg, max, min, group by, having, views creation and dropping.

- Implementation of triggers - creation of trigger, insertion using trigger, deletion using trigger, updating using trigger.
- Implementation of procedures- creation of stored procedures, execution of procedure, and modification of procedure.
- Implementation of cursors- declaring cursor, opening cursor, fetching the data, closing the cursor.

Reference Books:

- Peter Rob & Carlos Coronel, "Data base Systems design, Implementation and Management", 7th Edition.
- Raghurama Krishnan & Johannes Gehrke, "Data base Management Systems", TATA McGraw Hill, 3rd Edition.

CO-PO & PSO Correlation

Course Name : DBMS Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3							2	2	1	1
CO2:	1	3							2	2	1	1
CO3:	1	3							1	2		
CO4:	1	3							1	2	1	
CO5:	1	3							1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**II**
Name of the Course:		**Math Lab II**	**Course Code:**		**SOE-B-CSE208**
Credits	**:**	**2**	**No of Hours**	**:**	**2 Hrs./week**
Maximum Marks:		**25**			

Course Descriptions:

This course is designed as a programming lab to introduce python package Numpy to the students. Students will be solving real life problems using functionalities of Numpy.

Course Outcomes:
After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Implement mathematical problems related to Matrices.
CO2	Implement mathematical problems related to Linear Algebra.
CO3	Implement mathematical problems related to Statistics.

The following concepts will be covered in the lab:

Introduction to NumPy

- Implement real life problems related to Matrices.
- Implement real life problems related to Linear Algebra.
- Implement real life problems related to Statistics.

Text Books:

- Wesley J. Chun, “Core Python Applications Programming”.
- Charles Dierbach, “Introduction to Computer Science using Python”.

Reference Books:

- Mark Lutz, “Learning Python”, 5th edition, O'reilly Publication
- John Zelle, “Python Programming: An Introduction to Computer Science”, Second edition, Course Technology Cengage Learning Publications.

CO-PO & PSO Correlation

Course Name: Math Lab II												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2		2			1			2		1	2
CO2:	2	1	3			1			1		1	2
CO3:	1		3			1			1		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech. (01UG020)**	**Semester :**	**2nd**
Name of the Course:	**IT Workshop - II**	**Course Code:**	**SOE-B-CSE209**
Credits :	**2**	**No of Hours :**	**2 Hrs./week**
Max Marks: :	**50**		

Course Descriptions:

This course gives exposure on Solving of data science problems to students. Course also builds conceptual and practical understanding of the classification and Regression Model.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Students will be able to understand the basic commands of linux operating system and can write shell scripts
CO2	Students will be able to create file systems and directories and operate them
CO3	Students will be able to create processes background and fore ground etc..by fork() system calls
CO4	Students will be create shared memory segements,pipes ,message queues and can exercise interprocess communication

The following concepts will be covered in the lab:

1. Linux Installation
2. Execution of various file & directory handling commands.
3. Apache Server Installation and configuration
4. User, group creation and assign various permissions to access a directory.
5. Mysql Installation and configuration
6. Shell Scripting

Text books:

1. Unix and shell Programming, Behrouz A. Forouzan, Richard F. Gilberg.Thomson
2. Your Unix the ultimate guide, Sumitabha Das, TMH. 2nd Edition.

References:

1. Unix for programmers and users, 3rd edition, Graham Glass, King Ables, Pearson education.
2. Unix programming environment, Kernighan and Pike, PHI. / Pearson Education
3. The Complete Reference Unix, Rosen, Host, Klee, Farber, Rosinski, Second Edition, TMH.
4. Unix Shell programming, Yashwanth Kanitkar, 1st Edition, BPB Publisher

CO-PO & PSO Correlation

Course Name: IT Workshop - II												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3		2						2	3		
CO2:		2	3							1	2	
CO3:	3		1	2					2			
CO4:	1	2								1		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**II**
Name of the Course:		**Emerging Technologies Lab**	**Course Code:**		**SOE-B-CSE210**
Credits	**:**	**1**	**No of Hours :**		**1 hr / week**
Max Marks:	**:**	**25**			

Course Descriptions:

In this course students will learn to understand the problem domain and how to design and implement solutions using some emerging technologies like mobile technology, robotics, IoT, 5G, Blockchain, cyber security.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Decide the technology needed to solve a real-life problem / case study.
CO2	Understand the basic concepts and building blocks of IoT and Robotics
CO3	Demonstrate the working of simple blockchain, understand its applications in various domains.
CO4	Understand the notion of cyber security and its importance.

The following concepts will be covered in the lab:

- Designing and developing simple blockchain based applications
- Discussion about the Case study related to uses and applications of IoT
- Case study about threats and applications related to cyber security
- Study the current and future application areas of blockchain technology
- Study different applications of wearable technologies
- Study about the crypto currency in the global market

Text Books:

- Chellammal Surianarayanan, Kavita Saini, Pethuru Raj, “Blockchain Technology and Applications”, CRC Press, 2020
- Abhishek Kumar, Ashutosh Kumar Dubey, N. Gayathri, Prasenjit Das and S. Rakesh Kumar, “AI and IoT-Based Intelligent Automation in Robotics”, Wiley, 2021
- Lauren Collins, Scott R. Ellis, “Mobile Devices Tools and Technologies”, CRC Press, 2015

- Mohammad Razani, "Information, Communication, and Space Technology", CRC Press, 2012

References:

- Tiana Laurence, "Introduction to Blockchain Technology The Many Faces of Blockchain Technology in the 21st Century", Van Haren Publishing
- Dharm Singh Jat, Dinesh Goyal, S. Balamurugan, Sheng-Lung Peng, "The IoT and the Next Revolutions Automating the World, Engineering Science Reference", 2019
- Bharat Rao, Adam Jay Harrison, Balashankar Mulloth, "Defense Technological Innovation: Issues and Challenges in an Era of Converging Technologies", Edward Elgar Publishing, 2020
- Malcolm Macdonald, Viorel Badescu, "The International Handbook of Space Technology", Springer Berlin Heidelberg, 2014

CO-PO & PSO Correlation

Course Name: Emerging Technologies Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	2						2		1	2
CO2:	3		3						2		1	2
CO3:	1	1							1		1	2
CO4:		1										

Note: 1.: Low 2.: Moderate 3.: High

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. code- 01UG020

Academic Semester III

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/2 (L+P+T)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE-21-301	CSE	Discrete Mathematics	3	1	0	30	20	50	100	4
2	SOE-B-CSE-21-302	CSE	Data Structure	3	1	0	30	20	50	100	4
3	SOE-B-CSE-21-303	CSE	Object Oriented Programming using JAVA	3	0	0	20	15	40	75	3
4	SOE-B-CSE-21-304	CSE	Formal Language and Automata Theory	3	0	0	20	15	40	75	3
5	SOE-B-CSE-21-305	CSE	Object Oriented Programming Lab	0	0	4	0	30	20	50	2
6	SOE-B-CSE-21-306	CSE	Data Structure Lab	0	0	4	0	30	20	50	2
7	SOE-B-CSE-21-307	CSE	Web Development Lab I	0	0	4	0	30	20	50	2
8	SOE-B-CSE-21-308	CSE	Data Visualization Lab	0	0	2	0	15	10	25	1
9	SOE-B-CSE-21-309	CSE	MOOCS/SWAYAM/Certification/Liberal Arts (Programing in C++)	_	_	_	_	30	20	50	2
10	SOE-B-CSE-21-310	CSE	Professional Development III	0	0	2	0	25	0	25	1
			Total	**12**	**2**	**16**	**100**	**230**	**270**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Discrete Mathematics**	**Course Code:**		**SOE-B-CSE-21-301**
Credits	**:**	**4**	**No of Hours**	**:**	**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

This course will discuss fundamental concepts in discrete mathematics with emphasis on their applications to computer science. Example topics include logic and Boolean circuits; sets, functions and relations; analysis techniques based on counting methods and recurrence equations; trees and more general graphs.

Course Outcomes:

After Completion of the course Students will be able:

CO Number	Course Outcome
CO1	To formulate logic expression for variety of applications.
CO2	To use Algebraic structures for problem solving .
CO3	To describe and manipulate sequences.
CO4	To analyses and solve counting problems on finite and discrete structures .
CO5	To apply graph theory in solving computing problems .

Syllabus:

Unit-I: Mathematical logic

Statements and notations, Connectives, Well-formed formulas, Truth Tables, tautology, equivalence implication, Normal forms, Quantifiers, universal quantifiers. Predicates: Predicative logic, Free & Bound variables, Rules of inference, Consistency, proof of contradiction, Automatic Theorem Proving.

Unit-II: Relations

Properties of Binary Relations, equivalence, transitive closure, compatibility and partial ordering relations, Lattices, Hasse diagram. Functions: lnverse Function Composition of functions, recursive Functions, Lattice and its Properties.

Algebraic structures: Algebraic systems Examples and general properties, Semi groups and monads, groups sub groups' homomorphism, Isomorphism.

Unit-III: Recurrence Relation

Generating Functions, Function of Sequences Calculating Coefficient of generating function, Recurrence relations, Solving recurrence relation by substitution and Generating funds. Characteristics roots solution of non-homogeneous Recurrence Relation.

Unit-IV: Combinatorics

Elementary Combinatorics: Basis of counting, Combinations & Permutations, with repetitions, Constrained repetitions, Binomial Coefficients, Binomial Multinomial theorems, the principles of Inclusion – Exclusion. Pigeon hole principles and its application.

Unit-V: Graph Theory

Notations & terminology, directed and undirected graphs, incidence and degrees, Sub-graphs, Walks paths, cycles, circuits, components, connectedness algorithms, shorter path algorithm. Euclidian and Hamiltonian graphs, the traveling Salesman Problem, Trees: Spanning trees, rooted trees and binary trees.

Text Books:

- A. Doerr and K. Levasser, "Applied Discrete Structures for Computer Science".
- B Kolman & R.C. Busby, "Discrete Mathematical Structures for Computer Science".
- Kenneth H Rosen, "Discrete Mathematics and its Applications with Combinatorics and Graph Theory", 7th Edition, TMH.
- C.V.Sastry, Rakesh Nayak, "A Text Book on Discrete Mathematics", Wiley, Dreamtech press

Reference Books:

- J.P. Trembley & R. P. Manohar, "Discrete Mathematical Structures with Application to Computer Science".
- Graph Theory by F. Harary.
- C. Liu, "Elements of Discrete Mathematics".

CO-PO & PSO Correlation

Course Name : Discrete Mathematics												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2	2						2		1	2
CO2:		1	2						1		1	2
CO3:		2	2						1		1	2
CO4:		1	2						2		1	2
CO5:		2	2						2		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**III**
Name of the Course:		**Data Structure**	**Course Code:**		**SOE-B-CSE-21-302**
Credits	**:**	**4**	**No of Hours**	**:**	**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

This course emphasizes on logical structure of data, it's physical representation and techniques for program development and debugging. In this course, students will also learn how to select best suited data structure to solve a particular problem. This course is also about the computational complexities of different data structures.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Identify the correctness of the algorithms.
CO2	Analyze the times complexity of the algorithms using asymptotic analysis.
CO3	Compare between different data structures. Pick an appropriate data structure for a design situation.
CO4	Analyze/ summarize searching and sorting techniques.
CO5	Employ and map suitable algorithms to solve engineering problems.

Syllabus:

Unit-I: Introduction

Introduction: Basic Terminology, Data types and its classification, Abstract Data Types. Time and Space Analysis of Algorithms, Asymptotic Notations - Average, best and worst case analysis, Simple recurrence relations and use in algorithms, Sorting and Searching algorithms.

Unit-II: Linear Data Structure:

Arrays, Stacks, Queues, Linked Lists Arrays, Sparse Matrices, Stacks, Recursion, Queues, Types of queues, linked list, Generalized linked list, Application: Garbage collection and compaction, Conversion of Infix to Postfix Expressions, Polynomial Arithmetic etc.

Unit-III: Non-linear Data Structure:

Trees, Binary Trees, Tree Traversal, Threaded Binary trees, Binary Search Tree (BST), balanced trees - AVL Trees, B-trees, B+ tree. Application: Huffman coding Algorithm etc.

Unit-IV: Nonlinear Data Structure: Graphs

Graphs, Directed graph, Undirected graph, Traversal, Application of Graphs: Shortest path - Minimal spanning tree etc.

Unit-V: Hashing

Introduction, types, Collision Resolution Strategies, NP-completeness.

Textbooks:

- Alfred. V. Aho, John. E. Hopcroft, Jeffrey. D. Ullman, "Data Structures and Algorithms", Addison-Wesley Publications.,1985
- Horowitz and Sahani, "Fundamentals of data Structures", Galgotia Publication Pvt. Ltd., N Delhi.
- C V Sastry, Rakesh Nayak, Ch Raja Ramesh, "Data Structures and Algorithms", Wiley, Dreamtech press.

Reference books:

- Mark Allen Weiss, "Data Structures and Algorithm Analysis in C", Second Edition, Pearson Education, Asia.1994.
- Jean-Paul Tremblay, Paul. G. Sorenson, "An Introduction to Data Structures with Applications", Tata McGraw Hill second edition, 1991.
- Thomas. H. Cormen, Charles. E. Leiserson, Ronald. L. Rivest, "Introduction to Algorithms", PHI 1998.
- Lipschutz; "Data structure", (Schaum); TMH
- R. Kruse et al, "Data Structures and Program Design in C", Pearson Education Asia, Delhi-2002.

CO-PO & PSO Correlation

Course Name: Data Structure												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	1							2			
CO2:	2	2	1						2	2		
CO3:	2	2	1						2	2		
CO4:	1		2						1			1
CO5:	1		2						2	2		

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Object Oriented Programming using JAVA**	**Course Code:**		**SOE-B-CSE-21-303**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./week**
Max Marks	**:**	**75**			

Course Description:

The course will provide foundational knowledge of classes and objects, interface and inheritance, handling exception and multithreading, I/O stream and JDBC, Designing GUI using AWT and SWING.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the concept of classes and objects.
CO2	Demonstrate concept of interface and inheritance.
CO3	Demonstrate concept of Exception handling and multithreading
CO4	Demonstrate concept of I/O stream and JDBC
CO5	Demonstrate concept of GUI design using AWT and SWING.

Syllabus:

Unit-I: Object Oriented Programming

Class Fundamentals, Object & Object reference, Object Life time & Garbage Collection, Creating and Operating Objects, Constructor & initialization code block, Access Control, Modifiers, methods Nested, Inner Class &Anonymous Classes, Abstract Class & Interfaces Defining Methods, Argument Passing Mechanism, Method Overloading, Recursion, Dealing with Static Members, Finalize () Method, Native Method. Use of "this "reference, Use of Modifiers with Classes & Methods, Design of Accessors and Mutator Methods Cloning Objects, shallow and deep cloning, Generic Class Types.

Unit-II: Extending Classes and Inheritance

Extending Classes and Inheritance Use and Benefits of Inheritance in OOP, Types of Inheritance in Java, Inheriting Data members and Methods, Role of Constructors in inheritance, Overriding Super Class Methods, Use of "super", Polymorphism in inheritance, Type Compatibility and Conversion Implementing interfaces. Package

Organizing Classes and Interfaces in Packages, Package as Access Protection, Defining Package, CLASSPATH Setting for Packages, Making JAR files for Library Packages Import and Static Import Naming Convention for Packages.

Unit-III: Exception Handling and Multithreading

Exception Handling: The Idea behind Exception, Exceptions & Errors, Types of Exception, Control Flow in Exceptions, JVM reaction to Exceptions, Use of try, catch, finally, throw, throws in Exception Handling, In-built and User Defined Exceptions, Checked and Un-Checked Exceptions.

Thread: Understanding Threads, Needs of Multi-Threaded Programming, Thread Life-Cycle, Thread Priorities, Synchronizing Threads, Inter Communication of Threads, Critical Factor in Thread –DeadLock.

Unit-IV: Input/Output Streams and JDBC

Concept of streams, Input Streams and Output Streams classes, byte oriented data processing, character oriented data processing, creation of files, inserting data into files, Reading/ Writing characters, Reading/ Writing bytes, concatenating files. copying data from one file to another using byte/character-oriented streams, Introduction to JDBC, JDBC Drivers & Architecture, Connecting to non-conventional Databases.

Unit-V: GUI design using AWT and SWING

Designing Graphical User Interfaces in Java, Components and Containers, Basics of Components, Using Containers, Layout Managers, AWT Components, Adding a Menu to Window, Extending GUI Features Using Swing Components, Java Utilities (java.util Package)

Text Books:

- Herbert Shildt, “The Complete reference Java”, McGraw-Hill, Seventh Edition, 2007.
- E. Balagurusamy, “Programming with Java”, McGraw-Hill, Third Edition, 2007.

Reference Books:

- Eckel, Bruce, “Thinking in Java: Exploratory Data Analysis in Python”, fourth edition, 2008.

CO-PO & PSO Correlation

Course Name: Object Oriented Programming using JAVA												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**	**3**							**2**			
CO2:		**1**							**2**	**1**	**1**	
CO3:		**3**	**3**						**2**	**2**	**2**	
CO4:	**2**	**3**	**3**						**2**	**2**	**2**	**3**
CO5:	**3**	**3**	**3**						**1**		**2**	**3**

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B. Tech. (01UG020)**	**Semester :**	**III**
Name of the Course:		**Formal Language and Automata Theory**	**Course Code:**	**SOE-B-**
Credits	**:**	**3**	**No of Hours :**	**3 Hrs./**
Max Marks	**:**	**75**		

Course Description:

This course will discuss fundamental concepts of finite automata. It will help in understanding into formal language, grammar and automata. Classification of different machines and their usage will help in understanding and finite system effectively.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Construct deterministic and non-deterministic machines.
CO2	Convert Language to Finite automata and vice versa.
CO3	Distinguish Push down Automata and Turing Machine.
CO4	Understand Decidable and Undecidable problem.

Syllabus:

Unit-I: Introduction to Automata

Introduction to Automata, Finite Automation, Transition Systems, Acceptance of a String by a Finite Automation, DFA, Design of DFAs, NFA, Design of NFA, Equivalence of DFA and NFA, Conversion of NFA into DFA, Finite Automata with E-Transition, Minimization of Finite Automata, Mealy and Moore Machines, Applications and Limitation of Finite Automata.

Unit-II: Formal Languages

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, e-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

Unit-III: Context Free Grammars

Formal Languages, Grammars, Classification of Grammars, Chomsky Hierarchy Theorem, Context Free Grammar, Leftmost and Rightmost Derivations, Parse Trees, Ambiguous Grammars, Simplification of Context Free Grammars-Elimination of Useless Symbols, e-Productions and Unit Productions, Normal Forms for Context Free Grammars-Chomsky Normal Form and Greibach Normal Form, Pumping Lemma, Closure Properties, Applications of Context Free Grammars.

Pushdown Automata:
Pushdown Automata, Definition, Model, Graphical Notation, Instantaneous Description Language Acceptance of pushdown Automata, Design of Pushdown Automata, Deterministic and Non – Deterministic Pushdown Automata, Equivalence of Pushdown Automata and Context Free Grammars Conversion, Two Stack Pushdown Automata, Application of Pushdown Automata.

Unit-IV: Turing Machine

Turing Machine, Definition, Model, Representation of Turing Machines-Instantaneous Descriptions, Transition Tables and Transition Diagrams, Language of a Turing Machine, Design of Turing Machines, Techniques for Turing Machine Construction, Types of Turing Machines, Universal Turing Machine.

