AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

STUDY SCHEME & DETAILED SYLLABUS

Bachelor of Technology

In

Computer Science and Engineering

(Batch 2021 onwards)

Study Scheme for B.Tech. CSE

Semester: 1st/2nd

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGCH - 21101	Engg. Chemistry	3	1	0	40	60	100	4
AGES - 21101	Environmental Studies	2	0	0	40	60	100	2
AGAM - 21101	Engineering Mathematics-I	3	1	0	40	60	100	4
AGCS - 21101	Programming for Problem Solving	3	0	0	40	60	100	3
AGHU - 21101	English-I	3	0	0	40	60	100	3
AGHU - 21103	English Lab-I	0	0	2	30	20	50	1
AGCH - 21102	Engg. Chemistry Lab	0	0	2	30	20	50	1
AGEG - 21101	Engineering Graphics	1	0	6	30	20	50	4
AGCS - 21102	Programming for Problem Solving Lab	0	0	4	30	20	50	2
		15	2	14				
		Contact Hours = 31 hrs			320	380	700	24

Semester: 1st/2nd

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGPH - 21101	Engineering Physics	3	1	0	40	60	100	4
AGAM - 21102	Engineering Mathematics-II	3	1	0	40	60	100	4
AGHU - 21102	English-II	3	0	0	40	60	100	3
AGEE - 21101	Basic Electrical & Electronics Engineering	3	1	0	40	60	100	4
AGHV - 21101	Human Values & Professional Ethics	3	0	0	40	60	100	3
AGPH - 21102	Engineering Physics Lab	0	0	2	30	20	50	1
AGHU - 21104	English Lab-II	0	0	2	30	20	50	1
AGEE - 21102	Basic Electrical & Electronics Engineering Lab	0	0	2	30	20	50	1
AGMP - 21101	Manufacturing Practice	0	0	4	60	40	100	2
AGGF - 21101	General Fitness	0	0	0	100	0	100	1
		15	3	10				
		Contact Hours = 28 hrs			450	400	850	24

Syllabus for CSE 2021 batch onwards

Semester: 3rd

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGCS - 21301	Mathematics and Statistics	3	1	-	40	60	100	4
AGCS - 21302	Data Structures	3	1	-	40	60	100	4
AGCS - 21303	Object Oriented Programming using C++	3	-	-	40	60	100	3
AGCS - 21304	Computer Networks	3	-	-	40	60	100	3
AGCS - 21305	Computer Architecture	3	1	-	40	60	100	4
AGCS - 21306	Data Structures Lab	-	-	2	30	20	50	1
AGCS - 21307	Object Oriented Programming using C++ Lab	-	-	2	30	20	50	1
AGCS - 21308	Computer Networks Lab	-	-	2	30	20	50	1
AGFE - 21301	Functional English - I	-	1		50		50	1
AGMC - 21301	Indian Constitution	1	-	-	-	-	-	-
AGCS - 21309	Institutional Training	-	-	2	60	40	100	1
		16	4	8	400	400	800	23
		Contact Hours = 28 hrs						

Semester: 4th

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGCS - 21401	Discrete Structures	3	1	-	40	60	100	4
AGCS - 21402	Relational Database Management Systems	3	1	-	40	60	100	4
AGCS - 21403	Programming in Python	3	-	-	40	60	100	3
AGCS - 21404	Operating Systems	3	-	-	40	60	100	3
AGCS - 21405	Web Development	3	-	-	40	60	100	3
AGCS - 21406	Relational Database Management Systems Lab	-	-	2	30	20	50	1
AGCS - 21407	Programming in Python Lab	-	-	2	30	20	50	1
AGCS - 21408	Operating Systems Lab	-	-	2	30	20	50	1
AGCS - 21409	Web Development Lab			2	30	20	50	1
AGAP - 21401	Engineering Aptitude - I	-	1	-	50	0	50	1
AGFE - 21402	Functional English - II	-	1	-	50	0	50	1
AGMC- 21401	Essence of Indian Knowledge Tradition	1	-	-	-	-	-	-
		16	4	8	420	380	800	23
		Contact Hours = 28 hrs						

Syllabus for CSE 2021 batch onwards

Semester: 5th

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGCS - 21501	Design and Analysis of Algorithms	3	1	-	40	60	100	4
AGCS - 21502	Software Engineering	3	1	-	40	60	100	4
AGCS - 21503	Programming in Java	3	-	-	40	60	100	3
AGCS - 21504X	Professional Elective Course-1 (PEC-1)	3	1	-	40	60	100	4
AGCS - 21505	Artificial Intelligence	3	-	-	40	60	100	3
AGCS - 21506	Design and Analysis of Algorithms Lab	-	-	2	30	20	50	1
AGCS - 21507	Software Engineering Lab	-	-	2	30	20	50	1
AGCS - 21508	Programming in Java Lab	-	-	2	30	20	50	1
AGCS - 21509	Artificial Intelligence Lab	-	-	2	30	20	50	1
AGAP - 21502	Engineering Aptitude - II	-	1	-	50	-	50	1
AGCS - 21510	Summer Training	-	-	-	60	40	100	1
		15	4	8	430	420	850	24
		Contact Hours = 27 hrs						

Semester: 6th

Course code	Course Name	Load Allocation			Marks Distribution		Total Marks	Credit
		L	T	P	Internal	External		
AGCS - 21601	Machine Learning	3	1	-	40	60	100	4
AGCS - 21602	Cloud Computing	3	-	-	40	60	100	3
AGCS - 21603	Big Data Analytics	3	-	-	40	60	100	3
AGCS - 21604X	Professional Elective Course-2 (PEC-2)	3	-	-	40	60	100	3
AGCS - 21605	Mobile Application Development	3	1	-	40	60	100	4
AGCS - 21606	Machine Learning Lab	-	-	2	30	20	50	1
AGCS - 21607	Cloud Computing Lab	-	-	2	30	20	50	1
AGCS - 21608	Big Data Analytics Lab	-	-	2	30	20	50	1
AGCS - 21609	Mobile Application Development Lab	-	-	2	30	20	50	1
AGFE - 21603	Functional English - III	-	1	-	50	0	50	1
AGAP - 21603	Engineering Aptitude - III	-	1	-	50	0	50	1
		15	4	8	420	380	800	23
		Contact Hours = 27 hrs						

Syllabus for CSE 2021 batch onwards

<table>
<tr><td colspan="10" align="center">**Semester: 7th / 8th**</td></tr>
<tr><td rowspan="2">**Course code**</td><td rowspan="2">**Course Name**</td><td colspan="3">**Load Allocation**</td><td colspan="2">**Marks Distribution**</td><td rowspan="2">**Total Marks**</td><td colspan="2">**Credit**</td></tr>
<tr><td>**L**</td><td>**T**</td><td>**P**</td><td>**Internal**</td><td>**External**</td><td></td><td></td></tr>
<tr><td>AGCS - 21701</td><td>Data Science</td><td>3</td><td>1</td><td>-</td><td>40</td><td>60</td><td>100</td><td colspan="2">4</td></tr>
<tr><td>AGCS - 21702X</td><td>Professional Elective Course-3 (PEC-3)</td><td>3</td><td>-</td><td>-</td><td>40</td><td>60</td><td>100</td><td colspan="2">3</td></tr>
<tr><td>AGCS - 21702Y</td><td>Professional Elective Course-4 (PEC-4)</td><td>3</td><td>-</td><td>-</td><td>40</td><td>60</td><td>100</td><td colspan="2">3</td></tr>
<tr><td>AGOE</td><td>Open Elective</td><td>3</td><td>-</td><td>-</td><td>40</td><td>60</td><td>100</td><td colspan="2">3</td></tr>
<tr><td>AGCS - 21703</td><td>Data Science Lab</td><td>-</td><td>-</td><td>2</td><td>30</td><td>20</td><td>50</td><td colspan="2">1</td></tr>
<tr><td>AGCS - 21704</td><td>Major Project Lab</td><td>-</td><td>-</td><td>4</td><td>60</td><td>40</td><td>100</td><td colspan="2">2</td></tr>
<tr><td colspan="2"></td><td>**12**</td><td>**1**</td><td>**6**</td><td rowspan="2">**250**</td><td rowspan="2">**300**</td><td rowspan="2">**550**</td><td colspan="2" rowspan="2">**16**</td></tr>
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<tr><td colspan="9" align="center">**Semester: 7th / 8th**</td></tr>
<tr><td rowspan="2">**Course code**</td><td rowspan="2">**Course Name**</td><td colspan="3">**Load Allocation**</td><td colspan="2">**Marks Distribution**</td><td rowspan="2">**Total Marks**</td><td rowspan="2">**Credit**</td></tr>
<tr><td>**L**</td><td>**T**</td><td>**P**</td><td>**Internal**</td><td>**External**</td></tr>
<tr><td>AGCS - 21801</td><td>Industrial Training</td><td>-</td><td>-</td><td>-</td><td>300</td><td>200</td><td>500</td><td>12</td></tr>
<tr><td colspan="2"></td><td>**0**</td><td>**0**</td><td>**0**</td><td rowspan="2">**300**</td><td rowspan="2">**200**</td><td rowspan="2">**500**</td><td rowspan="2">**12**</td></tr>
<tr><td colspan="2"></td><td colspan="3" align="center">**Contact Hours = 0 hrs**</td></tr>
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X	PEC-1	PEC-2
A	Theory of Computations	Information Security
B	Compiler Design	Cyber Security
C	Soft Computing	Blockchain Technology
D	Distributed Systems	Ethical Hacking

X	PEC-3	Y	PEC-4
A	Software Testing	F	Introduction to Internet of Things
B	Deep Learning	G	Social Network Analysis
C	Computer Vision	H	Reinforcement Learning
D	Advanced Computer Networks	I	Object Oriented Analysis and Design using UML
E	Business Intelligence and Analytics	J	Foundations of Cryptography
		K	Natural Language Processing