Unit-V: Computability

Decidable and Un-decidable Problems, Halting Problem of Turing Machines, Post's Correspondence Problem, Modified Post's Correspondence Problem, Classes of P and NP, NP Hard and NP Complete Problems.

Text Books:

- J.E.Hopcroft, R.Motwani and J.D.Ullman, "Introduction to Automata Theory, Languages and Computation", 3rd Edition, Pearson 2008
- K.L.P.Mishra and N.Chandrasekharan, "Theory of Computer Science-Automata, Languages and Computation", 3rd Edition, PHI, 2007.
- K.L.P. Mishra and N.Chandrasekaran, "Theory of Computer Science (Automata, Languages and Computation ", 3rd ed., Thirty-fourth printing (Third Edition) April, 2016.

Reference Books:

- K.V.N.Sunitha and N.Kalyani, "Formal Language and Automata Theory", Pearson, 2015.
- Shyamalendu Kandar," Introduction to Automata Theory, Formal Languages and Computation" , Pearson,2013.
- V.Kulkarni, "Theory of Computation", Oxford University Press,2013.
- Rajendra Kumar, "Theory of Automata, Languages and Computation", McGraw Hill,2014.

CO-PO & PSO Correlation

Course Name: Formal Language and Automata Theory												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2		2						2		1	2
CO2:			3						1		1	2
CO3:			3						1		1	2
CO4:			3						2		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Object Oriented Programming using Java Lab**	**Course Code:**		**SOE-B-CSE-21-305**
Credits	**:**	**2**	**No of Hours**	**:**	**3 Hrs. / week**

Course Descriptions:

The course will provide foundational knowledge of classes and objects, interface and inheritance, handling exception and multithreading, I/O stream and JDBC, Designing GUI using AWT and SWING.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Implement classes and objects,
CO2	Implement interface and inheritance.
CO3	Implement exception handling and multithreading
CO4	Implement input and output stream and JDBC
CO5	Implement GUI design using AWT and SWING.

The following concepts will be covered in the lab:

- Concepts related to classes and objects.
- Concepts related access specifiers and scope.
- Concepts related to interface and inheritance, polymorphism.
- Concepts related exception handling and multithreading
- Concepts related to file handling
- Concepts related to GUI design using AWT and SWING.

Text Books:

- Herbert Shildt, “The Complete reference Java”, McGraw-Hill, Seventh Edition, 2007.
- E. Balagurusamy, “Programming with Java”, McGraw-Hill, Third Edition, 2007.

Reference Books:

- Eckel, Bruce, "Thinking in Java: Exploratory Data Analysis in Python", fourth edition, 2008.

CO-PO & PSO Correlation

Course Name: Object Oriented Programming using Java Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	1	2	2					1	2	2	
CO2:	3	3	2	2					2	2	2	
CO3:			3								3	
CO4:	1				2						2	
CO5:	2	2		1					2		1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech. (01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Data Structure Lab**	**Course Code:**		**SOE-B-CSE-21-306**
Credits	**:**	**2**	**No of Hours**	**:**	**2 Hrs./week**
Max. Marks	**:**	**50**			

Course Descriptions:

The objective of this lab is to teach students various data structures and to explain them algorithms for performing various operations on these data structures. This lab complements the data structures course. Students will gain practical knowledge by writing and executing programs using various data structures such as arrays, linked lists, stacks, queues, trees, graphs, hash tables and search trees.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Arrays, records, linked structures, stacks, queues, trees, and graphs, etc.
CO2	Apply different data structures in real applications.

The following concepts will be covered in the lab:

- Implementation of the Queue: Linear Queue, Circular Queue, D-queue and Priority Queues.
- Implementation of Stack & perform infix to postfix conversion.
- Implementation of Linked list : Singly, Doubly and Circular Linked list.
- Representation of a polynomial using Linked list and write functions for polynomial addition.
- Implement and analyze the various Searching algorithms i.e. Linear, Binary and Hashing.
- Implement and analyze the various Sorting algorithms i.e. Selection, Insertion, Bubble,
  Quick, Merge, Heap, Radix sort etc.

- Implementation of Tree and its applications i.e. Spanning tree, Binary Search Tree, AVL tree

  and Tree traversal etc.

- Representation of Graph and Implement some of its application i.e. Shortest path.

Text Books:

- Deepali Srivastava and S. K. Srivastava , "Data Structures Through C in Depth", BPB Publication.
- "Fundamentals of Computing with C++" by John R. Hubbard, Schaum's Outline Series.

Reference Books:

- Brian W. Kernighan and Dennis M. Ritchie, "The C Programming Language", Pearson Publication.
- Byron Gottfried, "Programming with C", Schaum's Outline Series.
- Seymour Lipschutz, "Data Structures", Schaum's Outline Series.

CO-PO & PSO Correlation

Course Name: Data Structure Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	1	2	2		2	2		1	2	2	
CO2:	3	3	2	2		1			2	2	2	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Web Development Lab I**	**Course Code:**		**SOE-B-CSE-21-307**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs. / week**
Max. Marks	**:**	**50**			

Course Descriptions:

This course is designed as a programming intensive introduction to web technologies. We will study and build software programs using several different programming languages, markup languages and meta- markup languages. We will consider and work with two styles of client side programming - programming within the browser and programming standalone clients. On the server, we will program using Node JS.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Develop Static web based application.
CO2	Implement client side scripting.
CO3	Implement server side scripting.
CO4	Develop dynamic web based application.

The following concepts will be covered in the lab:

- Introduction to different browsers and HTML
- Designing of simple web pages using basic HTML tags, attributes and elements.
- Introduction to Doctype element and importance of comments.
- Web pages containing Headings, Paragraphs, and Formatting Text, lists, and links
- Introduction to Images and Tables in HTML
- Introduction to CSS and applying CSS to HTML
- Web page design using CSS Selectors, Properties and Values
- Web page design using CSS Colors and Backgrounds
- Web page design using CSS Box Model
- Web page design using CSS Margins, Padding, Borders, Text and Font Properties
- Introduction to JavaScript, its variables and operators

- Introduction to Document and Window Object
- Programs related to JS Data Types and Num Type Conversion, Math and String Manipulation, Objects and Arrays
- Programs related to Date and Time, Conditional Statements, Switch Case, Looping in JS, and Functions
- Overview of NodeJS: Basics, setup, console, command utilities and modules

Text Books:

- HTML5 : Cover CSS 3, JavaScript, XML ,XHTML,Ajazx,Jquery :Black Book , Second Edition, Dreamtech .
- Brad Dayley, "Node.js, MongoDB, and AngularJS Web Development", BAddison-Wesley Professional

Reference Books:

- Achyt S Godbole &Atul Kahate, "Web Technologies TCP/IP Architecture and Java Programming" ,2nd Edition, TMH.
- Uttam K. Roy, "Web Technologies" , Oxford.

CO-PO & PSO Correlation

Course Name: Web Development Lab I												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	2		2					1	2	1	
CO2:	1	3	1						1	2	1	
CO3:	1	3	1	2					1	2	1	
CO4:	1	3	2						1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**III**
Name of the Course:		**Data Visualization Lab**	**Course Code:**		**SOE-B-CSE-21-308**
Credits	**:**	**1**	**No of Hours :**		**1 Hr. / week**
Max Marks	**:**	**25**			

Course Description:

This course is all about data visualization, the art and science of turning data into readable graphics. We'll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modeling, data processing (such as aggregation and filtering), mapping data attributes to graphical attributes, and strategic visual encoding based on known properties of visual perception as well as the task(s) at hand. Students will also learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of color and choice of visual encoding.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the key techniques and theory behind data visualization.
CO2	Use effectively the various visualization structures (like tables, spatial data, tree and network etc.)
CO3	Evaluate information visualization systems and other forms of visual presentation for their effectiveness.
CO4	Design and build data visualization systems

The following concepts will be covered in the lab:

- Introduction to Matplotlib by drawing basic plots (plot, scatter, bar, stem, step)
- Learn to draw various statistical plots like histogram, boxplot, error bar, violin plot, pie plot.
- Explore different parameters of line plot: line color, line width, line style, legend, marker with the help of an example.
    - Example: Compare the salaries of data scientists and software engineers using line graph
- Explore different parameters of bar charts: bar width, bar color, shifting the bars, xticks, legends using the above example

- Explore different parameters of pie chart: strangle, explode, fig size, explode, color options, legend, autopct, title, font etc. with the help of an example.
- Learn to draw Histogram with the help of sample dataset
- Learn to draw Box plot with the help of sample dataset
- Introduction to SEABORN
- Draw Line plot using SEABORN library and explore different parameters of it.
- Draw Bar plot using SEABORN library and explore different parameters of it.
- Draw Cat plot using SEABORN library and explore different parameters of it.
- Explore the utilities and applications of Histogram
- Learn to draw Pair plot on iris dataset
- Draw Heat Map using SEABORN library and explore different parameters of it.

Text Books:

- Tamara Munzner, "Visualization Analysis and Design", A K Peters Visualization Series, CRC Press, 2014.
- Scott Murray, "Interactive Data Visualization for the Web", O'Reilly, 2013.

Reference Books:

- Alberto Cairo, "The Functional Art: An Introduction to Information Graphics and Visualization", New Riders, 2012
- Nathan Yau, "Visualize This: The Flowing Data Guide to Design, Visualization and Statistics", John Wiley & Sons, 2011.

CO-PO & PSO Correlation

Course Name: Data visualization lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1		1						1	2	1	
CO2:	2	1	2	2					1			
CO3:			1								2	
CO4:	1	2									2	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**III**
Name of the Course	**:**	**MOOCS/SWAYAM/Certification/ Liberal Arts(Programing in C++)**	**Course Code**	**:**	**SOE-B-CSE-21-309**
Credits	**:**	**2**	**No of Hours**	**:**	**2 Hrs./week**
Max Marks	**:**	**50**			

Course Description:

Introduction to computer programming using C++. Emphasis on the fundamentals of object-oriented design with development, testing, implementation, and documentation. Includes language syntax, data and file structures, input/output devices, and files.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the concepts of Object-oriented feature.
CO2	Understand the concepts of: a) Variables, data Types (including strings and arrays) and Expressions b) Flow of Control c) Functional and procedural abstraction and its importance in good program design d) Pointers and memory allocation (static and dynamic) e) Iteration and Recursion
CO3	Analyze a simple programming problem specification.
C04	Design a high-level (programming language independent) solution to the problem using functional abstraction and general imperative programming language constructs.

Syllabus:

Unit-I:

Object-Oriented Programming Concepts: Introduction, comparison between procedural programming paradigm and object-oriented programming paradigm, basic concepts of object-oriented programming — concepts of an object and a class, interface and implementation of a class, operations on objects, relationship among objects, abstraction, encapsulation, data hiding, inheritance, overloading, polymorphism, messaging.

Unit-II:
Standard Input/Output: Concept of streams, hierarchy of console stream classes, input/output using overloaded operators >> and << and member functions of i/o stream classes, formatting output, formatting using ios class functions and flags, formatting using manipulators. Classes and Objects: Specifying a class, creating class objects, accessing class members, access specifiers, static members, use of const keyword, friends of a class, empty classes, nested classes, local classes, abstract classes, container classes, bit fields and classes.

Unit-III:
Pointers and Dynamic Memory Management: Declaring and initializing pointers, accessing data through pointers, pointer arithmetic, memory allocation (static and dynamic), dynamic memory management using new and delete operators, pointer to an object, this pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures. Constructors and Destructors: Need for constructors and destructors, copy constructor, dynamic constructors, explicit constructors, destructors, constructors and destructors with static members, initializer lists.

Unit-IV:
Operator Overloading and Type Conversion: Overloading operators, rules for overloading operators, overloading of various operators, type conversion - basic type to class type, class type to basic type, class type to another class type. Inheritance: Introduction, defining derived classes, forms of inheritance, ambiguity in multiple and multipath inheritance, virtual base class, object slicing, overriding member functions, object composition and delegation, order of execution of constructors and destructors.

Unit-V:
Virtual functions & Polymorphism: Concept of binding - early binding and late binding, virtual functions, pure virtual functions, abstract clasess, virtual destructors. Exception Handling: Review of traditional error handling, basics of exception handling, exception handling mechanism, throwing mechanism, catching mechanism, rethrowing an exception, specifying exceptions. Templates and Generic Programming: Template concepts, Function templates, class templates, illustrative examples. Files: File streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

Text Books:

1. Lafore R., "Object Oriented Programming in C++", Waite Group.
2. E. Balagurusamy, "Object Oriented Programming with C++", Tata McGraw Hill.

Reference Books:

1. R. S. Salaria, "Mastering Object-Oriented Programming with C++", Salaria Publishing House.
2. Bjarne Stroustrup, "The C++ Programming Language", Addison Wesley.
3. Herbert Schildt, "The Complete Reference to C++ Language", McGraw Hill-Osborne.
4. Lippman F. B, "C++ Primer", Addison Wesley.
5. R. S. Salaria, "Test Your Skills in Object-Oriented Programming With C++", Salaria Publishing House.

CO-PO & PSO Correlation

Course Name: MOOCS/SWAYAM/Certification/Liberal Arts (Programing in C++)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	1						2			
CO2:	2	2										1
CO3:			2						1			
CO4:	2	2										

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech**	**Semester**	**:**	**III**
Name of the Course:		**PROFESSIONAL DEVELOPMENT-III**	**Course Code:**		**SOE-B-CSE-21-310**
Credits	**:**	**1**	**No of Hours**	**:**	**1 Hrs./ week**
Max Marks	**:**	**25**			

Course Description:

Information is crucial to an organization and when this information is communicated in writing, the quality of such communications can have a significant impact on business performance and decision making. Effective business writing is concise, accurate, unambiguous, logical and easily understood. This Professional Development (Business Writing Skills) course teaches the best practices students must know to be able to write clear, effective, professional business documents. This course will help students to develop the skills necessary for successful business writing – be it reports, business proposals and official communication.

The another purpose of this course is to equip the students with the nuances of the English language which includes proficiency in vocabulary and its effective usage in speaking and writing. It further helps them to prepare for various competitive exams and to keep up with the increasing demand for English in Indian society and at the global level. It also develops their overall confidence and personality.

Course Objectives:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	To make student understand the benefits and usage of effective communication and business communication context by removing barriers of communication
CO2	To make students conversant with the basic forms, formats and techniques of business writings
CO3	To make students proficient in vocabulary and its effective usage of English in speaking and writing.
CO4	To make students proficient in reading comprehension to stand out in any competitive exam
CO5	Students will be able to prepare various business and project reports, Proposals

Syllabus

UNIT- I: Communication In Business

Business Communication-functions and principles of communication (7C's of communication), Types of Communication, Context of communication, Medium of communication, Barriers to communication.

UNIT – II: Elements Of Business Writing

Business letter -principles of business writing; Elements of letter writing and styles of writing, Resume, covering letter.

UNIT–III: Competitive English I

Enhance word Power, Synonyms and Antonyms, one-word substitution, error detection, rearrangement of sentence, paragraph, jumbled parts, idioms and phrase

UNIT-IV: Competitive English II

Reading comprehension, Theme detection, deriving conclusion from passages, Comprehension of Unseen Passages, Précis writing.

UNIT – V: Business Proposals And Reports

Project proposals- characteristics and structure, Project reports – types- characteristics – structure, Process and mechanics of report writing- visual aids- abstract - executive summary- recommendation Writing- definition of terms.

Text Books:

- Raman, Meenakhshi, and Prakash Singh, "Business Communication" O U P, New Delhi, 2008.
- Lesikar, Raymond V., John D Pettit, and Mary E FlatlyLesikar's, "Basic Business Communication", 10th ed. Tata McGraw-Hill, New Delhi, 2007.

- Gerson, Sharan J., and Steven M Gerson, "Technical Writing: Process and Product. Pearson Education", New Delhi, 2008.
- Murphy, Herta, Herbert W Hildebrandt, and Jane P Thomas, "Effective Business Communication" 7th ed. Tata McGraw-Hill, New Delhi.
- Bovee, Courtland and John V Thill, "Business Communication Today", 8th ed. Pearson Education, New Delhi, 2008.

Reference Books:

- Stuart Bonne E., Marilyn S Sarow and Laurence Stuart, "Integrated Business Communication in a Global Market Place",3rd ed. John Wiley India, New Delhi, 2007.
- Guffey, Mary Ellen., "Business Communication: Process and Product", 3rd ed. Thomson and South-western, 2004.
- Fiske, john, "Introduction to Communication Studies", Rotledge London, 1990.
- Geoffrey Leech & Jan Svartvik – "A Communicative Grammar of English", ELBS Longman, England.
- Bill Scott, "The Skills of Communicating", Jaico Publishing House, Mumbai, 2004.
- Gartside L, "Model Business Letters", Pitman, London, 1992.
- T.L.H. Smith, Pearse, I.E.S., "The English Errors of Indian Students", Oxford University Press, Madras- Latest Edition.
- P.R. Sarkar, "Grammar and Composition", Anand Marg Publications, Kolkata

CO-PO & PSO Correlation

Course Name: PROFESSIONAL DEVELOPMENT-III												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:		**2**		**3**		**1**	**2**					**1**
CO2:		**1**		**2**		**1**	**1**					
CO3:				**3**		**2**	**2**					**1**
CO4:				**1**		**1**	**1**					
CO5:						**2**	**1**				**1**	

Note: 1: Low 2.: Moderate 3: High

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester IV

S. No.	Subject Code	Board of Study	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P)/ 2 (L+T+P)
				L	T	P	PRE**		ESE*	Total Marks	
							Mid Sem	TA			
1	SOE-B-CSE-21-401	CSE	Probability and Statistics	3	1	0	30	20	50	100	4
2	SOE-B-CSE-21-402	CSE	Introduction to AI & Machine Learning	3	1	0	30	20	50	100	4
3	SOE-B-CSE-21-403	CSE	Analysis and Design of Algorithm	3	1	0	30	20	50	100	4
4	SOE-B-CSE-21-404	CSE	Compiler Design	3	0	0	20	15	40	75	3
5	SOE-B-CSE-21-405	CSE	Analysis and Design of Algorithm Lab	0	0	4	0	30	20	50	2
6	SOE-B-CSE-21-406	CSE	Web Development Lab II	0	0	4	0	30	20	50	2
7	SOE-B-CSE-21-407	CSE	AI &ML Lab	0	0	8	0	60	40	100	4
8	SOE-B-CSE-21-408	CSE	Professional Development IV	0	0	2	0	25	0	25	1
			Total	**12**	**3**	**18**	**110**	**220**	**270**	**600**	**24**

* End Semester Examination
** Progress Review Examination

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**IV**
Name of the Course:		**Probability and Statistics**	**Course Code:**		**SOE-B-CSE-21-401**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

The purpose of studying Probability Statistics and Numerical Analysis is to introduce the mind to the scientific method of analysis through which, the practical problems can be identified, explanations generated, and logical solutions selected which in essence are requisites for the development of good engineering sense.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Numerically estimate the roots of algebraic and transcendental equations.
CO2	Solve the system of linear algebraic equations by direct and iterative methods.
CO3	Obtain the numerical solution of differentiation and integration.
CO4	Obtain the numerical solution of Ordinary Differential Equations.
CO5	Use the mathematical concepts of Discrete and Continuous Probability Distributions to formulate and solve the real life problems.

Syllabus:

Unit–I: Solution of algebraic and transcendental equations:

Roots of Algebraic and Transcendental Equations, Bisection, Regula- Falsi and Newton-Raphson Methods, System of linear algebraic equations, Consistency and Existence of Solutions, Direct Methods: Gauss Elimination and Gauss-Jordan Methods, Iterative Methods: Jacobi's, Gauss-Siedal & Successive Over Relaxation Methods.