	List of Open Electives
AGOE - 21701	Air Pollution and Control
AGOE - 21702	Disaster Management
AGOE - 21703	Product Design and Development
AGOE - 21704	Material Management
AGOE - 21705	Non-Conventional Energy Sources
AGOE - 21706	Electrical Power Utilization
AGOE - 21709	Management of Human Resources
AGOE - 21710	Basics of Management

Syllabus for CSE 2021 batch onwards

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 1ˢᵗ/2ⁿᵈ SEM

1st Semester	AGAM 21101: ENGINEERING MATHEMATICS -I			

			L	T	P
Internal Marks:	40		**3**	**1**	**0**
External Marks:	60				
Total Marks:	100		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:
CO-1	Apply range of techniques to find solution of standard partial differential equations.
CO-2	Analyze how a function can be minimized or maximized.
CO-3	Understand the convergence and divergence of infinite series.
CO-4	Apply the engineering problem mathematically using theory of matrices.
CO-5	Analyze and designing complex systems that involve quantities with both magnitude and direction.
CO-6	Determine gradient vector fields and find potential functions.

Part	Content	CO
I	**Partial Differentiation:** Partial differentiation: Homogeneous functions and Euler's theorem, composite functions, Total derivative, Derivative of an implicit function, Change of variable, Jacobians.	CO-1
II	**Applications of Partial Differentiation:** Tangent and normal to a surface, Taylor's and Maclaurine's series for a function of two variables, Maxima and Minima of function of two variables	CO-2
	Sequence and Series: Convergence and divergence of series, Tests of convergence, Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test and Gauss test. Convergence and absolute convergence of alternating series.	CO-3
III	**Matrices:** Inverse and rank of a matrix, System of linear equations, Symmetric, skew-symmetric and orthogonal matrices, Determinants, Eigenvalues and eigenvectors, Diagonalization of matrices, Cayley-Hamilton Theorem.	CO-4
IV	**Vector Calculus** Scalar and Vector fields, differentiation of vectors, velocity and acceleration, Vector differential operators, Del, Gradient, Divergence and Curl and their physical interpretations. Formulae involving Del applied to point functions and their products.	CO-5
	Applications of Vector Calculus: Line integral, Solenoidal Vector point function, irrotational vector, Conservative field (Irrotational field).	CO-6

References:
• Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition, Peason Education Mathematical Statistics: S.C.Gupta
• Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.
• Peter. V. O" Nil, Advanced Engineering Mathematics, Wordsworth Publishing Company
• Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company
• Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi
• Taneja, H.C., Engineering Mathematics, Volume-I & Volume-II, I.K. Publisher
• Babu Ram, Advance engineering Mathematics, Pearson Education.
• Bindra,. J.S., Applied Mathematics, Volume-I, Kataria Publications

1st Semester	AGHU 21101: ENGLISH-I			
		L	**T**	**P**
Internal Marks:	40			
External Marks:	60	**3**	**0**	**0**
Total Marks:	100	**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand and build vocabulary for preparing the foundation to learn English Language.
CO-2	Generate a coherent argument in response to a situation or question.
CO-3	Understand the given text to enhance Reading Skills for the use of English in everyday life.
CO-4	Create understanding of the various grammatical components to master Communicative Skills in English.
CO-5	Create awareness of appropriate format and competence of explaining views in a rational manner.
CO-6	Understand the relation between language and literature for enhancing interest in literature.

Part	Content	CO
I	Vocabulary Reading -The Concept of word formation, Root words from foreign language and their use in English, Prefixes, Suffixes and Collocation	CO-1
II	Essay Writing	CO-2
	Comprehension	CO-3
III	Sentence Structure, Use of Phrases and clauses in sentences, Unity & Coherence in Writing, Parts of Speech, Gerund & Infinitive, Use of Tenses	CO-4
IV	Letter to Editor, Sales Letter,	CO-5
	The Road not taken by Robert Frost, The World is too much with us by William Wordsworth	CO-6

References:
- Practical English Usage. Michael Swan. OUP. 1995. Remedial English Grammar. F.T. Wood. Macmillan.2007   - On Writing Well. William Zinsser. Harper Resource Book. 2001   - Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

1st Semester	AGHU 21103: ENGLISH-I LAB			

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Develop the skills of writing and expressing his ideas about introduction
CO-2	Present before others/audience to highlight special traits/qualities/weaknesses etc
CO-3	Think cognitively extensively about a situation and put the ideas on paper in writing
CO-4	Speak instantaneously on any topic/situation which will enhance his confidence to speak fluently
CO-5	Imagine a situation and develop conversation in writing in association with another student
CO-6	Master the skill to converse in telecommunication mode in day-to-day life as well organizational setup

Part	Content	CO
I	Self-Introduction Written Document	CO-1
	Introduction of the Lab Activities. Description and Performance of the First Activity: Professional Self Introduction for 2 minutes	CO-2
	Extempore Written Document	CO-3
	Activity: Extempore Description & Performance	CO-4
	Telephonic Conversation Written Document	CO-5
	Activity: Telephonic Conversation Description, Understanding and Individual performance	CO-6

References:
• The Audio CD accompanying S.P. Dhanavel's Book (Part 1 & 2)
• English Lab Software by Bureau for Health and Education Status Upliftment

1st/2nd Semester		AGCH 21101: ENGINEERING CHEMISTRY			
			L	**T**	**P**
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		**Credits**		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand periodic properties and arrangement of elements in periodic table according to electronic configuration.
CO-2	Differentiate between different types of polymers and to understand their properties and their applications.
CO-3	Evaluate hardness present in water and to solve the problems related to municipal water.
CO-4	Study different types of corrosion, its consequences and the methods to minimize corrosion.
CO-5	Recognize different properties and physical separation methods of petrochemicals, applicability of engineering and nanomaterials in our day to day life .
CO-6	Evaluate fundamentals of electrochemistry, electrodes and cell.

Part	Content	CO
I	Periodic Properties (Properties, Configuration and arrangement of elements in periodic table)	CO-1
	Polymers (Types, Applications, Numerical related to molecular mass)	CO-2
II	Water and its treatment (Types of hardness, Problems related to water and their prevention method)	CO-3
	Corrosion (Types, Effects and Prevention methods.)	CO-4
III	Engineering materials and nanomaterials	CO-5
IV	Electrochemistry (types of cells, Nernst equation, Application	CO-6

References:
• Engg. Chemistry by Jain & Jain.
• Engg. Chemistry by RS Grewal.
• Engg. Chemistry by B. Sivasankar, Mc Geaw Hill.
• C.P. Poole, Jr, F.J Owens, Introduction to nanotechnology, Wiley Interscience.2003.

1st/2nd Semester	AGES 21101: ENVIRONMENTAL STUDIES			

			L	T	P
Internal Marks:	40		**2**	**0**	**0**
External Marks:	60		**2**	**0**	**0**
Total Marks:	100		**Credits**		**2**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Attribute the knowledge of multidisciplinary nature of environmental studies.
CO-2	Identify the role of natural resource on the basis of their utilization and recognize overexploitation of natural resources.
CO-3	Evaluate the interlink between biotic and abiotic components of ecosystem.
CO-4	Differentiate the terms of biodiversity and understanding the role of biodiversity in society.
CO-5	Apply the knowledge to understand the problems and remedies of environmental sciences.
CO-6	Relate the importance of environment sciences for sustainable development of the society.

Part	Content	CO
I	Multidisciplinary nature of environmental sciences.	CO-1
	Natural Resources (Types, Uses and overexploitation)	CO-2
II	Ecosystem (Introduction, Types, Flow of Energy and nutrition in ecosystem and Ecological Pyramids)	CO-3
	Biodiversity (Levels, Threats, Values and Conservation)	CO-4
III	Environmental Pollution (Types, Causes and Control measures)	CO-5
	Social Issues and the Environment	
IV	Human Population and Environment and Field Work	CO-6

References:
- Environmental Sciences, Tata McGraw Hill Pub., Banny Joseph   - Textbook of Environmental Studies for UG courses by Erach Bharucha.   - Environmental Studies by Anubha Kaushik and CP Kaushik (New Age Pub.)

1st/2nd Semester	AGCS 21101: PROGRAMMING FOR PROBLEM SOLVING			

			L	T	P
Internal Marks:	40		**3**	**0**	**0**
External Marks:	60		**3**	**0**	**0**
Total Marks:	100		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Demonstrate the basic building blocks of general-purpose digital computer system like hardware/software, memory and peripheral devices and the program development life cycle using various tools like flowcharts algorithms and pseudo-code.
CO-2	Familiarize and classify character set, data types, operators, expressions and control statements of a programming language.
CO-3	Understand the concept arrays and strings.
CO-4	Apply the concept of modular programming and code reusability using functions.
CO-5	Understand the concept of structures, unions and pointers.
CO-6	Implement the concept of file handling for developing real world applications.

Part	Content	CO
I	**Introduction to Computers:** Features, advantages and applications of computer, generations of computer, Components of a computer system along with block diagram of a computer, processor, memory, peripheral devices, operating system, its types and functions, translator, interpreters and compilers. **Idea of Algorithm:** Steps to solve logical and numerical problems, representation of algorithm, flowchart/pseudo code with examples.	CO-1
II	**Introduction to Programming:** From algorithms to programs, source code, variables and memory locations, syntax and logical errors in compilation, object and executable code, data types in C, operators: unary and binary, categories of operators, Arithmetic, relational, logical, conditional, increment/decrement, arithmetic expressions and precedence of operators, Storage Classes in C, Data input/output using scanf() and printf() functions along with their different formats, getchar() and putchar() functions along with their variations. **Control Statements:** If, If else, if else if, nested if statements, switch case statement. Iteration and loops using while, do-while and for loops, nested loops, continue statement, break statement and go to statement.	CO-2
	Arrays: Arrays (1-D, 2-D) declaration, initialization, accessing elements, searching and sorting of elements, matrix addition, multiplication, transpose. **Strings:** String handling functions such as strupr(), strlwr(), strcat(), strrev(), strlen(), strcpy().	CO-3
III	**Functions:** Function prototyping, function definition, function advantages, parameter passing in functions, call by value and call by reference, passing arrays to functions, passing strings to functions, recursion.	CO-4
	Structures: Defining structures, initializing a structure, structure assignment, array of structures, nesting of structures. **Unions:** Defining a union, structures Vs Unions. **Pointers:** Idea of pointers, defining pointers, pointer arithmetic, void pointer, pointer with arrays, pointer with strings, pointer with structures, array of pointers, malloc(), calloc(), realloc() and free().	CO-5
IV	**File handling:** Text file and binary file, file opening modes, writing in a file, reading from a file, copying a file to another file, errors in file handling.	CO-6