Unit-II: Finite Differences and Interpolation:

Finite Differences and Interpolation, Interpolation with equally and unequally spaced points, Interpolation Formulae based on forward, backward, central and divided differences, Lagrange's Interpolation formula, Inverse Interpolation.

Unit-III: Numerical Differentiation and Integration:

Numerical Differentiation, Derivatives using Forward, Backward and Central Difference Formulae, Numerical Integration, Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's rules, Weddle's rule.

Unit-IV: Statistics:

Measure of central tendency: Moments, Expectation, dispersion, skewness, kurtosis, expected value of two dimensional random variable, Linear Correlation, correlation coefficient, rank correlation coefficient, Regression, Bounds on probability, Chebyshev's Inequality.

Unit-V: Probability:

Random variables, Expectation, Mean, Standard Deviation of Discrete & Continuous Random Variables, Probability Distributions, Discrete & Continuous Probability Distributions, Binomial, Poisson and Normal distributions.

Text Books:

- B.S. Grewal,"Higher Engineering Mathematics", (38th edition),Khanna Publishers.
- Dr. B.S. Grewal, "Numerical Methods in Engineering and Science", Khanna Publishers.
- M. K. Jain, S. R. K. Iyengar & R. K. Jain, "Numerical Methods for Scientific and Engineering Computation" Wiley Eastern Limited.

Reference Books:

- Erwin Kreyszig, "Advanced Engineering. Mathematics",(8th edition) – John Wiley & Sons.
- B. V. Rammana, "Higher Engineering Mathematics", Tata McGraw Hill.
- K. Shankar Rao, "Numerical Methods for Scientists and Engineers", Prentice Hall of India.
- S. S. Sastry," Numerical Methods", Prentice Hall Inc. India.

CO-PO & PSO Correlation

Course Name: Probability Statistics and Numerical Analysis												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2	2						2		1	2
CO2:		1	2						1		1	2
CO3:		2	2						1		1	2
CO4:		1	2						2		1	2
CO5:		2	2						2		1	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**IV**
Name of the Course:		**Introduction to AI & Machine Learning**	**Course Code:**		**SOE-B-CSE-21-402**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description:

The course will cover both fundamental concepts of Artificial Intelligence and Machine Learning such as search techniques, knowledge representation, supervised and unsupervised learning. This course also covers the applications as well as case studies of both the areas. This course is intended for both students majoring in Computer Science as well as no specialists with the necessary background who wish to acquire a general familiarity with Artificial Intelligence.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explore the fundamental issues and challenges in AI and Machine Learning including data and model selection.
CO2	Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
CO3	Evaluate the various Supervised Learning algorithms using appropriate Dataset
CO4	Evaluate the various unsupervised Learning algorithms using appropriate Dataset.
CO5	Understand various applications of AI and ML in different domains.

Syllabus:

Unit-I: Overview of Artificial Intelligence and Machine Learning

AI problems, foundation of AI and history of AI intelligent agents, Agents and Environments, Overview of human learning and machine learning, types of machine learning, Data Preparation: Validation, Dimensionality, Missing Values

Unit-II: Knowledge Representation and Search Techniques

Knowledge representation issues, Predicate logic- logic programming, Rule-based systems, Semantic nets, Search Techniques: Uniformed search strategies – Breadth first search, depth first Search. Search with partial information (Heuristic search) Hill climbing, A*, AO* Algorithms.

Unit-III: Supervised Learning

Bayesian Learning, Naïve Bayes Classifier, K-Nearest Neighbour, Support Vector Machines, Decision Tree classifier, Linear Regression, Logistic Regression, Performance evaluation of a model: basics of confusion metrics, evaluation metrics, Techniques to improve Classification

Accuracy: Cross-validation, Ensemble methods, Bagging, Boosting, Random Forest

Unit-IV: Unsupervised Learning

Supervised vs. Unsupervised Learning, Applications, Clustering, K-Means clustering, agglomerative hierarchical clustering, Density-Based Methods, Evaluation of clustering, Outliers and Outlier detection methods

Unit–V Applications and Case Studies

Case study: Self Driving Cars, Smart Home and IoT Applications, Robotics, Mine Detections, Medical Diagnosis, Personalised medicine, Applications in multiple domains. Smart City, Implications of AI, Predicting the Future and Social Implications

Text Books:

- Kevin Warwick, “Artificial Intelligence by The Basics”
- C.M. Bishop, “Pattern recognition and machine learning”, Springer, 2006
- S. Russel and P. Norvig, “Artificial Intelligence- A Modern Approach”, (Second Edition), Pearson Education,
- R. O. Duda, P. E. Hart and D.G. Stork, “Pattern Classification”, John Wiley, 2001

Reference Books:

- Saikat Dull, S. Chjandramouli, Das, “Machine Learning”, Pearson
- Mark Fenner, “Machine Learning with Python for Everyone”, Pearson
- Anuradha Srinivasaraghavan, Vincy Joseph, “Machine Learning”, Wiley
- David Poole, Alan Mackworth, Randy Goebel, “Computational Intelligence: a logical approach”, Oxford University Press.
- G. Luger, “Artificial Intelligence: Structures and Strategies for complex problem-solving”, Fourth Edition, Pearson Education.
- J. Nilsson, “Artificial Intelligence: A new Synthesis”, Elsevier Publishers.

CO-PO & PSO Correlation

Course Name: Introduction to AI and Machine Learning												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	1	2	2					1	2	2	
CO2:	3	3	2	2					2	2	2	
CO3:			3								3	
CO4:	1										2	
CO5:	2	1							2			

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**IV**
Name of the Course:		**Analysis and Design of Algorithm**	**Course Code:**		**SOE-B-CSE-21-403**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks	**:**	**100**			

Course Description

Algorithms are the soul of computing. This course introduces basic methods for the design and analysis of efficient algorithms emphasizing methods useful in practice. Different algorithms for a given computational task are presented and their relative merits evaluated based on performance measures.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Analyse the performance of algorithms.
CO2	Employ graphs to model engineering problems, when appropriate.
CO3	Implement the design techniques i.e. dynamic programming, greedy algorithm etc. for more complex problems and analyze their performance.
CO4	Understand how the choice of data structures and the algorithm design methods impact the performance of programs.

Syllabus:

Unit-I Introduction:

Algorithm, Properties, Representations of Algorithms and Testing Algorithms, Performance Analysis-Space Complexity, Time Complexity, Asymptotic Notations-Big Oh Notation, Omega Notation, Theta Notation and Little Oh Notation, Limiting Behaviors of Asymptotic Notations, Solving Recurrence Relations-Substitution Method, Master Method and Recursion Tree Methods

Unit-II:

Disjoint Sets, Spanning Trees, Connected and Biconnected Components: Disjoint set operations, Union and find algorithms, spanning trees, connected components and biconnected components.

Unit-III: Divide and Conquer:

General method, Application- Binary Search, Quick Sort, Merge Sort, Strassen's Matrix Multiplication. Greedy Method: General Method, Applications-0/1 Kpsack Problem, Job Sequencing with Deadlines, Minimum Cost Spanning Trees, Single source shortest path problem

Unit-IV:

Dynamic Programming: General Method, Applications-Matrix Chain Multiplication, Optimal Binary Search Trees, 0/1 Knapsack Problem, all pair shortest path problem, Travelling salesman problem

Unit-V: Backtracking:

General Method, Applications- n – queen's problem, Sum of subsets problem, Graph Coloring, Hamiltonian Cycle Np-Hard and NP-Complete Problems: Basic Concepts, Non-Deterministic Algorithms, NP-Hard and NP-Complete Classes, Cock's Theorem

Text Books:

- Ellis Horowitz, Sartaj Sahni and S. Rajasekharan, "Fundamentals of Computer Algorithms", 2nd Edition, Universities Press.
- T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, PHI.
- P. H. Dave, H.B. Dave, "Design and Analysis of Algorithms", 2nd edition, Pearson Education.

Reference Text Books:

- M. T. Goodrich and R. Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons.
- S. Sridhar, "Design and Analysis of Algorithms", Oxford Univ. Press.
- Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education.
- R. Neapolitan and K. Imipour, "Foundations of Algorithms", 4th edition, Jones and Bartlett Student edition.

CO-PO & PSO Correlation

Course Name: Analysis and Design of Algorithm												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	3							3	3	2	1
CO2:	2	2							3	2	2	2
CO3:	2	2	2						3	2	2	2
CO4:	2	2	2						3	2	2	2

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**IV**
Name of the Course:		**Compiler Design**	**Course Code:**		**SOE-B-CSE-21-404**
Credits	**:**	**3**	**No of Hours**	**:**	**3 Hrs./ week**
Max Marks	**:**	**75**			

Course Description

The aim of this course is to learn how to design and implement a compiler and also to study the underlying theories. The main emphasis is for the imperative languages. This study explains the principles, techniques and tools required in developing compilers in a systematic way; To gain an understanding on different theoretical and systems concepts from computer science coming together in building a compiler.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Design and implement of a prototype compiler.
CO2	Define a grammar for a language and validation.
CO3	Generate Three address code of a grammar.
CO4	Learn about storage allocation.
CO5	Apply various optimization techniques to produce efficient code.

Syllabus:

Unit-I Introduction to Compiler

Single and Multi-Pass Compilers, Translators, Phases of Compilers, Compiler writing tools, Bootstrapping, Back patching. Finite Automata and Lexical Analysis: Role of Lexical Analyzer, Specification of tokens, Recognition of tokens, Regular expression, Finite automata from regular expression to finite automata, transition diagrams, Implementation of lexical analyzer, Tool for lexical analyzer – LEX, Error reporting.

Unit-II Syntax Analysis and Parsing Techniques:

Context free grammars, Bottom-up-parsing and top down parsing, Top down parsing: elimination of left recursion, recursive descent parsing, Predictive parsing; Bottom Up Parsing: Operator precedence parsing, LR parsers, Construction of SLR, canonical LR and LALR parsing tables, Construction of SLR parse tables for ambiguous grammar, the parser generator – YACC, error recovery in top down and bottom up parsing.

Unit-III Syntax Directed Translation & Intermediate code generation:

Synthesized and inherited attributes, dependency graph, Construction of syntax trees, bottom up and top down evaluation of attributes, S-attributed and L-attributed definitions. Postfix notation; Three address code, quadruples, triples and indirect triples, Translation of assignment statements, control flow, Boolean expressions and Procedure Calls.

Unit-IV Runtime Environment:

Storage organization, activation tree, activation record, allocation strategies, Parameter passing, symbol table, dynamic storage allocation.

Unit-V Code Optimization & Code Generation:

Basic blocks and flow graphs, Optimization of basic blocks, Loop optimization, Global data flow analysis, Loop invariant computations. Issues in the design of Code generator, register allocation, the target machine and a simple code generator.

Text Books:

- Alfred V.Aho, Ravi Sethi and J. D. Ullman, "Compiler-Principles, Techniques and Tools", Addison Wesley.
- Alfred V.Aho and J.D.Ullman, "Principles of Compiler Design", Narosa Publication.

Reference Books:

- A.C. Holub, "Compiler Design in C", Prentice Hall of India.
- A.Barret William and R.M.Bates, "Compiler Construction (Theory and Practice) ", (Galgotia Publication)
- Kakde, "Compiler Design", Galgotia Publication.

CO-PO & PSO Correlation

Course Name: Compiler Design												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	1						2	2	1	
CO2:		2	2						2	1	2	1
CO3:	2								2		2	1
CO4:	1	2							2	2	1	1
CO5:	2	2							2		2	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**IV**
Name of the Course	**:**	**Analysis and Design of Algorithm Lab**	**Course Code:**		**SOE-B-CSE-21-405**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./ week**
Max Marks:	**:**	**50**			

Course Description:

The lab experiment in this course is designed to introduce the principle techniques and practices required to understand the given problem and design the algorithm for solving the problem. It includes the study of various algorithmic design aspects to design algorithm in an efficient manner.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Analyze and estimate the time and space complexities of the algorithm.
CO2	Identify the computational issues and apply suitable algorithms to solve it effectively.
CO3	Conceptualize and design efficient and effective algorithmic solutions for different real-world problems.
CO4	To learn use of divide and conquer techniques and their application to solve the problems.
CO5	To learn use of greedy and dynamic programming techniques and their application in the field of computer science to solve problems.

The following concepts will be covered in the lab:

- Provide algorithms and programs to implement the following searching procedures.
  - Linear search
  - Binary search

  Discuss the detailed analysis of the developed algorithm.

- Implementation of Sorting algorithm like Quick sort, Heap Sort, Merge sort etc. and computation of its time complexity. Run the program for varied values of n> 5000, and record the time taken to sort. Plot a graph of the time taken versus

non graph sheet. The elements can be read from a file or can be generated using the random number generator.

- Implementation of divide-and-conquer method works along with its time complexity analysis: worst case, average case and best case.
- Implementation of ,0/1 Knapsack problem using (a) Dynamic Programming method (b) Greedy method.
- Implementation of Dijkstra's algorithm to find shortest paths from a given vertex in a weighted connected graph.
- Implementation of finding Minimum Cost Spanning Tree of a given connected undirected graph using Kruskal'salgorithm.
- Implementation of Prim's algorithm to find Minimum Cost Spanning Tree of a given connected undirected graph.
- Implementation of All-Pairs Shortest Paths problem using Floyd's algorithm.
- Implementation of Travelling Sales Person problem using Dynamic programming.
- Implementation of finding all Hamiltonian Cycles in a connected undirected Graph G of n vertices using backtracking principle.

Text Books:

- T. H. Cormen, C. E. Leiserson, R. L. Rivest, and C. Stein, "Introduction to Algorithms", 3rd Edition, PHI.
- P. H. Dave, H.B. Dave, "Design and Analysis of Algorithms", 2nd edition, Pearson Education.

Reference Text Books:

- M. T. Goodrich and R. Tomassia, "Algorithm Design: Foundations, Analysis and Internet examples", John Wiley and sons.
- S. Sridhar, "Design and Analysis of Algorithms", Oxford Univ. Press.
- Aho, Ullman and Hopcroft, "Design and Analysis of algorithms", Pearson Education.
- R. Neapolitan and K. Imipour, "Foundations of Algorithms", 4th edition, Jones and Bartlett Student edition.

CO-PO & PSO Correlation

Course Name: Analysis and Design of Algorithm Lab												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	1	2	2					1	2	2	
CO2:	2	2	2	2					2	2	2	
CO3:			1					1			3	
CO4:	1				2			2			2	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.(01UG020)**	**Semester**	**:**	**IV**
Name of the Course:		**Web Development Lab II**	**Course Code:**		**SOE-B-CSE-21-406**
Credits	**:**	**2**	**No of Hours :**		**2 Hrs./week**
Max Marks:	**:**	**50**			

Course Descriptions:

This course is designed as a programming intensive introduction to web technologies. We will study and build software programs using several different programming languages, markup languages and meta- markup languages. We will consider and work with two styles of client side programming - programming within the browser and programming standalone clients. On the server, we will program using NodeJS,

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Develop Static web based application.
CO2	Implement client side scripting.
CO3	Implement server side scripting.
CO4	Develop dynamic web based application.

The following concepts will be covered in the lab:

- Introduction to React JS, its templates, components, state and props
- Concepts related to Lifecycle of components, rendering list and portals
- Error handling in React JS, Routers, Redux and Redus Saga
- Service side rendering and unit testing in React JS
- Revisit the concepts of NodeJS from web development lab -I
- Introduction to Angular JS with various examples
- Concepts related to data binding, controller, 2-way data binding and filters in Angular JS
- Form and input validation in Angular JS
- Introduction to MongoDB and migration of Data into MongoDB
- Concepts of SQL and NoSql
- MongoDB with PHP, MongoDB with NodeJS
- Programs depicting Services Offered by MongoDB

- Python installation and configuration
- Developing a Python application
- Connection of MongoDB with Python
- Concepts of VCS: version control with Git

Text Books:

- HTML5 : Cover CSS 3, JavaScript, XML ,XHTML,Ajazx,Jquery :Black Book , Second Edition, Dreamtech .
- Brad Dayley, "Node.js, MongoDB, and AngularJS Web Development", Addison-Wesley Professional

Reference Books:

- Achyt S Godbole &Atul Kahate,"Web Technologies TCP/IP Architecture and Java Programming", ,2nd Edition, TMH.
- Uttam K. Roy, "Web Technologies", Oxford.

CO-PO & PSO Correlation

Course Name : Web Technology Lab II												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2							1	2	1	
CO2:	1	3	1						1	2	1	
CO3:	1	3	1						1	2	1	
CO4:	1	3	2						1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**IV**
Name of the Course:		**AI and ML Lab**	**Course Code:**		**SOE-CSE-21-407**
Credits	**:**	**4**	**No of Hours :**		**4 Hrs./week**
Max Marks	**:**	**100**			

Course Descriptions:

The laboratory augments the lecture course in Artificial Intelligence (AI) and Machine Learning (ML) by providing experience with different programming techniques. The laboratory introduces Commonly used AI and ML algorithms for various application domains.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Explain artificial intelligence, its characteristics and its application areas
CO2	Select and apply appropriate algorithms and AI techniques to solve complex problems
CO3	Solve different classification and regression problems using various supervised learning algorithms
CO4	Apply clustering algorithms to real life datasets

The following concepts will be covered in the lab:

- Implementation of DFS for water jug problem
- Implementation of BFS for tic-tac-toe problem using
- Implementation of TSP using heuristic approach
- Implementation of Simulated Annealing Algorithm
- Implementation of Hill-climbing to solve 8- Puzzle Problem
- Implementation of Data classification using Naïve Bayes classifier
- Implementation of Data classification using K-Nearest Neighbor classifier
- Implementation of K-Means Clustering Algorithm
- Implementation of Hierarchical Clustering Algorithm
- Implementation of Linear Regression

Text Books:

- Kevin Warwick, Artificial Intelligence: The Basics
- S. Russel and P. Norvig, "Artificial Intelligence – A Modern Approach", Second Edition, Pearson Education
- Mark Fenner, "Machine Learning with Python for Everyone", Pearson

Reference Books:

- David Poole, Alan Mackworth, Randy Goebel, "Computational Intelligence: a logical approach", Oxford University Press.
- Saikat Dull, S. Chjandramouli, Das, "Machine Learning", Pearson
- R. O. Duda, P. E. Hart and D.G. Stork, "Pattern Classification", John Wiley, 2001
- G. Luger, "Artificial Intelligence: Structures and Strategies for complex problem-solving" , Fourth Edition, Pearson Education.
- J. Nilsson, "Artificial Intelligence: A new Synthesis", Elsevier Publishers.

CO-PO & PSO Correlation

Course Name: AI &ML Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	1	2	2					1	2	2	
CO2:	3	3	2	2					2	2	2	
CO3:			3								3	
CO4:	1							2			2	

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech.**	**Semester :**	**IV Semester**
Name of the Course:	**PROFESSIONAL DEVELOPMENT -IV**	**Course Code:**	**SOE-B-CSE-21-408**
Credits :	**1**	**No of Hours :**	**1 Hr. / week**
Max Marks :	**25**		

Course Description

'Effective Speaking Skills' course is designed to teach students to apply theories and principles of effective interpersonal and public speaking. This course provides instruction and experience in preparation and delivery of speeches within a public setting and group discussion. Emphasis is on research, preparation, delivery, and evaluation of informative, persuasive, and special occasion public speaking. Upon completion, students should be able to prepare and deliver well-organized speeches and participate in group discussion with appropriate audiovisual support. Students should also demonstrate the speaking, listening, and interpersonal skills necessary to be effective communicators in academic settings, in the workplace, and in the community.