Syllabus for CSE 2021 batch onwards

References:

- Byron Gottfried, Schaum's Outline of Programming with C, McGraw-Hill
- E. Balaguruswamy, Programming in ANSIC, Tata McGraw-Hill Suggested

Syllabus for CSE 2021 batch onwards

1st/2nd Semester		AGCH 21102: ENGINEERING CHEMISTRY LAB			
Internal Marks:	40		L	T	P
External Marks:	60		0	0	2
Total Marks:	100		Credits		1

Course Outcomes: After studying the course, students will be able to:	
CO-1	Synthesize thermosetting polymers and analyse the properties.
CO-2	Evaluate the hardness of water using complex metric titration.
CO-3	Understand different separation techniques such as chromatography.
CO-4	Measure physical properties such as surface tension and viscosity of fluid.
CO-5	Apply the concept of conductivity.
CO-6	Create a mini project related to the course AGCH-21101.

Part	Content	CO
A	Synthesis of polymers	CO-1
	Determination of hardness of water	CO-2
	Separation of components using chromatography	CO-3
	Measurement of Surface Tension and Viscosity of fluid.	CO-4
	Determination of strength of an acid using Conductivity meter.	CO-5
B	Mini Project related to course AGCH-21101	CO-6

References:
• Engineering chemistry Practical by Nagendar Mani Khadka.
• Laboratory Manual Engg Chemistry, Anupama Rajput

1st/2nd Semester	AGCS-21102: PROGRAMMING FOR PROBLEM SOLVING LAB

			L	**T**	**P**
Internal Marks:	**30**		**0**	**0**	**4**
External Marks:	**20**				
Total Marks:	**50**		**Credits**		**2**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Demonstrate building block of computers, installation of C compiler and proper usage of IDE for debugging and execution.
CO-2	Understand and implement basic concepts of C Programming and various control structures.
CO-3	Perform linear array, matrices and strings in C programming.
CO-4	Apply the concept of modular programming and code reusability using functions.
CO-5	Understand and implement the concepts of structures, union, pointers.
CO-6	Apply skill of identifying appropriate programming constructs for problem solving using file handling.

Part	Experiment	CO
A	**Fundamentals of computer system, C compiler and IDE:** Basic building block of computer system, installation of C compiler, familiarization with programming environment, basic structure of C program, compiling and executing a C program.	CO-1
	Basic concepts of C programming and Control Statements: Simple computational problems using arithmetic expressions. Problems involving conditional statements (If, If-else, If-else-if ladder, nested if, Switch case) iterative statements (while, do while and for loops) and branching/jumping statements (break, continue, go to), storage classes.	CO-2
	Arrays & Strings: 1D Arrays: Creation, initialization, accessing, searching, sorting. 2D arrays: Creation, initialization, accessing, matrix problems. Strings: Creation, accessing and implementation of all string operations.	CO-3
	Modular Programming using Functions: Functions (including built in libraries), parameter passing in functions, call by value, call by reference, passing arrays to functions, passing strings to functions, recursion.	CO-4
	Structures, Unions, Pointers: Defining structures, initializing a structure, structure assignment array of structures, nested structures, defining union, implementing union. Defining pointers, pointer arithmetic, void pointer, pointer with arrays, pointer with strings, pointer with structures, array of Pointers	CO-5
B	To make a mini project through file handling by implementing various file operations: Insert, Delete, Update, Display and Search modules should be covered by each project.	CO-6

Syllabus for CSE 2021 batch onwards

1st/2nd Semester		AGPH 21101: ENGINEERING PHYSICS			
			L	**T**	**P**
Internal Marks:	**40**		**4**	**1**	
External Marks:	**60**				
Total Marks:	**100**		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand new concepts of physics like laser emission, holography etc which will help the students in engineering and technological applications.
CO-2	Generate logical thinking and ability to solve numerical problems which will lead to improve the problem solving ability in students.
CO-3	Understand need of quantum mechanics and it applications in every branch of engineering.
CO-4	Analyse and classify different types of electronic materials such as Magnetic materials, Nanomaterials, Metamaterials, Superconductors, etc and concept of superconductivity.
CO-5	Understand about the concept of heat, different modes of transfers of heat and thermal expansion of materials which is required for every branch of engineering in upcoming semesters
CO-6	Classify branches of physics like Electromagnetics, modern physics which will surely help the students in engineering and technology in future.