Course Objectives

CO Number	Course Outcome
CO1	Students will understand the importance of Public speaking in securing job and move ahead in career.
CO2	Students will be able to Combat Stage Fright, able to deliver Different Types of Speeches
CO3	Students will be able to give professional presentation using Power point and create impression in professional environment
CO4	Students will able to give opinions in group discussion and will be able to conduct outcome based discussion.
CO5	Students will be able to understand Interview process and handle the basic HR Interview questions confidently.

Course Content

UNIT- I: Speaking: An Overview

Speaking: An Overview, Listening Effectively, Non-Verbal Communication, Art of Persuasion.

UNIT- II: Dynamics Of Professional Speaking

Introduction, Combating Stage Fright, Describing Objects/Situations/People, Delivering Just-a-minute Sessions, Delivering Different Types of Speeches.

UNIT- III: Professional Presentations

Planning of a Presentation, designing of a Presentation, Preparing Power Point Slides for Presentations, Individual and Group Presentations, Making Presentation.

UNIT- IV: Group Discussions

Introduction, GD and Debate, Types of GD, Personality Traits to be evaluated, Dynamics of Group Behaviour, DOs and DON'Ts of GD.

UNIT –V: Job Interviews

Introduction, Process, Stages in Job Interviews, Types, Desirable Qualities, Preparation, Tips for Success

Text Books

- Jeff Butterfield, "Soft Skills for Everyone", CENAGE LEARNING, Delhi, 2014
- Sanjay Kumar and Pushp Lata, "Communication Skills", New Delhi: Oxford University Press, 2011
- Pushp Lata and Sanjay Kumar, "Communicate or Collapse: A Handbook of Effective Public Speaking, Group Discussion and Interviews", New Delhi: Prentice Hall of India, 2007
- Dale Carnegie, "The Art of Public Speaking", New Delhi: Ocean Paperbacks, 2016

Reference Books

- Stephen E. Lucas, "The Art of Public Speaking", Third Edition, Singapore: McGraw-Hill, 1989
- Sonya Hamlin, "How to Talk so People Listen", New York: Throson, 1993
- Jeff Davidson, "The Complete Guide to Public Speaking", Manjul Books PVT. Bhopal, 2006
- Turk, Cristopher, "Effective Speaking, Second Indian Reprint", Taylor and Francis Group, Delhi, 2010

CO-PO & PSO Correlation

Course name: Professional Development (IV)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:		2		3		1	2					1
CO2:		1		2		1	1					
CO3:				3		2	2					1
CO4:				1		1	1					
CO5:				1		1	1					1

Note: 1: Low 2.:Moderate 3: High

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester V

Board of Study	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2
			L	T	P	PRE** Mid Sem	PRE** TA	ESE*	Total Marks	(L+T+P)
CSE	SOE-B-CSE-21-501	Microrprocessor & Microcontroller	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-502	Computer Networks	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-503	Data Mining and Warehousing	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-504	Cloud Computing	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-505(X)	Professional Elective-I	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-506	Microrprocessor & Microcontroller Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-507	Computer Network lab	0	0	4	0	30	20	50	2
CSE	SOE-B-CSE-21-508	Data Mining and Warehousing Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-509(X)	Professional Elective Lab-I	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-510	Professional Development - V	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-511	Open Elective (MOOCS/SWAYAM/Certification/Liberal Arts)	_	_	_	_	30	20	50	2
		Total	**15**	**0**	**12**	**150**	**280**	**370**	**800**	**23**

Professional Elective - I

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-505(1)	CSE	Computer Graphics
2	SOE-B-CSE-21-505(2)	CSE	Cryptography and Information Security
3	SOE-B-CSE-21-505(3)	CSE	Optimization using Machine Learning
4	SOE-B-CSE-21-505(4)	CSE	Introduction to IoT
5	SOE-B-CSE-21-505(5)	CSE	Mobile Application Development

Professional Elective Lab - I

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-509(1)	CSE	Computer Graphics Lab
2	SOE-B-CSE-21-509(2)	CSE	Cryptography and Information Security Lab
3	SOE-B-CSE-21-509(3)	CSE	Optimization using Machine Learning Lab
4	SOE-B-CSE-21-509(4)	CSE	Introduction to IoT Lab
5	SOE-B-CSE-21-509(5)	CSE	Mobile Application Development Lab

Programme:	**B.Tech.**	**Semester:**	**V**
Name of the Course:	**Microprocessor and Microcontrollers**	**Course Code:**	**SOE-B-CSE-21-501**
Credits:	**3**	**No of Hours :**	**3 Hrs. / week**
Max Marks:	**100**		

Course Description:

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation. Advanced microcontrollers are often much more powerful, comparable to the very advanced microprocessors. The AVR and ARM processors are of this category.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand fundamental operating concepts behind microprocessors and microcontrollers.
CO2	Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications
CO3	Design microprocessor based solutions to problems.
CO4	Understand Low-Level and Embedded C Programming.
CO5	Apply this knowledge to more advanced structures.

Course Content

Unit I.

Brief introduction to 8085 CPU Architecture, Pin configuration and description of various signals, Addressing Modes Registers, Memory Addressing Instructions Set Instruction formats. Instruction set of 8085. Addressing modes — Instruction set and assembler directives — Assembly language programming — Modular Programming — Linking and Relocation — Stacks — Procedures — Macros — Interrupts and interrupt service routines — Byte and String Manipulation.

Unit II.

THE 8086 ARCHITECTURE: Pin diagram of 8086 and description of various signals. Architecture block diagram of 8086 & description of sub-blocks such as EU & BIU & of

various registers; Description of address computations & memory segmentation; Program relocation; addressing modes; Instruction formats. Instruction set of 8086.

Unit III.

Microcontrollers: Type, processor architecture memory type, hardware features, 8051 Processor architecture, Addressing modes, 8051InstructionSet– Data movement Instruction, arithmetic instruction, Logic instruction, Branch group Instruction

Unit IV.

8051 software and programming: Memory interfacing and address decoding, programming Input/Output port/timer/ADC/DAC, Serial data communication controller and interrupt controller for different application with respect to instrumentation & control. ARM Processor Fundamentals.

Unit V.

Programming 8051 Timers — Serial Port Programming — Interrupts Programming — LCD & Keyboard Interfacing — ADC, DAC & Sensor Interfacing — External Memory Interface-Stepper Motor and Waveform generation — Comparison of Microprocessor, Microcontroller, PIC and ARM processors

Text Books:

- Ramesh S.Gaonkar, Microprocessor Architecture, Programming, and Applications with 8085, Prentice Hall
- Brey, The Intel Microprocessors 8086- Pentium processor, PHI
- A.K.Ray and K.M.Bhurchandi, “Advanced Microprocessors and Peripherals”,Tata McGrawHill,2000.
- Badri Ram, Advanced Microprocessors and Interfacing, TMH
- Triekel & Singh, The 8088 & 8086 Microprocessors- Programming, Interfacing, Hardware & Applications: PHI.
- D.B.Hall, Microprocessor and Interfacing, McGrawHill
- Andrew N. Sloss, Dominic Symes, Chris Wright and John Rayfield, “ARM System Developer's Guide, Designing and Optimizing System Software”, Elsevier, 2004.

Reference books:

- Yu-Chang Liu & Glenn, A Gibson, Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design, PHI.
- Microsoft MASM Reference Manual– Published by Microsoft Corporation (Softcopy of Document available with MASM Software)
- Assembler Inside & Out; Harley Hahn Pub. Osborn MgGrawHill, Burkley USA.

CO-PO & PSO Correlation

Course Name: Microprocessor and Microcontrollers												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	3	2	2	2	2	1	1	3	3	2	2
CO2:	3	3	3	3	2	2	2	2	3	3	3	3
CO3:	3	3	2	2	2	2	1	1	3	3	2	2
CO4:	3	3	2	2	2	2	1	1	3	3	2	2
CO5:	3	3	3	3	2	2	2	2	3	3	3	3

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Computer Networks**	**Course Code:**		**SOE-B-CSE-21-502**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / week**
Max Marks	**:**	**100**			

Course Description:

This course offers lectures, tutorials, case studies, laboratory, and online interaction to provide a foundation in software engineering concepts. It includes representing information with the traditional and modern approaches in software engineering including knowledge of CASE tools. This course further explains concepts of software development process, agile, scrum and DevOps development process, software project management, software requirement and design engineering, development, quality assurance, automated testing, operational support and software maintenance.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Develop fundamental communication systems with customize requirement(s).
CO2	Design computer network as per the specifications given.
CO3	Acquire analytical ability to identify the problems area in the hardware planning of computer network with possible trouble shooting technique.
CO4	Diagnose the possible Bugs in the software application and to provide the possible trouble shoot.
CO5	Understand the basic concept to Project planning, Network planning, design, selection of hardware components and its configuration.

Syllabus:

Unit - I Network Fundamentals and Reference Models:

Protocol Hierarchies, Design Issues for the Layers, Connection-Oriented and Connectionless Services, Service Primitives, The Relationship of Services to Protocols. Reference Models: The OSI Reference Model. The TCP/IP Reference Model. A Comparison of the OSI and TCP/IP Reference Model.

Unit - II The Physical Layer and Flow Control:

Guided Transmission Media: Magnetic Media, Twisted Pair, Coaxial Cable, and Fiber Optics. Data Link Layer Design Issues: Service Provided to the Network Layer, Framing,

Error detection and corrections, Elementary Data Link Protocols: Stop-and-Wait Protocol, Sliding Window Protocol, Go Back N etc.

Unit - III Medium Access Control Sub-layer:

The Channel Allocation Problem: Static and Dynamic Channel Allocation in LANs and MANs. Multiple Access Protocols: ALOHA, Carrier Sense Multiple Access Protocols (CSMA), Collision-Free Protocols. Ethernet Cabling and Manchester Encoding. Data Link Layer Switching: Basic Concepts of networking devices, Virtual LAN.

Unit - IV Network Layer: Network Layer Design Issues:

Store-and-Forward Packet Switching, Services Provided to the Transport Layer, Implementation of Connectionless & Connection-Oriented Service, Comparison of Virtual-Circuit and Datagram, Subnets. Routing Algorithms and Congestion Control algorithm, IP Addressing .

Unit - V Transport and Application Layer:

Services Provided to the Upper Layers, Transport Service Primitives, Berkeley Sockets. Elements of Transport Protocols: Addressing, Connection Establishment, Connection Release, Flow Control and Buffering, Multiplexing, Crash Recovery. The Internet Transport Protocols: TCP Service Model, TCP Segment Header, Application layer protocols.

Text Books:

- "Computer Networks" by Andrew S Tananbaum 4th Edition by Pearson Publication.
- "Computer Networking with Internet Protocols and Technology" by William Stallings Pearson's.
- "Data Communications and Computer Networks" 2nd Edition by Prakash C Gupta PHI.

Reference Books:

- "Internetworking with TCP/IP, Principles Protocols and Architecture" 5th Edition Vol1 by Duglas E Comer by PHI.
- "TCP/IP Protocol Suit" 4th Edition by Behrouz a Forouzen Tata McGraw Hills.
- "Computer Network - a Systems Approach" by Larry L Peters and Bruce S Davie 5th Edition by Morgan Kaufmabb Elsevier.
- "Data Networks" 2nd Edition by Dimitri Betsekas Robert Gallager by PHI.

CO-PO & PSO Correlation

Course Name: Computer Networks												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	1				3						
CO2:	2	1				1			2	2		1
CO3:	1		1			2	2	2	1	2		
CO4:	1	2	1				3	3	1	1		2
CO5:	1	1				1				2	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Datamining & Warehousing**	**Course Code:**		**SOE-B-CSE-21-503**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / week**
Max Marks	**:**	**100**			

Course Description:

This course provides the student with in depth knowledge of Data Warehousing principles, Data Warehouse techniques, and Business Intelligence systems. The course introduces the topics of Data Warehouse design, Extract-Transform-Load (ETL), Data Cubes, and Data Marts. Students will create Business Intelligence using Data Warehouses with several OLAP and analytical tools.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the functionality of the various data mining and data warehousing component
CO2	Appreciate the strengths and limitations of various data mining and data warehousing models
CO3	Explain the analyzing techniques of various data
CO4	Describe different methodologies used in data mining and data ware housing.

Syllabus:

Unit-I: Introduction

Data Warehousing – Introduction, Overview and Concepts: Need for data warehousing, Basic elements of data warehousing, Architecture and Infrastructure, Data Design and Data Representation, OLAP in data warehouse – ROLAP, MOLAP, HOLAP, Various Data Warehouse Schemas.

Unit-II: Introduction to Data Mining

Definition, KDD, Challenges, Data Mining Tasks, Data Preprocessing- Data Cleaning, Missing Data, Dimensionality Reduction, Feature Subset Selection, Discretization and Binaryzation , Data Transformation; Measures of similarity and dissimilarity-Basics.

Unit-III: Association Rules:

Problem Definition, Frequent Item Set Generation, Support and Confidence Measures, Association Rule Generation, APRIORI Algorithm, The Partition Algorithms, FP-Growth Algorithms etc.

Unit-IV: Classification:

General Approaches to solving a classification problem, Evaluation of Classifiers, Classification techniques, Decision trees, Methods for expressing attribute test conditions, Measures for Selecting the Best split, Naïve-Bayes Classifier, Bayesian Belief Networks; K-nearest neighbor Classification-Algorithm and characteristics.

Unit-V: Clustering Techniques

Overview, features of cluster analysis, Types of Cluster Analysis Methods, Partitioned Methods, Hierarchical Methods, Density Based Methods.

Text Books:

- J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Ed, 2006.
- Data Mining Techniques – Arun K Pujari, University Press.

Reference Books

- W. H. Inmon, "Building the Data Warehouse", 3rd edition.
- Anahory and Murray, Data warehousing in the real world , Pearson Education/Addison Wesley.
- Margaret Dunham, Data Mining: Introductory and Advanced Topics, Published by Prentice Hall.

CO-PO & PSO Correlation

Course Name: Datamining & Warehousing												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2	1			1			1	2		
CO2:	1	2				1			1	2		
CO3:	1	2	1			1			1	2		
CO4:	1		2			1			1	2		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**: V**
Name of the Course	**:**	**Cloud Computing**	**Course Code:**	**SOE-B-CSE-21-504**
Credits	**:**	**3**	**No of Hours :**	**3 Hrs. / week**
Max Marks	**:**	**100**		

Course Description:

This course is aims to understand the basics of cloud computing and its working. The concept of virtualization in cloud computing will be explained, and the types of virtualization and hypervisor will be covered. In all, the difference services and deployment models will be covered, and the trust over cloud computing and security challenges will be discussed.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the basic concept of the cloud computing
CO2	Understand the concept of virtualization, hypervisor and implementation of virtual machines
CO3	Gain the knowledge of the Cloud Delivery Models like IaaS, PaaS and SaaS with reference to Services.
CO4	Understanding of Cloud Computing Reference Architecture with reference to relationships between various functional units and Security issues

Syllabus:

Unit-I: Introduction:

Cloud Computing, Layers and Types of Clouds, Cloud Infrastructure Management, Challenges and Applications. Cloud Services: Introduction to Cloud Services IaaS, PaaS and SaaS. Cloud Architecture: Public, Private, Hybrid, and Community Cloud.

Unit-II: Virtualization:

Introduction to Virtualization Technologies, Load Balancing and Virtualization, Understanding Hyper visors, Type of Hypervisor, Understanding Virtual Machines Provisioning and Manageability Virtual Machine Migration Services, Provisioning in the Cloud Context, Virtualization of CPU, Memory, I/O Devices, Virtual Clusters and Resource management.

Unit-III: Cloud Services:

Software as a Service (SaaS): Evolution of SaaS, Challenges of SaaS Paradigm, SaaS Integration Services, SaaS Integration of Products and Platforms. Infrastructure as a Services (IaaS): Introduction, Background & Related Work. Virtual Machines Provisioning and Manageability. Platform as a service (PaaS): Integration of Private and Public Cloud, Technologies and Tools for Cloud Computing, Resource Provisioning services.

Unit-IV: Cloud Deployment Models:

Private Cloud: Illustration of Private Cloud, Advantages of Private Cloud, Limitations of Private Cloud, Service Management, Journey into Private Cloud, Planning and Strategy. Standardization, Virtualization, Automation, Cloud, Case study – VMware.

Public Cloud: Illustration of Public Cloud, Why Public Cloud, Advantages of Public Cloud, Limitations of Public Cloud, Low degree of security and control, Lack of control on infrastructure, configuration, Network latency and accessibility concerns, Highest long term cost, Public v/s Private.

Hybrid Cloud: Why Hybrid Cloud, Illustration of Hybrid Cloud, Advantages of Hybrid Cloud, Challenges of Hybrid Cloud, Develop and manage hybrid workloads, developing applications for hybrid cloud, develop applications using PaaS, Managing hybrid workloads.

Unit-V: Cloud Security:

Architectural Considerations, General Issues, Trusted Cloud Computing, Secure Execution environments and Communications, Micro architectures, Identity Management and Access Control, Autonomic Security.

Text Books:

- Cloud computing a practical approach - Anthony T.Velte , Toby J. Velte Robert Elsenpeter, TATA McGraw- Hill , New Delhi – 2010
- John W. itinghouse james F.Ransome, “Cloud Computing Implementation, Management and Security”, CRC Press.

Reference Books:

- Cloud Computing (Principles and Paradigms), Edited by Rajkumar Buyya, James Broberg, Andrzej Goscinski, John Wiley & Sons, Inc. 2011
- Cloud Security: A Comprehensive Guide to secure Cloud Computing, Ronald L. Krutz, Russell Dean Vines, Wiley

CO-PO & PSO Correlation

Course Name: Cloud Computing												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1								3			
CO2:		3	1		1						3	1
CO3:		3			1					1	2	
CO4:	1	3			1					1	2	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Computer Graphics**	**Course Code:**		**SOE-B-CSE-21-505(1)**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / Week**
Max Marks	**:**	**100**			

Course Description:

The objectives of this course are to equip students with the fundamental knowledge and basic technical competence in the field of computer graphics, emphasize on implementation aspect of Computer Graphics Algorithms and advance areas like Image Processing. Topics covered include graphics systems and input devices; geometric representations and 2D/3D transformations; viewing and projections; illumination and color models; animation; rendering and implementation; visible surface detection.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Define basics of Computer Graphics, display devices along with output primitives
CO2	Design and implement model and viewing transformations
CO3	Use the underlying algorithms, mathematical concepts, supporting computer graphics
CO4	Use and select among current models for surfaces (e.g., geometric; polygonal; hierarchical; mesh; curves, splines).
CO5	Discuss the application of computer graphics concepts in the development of computer games, information visualization, and business applications

Syllabus:

Unit 1: Introduction and Overview of Graphics System

Introduction of Coordinate representation and Pixel Graphics output devices: CRT, Raster Scan & Random Scan systems; Color CRT monitors, DVST, flat-panel displays, video controller and raster scan display processor. Graphics Input Devices: Keyboard, Mouse, Track-ball, space ball, Joysticks, data Glove, Light Pen, Digitizer, Image scanners, touch panels, voice systems; Graphics software

Unit 02: Output Primitives

Point, line, circle and Bresenham algorithm for line drawing, midpoint algorithm for ellipse generating algorithm, Aliasing, Antialiasing techniques like Pre and post filtering , super sampling and pixel phasing. Filled Area Primitive: Scan line Polygon Fill algorithm, inside outside tests, Boundary Fill and Flood fill algorithm.