Part	**Content**	**CO**
I	Lasers, Population Inversion, Properties of Laser Light, Stimulated and Spontaneous Emission, Einstein A and B Coefficients, Pumping, Types of LASER-Ruby Laser, He-Ne Laser, and Applications of LASERS, Introduction to Holography, Difference between Holography and Photography.	CO-1
	Laws of Reflection and Refraction, TIR, Essential conditions of TIR, Applications of TIR, Optical Fibre, Acceptance Angle, Numerical Aperture, Propagation of waves, Attenuation of Optical fibre Signals, Applications of Optical Fibres , Numericals related to heat and temperature.	CO-2
II	Introduction to Classical Mechanics and Quantum Mechanics, Need of Quantum Mechanics, Uncertainty Principle, Wave-particle duality, Matter Waves, Black Body Radiation, Concept of Wave function, Application of Quantum Mechanics, Davisson Germer Experiment.	CO-3
III	Basic Idea of Dia, Para and Ferromagnetic material, Soft and Hard Magnetic Materials, Magnetostriction, Magnetic Anisotropy, Hysteresis curve. Introduction to semiconductors, Dielectrics, Metamaterials, Superconductors and Nanomaterials; types and their Applications, Superconductivity, Meissner Effect, Type I and Type II superconductors, Properties of superconductors, Isotope Effect, Cooper Pair, BCS Theory(Qualitative Idea), London Equations (No derivations).	CO-4
IV	Concept of Heat and Temperature, Units, Difference between Heat and Temperature, Different scales of temperature and their conversions, Expansion of Solids, Linear Expansion, Superficial Expansion and Volume Expansion, Relation between α, β and γ , Coefficient of Thermal Conductivity, Transfer of Heat, Modes of Transfer of Heat (Conduction, Convection and Radiation)	CO-5
	Introduction and properties of EM Waves, Divergence, Gradient and Curl, Applications of EM Waves, Displacement Current, Continuity Equation, Maxwell's Equations in Differential form	CO-6

References:
• Physics for Scientists & Engineers (Vol. I & II), Serway & Jewett, 9th Edition. Cengage Learning.

Syllabus for CSE 2021 batch onwards

- Engineering Physics, Malik; HK, Singh; AK, Tata McGraw Hill,
- Concepts of Modern Physics, Beiser; A., Mahajan; S., Choudhary; SR, Tata McGraw Hill.
- Physics; A calculus based approach (Vol. I & II) Serway; RA & Jewitt; JW, Cengage Learning.Materials Science & Engineering, Callister; WD, John Wiley & Sons.
- Introduction to Electrodynamics, Griffiths; DJ, Prentice Hall.
- D.A Neaman, "Semiconductor Physics and devices", Times Mirror High Education Group, Chicago. 1997
- Laser Theory & Applications, Thygrajan; K, Ghatak; AK, Mc Millan India Ltd.
- Engineering Mechanics, 2nd ed. — MK Harbola
- Principles of Mechanics — JL Synge & BA Griffith.
- Mechanics by D S Mathur, S Chand Publishing,1981
- Halliday and Resnick, Physics W. Saslow, Electricity, magnetism and light

1st/2nd Semester	AGEE 21101: BASIC ELECTRICAL AND ELECTRONICS ENGINEERING

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:

CO-1	Verify the basic laws in DC circuits and understand the concepts related to solar energy.
CO-2	Understand the concept of AC circuits with R, L, C and their combinations.
CO-3	Understand the concept of balanced 3-phase system and magnetic circuits.
CO-4	Understand the concept of single-phase conventional transformer and autotransformer
CO-5	Verify the working of DC and AC Motors and generators.
CO-6	To understand the applications of various electronic devices like diodes, transistors, rectifiers, logic gates and transducers.

Part	Content	CO
I	Direct Current (DC) Circuits Circuit elements, Ohm's Law, Kirchoff's Laws, Star-Delta Conversion, Superposition and Thevenin Theorem. Introduction to Solar Energy: Operating principle of solar cells, photovoltaic effect, environmental impacts and practical applications.	CO-1
II	Alternating Current (AC) Circuits, Representation of sinusoidal waveforms, Peak and RMS values, Analysis of single phase AC Circuits consisting of R, L, C, RL, RC and RLC, Introduction to balanced three phase system and its different types of connections. Magnetic Circuits. Comparison between magnetic and electric circuits, Faraday's law of Electromagnetic Induction, Self and Mutual Induction.	CO-2 & CO-3
III	Static Machines, Single Phase Transformer: Working principle, Construction (Core and Shell type), Efficiency, Autotransformer: Construction, Comparison with single phase transformer and industrial applications. Rotating Electrical Machines, D.C. machines (motor and generator), Three phase Induction motor, Single phase Induction motor: construction, working principle and industrial applications.	CO-4 & CO-5
IV	Transducers and Semiconductor Devices, Introduction, classification of transducers, LVDT: working principle, construction and industrial applications. Application of diodes as rectifiers, Application of transistor as amplifier, Introduction to logic gates and its truth table.	CO-6

References:
- Basic Electrical and Electronics and Computer Engineering by R Muthusubramanian, S Salivahanan,K A Muraleedharan, Tata McgrawHill
- A Textbook of Electrical Techology by B.L Theraja. & A.K Theraja, S Chand publishers.
- Electrical Technology, Edward Hughes, Addisin Wesley Longman Limited.
- A Course in electrical and electronic Measurements & Instumentation by A.K Sawhney, Dhanpat Rai & Co.
- Basic Electrical and Electronics Engineering by S.K. Sahdev, Uneek Publishers.

Syllabus for CSE 2021 batch onwards

1st/2nd Semester	AGHV 21101: HUMAN VALUES AND PROFESSIONAL ETHICS

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand Need and Process of Value Education.
CO-2	Identify and Analyse Basic Human Aspirations.
CO-3	Analyse the Needs and Activities of Self and Body.
CO-4	Identify and Understand the Comprehensive Human Goal.
CO-5	Understand Existence as Co-existence at all levels
CO-6	Visualize futuristic goals for Holistic Development.

Part	Content	CO
I	Introduction to Value Education, Self-Exploration as the Process of Value Education	CO-1
	Basic Human Aspirations and the Program to fulfil Basic Human Aspirations	CO-2
II	Understanding the Human Being as Co-existence of Self (I') and Body	CO-3
III	Harmony in the Family, Extending relationship from Family to society.	CO-4
	Harmony in Nature and the Holistic perception of Harmony in Existence	CO-5
IV	Implications of Holistic Understanding for mutually enriching and sustainable systems	CO-6

References:
- A Foundation Course in Human Values and Professional Ethics by R R Gaur, R Sangal & G P Bagaria
- Ethics and Human Values by S. Abdul Sattar.
- Human Values by Dr. Kshitiz Jain.

1st/2nd Semester	AGPH-21102: ENGINEERING PHYSICS LABORATORY

			L	T	P
Internal Marks:	30		0	0	2
External Marks:	20		0	0	2
Total Marks:	50		Credits		1

Part	Course Outcomes: After studying the course, students will be able to:	CO
A	Study the properties of variety of electrical and optical systems.	CO-1
	Understand principle, concept, working and application of new technology and comparison of results with theoretical calculations.	CO-2
	Understand measurement technology, usage of new instruments and real time applications in engineering studies.	CO-3
	Design new instruments with practical knowledge.	CO-4
	Develop experimentation skills and understand importance of measurement practices in Science & Technology.	CO-5
B	To make a mini project that demonstrate a concept, based on the content of AGPH-21101 (Engineering Physics)	CO-6

Exp. No.	Aim of Experiment	CO
I	To analyse the suitability of Zener diode as voltage regulator	CO-1
II	To study the laser beam characteristics like wave length using diffraction grating aperture.	
III	To find out the frequency of AC mains using electric-vibrator.	CO-2
IV	To determine the time period of simple pendulum for different length and acceleration due to gravity.	
V	To determine the band gap of a semiconductor material.	
VI	Use of multimeter for measuring (a) resistance (b) ac and dc voltages (c) dc current (d) capacitance (e) checking electrical fuses.	CO-3
VII	To determine the grain size of a material using optical microscope	
VIII	To find divergence of given laser beam.	CO-4
IX	To measure the length and diameter using Vernier calliper, screw gauge and travelling Microscope, use of plumb line and spirit level.	CO-5

(SOME SAMPLE PROJECTS RELATED TO ENGINEERING PHYSICS FOR REFERENCE)

✓ Designing and developing demo models of series and parallel circuits.

✓ Design and develop demo model for exploring concepts in current and voltage with a Vande-Graff Generator.

✓ Design and develop demo model of Homemade generators and emergency lamps.

✓ Design and develop demo model of Mini Maglev train.

✓ Design and develop demo model of electromagnetic motor.

✓ Design and develop demo model to check speed of sound at Room Temperature.

✓ Design and develop working model of elevator using Magnetic levitation.

✓ Design and develop a portable mobile charger.

✓ Design and develop working model of laser security system

✓ Design and develop working model for studying phenomenon of electromagnetic induction.

✓ Design and develop working model of Electromagnetic suction

Syllabus for CSE 2021 batch onwards

References:

- Practical Physics, C.L. Arora, S. Chand & Company Ltd.
- Practical Physics, R.S. Sirohi, Wiley Eastern.
- Advanced Practical Physics for students, B.L. Flint and H.T. Worsnop, 1971, Asia Publishing House.
- Practical Physics, G.L.Squires, Cambridge University Press, Cambridge, 1985
- https://vlab.amrita.edu/index.php?sub=1
- http://www.vlab.co.in
- physicsandbox.com/projects/double_pendulum.com
- 1000sciencefairprojects.com
- Seminarsonly.com/engineering-projects/physics
- https://learning-center.homesciencetools.com/article/electromagnetism-science-project/

1st/2nd Semester	AGEE 21102: BASIC ELECTRICAL ENGINEERING AND ELECTRONICS LAB

			L	T	P
Internal Marks:	30		**0**	**0**	**2**
External Marks:	20		**0**	**0**	**2**
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Learn to measure the electrical quantities with different measuring devices like multimeter, voltmeter, ammeter, etc. and understand the concept of solar panel
CO-2	Explain the concept of circuit laws and apply them to laboratory measurements.
CO-3	Be able to understand the connections of single phase and three phase transformers.
CO-4	Acknowledge the principles of operation and the main features of rotating electric machines and their applications.
CO-5	Prepare projects related to basic electrical circuits
CO-6	Prepare projects related to basic electronic circuits