Unit 03: Two Dimensional Geometric Transformations, Viewing and Clipping

Basic transformations: Translation, Scaling, Rotation Matrix representation and Homogeneous Coordinate Composite transformation. Other transformations: Reflection and Shear Raster method for transformation.

Viewing transformation pipeline and Window to Viewport coordinate transformation, Clipping operations – Point clipping , Line clipping algorithms : Cohen – Sutherland, Liang – Barsky, Polygon Clipping Algorithms : Sutherland – Hodgeman, Weiler – Atherton, Text Clipping.

Unit 04: Three Dimensional Object Representations, Geometric Transformations and 3D Viewing

Boundary Representation and Space partitioning representation: Polygon Surfaces, Bezier Curve, Bezier Surface, B-Spline Curve, Sweep Representation, Constructive Solid Geometry, Octree, Fractal-Geometry. 3D Transformations: Translation, Rotation, Scaling and Reflection. Composite transformations, Transformation Function, Modeling and coordinate transformation pipeline, Projections – Parallel, Perspective, 3D clipping.

Unit 5: Visible Surface Detection

Classification of Visible Surface Detection algorithm, Back Surface detection method, Depth Buffer method, Depth Sorting method, Scan line method, Area Subdivision method

Text Books:

- "Computer Graphics C version", Hearn D. & Baker M. P. 2nd Ed. Pearson.
- "Computer Graphics Principles and Practice in C", Foley J. D., Dam A. V., Feiner S. K. & Hughes J. F. 2nd Ed. Pearson.
- "Computer Graphics", Maurya R. K. Wiley India Publication.
- "Computer Graphics", Bhattacharya S. Oxford Publication.

Reference Books:

- "Procedural Elements for Computer Graphics", Rogers D.. Tata McGraw-Hill Publications.
- "Computer Graphics", Xiang Z. & Plastock R. Schaum"s Outlines. McGraw-Hill Education.

- "Computer Graphics using OpenGL", Hill F. S., 3rd Ed. Pearson Publications.

CO-PO & PSO Correlation

Course Name: Computer Graphics												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2											
CO2:	2			2								
CO3:	2	2	2									
CO4:	2	2	2									
CO5:	2	2	2		2							

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Cryptography and Information Security**	**Course Code:**		**SOE-B-CSE-21-505(2)**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / Week**
Max Marks	**:**	**100**			

Course Description:

The course covers fundamental aspects of security in a modern networked environment with the focus on system design aspects and cryptography in the specific context of network / internetwork security. It also dwells into basics of cryptographic techniques, algorithms and protocols required to achieve these properties; computational issues in implementing cryptographic protocols and algorithms; and system/application design issues in building secure networked systems.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Classify the symmetric encryption techniques and Illustrate various Public key cryptographic techniques
CO2	Understand security protocols for protecting data on networks and be able to digitally sign emails and files.
CO3	Understand vulnerability assessments and the weakness of using passwords for authentication
CO4	Be able to perform simple vulnerability assessments and password audits
CO5	Summarize the intrusion detection and its solutions to overcome the attacks

Syllabus:

Unit-I:

Introduction to security attacks, services and mechanism, Classical encryption techniques, substitution ciphers and transposition ciphers, cryptanalysis, steganography, Stream and block ciphers. Modern Block Ciphers: Block ciphers principles, Shannon's theory of confusion and diffusion, fiestal structure, Data encryption standard (DES), Strength of DES, block cipher modes of operations, Triple DES

Unit-II:

Introduction to group, field, finite field of the form GF(p), modular arithmetic, prime and relative prime numbers, Extended Euclidean Algorithm, Advanced Encryption Standard (AES) encryption and decryption, Fermat's and Euler's theorem, Primarily testing, Chinese Remainder theorem, Discrete Logarithmic Problem, Principals of public key crypto systems, RSA algorithm, security of RSA.

Unit-III:

Message Authentication Codes: Authentication requirements, authentication functions, message authentication code, Hash functions, birthday attacks, security of hash functions, Secure hash algorithm (SHA), Digital Signatures: Digital Signatures, RSA Digital Signature, Elgamal Digital Signature, Digital signature standards (DSS).

Unit-IV:

Key Management and distribution: Symmetric key distribution, Diffie-Hellman Key Exchange, Public key distribution, X.509 Certificates, Public key Infrastructure. Authentication Applications: Kerberos. Electronic mail security: pretty good privacy (PGP), S/MIME.

Unit-V:

IP Security: Architecture, Authentication header, Encapsulating security payloads, combining security associations, key management. Introduction to Secure Socket Layer, Secure electronic, transaction (SET) System Security: Introductory idea of Intrusion, Intrusion detection, Viruses and related threats, firewalls.

Text Books:

- William Stallings, "Cryptography and Network Security: Principals and Practice", Pearson Education.
- Behrouz A. Frouzan: Cryptography and Network Security, McGraw Hill .
- C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
- Bruce Schiener, "Applied Cryptography". John Wiley & Sons
- Bernard Menezes," Network Security and Cryptography", Cengage Learning.
- Atul Kahate, "Cryptography and Network Security", McGraw Hill

Reference Books:

- C K Shyamala, N Harini, Dr T R Padmanabhan, "Cryptography and Network Security", 1st Edition, Wiley India
- Forouzan Mukhopadhyay, "Cryptography and Network Security", 3rd Edition, Mc Graw Hill
- Mark Stamp, "Information Security, Principles, and Practice", Wiley India.
- WM. Arthur Conklin, Greg White, "Principles of Computer Security", TMH.

- Neal Krawetz, "Introduction to Network Security", CENGAGE Learning.
- Bernard Menezes, "Network Security and Cryptography", CENGAGE Learning.

CO-PO & PSO Correlation

Course Name: Cryptography and Information Security												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**3**	**2**	**1**						**2**			
CO2:	**2**	**2**								**1**		
CO3:						**2**			**1**			
CO4:	**2**	**2**										
CO5:	**2**	**2**							**1**			

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Optimization using Machine Learning**	**Course Code:**		**SOE-B-CSE-21-505(3)**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / Week**
Max Marks	**:**	**100**			

Course Description:

It is a subject that teaches students how to apply optimization techniques to solve engineering problems. The course covers both theoretical concepts and practical applications of optimization techniques in various engineering domains.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Acquire knowledge about optimization methods to model real-life problems
CO2	Apply the knowledge of optimization techniques to solve engineering optimization problems.
CO3	Understand the notion of multi variable optimization algorithms
CO4	Design and develop a solution to complex engineering problem with the help of suitable optimization technique.
CO5	Apply multi-objective optimization algorithms to various engineering problems

Syllabus:

Unit-I: Introduction

Optimal Problem Formulation: Design Variables, Constraints, Formulation of objective function, Variable Bounds, Incorporating constraints in objective function, Engineering Optimization Problems, Classification of Optimization algorithms.

Unit-II: Single Variable Optimization Algorithm

Bracketing methods, Region elimination methods; Interval halving method, Fibonacci search method, Point-estimation method; Successive quadratic estimation method. Gradient-based methods: Newton-Raphson method, Bisection method, Secant method

Unit-III: Multi Variable Optimization Algorithm

Optimality criteria, Unidirectional search, Direct search methods: Evolutionary optimization method, Simplex search method, Hooke-Jeeves pattern search method

Unit-IV: Non-Traditional and Evolutionary Optimization Algorithms

Differential Evolution, Particle Swarm Optimization, Ant Colony Optimization, Crow Search Algorithm, Teaching Learning Based Optimization. Application of evolutionary optimization algorithms in Computer Science

Unit-V: Multi-Objective Optimization

Formulation of optimization problem with multiple objectives, Pareto Optimality, NSGA (Nondominated-sorted genetic algorithm).

Text Books:

- Kalyanmoy Deb, Optimization for Engineering Design, Algorithms and Examples, Prentice Hall, 1995.
- KalyanmoyDeb, Multiobjective Optimization Using Evolutionary Algorithms, Wiley.

Reference Books:

- S S Rao, Engineering Optimization- Theory and Practice, New Age International, 1996.

CO-PO & PSO Correlation

Course Name: Optimization using Machine Learning												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	1	2								1	1
CO2:	2	1	2						1	1	1	1
CO3:	1	2	2							2	2	1
CO4:	2	3	3						1		2	1
CO5:	2	3	2								2	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Introduction to IoT**	**Course Code:**		**SOE-B-CSE-21-505(4)**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs. / Week**
Max Marks	**:**	**100**			

Course Description:

In this course, introduce evolution of internet technology and need for IoT. Discuss on IoT reference layer and various protocols and software. Train the students to build IoT systems using sensors, single board computers and open source IoT platforms. Make the students to apply IoT data for business solution in various domain in secured manner.

Course Outcomes:

At the end of this course, the student will be able:

CO Number	Course Outcome
CO1	Identify the IoT networking components with respect to OSI layer.
CO2	Build schematic for IoT solutions.
CO3	Design and develop IoT based sensor systems.
CO4	Select IoT protocols and software.
CO5	Evaluate the wireless technologies for IoT.
CO6	Appreciate the need for IoT Trust and variants of IoT..

Syllabus:

Unit-I

Evolution of IoT, Review of computer communication concepts (OSI layers, components, packet communication, Networks, TCP-IP, subnetting, IPV4 addressing and challenges). IPV6 addressing. IoT architecture reference layer.

Unit-II

Introduction to IoT components, Characteristics IoT sensor nodes, Edge computer, cloud and peripheral cloud, single board computers, open source hardware's, Examples of IoT infrastructure

Unit-III

IoT protocols and software's, MQTT, UDP, MQTT brokers, publish subscribe modes, HTTP, COAP, XMPP and gateway protocols, IoT point to point communication technologies, IoT Communication Pattern, IoT protocol Architecture, Selection of

Wireless technologies (6LoWPAN, Zigbee, WIFI, BT, BLE,SIG,NFC, LORA, Lifi, Widi), Introduction to Cloud computation and Big data analytics.

Unit-IV

IoT security, Need for encryption, standard encryption protocol, light weight cryptography, Quadruple Trust Model for IoT-A – Threat Analysis and model for IoT-A, Cloud security

Unit-V

IoT application and its Variants, Case studies: IoT for smart cities, health care, agriculture, smart meters.M2M, Web of things, Cellular IoT, Industrial IoT, Industry 4.0, IoT standards.

Text Books:

1. Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, "Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model", Springer Open, 2016
2. Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, "From Machine to Machine to Internet of Things", Elsevier Publications, 2014.
3. "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).
4. "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press).

Reference Books

1. LuYan, Yan Zhang, Laurence T. Yang, Huansheng Ning, The Internet of Things: From RFID to the Next-Generation Pervasive Network, Aurbach publications, March,2008.
2. Vijay Madisetti , Arshdeep Bahga, Adrian McEwen (Author), Hakim Cassimally "Internet of Things A Hands-on-Approach" Arshdeep Bahga & Vijay Madisetti, 2014.
3. Asoke K Talukder and Roopa R Yavagal, "Mobile Computing," Tata McGraw Hill, 2010.
4. Barrie Sosinsky, "Cloud Computing Bible", Wiley-India, 2010
5. RonaldL. Krutz, Russell Dean Vines,Cloud Security: A Comprehensive Guide to Secure Cloud Computing,Wiley-India, 2010

CO-PO & PSO Correlation

Course Name: Introduction to IoT												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2			1	3		2		2			
CO2:		1				2		3		1		
CO3:			3	2							3	2
CO4:							1			1		
CO5:				3		1		2	2			

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Mobile Application Development**	**Course Code:**		**SOE-B-CSE-21-505(5)**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Description:

Mobile Application development is becoming need of the day as webpage development was about ten years ago. Most companies are developing their mobile applications so that customers may interact with them on mobiles itself. Android is most popular mobile operating system of today. Android application development course is therefore designed to enable the diploma information technology students to build mobile applications on this platform. This course covers the basics of Android along with required programming codes for developing necessary programming skills for mobile applications. Thus, this course is an important course for IT students with possibilities of self employment.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Interpret feature of mobile operating system.
CO2	Configure android environment and development tools.
CO3	Develop rich user interface using layout and controls.
CO4	Use User Interface component for android application development.
CO5	Create android application using database and publish application.

Syllabus:

Unit-I: Android OS:

Mobile technology: Overview of Android - An Open Platform for Mobile development, Open Handset Alliance, Use Android for mobile app development, Android Marketplaces, Android Development Environment setup, Android development Framework - Android-SDK, Eclipse Emulators / Android AVD., Creating & setting up custom Android emulator, Android Project Framework and its applications

Unit-II: Android Architecture:

Linux Kernel, Libraries, Android Runtime, Application Framework, Applications, Android Startup and Zygote, Android Debug bridge, Android Permission model, Android Manifest File

Unit-III: Android Activities and UI Design:

Design Android UI Layout :Android application components Intent, Activity, Activity Lifecycle, Broadcast receivers, Services and Manifest ,Create Application and new Activities, Expressions and Flow control, Android Manifest Simple UI -Layouts and Layout properties, Fundamental Android UI Design Introducing Layouts, Creating new Layouts, Drawable Resources, Resolution and density independence (px,dp,sp),Use GUI Objects to develop applications, XML Introduction to GUI objects viz.,Push Button, Text / Labels, EditText, ToggleButton WeightSum, Padding,LayOut Weight

Unit-IV: Advanced UI Programming:

Event driven Programming in Android (Text Edit, Button clicked etc.), Creating a splash screen, Android Activity Lifecycle, Introduction to threads in Android, Menu: Custom Vs. System Menus, Creating and Using Handset menu Button (Hardware), Android Themes, Dialog, create an Alter Dialog, Toast in Android, List & Adapters, Android Manifest.xml File

Unit-V: Working with Database:

SQLite: Open Helper and create database, Open and close a database

Text Books:

- Professional Android 2 Application Development Reto Meier Wiley India Pvt Ltd
- Beginning Android Mark L Murphy Wiley India Pvt Ltd
- Professional Android Sayed Y Hashimi and Satya Komatineni Wiley India Pvt Lt

Reference Books:

- Android Wireless Application Development by Lauren Darcey and Shane Conder, Pearson Education, 2nd Edition.
- Unlocking Android Developer's Guide by Frank Ableson and Charlie Collins and Robi Sen, Manning Publication Co.
- Android Studio Development Essentials by Neil Smyth
- The Definitive Guide to SQL Lite by Michael Owens

CO-PO & PSO Correlation

Course Name: Mobile Application												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	2	1	3				2	2	1	1
CO2:	3	3	3	2	2				1	1	1	1
CO3:	3	3	3	2	2				2	2	1	1
CO4:	3	3	2	2	2				2	2	1	1
CO5:	3	3	3	2	3				1	1	1	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Microprocessor & Microcontroller Lab**	**Course Code:**	**SOE-B-CSE-21-506**
Credits	**:**	**1**	**No of Hours :**	**2 Hrs. / week**
Max Marks	**:**	**50**		

Course Description:

The purpose of this course is to teach students the fundamentals of microprocessor and microcontroller systems. The student will be able to incorporate these concepts into their electronic designs for other courses where control can be achieved via a microprocessor/controller implementation.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand fundamental operating concepts behind microprocessors and microcontrollers.
CO2	Appreciate the advantages in using RISC microprocessors / microcontrollers in engineering applications
CO3	Design microprocessor based solutions to problems.
CO4	Understand Low-Level and Embedded C Programming.
CO5	Apply this knowledge to more advanced structures.

The following concepts will be covered in the lab:

- 8085 CPU Architecture, Pin configuration and description of various signals, Addressing Modes Registers,
- Pin diagram of 8086 and description of various signals. Architecture block diagram of 8086
- Instruction set of 8085.
- Instruction set of 8086.
- 8051InstructionSet– Data movement Instruction, arithmetic instruction, Logic instruction, Branch group Instruction

Text Books:

- Ramesh S.Gaonkar, Microprocessor Architecture, Programming, and Applications with 8085, Prentice Hall
- Brey, The Intel Microprocessors 8086- Pentium processor, PHI
- A.K.Ray and K.M.Bhurchandi, “Advanced Microprocessors and Peripherals”,Tata McGrawHill,2000.

- Badri Ram, Advanced Microprocessors and Interfacing, TMH
- Triekel & Singh, The 8088 & 8086 Microprocessors- Programming, Interfacing, Hardware & Applications: PHI.
- D.B.Hall, Microprocessor and Interfacing, McGrawHill
- Andrew N. Sloss, Dominic Symes, Chris Wright and John Rayfield, "ARM System Developer's Guide, Designing and Optimizing System Software", Elsevier, 2004.

Reference books:

- Yu-Chang Liu & Glenn, A Gibson, Microcomputer systems: the 8086/8088 Family: architecture, Programming & Design, PHI.
- Microsoft MASM Reference Manual– Published by Microsoft Corporation (Softcopy of Document available with MASM Software)
- Assembler Inside & Out; Harley Hahn Pub. Osborn MgGrawHill, Burkley USA.

CO-PO & PSO Correlation

Course Name: **Microprocessor & Microcontroller Lab**												
	Program Outcomes								**PSOs**			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**3**	**2**	**2**
CO2:	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**
CO3:	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**3**	**2**	**2**
CO4:	**3**	**3**	**2**	**2**	**2**	**2**	**1**	**1**	**3**	**3**	**2**	**2**
CO5:	**3**	**3**	**3**	**3**	**2**	**2**	**2**	**2**	**3**	**3**	**3**	**3**

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Computer Network Lab**	**Course Code:**	**SOE-B-CSE-21-507**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs. / week**
Max Marks	**:**	**50**		

Course Descriptions:

This lab is designed to Learn basic concepts of computer networking and acquire practical notions of protocols with the emphasis on TCP/IP. A lab provides a practical approach to Ethernet/Internet networking: networks are assembled, and experiments are made to understand the layered architecture and how do some important protocols work.

Course Outcomes:

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

CO Number	Course Outcome
CO1	The students will be able to develop fundamental communication systems with customize requirement(s).
CO2	The students will be able to design computer network as per the specifications given.
CO3	The students will acquire analytical ability to identify the problems area in the hardware planning of computer network with possible trouble shooting technique.
CO4	The students will be able to diagnose the possible Bugs in the software application and to provide the possible trouble shoot.
CO5	Project planning Network planning, design, selection of hardware components and its configuration.

The following concepts will be covered in the lab:

Part-I Application Development:

- Experiment on ECHO Program as per TCP specifications.
  - Part-I: Develop an echo program with Client and Iterative Server using TCP.
  - Part-II: Develop and echo program with Client and Concurrent Server using TCP.
- Experiment on ECHO Program as per UDP specifications.
- Development of ECHO program with client and concurrent server using UDP.
- Experiment on Chat application Development.
- Develop a chatting program following client – server model
- Systems Information Retrieval Program

- Develop a program to retrieve date as well as time using TCP and UDP.
- Experiment on Stream Socket and Datagram Socket.
    - Part-I: Develop an Echo client and Server program using UNIX domain stream socket.
    - Part-II: Develop an Echo Client and server program using UNIX domain Datagram Socket.
- File Transfer Application:
- Develop a program to implement file transfer using TCP from Client to Server in JAVA.

Part-II: Case Study

The students would take up a study project to understand a real network environment. It is recommended to take up the existing networks around the campus. The identified areas are OPJU computer network or the networks of the organizations/ industries all around the university campus.

Text Books :

- "Internetworking with TCP/IP, Principles Protocols and Architecture" 5th Edition Vol1 by Duglas E Comer by PHI.
- "TCP/IP Protocol Suit" 4th Edition by Behrouz A Forouzen Tata MGraw Hills.
- "Computer Network - a Systems Approach" by Larry L Petersnand Bruce S Davie 5th Edition by Morgan Kaufmabb Elsevier.
- "Data Networks" 2nd Edition by Dimitri Betsekas Robert Gallager by PHI.

CO-PO & PSO Correlation

Course Name: Computer Network Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	2	2	2						1		2	
CO2:	2									2		1
CO3:	2	3	2								1	2
CO4:		2										1
CO5:	1	1										

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Data Mining and Warehousing Lab**	**Course Code:**	**SOE-B-CSE-21-508**
Credits	**:**	**1**	**No of Hours :**	**2 Hrs. / week**
Max Marks	**:**	**50**		

Course Descriptions:

This course provides the student with in depth knowledge of Data Warehousing principles, Data Warehouse techniques, and Business Intelligence systems. The course introduces the topics of Data Warehouse design, Extract-Transform-Load (ETL), Data Cubes, and Data Marts. Students will create Business Intelligence using Data Warehouses with several OLAP and analytical tools.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Ability to understand the various kinds of tools.
CO2	Demonstrate the classification, clustering and etc. in large data sets.
CO3	Ability to add mining algorithms as a component to the exiting tools.
CO4	Ability to apply mining techniques for realistic data.

The following Experiments will be covered in the lab:

- Explore WEKA Data Mining/Machine Learning Toolkit.
- Create an Employee Table with the help of Data Mining Tool WEKA.
- Apply Pre-Processing techniques to the training data set of Weather Table.
- Finding Association Rules for Banking data using apriori algorithm.
- Demonstration of classification rule process on dataset weather.arff using j48 algorithm
- Write a procedure for Clustering Customer data using Simple KMeans Algorithm.
- Extract if-then rues from decision tree generated by classifier, Observe the confusion matrix and derive Accuracy, F- measure, TPrate, FPrate , Precision and recall values. Apply cross-validation strategy with various fold levels and compare the accuracy results.
- Load each dataset into Weka and perform Naïve-bayes classification and k-Nearest Neighbor classification, Interpret the results obtained.
- Explore visualization features of weka to visualize the clusters. Derive interesting insights and explain.

- Load each dataset into Weka and perform k-Nearest Neighbor classification, Interpret the results obtained.

Text Books:

- J. Han & M. Kamber, Data Mining: Concepts and Techniques, Morgan Kaufmann, 2nd Ed, 2006.
- Data Mining Techniques – Arun K Pujari, University Press.

Reference Books

- W. H. Inmon, "Building the Data Warehouse", 3rd edition.
- Anahory and Murray, Data warehousing in the real world , Pearson Education/Addison Wesley.
- Margaret Dunham, Data Mining: Introductory and Advanced Topics, Published by Prentice Hall.

CO-PO & PSO Correlation

Course Name: Data Mining and Warehousing Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:		1									2	
CO2:	1		3		1		1			1		
CO3:				2							1	2
CO4:	2				2				1			

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Computer Graphics Lab**	**Course Code:**		**SOE-B-CSE-21-509(1)**
Credits	**:**	**1**	**No of Hours :**		**2 Hrs. / Week**
Max Marks	**:**	**50**			

Course Descriptions:

The objectives of this course are to equip students with the fundamental knowledge and basic technical competence in the field of computer graphics, emphasize on implementation aspect of Computer Graphics Algorithms and advance areas like Image Processing.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Implement basic algorithms related to line & circle drawing.
CO2	Implement various line & circle drawing algorithms.
CO3	Hands on experiments on 2D transformations.
CO4	Conceptual implementation of clipping and other drawing algorithms.
CO5	Describe the importance of viewing and projections.

The following concepts will be covered in the lab:

- Line and Circle Drawing
- 2D Transformation
- 3D Transformation
- Polygon Filling using Scan Fill, Flood Fill and Boundary Fill Algorithm
- Line Clipping and Polygon Clipping Algorithm

Text Books :

- "Computer Graphics C version", Hearn D. & Baker M. P. 2nd Ed. Pearson.
- "Computer Graphics Principles and Practice in C", Foley J. D., Dam A. V., Feiner S. K. & Hughes J. F. 2nd Ed. Pearson.
- "Computer Graphics", Maurya R. K. Wiley India Publication.
- "Computer Graphics", Bhattacharya S. Oxford Publication.

CO-PO & PSO Correlation

Course Name: Computer Graphics												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2											
CO2:	2			2								
CO3:	2	2	2									
CO4:	2	2	2									
CO5:	2	2	2		2							

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**V**
Name of the Course	**:**	**Cryptography and Information Security Lab**	**Course Code:**		**SOE-B-CSE-21-509(2)**
Credits	**:**	**1**	**No of Hours :**		**2 Hrs. / Week**
Max Marks	**:**	**50**			

Course Descriptions:

To give practical exposure on basic security attacks, encryption algorithms, authentication techniques and digital signature.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Develop code for classical Encryption Techniques to solve the problems.
CO2	Build cryptosystems by applying symmetric and public key encryption algorithms.
CO3	Construct code for authentication algorithms.
CO4	Develop a signature scheme using Digital signature standard.

The following concepts will be covered in the lab:

- Symmetric key cryptography.
- Asymmetric key cryptography.
- Key exchange protocol.
- Authentication algorithms.
- Digital signature standards.

Text Books :

- William Stallings, “Cryptography and Network Security: Principals and Practice”, Pearson Education.
- Behrouz A. Frouzan: Cryptography and Network Security, McGraw Hill .
- C K Shyamala, N Harini, Dr. T.R.Padmnabhan Cryptography and Security ,Wiley
- Bruce Schiener, “Applied Cryptography”. John Wiley & Sons
- Bernard Menezes,” Network Security and Cryptography”, Cengage Learning.
- Atul Kahate, “Cryptography and Network Security”, McGraw Hill

CO-PO & PSO Correlation

Course Name: Cryptography and Information Security Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	3	2	1						2			
CO2:	2	2								1		
CO3:						2			1			
CO4:	2	2										

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech**	**Semester :**	**V**
Name of the Course:		**Optimization using Machine Learning Lab**	**Course Code:**	**SOE-B-CSE-21-509(3)**
Credits	**:**	**1**	**No of Hours :**	**2 Hr. / Week**
Max Marks	**:**	**50**		

Course Descriptions:

This Lab teaches students how to apply optimization techniques to solve engineering problems. The course covers the theoretical concepts students have studied in the Optimization using ML course.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Apply the single variable optimization algorithms
CO2	Apply the multi variable optimization algorithms
CO3	Apply the non-traditional optimization algorithms
CO4	Apply the multi objective optimization algorithms

The following concepts will be covered in the lab:

- Implementation of single variable optimization algorithms
- Implementation of multi variable optimization algorithms
- Implementation of nature inspired optimization algorithms like PSO, CSA etc.
- Implementation of non-traditional optimization algorithms like DE, TLBO etc.
- Implementation of multi-objective optimization algorithms

Text Books :

- Kalyanmoy Deb, Optimization for Engineering Design, Algorithms and Examples, Prentice Hall, 1995.
- KalyanmoyDeb, Multiobjective Optimization Using Evolutionary Algorithms, Wiley.

CO-PO & PSO Correlation

Course Name: Optimization using Machine Learning												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	1	2								1	1
CO2:	2	1	2						1	1	1	1
CO3:	1	2	2							2	2	1
CO4:	2	3	3						1		2	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Introduction to IoT Lab**	**Course Code:**	**SOE-B-CSE-21-509(4)**
Credits	**:**	**1**	**No of Hours :**	**2 Hr. / Week**
Max Marks	**:**	**50**		

Course Descriptions:

In this course, introduction of evolution of internet technology and need for IoT. Discussion on IoT reference layer and various protocols and software. Train the students to build IoT systems using sensors, single board computers and open source IoT platforms. Make the students to apply IoT data for business solution in various domain in secured manner.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Choose the sensors and actuators for an IoT application
CO2	Select protocols for a specific IoT application
CO3	Utilize the cloud platform and APIs for IoT application
CO4	Experiment with embedded boards for creating IoT prototypes
CO5	Design a solution for a given IoT application

The following concepts will be covered in the lab:

- Experiments will be completed by students on boards like aurdino UNO and RaspberryPi. Under this lab they will learn to connect boards, supply data, connection with cloud etc.

Text Books :

- Alessandro Bassi, Martin Bauer, Martin Fiedler, Thorsten Kramp, Rob van Kranenburg, Sebastian Lange, Stefan Meissner, “Enabling things to talk – Designing IoT solutions with the IoT Architecture Reference Model”, Springer Open, 2016
- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stamatis Karnouskos, Stefan Avesand, David Boyle, “From Machine to Machine to Internet of Things”, Elsevier Publications, 2014.
- "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", by Pethuru Raj and Anupama C. Raman (CRC Press).

- "Internet of Things: A Hands-on Approach", by Arshdeep Bahga and Vijay Madisetti (Universities Press).

CO-PO & PSO Correlation

Course Name: Introduction to IoT Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**		**3**		**1**		**3**	**2**	**2**			3
CO2:		**1**	**2**	**3**	**1**	**3**	**2**			**3**		
CO3:	**3**		**1**	**2**						**2**	**1**	
CO4:					**3**		**2**	**1**	**1**			

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Mobile Applications Development Lab**	**Course Code:**	**SOE-B-CSE-21-509(5)**
Credits	**:**	**1**	**No of Hours :**	**2 Hr. / Week**
Max Marks	**:**	**50**		

Course Descriptions:

The course content should be taught and implemented with the aim to develop required skills in the students so that they are able to acquire following competency: Develop GUI based mobile applications with Eclipse Android SDK on open-source Android and propriety platforms with database connectivity, The theory should be taught and practical should be carried out in such a manner that students are able to acquire different learning out comes in cognitive, and affective domain to demonstrate following course outcomes.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the concept of open-source mobile development
CO2	Describe Android architecture frame work & Design Android UI Layout
CO3	Develop event driven programs.
CO4	Develop applications using menus and dialog boxes
CO5	Develop applications using database.

Suggested list of Exercise / Practical's:

- Installation of Android studio.
- Development Of Hello World Application.
- Create an application that takes the name from a text box and shows hello message along with the name entered in text box, when the user clicks the OK button.
- Create a screen that has input boxes for User Name, Password, Address, Gender (radio buttons for male and female), Age (numeric), Date of Birth (Date Picket), State (Spinner) and a Submit button. On clicking the submit button, print all the data below the Submit Button (use any layout).

- Design an android application to create page using Intent and one Button and pass the Values from one Activity to second Activity.
- Create sample application with login module. (Check username and password), validate it for login screen.
- Create an application that will display toast (Message) at some regular interval of time.
- Design an android application Send SMS using Intent.
- Create an android application using Fragment.
- Design an android application Using Radio button.
- Design an android application for menu.
- Create a user registration application that stores the user details in a database table.

Text Books:

- Professional Android 2 Application Development Reto Meier Wiley India Pvt Ltd
- Beginning Android Mark L Murphy Wiley India Pvt Ltd
- Professional Android Sayed Y Hashimi and Satya Komatineni Wiley India Pvt Ltd
- Android Studio Development Essentials by Neil Smyth
- The Definitive Guide to SQL Lite by Michael Owens

CO-PO & PSO Correlation

Course Name: Mobile Applications Development Lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	2	2	1	3				2	2	1	1
CO2:	3	3	3	2	2				1	1	1	1
CO3:	3	3	3	2	2				2	2	1	1
CO4:	3	3	2	2	2				2	2	1	1
CO5:	3	3	3	2	3				1	1	1	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**V**
Name of the Course:		**Managing work & others (MWO)**	**Course Code:**	**SOE-B-CSE-21-510**
Credits	**:**	**1**	**No of Hours :**	**2 Hr. / Week**
Max Marks	**:**	**50**		

Course Description:

In this course (Managing work and others-MWO), students will be taught to develop and become team player for creativity and innovation in the organization they work in. Students will be taught methods to develop cordial relation using "Johari Window", which will help them in managing change in their organizations. Since they would be entering the world of work, special emphasis will also be given to manners, etiquettes, negotiation, stress and conflict management. Finally, students will be rigorously prepared for facing various selection tools like – GD, PI and resume preparation.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Communicating effectively in a variety of public and interpersonal settings
CO2	Applying concepts of change management for growth and development by understanding inertia of change and mastering the Laws of change
CO3	Analysing scenarios, synthesizing alternatives and thinking critically to negotiate, resolve conflicts and develop cordial interpersonal relationships
CO4	Functioning in a team and enabling other people to act while encouraging growth and creating mutual respect and trust
CO5	Handling difficult situations with grace, style, and professionalism

Syllabus:

Unit-I:

- Creativity and Innovation- Concept & Theory
- Creativity and Innovation- Activity
- Understanding self and others (Johari window) - Concept & Theory

- Understanding self and others (Johari window) - Activity
- Stress Management
- Managing Change for competitive success

Unit-II:

- Handling feedback and criticism- Models & Theory
- Handling feedback and criticism- Activity
- Conflict management -Models & Theory
- Conflict management- Case study and Activity

Unit-III:

- Development of cordial interpersonal relations at all levels
- Negotiation
- Importance of working in teams in modern organisations
- Manners, etiquette and net etiquette

Unit-IV:

- Job Seeking Process and Tools
- Occupational Research- Assignment & Presentation
- Group discussion (GD)- Concept
- Group discussion (GD)- Practice
- Personal Interview- Concept
- Frequently asked questions (FAQ's)
- Personal Interview- Practice

Text Books :

- Robbins, Stephen P., Judge, Timothy A., Vohra, Neharika, Organizational Behavior (2018), 18th ed., Pearson Education
- Burne, Eric, Games People Play (2010), Penguin UK
- Carnegie, Dale, How to Win Friends and Influence People (2004), RHUK
- Rathgeber, Holger, Kotter, John, Our Iceberg is melting (2017), Macmillan
- Steinburg, Scott, Netiquette Essentials (2013), Lulu.com
- https://www.hloom.com/resumes/creative-templates/
- https://www.mbauniverse.com/group-discussion/topic.php

CO-PO & PSO Correlation

Course Name: Managing work & others (MWO)												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:				3	3	2	1	2		2		2
CO2:	1	2	3		2	1			1	2		3
CO3:	1	1		3	2	3	2	2		2	3	
CO4:				3	3	2	2	1	1	2		2
CO5:	2	2	2	3	2	1			1		1	2

Note: 1.: Low 2.: Moderate 3.: High

Computer Science and Engineering
L: Lecture, T: Tutorial, P: Practical, C: Credit

Scheme of Teaching and Examination
B. Tech (Computer Science and Engineering) Prog. Code- 01UG020

Academic Semester VI

Board of Study	Subject Code	SUBJECT	Periods per week			Scheme of Examination and Marks				Credit L+(T+P) /2
						PRE**		ESE*	Total Marks	(L+T+P)
			L	T	P	Mid Sem	TA			
CSE	SOE-B-CSE-21-601	Software Engineering	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-602	Data Analytics and Visualization	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-603	Blockchain Technology	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-604	Management and Organizational Behavior	2	0	0	15	10	25	50	2
CSE	SOE-B-CSE-21-605 (X)	Professional Elective-II	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-606 (X)	Professional Elective-III	3	0	0	30	20	50	100	3
CSE	SOE-B-CSE-21-607	Software Engineering Lab	0	0	4	0	30	20	50	2
CSE	SOE-B-CSE-21-608	Data Analytics and Visualization Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-609	Blockchain Technology Lab	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-610	Professional Development - VI	0	0	2	0	30	20	50	1
CSE	SOE-B-CSE-21-611	Open Elective (MOOCS/SWAYAM/Certification/Liberal Arts)	_	_	_	_	30	20	50	2
		Total	**17**	**0**	**10**	**165**	**260**	**375**	**800**	**24**

Professional Elective - II

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-605 (1)	CSE	Computer Vision
2	SOE-B-CSE-21-605 (2)	CSE	Industrial IoT
3	SOE-B-CSE-21-605 (3)	CSE	Soft Computing

Professional Elective - III

Sr. No.	Subject Code	Board of Study	Subject
1	SOE-B-CSE-21-606 (1)	CSE	Digital Forensics
2	SOE-B-CSE-21-606 (2)	CSE	Wireless sensor network
3	SOE-B-CSE-21-606 (3)	CSE	Natural Language Processing

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Software Engineering**	**Course Code:**		**SOE-B-CSE-21-601**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Description:

This course offers lectures, tutorials, case studies, laboratory, and online interaction to provide a foundation in software engineering concepts. It includes representing information with the traditional and modern approaches in software engineering including knowledge of CASE tools. This course further explains concepts of software development process, agile, scrum and DevOps development process, software project management, software requirement and design engineering, development, quality assurance, automated testing, operational support and software maintenance.

Course Outcomes:

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

CO Number	Course Outcome
CO1	To learn and understand the Concepts of Software Engineering
CO2	To Learn and understand Software Development Life Cycle
CO3	To apply the project management and analysis principles to software project development.
CO4	To apply the design & testing principles to software project development.

Syllabus:

Unit-I: Introduction Software Engineering and Process Models

Software, Types of software, Characteristics of Software, Attributes of good software, Software Engineering, Software engineering costs, key challenges, software process, software process model, waterfall model, Evolutionary development, Component-Based Software Engineering (CBSE), Process Iteration, Incremental delivery, Spiral development, Agile methods, Extreme programming, Rapid application development (RAD), Software prototyping, Computer Aided Software Engineering (CASE)

Unit-II: Software Requirement and Specification

System and software requirements, Types of software requirements, Functional and non-functional requirements, Domain requirements, User requirements, Elicitation and analysis of requirements, Overview of techniques: Viewpoints, Interviewing, Scenarios, Use-cases, Process modeling with physical and logical DFDs: Entity Relationship Diagram, Data Dictionary, Requirement validation, Requirement specification: Software requirement Specification (SRS), Structure and contents, SRS format, Feasibility Study.

Unit-III: Software Design

Design concepts: Abstraction, Architecture, Patterns, Modularity, Cohesion, Coupling, Information hiding, Functional independence, Refinement. Design of User Interface design: Elements of good design, Design issues, Features of modern GUI - Menus, Scroll bars, windows, Buttons, icons, panels, error Messages.

Unit-IV: Software Implementation, Testing and Quality Assurance

Programming languages and development tools, Selecting languages and tools, Good programming practices, Coding Standards. Verification and validation, Techniques of testing: Black-box and White-box testing, Inspections. Levels of testing: Unit testing, Integration Testing, Interface testing, System testing, Alpha and beta testing, Regression testing. Design of test cases, Quality management activities, Product and process quality. Standards: ISO9000, Capability Maturity Model (CMM), Six Sigma.

Unit-V: Software Operation Support and Maintenance

Need for the proper management of software projects, Management activities, Project planning, Software Size Estimation and Cost Estimation, Software Estimation –Size Estimation, Function Point Analysis, LOC Estimation, what is Productivity, COCOMO, Project scheduling, Task set for Software project, defining a task network, Scheduling, earned value analysis, Risk management, Reactive versus proactive Software Risk, Risk Identification, Risk projection, Risk refinement, Risk mitigation, monitoring & management-The RMMM, Managing people

Text Books:

- Pearson Edu, “Software Engineering by Ian SomMerville”, 9th edition, 2010
- Roger P, “Software Engineering – A Practitioner’s Approach”, seventh edition, Pressman, 2010.
- The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education, 2nd Edition, 2005.

Reference Books:

- Agile Product Management with Scrum: Creating Products that Customers Love by Roman Pichler, Addison-Wesley Professional, 2010.

- The DevOps Handbook: How to Create World-Class Agility, Reliability, and Security in Technology Organizations by Gene Kim, Jez Humble, Patrick Debois, John Willis, 2016.

CO-PO & PSO Correlation

Course Name: Software Engineering												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	3	1			1			2	2	1	1
CO2:	1	2							1		1	
CO3:	2	2				1			1		1	
CO4:	1	2	1			2			1	2	2	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Data Analytics and Visualization**	**Course Code:**		**SOE-B-CSE-21-602**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Description:

This course introduces students to data analysis and visualization in the field of exploratory data science using Python. The Applied Data Analytics and Visualization will prepare to transform data into valued insight for a variety of decision makers. Will learn techniques to set-up systems to retrieve, aggregate, and process large data sets; separate big data sets into manageable and logical components; and eliminate "noise" by cleaning data. Also learn different methods of data analysis and visualization, aided by statistical and graphics software.

Course Outcomes:

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

CO Number	Course Outcome
CO1	To Introduce the concept of Data Analytics, python & Data analytics tools
CO2	Use data analysis tools in the panda's library
CO3	Load, clean, transform, merge and reshape data.
CO4	Handle external files as well as exceptions.
CO5	Analyse and manipulate time series data.

Syllabus:

Unit-I Introduction:

Introduction to Data Science, Exploratory Data Analysis and Data Science Process. Motivation for using Python for Data Analysis, Introduction of Python shell ipython and Jupiter Notebook. Essential Python Libraries: NumPy, pandas, matplotlib, SciPy, scikit-learn, stats models.

Unit-II Getting Started with Pandas:

Arrays and vectorized computation, Introduction to pandas Data Structures, Essential Functionality, Summarizing and Computing Descriptive Statistics. Data Loading, Storage and File Formats, Reading and Writing Data in Text Format, Web Scraping, Binary Data Formats, Interacting with Web APIs, Interacting with

Databases, Data Cleaning and Preparation, Handling Missing Data, Data Transformation, String Manipulation.

Unit-III Data Wrangling

Hierarchical Indexing, Combining and Merging Data Sets Reshaping and Pivoting. Data Visualization matplotlib: Basics of matplotlib, plotting with pandas and seaborn, other python visualization tools.

Unit-IV Data Aggregation and Group operations

Group by Mechanics, Data aggregation, General split-apply-combine, Pivot tables and cross tabulation

Unit-V Time Series Data Analysis

Date and Time Data Types and Tools, Time series Basics, date Ranges, Frequencies and Shifting, Time Zone Handling, Periods and Periods Arithmetic, Resampling and Frequency conversion, Moving Window Functions.

Text Books:

1. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education services Wiley Publication
2. Data Analytics using Python: Bharati Motwani, Wiley Publications.
3. Practical Statistics for Data Scientists 50+ Essential Concepts Using R and Python, O 'Reilly Publications 2nd Edition
4. Practical Text Mining and statistical Analysis for non-structured text data applications,1st edition, Grey Miner, Thomas Hill

Reference Books:

1. Python for Data Analysis: 3rd Edition, Wes McKinney, Publisher(s): O'Reilly Media, Inc.
2. Getting Started with Business Analytics: Insightful Decision-Making, David Roi Hardoon, GalitShmueli, CRC Press Business Analytics, James R Evans, Pearson
3. Python Data science Handbook, Jake VanderPlas, Orally publication
4. Data Science for Business: What You Need to Know about Data Mining and Data-Analytic Thinking, Vovost Foster, Fawcett Tom

CO-PO & PSO Correlation

Course Name: Data Analytics and Visualization												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	3	3	2	1	2				2	2	1	1
CO2:	3	3	3	1	2				1	1	1	1
CO3:	3	2	2	1	2				2	1	1	1
CO4:	2	1	1	1	3				2	1	1	1
CO5:	3	3	3	1	2				2	2	1	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Blockchain Technology**	**Course Code:**		**SOE-B-CSE-21-603**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Description:

This course provides a broad overview of the essential concepts of Blockchain technology by initially exploring Bitcoin followed by the Ethereum platform to lay the foundation necessary for developing applications and programming. The students will learn about the decentralized peer-to-peer network, an immutable distributed ledger and the trust model that defines a Blockchain. This course enables you to explain basic components of a Blockchain (transaction, block, block header, and the chain), its operations (verification, validation, and consensus model), underlying algorithms, and essentials of trust (hard fork and soft fork).

Course Outcomes:

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

CO Number	Course Outcome
CO1	Introduce and define Blockchain, explain Blockchain types, Platforms, Components and Its Applications.
CO2	Understand and explain about the various cryptography used in Blockchain along with Bitcoin Platform.
CO3	Discuss the innovation of the Smart Contract, Ethereum Blockchain, review its protocol, and explore the payment model for code execution in solidity.
CO4	Discuss the concepts used in various Consensus Protocols and Blockchain Security Threats.
CO5	Understand the need of Enterprise Blockchain Platforms, its features and should be able to propose Blockchain based solution for a given Use Cases.

Syllabus:

Unit-I: Introduction to Blockchain and Applications

Introduction to Blockchain and Distributed Ledger, Blockchain Properties, Blockchain, Features, Blockchain Platforms, Generalized Architecture of Blockchain Platform, Applications of Blockchain

Unit-II: Essentials of Cryptocurrencies

Distributed identity: Public and private keys, Digital identification, and wallets; Decentralized network- Distributed ledger: Permissioning framework, Blockchain data structure- Double spending; Network consensus- Sybil attack, Block rewards and miners, Difficulty under competition, Forks and consensus chain, the 51% attack, Confirmations and finality- The limits of proof-of-work- Alternatives to Proof of work.

Unit-III: Blockchain Foundational Concepts & Bitcoin Platform

Bitcoin Architectures: Distributed peer-to-peer network, nodes, consensus protocol, mining: Type, Process, Bitcoin Crypto: Hashing, Digital Signatures, Wallet and Transactions in Bitcoin; Smart Contract and Ethereum Platform: Introduction Ethereum, Architecture, Smart Contracts, Elements of Smart Contracts, Ethereum Operations, Incentive Model, Transactions in Ethereum, Introduction Solidity

Unit-IV: Consensus Protocols and Security Issues

Trust Essentials: Decentralized Systems, Consensus Protocols: Proof-of-Work (PoW), Proof-of-Stake (PoS), Delegated Proof-of-Stake (DPoS), Proof-of-Burn (PoB), Byzantine Fault Tolerance (BFT), Practical Byzantine Fault Tolerance (PBFT), Proof-of-Activity (PoA), Proof of Elapsed Time (PoET). Blockchain Security Threats, Challenges and Issues.

Unit 5: Enterprise Blockchain Platforms and Blockchain Use Cases

Introduction to Enterprise Blockchain Platforms and tools: Hyperledger, Corda, Ripple, Staler, Blockchain Use Cases in Finance and Banking, International Trade, Supply-Chain, Healthcare and Pharmaceuticals, Energy and Power, Government public services and Defense.

Text Books:

- Debjani Mohanty, Blockchain from Concept to Execution: BitCoin, Ethereum, Quorum, Ripple, R3 Corda, Hyperledger Fabric/Saw Tooth/Indy, Multi Chain, IOTA, CoCo, BPB Publications, 2018.
- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University
- Andreas M. Antonopoulos, Gavin Wood Ph.D., Mastering Ethereum: Building Smart Contracts and DApps, O'Reilly Media, 2018
- Ashwani Kumar, Hyperledger Fabric In-Depth Learn, Build and Deploy Blockchain Applications Using Hyperledger Fabric, BPB PUBN, 2020.
- Debajani Mohanty, R3 Corda for Architects and Developers with Case Studies in Finance, Insurance, Healthcare, Travel, Telecom, and Agriculture, Apress, 2019

Reference Books:

- Mastering Blockchain - Distributed ledgers, decentralization and smart contracts explained, Author- Imran Bashir, Packt Publishing Ltd, Second Edition, ISBN 978-1- 78712-544-5, 2017
- Kenny Vaneetvelde, Ethereum Projects for Beginners: Build Blockchain-based Cryptocurrencies, Smart Contracts, and DApps, 2018
- Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos, O'Reilly Media, First Edition, 2014
- Jamiel Sheikh, Mastering Corda Blockchain for Java Developers,O'Reilly Media, 2020

CO-PO & PSO Correlation

Course Name: Blockchain Technology												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	3	3	2	1	3				1	2		
CO2:	2	2	2	1	3				1	2		
CO3:	3	3	2	2	3				1	3		
CO4:	2	2	1	1	3				1	2		
CO5:	3	3	2	2	3				1	3		

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Management and Organizational Behaviour**	**Course Code:**		**SOE-B-CSE-21-604**
Credits	**:**	**2**	**No of Hours :**		**2 Hr. / Week**
Max Marks	**:**	**50**			

Course Description

The major aim of this course is to enhance students' understanding of the scope of OB as a field of study and its potential value in today's organizational life. It focuses on three levels of analysis: the individual, group, and organization. Topics selected will help students to assess how basic theories of human behaviour may be applied to organizational settings.

Course Outcomes

After completion of the course students will be able to:

CO Numbers	Course Outcomes
CO1	Demonstrate a thorough knowledge and understanding of organizational behaviour at individual, group and organizational level
CO2	Apply relevant contemporary theories, concepts and models in order to analyze organizational environments, cases and issues.
CO3	Communicate their findings clearly and effectively using a variety of media
CO4	Communicate their findings clearly and effectively using a variety of media
CO5	Relate real work life organizational behaviour issues & concerns

Syllabus:

Unit I: Introduction to OB

Understanding Human Behaviour, Conceptual framework for understanding individual behaviour as an input-output system, biological foundation of Behaviour, The dynamics of people and Organization; Comprehensive organizational behaviour model; Determinants of organizational effectiveness; Biographical characteristics of individual behaviour.

Unit II: Individual Dynamics

Personality- Theories of Personality Importance of Personality, Perception- Perceptual Process, Motivation- Types and Theories, Attitude, Leadership, Emotional Intelligence, Creativity, Transactional Analysis, Learning.

Unit III: Group Dynamics

Nature of Group, Types of Group, Importance and need for group formation, Intra-group & Inter-group processes and behaviour, Team building & Teamwork, Punctuated Equilibrium model, Group v/s Team,

Unit IV: Organizational Dynamics

Organizational Culture & Climate, Organizational Structure, Job Design, Conflict, Power & Politics, Organizational Change, Forces of Change, Resistance to Change, Lewin's Three-Step Model,

Unit V: Stress Management

Stress Meaning & Nature; Characteristics; Types of stress, Stages and Models of Stress Stages of stress, Causes and symptoms of stress Consequences of stress Effect on behavior and personality; Effect of stress on performance; Strategies for stress management, Consequences and Coping strategies for stress

Text Books:

1. Robbins S.P., Organizational Behaviour, New Delhi, PHI.
2. Luthans Fred: Organizational Behaviour, TMH New Delhi.
3. Davis Keith, Human Behaviour at Work, TMH, New Delhi

Reference Books:

1. Nelson, Quick, Khandelwal, Organizational Behavior, Cengage Learning.
2. Singh, Dalip, Emotional Intelligence at Work, Response Books, Sage Publications, Delhi.
3. Pareek Udai, Organisational Behaviour, Oxford, IBH, Mumbai.

CO-PO & PSO Correlation

Course Name: Management and Organizational Behaviour												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:						1	1	1			1	1
CO2:		1				1	1				1	1
CO3:		2				1	1				1	1
CO4:			1			1	1				1	1

Note: 1: Low 2.: Moderate 3: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Computer Vision**	**Course Code:**		**SOE-B-CSE-21-605(1)**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Descriptions:

The course will cover techniques and tools for rrecent advances in algorithmic techniques, computation and memory technologies have reinvigorated interest in artificial intelligence (AI). Many of the successes in AI in last few years have come from its sub-area computer vision which deals with understanding, and extracting information from digital images and videos. This course provides an introduction to computer vision including fundamentals of image formation, camera imaging geometry, feature detection and matching, multiview geometry including stereo, motion estimation and tracking, and some machine learning problems such as image classification, object detection, and image segmentation.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Know the theoretical and practical aspects of computing with images and the foundation of image formation, measurement, and analysis
CO2	Implement common methods for robust image matching and alignment
CO3	Understand the geometric relationships between 2D images and the 3D world
CO4	Gain exposure to object and scene recognition and categorization from images
CO5	Develop the practical skills necessary to build computer vision applications

Syllabus:

Unit-I: Digital Image Fundamentals:

Introduction: Image Processing, Computer Vision and Computer Graphics , What is Computer Vision - Low-level, Mid-level, High-level , Overview of Diverse Computer Vision Applications: Document Image, Analysis, Bio-metrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing, Multimedia, Virtual Reality and Augmented Reality.

Unit-II: Image enhancement and filtering in spatial domain:

Image Formation Models: Monocular imaging system, Orthographic & Perspective Projection, Camera model and Camera calibration, Binocular imaging systems, Multiple views geometry, Structure determination, shape from shading, Photometric Stereo, Depth from Defocus, Construction of 3D model from images.

Unit-III: Image filtering in the frequency domain:

Image Processing, Feature Extraction, and Motion Estimation: Image pre-processing, Image representations (continuous and discrete) , Edge detection, Regularization theory , Optical computation ,Stereo Vision , Motion estimation , Structure from motion.

Unit-IV: Image restoration:

Shape Representation and Segmentation: Contour based representation, Region based representation, De-formable curves and surfaces, Snakes and active contours, Level set representations, Fourier, and wavelet descriptors, Medial representations, Multi-resolution analysis, Object recognition.

Unit-V: Image Compression and Segmentation

Image Understanding and Computer Vision Applications: Pattern recognition methods, Face detection, Face recognition, 3D shape models of faces Application: Surveillance – foreground-background separation –human gait analysis Application: In-vehicle vision system: locating roadway – road markings – identifying road signs – locating pedestrians.

Text Books:

- D. Forsyth and J. Ponce, Computer Vision - A modern approach, Prentice Hall
- Richard Szeliski, Computer Vision: Algorithms and Applications (CVAA), Springer, 2010

Reference Books:

- E. R. Davies, , Computer & Machine Vision, Academic Press, 2012
- Dana H. Ballard, Christopher M. Brown, Computer Vision, Prentice Hall 1st Edition (May 1, 1982) , ISBN-978-0131653160

CO-PO & PSO Correlation

Course Name: Computer Vision												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**1**	**2**	**3**	**4**	**5**				**1**	**2**	**3**	
CO2:	**2**	**2**							**1**	2	1	
CO3:	**2**			**1**	**1**					1	1	
CO4:	**2**	**2**								2		
CO5:	**2**	**1**							**1**	1	1	

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Industrial IoT**	**Course Code:**		**SOE-B-CSE-21-605 (2)**
Credits	**:**	**3**	**No of Hours :**		**3 Hr. / Week**
Max Marks	**:**	**100**			

Course Description

Industry 4.0 concerns the transformation of industrial processes through the integration of modern technologies such as sensors, communication, and computational processing. Technologies such as Cyber Physical Systems (CPS), Internet of Things (IoT), Cloud Computing, Machine Learning, and Data Analytics are the different drivers necessary for the transformation. Industrial Internet of Things (IIoT) is an application of IoT in industries to modify the various existing industrial systems. IIoT links the automation system with enterprise, planning and product lifecycle.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Describe Industrial Internet of Things and Cyber Physical manufacturing Demonstrate Cyber Physical and Cyber Manufacturing systems
CO2	Describe Architectural design patterns for industrial Internet of Things 20
CO3	Analyse AI and data Analytics for Industrial Internet of Things 20
CO4	Evaluation of Workforce and Human Machine Interaction and Application
CO5	Industrial Internet of Things

Syllabus:

Unit-I: Understanding Industrial Internet of Things (IIoT):

Industrial Internet of Things and Cyber Manufacturing Systems, Application map for Industrial Cyber Physical Systems.

Unit-II: Modeling of CPS and CMS:

Modeling of Cyber Physical Engineering and manufacturing, Model based engineering of supervisory controllers for cyber physical systems, formal verification of system, components.

Unit-III: Architectural Design Patterns for CMS and IIoT:

CPS-based manufacturing and Industries 4.0., Integration of Knowledge base data base and machine vision, Interoperability in Smart Automation, Communication and Networking of IIoT.

Unit-IV: Artificial Intelligence and Data Analytics for manufacturing:

Application of CPS in Machine tools, Digital production, Cyber Physical system, Intelligence, Introduction to big data and machine learning and condition Monitoring.

Unit-V: Evaluation of Workforce and Human Machine Interaction:

Worker and CPS, Strategies to support user intervention. Introduction to Advance manufacturing and Innovation Ecosystems.

Unit-VI: Application of IIoT:

Smart Metering, e-Health Body Area Networks, City Automation, Automotive, Applications, Home Automation, Smart Cards, Plant Automation, Real life examples of IIOT in Manufacturing Sector.

Text Books:

- Sabina Jeschke, Christian Brecher Houbing Song , Danda B. Rawat Editors Industrial Internet of Things Cyber Manufacturing Systems
- Hakima Chaouchi, " The Internet of Things Connecting Objects to the Web" ISBN : 978-1- 84821-140-7, Willy Publications Olivier Hersent, David Boswarthick, Omar Elloumi,
- The Internet of Things: Key Applications and Protocols, ISBN: 978-1-119-99435-0, 2nd Edition, Willy Publications
- Inside the Internet of Things (IoT), Deloitte University Press
- Peter Waher "Learning Internet of Things"
- S. Misra, C. Roy, and A. Mukherjee, 2020 "Introduction to Industrial Internet of Things and Industry 4.0", CRC Press.
- Simone Cirani, Gianluigi Ferrari, Marco Picone, and Luca Veltri, "Internet of Things: Architectures, Protocols and Standards", WILEY.

Reference Books:

- Internet of Things- From Research and Innovation to Market Deployment; By Ovidiu & Peter; River Publishers Series
- Five thoughts from the Father of the Internet of Things; by Phil Wainewright - Kevin Ashton
- How Protocol Conversion Addresses IIoT Challenges: White Paper By RedLion.
- Dr. Guillaume Girardin , Antoine Bonnabel, Dr. Eric Mounier, 'Technologies Sensors for the Internet of Things Businesses & Market Trends 2014 -2024',Yole Development Copyrights ,2014

CO-PO & PSO Correlation

Course Name: Industrial IoT												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1				2		1		2		3	1
CO2:	2	2		3				2		3		
CO3:	3				1		3				1	
CO4:	1	1			2					2		
CO5:	1		2			3	1		1		2	3

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Soft Computing**	**Course Code:**		**SOE-B-CSE-21-605 (3)**
Credits	**:**	**3**	**No of Hours :**		**3Hrs. / Week**
Max Marks	**:**	**100**			

Course Description:

This course covers the theory and applications of neural networks, fuzzy logic, evolutionary strategies and genetic algorithms in developing intelligent systems with examples and practical applications.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Apply basic principles of Soft Computing in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO2	Demonstrate proficiency in applying scientific method to models of machine learning and to build intelligent systems through soft computing techniques.
CO3	Recognize the feasibility of applying a soft computing methodology for a particular problem.
CO4	Develop intelligent machines to provide solutions to real world problems, which are not modeled or too difficult to model mathematically.
CO5	Exploit the tolerance for Approximation, Uncertainty, Imprecision, and Partial Truth in order to achieve close resemblance with human like decision making.

Syllabus:

Unit-I: Introduction

Concepts of Artificial Intelligence, Need of Machine Learning, Learning Methods, Soft Computing Approach, Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Applications

Unit-II: Artificial Neural Network

Neural Networks Neuron, Artificial Neuron and its model, activation functions, Neural network architecture: single layer and multilayer feed forward networks, recurrent networks. Various learning techniques; perception and convergence rule, Auto-associative and hetro-associative memory. Architecture: perceptron model, solution,

single layer artificial neural network, multilayer perception model; back propogation learning methods, effect of learning rule co-efficient; back propagation algorithm, factors affecting backpropagation training, applications.

Unit-III: Fuzzy Logic

Fuzzy Logic Basic concepts of fuzzy logic, Fuzzy sets and Crisp sets, Fuzzy set theory and operations, Properties of fuzzy sets, Fuzzy and Crisp relations, Fuzzy to Crisp conversion. Membership functions, interference in fuzzy logic, fuzzy if-then rules, Fuzzy implications and Fuzzy algorithms, Fuzzyfications & Defuzzificataions, Fuzzy Controller, Industrial applications.

Unit-IV: Genetic Algorithms

Fundamentals of Genetic Algorithms, Chromosomes, Encoding, Selection Operator, Mutation Probability, Mutation Operator, Crossover Probability, Crossover Operator, Fitness Function, Different Variants of Genetic Algorithms, Applications.

Unit-V: Nature Inspired Techniques and Hybrid System

Ant Colony, Particle Swarm Optimization, Integrating Neural Networks, Fuzzy Logic, and Genetic Algorithms, GA based Back Propagation Networks, Fuzzy Back Propagation Networks, Applications

Text Books:

- S N Sivanandam, S N Deepa, “Principles of Soft Computing”, Wiley India, 2007.
- Fakhreddine 0 Karray, Clarence D Silva, “Soft Computing and Intelligent System Design”, Pearson Edition, 2004.
- B. Yagnanarayana, "Artificial Neural Networks", 1st Ed., PHI, 2009.
- S. Rajasekaran, G. A. Vijayalakshmi Pai, "Neural Networks, Fuzzy Logic and Genetic Algorithm: Synthesis and Applications", PHI, 2007.

Reference Books:

- Siman Haykin, “Neural Netowrks”, Prentice Hall of India
- Timothy J. Ross, “Fuzzy Logic with Engineering Applications”, Wiley India

CO-PO & PSO Correlation

Course Name: Soft Computing												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1	2	1						1	2	2	
CO2:	2	2	2						1	2		1
CO3:	1	2	3						1		1	1
CO4:	2	3	2						1		1	2
CO5:	2	3	2						1		1	

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B.Tech.**	**Semester :**	**6**
Name of the Course :	**Digital Forensics**	**Course Code:**	**SOE-B-CSE-21-606 (1)**
Credits :	**3**	**No of Hours :**	**3**
Max Marks :	**100**		

Course Description:

A brief explanation of the objective is to provide digital evidences which are obtained from digital media. In order to understand the objectives of computer forensics, first of all, people have to recognize the different roles computer plays in a certain crime. According to a snippet from the United States Security Service, the functions computer has in different kinds of crimes.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Understand the fundamental and types of Computer Forensics
CO2	Describe about Evidence Collection and Data Seizure
CO3	Describe about Duplication, Preservation, Verification and Authentication of Digital Evidence
CO4	Know about Analysis and Validation of Digital Evidence and Network Forensics
CO5	Know about use various forensic tools for a wide variety of investigations

Syllabus:

Unit-I: Computer Forensics Fundamentals & types

Computer Forensics Fundamentals: What is Computer Forensics? ,Use of Computer Forensics in Law Enforcement, Computer Forensics Assistance to Human Recources/Employment Proceedings, Computer Forensics Services, Benefits of professional Forensics Methodology, Steps taken by Computer Forensics Specialists.

Types of Computer Forensics Technology: - Types of Business Computer Forensic Technology. Types of Military Computer Forensic Technology, Types of Law Enforcement- Computer Forensic Technology, Types of Business Computer Forensic Technology

Unit-II: Evidence Collection and Data Seizure

Evidence Collection and Data Seizure: Why Collect Evidence? Collection Options Obstacles-Types of Evidence-The Rules of Evidence-Volatile Evidence-General Procedure-Collection and Archiving-Methods of Collections-Art facts-Collection Steps - Controlling Contamination: The chain of custody.

Unit-III: Duplication, Preservation, Verification and Authentication of Digital Evidence

Duplication and Preservation of Digital Evidence: Preserving the Digital Crime Scene – Computer Evidence Processing Steps — Legal Aspects of Collecting and Preserving Computer Forensic Evidence Computer Image.

Verification and Authentication: Special Needs of Evidential Authentication – Practical Consideration – Practical Implementation.

Unit-IV: Analysis and Validation of Digital Evidence and Network Forensics

Computer forensic analysis and validation: Determining what data to collect and analyze, validating forensic data, addressing data-hiding techniques, performing remote acquisitions

Network Forensics: Network forensic overview, performing live acquisitions, developing standard procedures for network forensics using network tools, examining the honeynet project.

Unit-V: Forensic Tools, E-mail investigations and mobile device forensics

Current Computer Forensic Tools: evaluating computer forensic tool needs, computer forensic software tools, computer forensic hardware tools, validating and testing forensic software.

E-mail investigations: Exploring the role of email in investigations, exploring the role of client and server in email, investigating email crimes and violations, understanding email servers, using specialized email forensic tools.

Mobile device forensics: Understanding mobile device forensic, understanding acquisition procedures for cell phones and mobile devices.

Text Books:

- Computer Forensics, Computer Crime Investigation by John R,Vacca, Firewall Media, New Delhi.
- Computer Forensics and Investigations by Nelson, Phillips Enfinger, Steuart, CENGAGE Learning.

Reference Books:

- Real Digital Forensics by Keith j.Jones, Richard Bejitlich, Curtis W.Rose, Addison

Wesley Pearson Education
- Forensic Compiling, A Tractitioneris Guide by Tony Sammes and Brain Jenkinson, Springer International edition.
- Computer Evidence Collection &Presentation by Chrostopher L.T. Brown, Firewall Media.
- Homeland Security, Techniques & Technologies by Jesus Mena, Firewall Media.
- Software Forensics Collecting Evidence from the Scene of a Digital Crime by Robert M.Slade,TMH 2005
- Windows Forensics by chad Steel, Wiley India Edition.

CO-PO & PSO Correlation

Course Name: Digital Forensics												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	**2**	**1**	**1**						**2**			**1**
CO2:	**1**	**2**	**2**						**1**	**2**		**1**
CO3:	**1**	**2**							**1**			**1**
CO4:	**1**	**2**		**1**						**2**	**2**	**1**
CO5:		**2**	**2**			**1**			**1**			**1**

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course	**:**	**Wireless Sensor Network**	**Course Code:**		**SOE-B-CSE-21-606 (2)**
Credits	**:**	**3**	**No of Hours :**		**3 Hrs/Week**
Max Marks	**:**	**100**			

Course Description:

The goal of this course is to introduce the students to wireless network protocols and architecture. This course covers the various aspects of wireless networking such as: fundamentals of cellular communication, mobile radio propagation, multiple access techniques, mobile ad-hoc networks and routing in wireless and mobile networks.

Course Outcomes:

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

CO Number	Course Outcome
CO1	To describe and analyze the basic mobile network architecture.
CO2	To make critical assessment of mobile systems.
CO3	To be able to analyze and propose broad solutions for a range of mobile scenarios.
CO4	Use the different compiler construction tools.

Syllabus:

Unit - I: Wireless communication standards:

Introduction of Translators, Phases of Compiler, The role of the lexical analyzer- Input Buffering-Specification & Recognition of tokens, Compiler Construction Tools i.e., LEX & YACC etc.

Unit - II: Transmission and receiving technique:

Band-pass transmission technique for mobile radio, digital modulation, power spectral density, receiver technique for fading dispersive channels.

Unit - III: Cellular communication:

Frequency reuse and mobility management, cell cluster concepts, co channel and adjacent channel interference, call blocking and delay at cell site, cell splitting, sectoring.

Unit - IV: Multiple access technique:

Random access, carrier sense multiple access, conflict free multiple access, spectral efficiency.

Unit - V: Mobile network Layer:

Internet protocol, mobile IP, transmission control protocol, wireless application protocol, mobile ad hoc networks.

Text Books:

- Wireless communication & networking by Mark & Zuang, PHI.
- Wireless Communications and networks, William Stallings, PHI.

Reference Books:

- Wireless network performance handbook, by Smith, McGraw-Hill.
- Principles of wireless networks, by Pahlavan, PHI.

CO-PO & PSO Correlation

Course Name: Wireless Sensor Network												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	2	2						2	2	2	
CO2:	3	2	3						2	1	2	
CO3:	1		2								2	
CO4:	1		2								3	

Note: 1.: Low 2.: Moderate 3.: High

Programme :	**B. Tech**	**Semester/Year:**	**VI**
Name of the Course:	**Natural Language Processing**	**Course Code:**	**SOE-B-CSE-21-606(3)**
Credits :	**3**	**No of Hours :**	**3 Hrs. / Week**
Max Marks :	**100**		

Course Description:

The course will provide foundational knowledge of natural language processing. In the course, basic concepts of language designing, grammars, syntax and semantics and designing of NLP systems will be covered.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Tag a given text with basic Language features
CO2	Design an innovative application using NLP components
CO3	Implement a rule-based system to tackle morphology/syntax of a language
CO4	Design a tag set to be used for statistical processing for real-time applications
CO5	Compare and contrast the use of different statistical approaches for different types of NLP applications.

Syllabus:

Unit-I: Introduction

Origins and challenges of NLP – Language Modeling: Grammar-based LM, Statistical LM - Regular Expressions, Finite-State, Tokenization, Detecting and Correcting Spelling Errors, Minimum Edit Distance

Unit-II: Word level analysis

Unsmoothed N-grams, Evaluating N-grams, Smoothing, Interpolation and Backoff – Word Classes, Part-of-Speech Tagging, Rule-based, Stochastic and Transformation-based tagging, Hidden Markov and Maximum Entropy models.

Unit-III: Syntactic Analysis

Context-Free Grammars, Treebanks, Normal Forms for grammar – Dependency Grammar – Syntactic Parsing, Ambiguity, Dynamic Programming parsing –Probabilistic CFG, Probabilistic CYK, Probabilistic Lexicalized CFGs - Feature structures, Unification of feature structures.

Unit-IV: Semantics and pragmatics

Requirements for representation, First-Order Logic, Description Logics, Semantic attachments – Word Senses, Relations between Senses, Thematic Roles, selectional restrictions – Word Sense Disambiguation, WSD using Supervised, Dictionary & Thesaurus, Bootstrapping methods – Word Similarity using Thesaurus and Distributional methods.

Unit-V: Discourse analysis and lexical resources

Discourse segmentation, Coherence – Reference Phenomena, Anaphora Resolution using Hobbs and Centering Algorithm – Coreference Resolution – Resources: Porter Stemmer, Lemmatizer, Penn Treebank, Brill's Tagger, WordNet, PropBank, FrameNet, Brown Corpus, British National Corpus (BNC).

Text Books:

- Daniel Jurafsky, James H. Martin, "Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics and Speech", Pearson Publication, 2014.
- Steven Bird, Ewan Klein, Edward Loper, "Natural Language Processing with Python‖", 1st Edition, O_Reilly Media, 2009

Reference Books:

- Breck Baldwin, "Language Processing with Java and LingPipe Cookbook", Atlantic Publisher, 2015
- Richard M Reese, "Natural Language Processing with Java", O_Reilly Media, 2015
- Nitin Indurkhya, Fred J. Damerau, "Handbook of Natural Language Processing", 2nd Edition, Chapman and Hall/CRC Press, 2010.

CO-PO & PSO Correlation

Course Name: Natural Language Processing												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	2	2							1	2	1	
CO2:	2			1	1					1	1	
CO3:	2	2								2		
CO4:	2	1							1	1	1	
CO5:	1	2		1	1				1	2	1	

Note: 1.: Low 2.: Moderate 3.: High

SCHOOL OF ENGINEERING

Department of Computer Science & Engineering

Programme	**:**	**B.Tech.**	**Semester :**	**VI**
Name of the Course:		**Software Engineering Lab**	**Course Code:**	**SOE-B-CSE-21-607**
Credits	**:**	**2**	**No of Hours :**	**4 Hrs/Week**
Max Marks	**:**	**50**		

Course Descriptions:

This lab deals with the analysis and design of a software problem. The tool used in a lab is rational rose. this tool is used for an object oriented design of a problem. We draw a UML diagram in a rational rose which deals with the objects and classes in a system. The Unified Modeling Language or UML is a mostly graphical modelling language that is used to express designs. It is a standardized language in which to specify the artefacts and components of a software system. It is important to understand that the UML describes a notation and not a process. It does not put forth a single method or process of design, but rather is a standardized tool that can be used in a design process.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Provide users with a ready-to-use, expressive visual modeling language so they can develop and exchange meaningful models
CO2	Ability to generate a high-level design of the system from the software requirements
CO3	Will have experience and/or awareness of testing problems and will be able to develop a simple testing report
CO4	Ability to translate end-user requirements into system and software requirements

The following concepts will be covered in the lab:

1. Introduction to Software Engineering-LAB.
2. Data flow diagram:
    - What processes make up a system?
    - What data are used in each process?
    - What data are stored?
    - What data enter and leave the system?
3. Sample Design:

- Class Diagram
- Sequence Diagram
- State Chart Diagram
- Use-Case Diagram

4. Project:

- Write down the problem statement for a suggested system of relevance.
- Do requirement analysis and develop Software Requirement Specification Sheet (SRS) for suggested system.
- Perform the Data Flow Diagram (DFD).
- Performa the Sequence Diagram.
- Perform the State Chart Diagram.
- Perform The Use-Case Diagram.
- Perform the ER Diagram (If Database applicable).
- Prepare time line chart/Gantt Chart/PERT Chart for selected project.

Text Books :

- The unified modeling language user guide Grady Booch, James Rambaugh, Ivar Jacobson, Pearson Education, 2nd Edition, 2005.

CO-PO & PSO Correlation

Course Name: Software Engineering Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	1	3	1			1			2	2	1	1
CO2:	1	2							1		1	
CO3:	2	2				1			1		1	
CO4:	1	2	1			2			1	2	2	2

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester**	**:**	**VI**
Name of the Course:		**Data Analytics and Visualization Lab**	**Course Code:**		**SOE-B-CSE-21-608**
Credits	**:**	**1**	**No of Hours :**		**2 Hrs/Week**
Max Marks	**:**	**50**			

Course Description:

This course is all about the analysis of data and its visualization, the art and science of turning data into readable graphics. We'll explore how to design and create data visualizations based on data available and tasks to be achieved. This process includes data modeling, data processing (such as aggregation and filtering), mapping data attributes to graphical attributes, and strategic visual encoding based on known properties of visual perception as well as the task(s) at hand. Students will also learn to evaluate the effectiveness of visualization designs, and think critically about each design decision, such as choice of color and choice of visual encoding.

Course Outcomes:

After Completion of the course Students will be able to:

CO Number	Course Outcome
CO1	Understand the key techniques and theory behind analyzing the data.
CO2	Use effectively the various visualization structures (like tables, spatial data, tree and network etc.)
CO3	Evaluate data visualization systems and other forms of visual presentation for their effectiveness.
CO4	Design and build statistical tests for data visualization systems

The following concepts will be covered in the lab:

- Statistical data analysis tools
- Various hypothesis testing methods
- T-test, z-test, Wilcoxon signed rant test etc.
- Introduction to Matplotlib by drawing basic plots (plot, scatter, bar, stem, step)
- Learn to draw various statistical plots like histogram, boxplot, error bar, violin plot, pie plot.
- Explore different parameters of line plot: line color, line width, line style, legend, marker with the help of an example.

- Explore different parameters of bar charts: bar width, bar color, shifting the bars, xticks, legends using the above example
- Explore different parameters of pie chart: strangle, explode, fig size, explode, color options, legend, autopct, title, font etc. with the help of an example.
- Learn to draw Histogram with the help of sample dataset
- Learn to draw Box plot with the help of sample dataset

Text Books:

- Tamara Munzner, "Visualization Analysis and Design", A K Peters Visualization Series, CRC Press, 2014.
- Scott Murray, "Interactive Data Visualization for the Web", O'Reilly, 2013.

Reference Books:

- Alberto Cairo, "The Functional Art: An Introduction to Information Graphics and Visualization", New Riders, 2012
- Nathan Yau, "Visualize This: The Flowing Data Guide to Design, Visualization and Statistics", John Wiley & Sons, 2011.

CO-PO & PSO Correlation

Course Name: Data Analytics and visualization lab												
	Program Outcomes								PSOs			
Course Outcomes	1	2	3	4	5	6	7	8	1	2	3	4
CO1:	1		1						1	2	1	
CO2:	2	1	2	2					1			
CO3:			1								2	
CO4:	1	2									2	1

Note: 1.: Low 2.: Moderate 3.: High

Programme	**:**	**B.Tech.**	**Semester :**	**VI**
Name of the Course:		**Blockchain Technology Lab**	**Course Code:**	**SOE-B-CSE-21-609**
Credits	**:**	**2**	**No of Hours :**	**35**
Max Marks	**:**	**50**		

Course Descriptions

The Blockchain Technology Lab is a course designed for B.Tech. students to learn the basics and practical applications of blockchain technology. It covers concepts like distributed ledger technology, smart contracts, and decentralized applications, and provides hands-on coding exercises to develop blockchain projects. By the end of the course, students will have the skills needed to design and implement blockchain solutions in various industries.

Course Outcomes:

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

CO Number	Course Outcome
CO1	Gain a deep understanding of the fundamental concepts and practical applications of blockchain technology.
CO2	Develop the skills to design, develop, and deploy blockchain solutions using industry-standard tools and frameworks.
CO3	Acquire knowledge of the technical details of distributed ledger technology, including consensus algorithms, cryptographic protocols, and smart contracts.
CO4	Create functional, efficient, and secure blockchain projects that can be applied in various industries.

The following concepts will be covered in the lab:

- Basic Cryptography Concepts for Blockchain
- Overview of Blockchain
- Creating and Building Up Bitcoin Wallet:
- Ethereum Wallet
- Building a Private Ethereum Network and Deploying Smart Contract
- Introduction to Solidity
- Ethereum Smart Contract
- Introduction to Hyperledger
- Creating a Business Network using Hyperledger.

- Creating a Business Network using Hyperledger- II

Text Books:

- "Blockchain Basics: A Non-Technical Introduction in 25 Steps" by Daniel Drescher.
- "Mastering Blockchain: Distributed ledger technology, decentralization, and smart contracts explained" by Imran Bashir.
- "Blockchain: Blueprint for a New Economy" by Melanie Swan.
- "Blockchain Technology Explained: The Ultimate Beginner's Guide About Blockchain Wallet, Mining, Bitcoin, Ethereum, Litecoin, Zcash, Monero, Ripple, Dash, IOTA And Smart Contracts" by Alan T. Norman.

CO-PO & PSO Correlation

Course Name: Blockchain Technology Lab												
	Program Outcomes								PSOs			
Course Outcomes	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**1**	**2**	**3**	**4**
CO1:	3	3	2	1					1	2		
CO2:	2	2	2	1					1	2		
CO3:	3	3	2	2					1	3		
CO4:	2	2	1	1					1	2		

Note: 1.: Low 2.: Moderate 3.: High