Part	Content	CO
I	- To test the various components using Multimeter. - To verify Ohm's Law and its limitations. - To verify Kirchoff's Laws. - To study the voltage and current from solar panel output.	CO-1
II	- To find voltage-current relationship in a R-L series circuit and to determine the power factor of the circuit. - To start and reverse the direction of rotation of a 3-phase Induction motor. - To verify the working of LVDT	CO-2 & CO-3
III	- To obtain the characteristics of a P-N junction diode. - To verify the various waveforms for rectifier circuits. - To verify the truth table of logic gates.	CO-4
IV	- Design and develop the demo model for dancing LED lights. - Design and develop the demo model to check the continuity of supply. - Design and develop the demo model for water irrigation system using solar panel. - Design and develop the demo model for home lightning system using solar panel. - Design and develop the demo model for mobile charger using solar panel. - Design and develop the demo model for clap switch. - Electric model for equivalent circuit of rectifier using discrete components. - Any other project of their choice.	CO-5 & CO-6

References:
- S.K. Bhattacharya and R.K. Rastogi, Experiments in Electrical Engineering, New Age International Publisher Ltd., New Delhi.   - D.R. Kohli and S.K. Jain, Experiments in Electrical Machines.

1st/2nd Semester	AGMP 21101: MANUFACTURING PRACTICE			

			L	T	P
Internal Marks:	**40**		**3**	**1**	**0**
External Marks:	**60**				
Total Marks:	**100**		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:
CO-1	Identify the basics of tools and equipment used in Foundry Shop and welding shop. Also understand the various processes of Foundry shop and welding shop.
CO-2	Identify the basics of tools and equipment's used in Smithy shop and fitting shop. Also understand the basic processes of Smithy shop and Fitting shop.
CO-3	To make an ability to understand the various tools and processes performed in Machine Shop.
CO-4	To make an ability to understand the various tools used in Electrical and Electronic shop. Also make an ability to understand the exercises used in preparing PCB.
CO-5	Identify the basics of tools and equipment's used in Sheet Metal shop. Also familiarize with the production of models in Sheet Metal shop.
CO-6	Identify the basics of tools and equipment's used in carpentry shop. Also familiarize with the production of simple models in carpentry shop.

Part	Content	CO
I	**Foundry Shop:** Introduction to molding materials; moulds; use of cores; melting furnaces; tools and equipment used in foundry shops; firing of a cupola furnace; exercises involving preparation of small sand molds and castings. **Welding Shop:** Introduction to different welding methods; welding equipment; electrodes; welding joints; welding defects; exercises involving use of gas/electric arc welding.	CO-1
II	**Forging Practice:** Introduction to forging tools; equipments and operations; forgability of metals; exercises on simple smithy; forging exercises. **Fitting Shop**: Introduction of fitting practice and tools used in fitting shop; exercise involving marking, cutting, fitting practice (Right Angles), male- Female mating parts practice, trapping practice.	CO-2
	Machine Shop: Machines, Grinders etc; cutting tools and operations; exercises involving awareness.	CO-3
III	**Electrical and Electronics Shop:** Introduction to electrical wiring; preparation of PCBs involving soldering applied to electrical and electronic applications; exercises preparation of PCBs involving soldering applied to electrical and electronic applications.	CO-4
IV	**Sheet Metal:** Shop development of surfaces of various objects; sheet metal forming and joining operations, joints, soldering and brazing; exercises involving use of sheet metal forming operations for small joints.	CO-5
	Carpentry and Pattern Making: Various types of timber and practice boards, defects in timber, seasoning of wood; tools, wood operation and various joints; exercises involving use of important carpentry tools to practice various operations and making joints.	CO-6

References:
• P. N. Rao, Manufacturing Technology, Foundry, Forming and Welding, Mc Graw Hill
• Richard L Little, Welding and Welding Technology, McGraw Hill
• Amitabha Ghosh, Manufacturing Science, East-West Press Pvt Ltd

Syllabus for CSE 2021 batch onwards

2nd Semester		AGAM 21102: ENGINEERING MATHEMATICS II			
			L	**T**	**P**
Internal Marks:	**40**		3	1	0
External Marks:	**60**				
Total Marks:	**100**		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:

CO-1	Calculate the area of the region and the average value of a function of two variables over a rectangular region.
CO-2	Find the relation between line, surface and volume integral.
CO-3	Identify the type of a given differential equation and select and apply the analytical technique for finding the solution.
CO-4	Be familiar with the modelling assumptions and derivations that lead to PDEs
CO-5	Describe the need for extending the set of real numbers to the set of complex numbers.
CO-6	Understand the significance of differentiability for complex functions.

Part	Content	CO
I	**Multiple Integration:** Multiple Integration, Double integrals (Cartesian), change the order of integration in double integrals, Change of variables (Cartesian to polar),	CO-1
	Applications of Multiple Integration: Area and Volume. Triple integrals (Cartesian), scalar surface integrals, vector surface integrals, Theorems of Green, Gauss and Stokes.	CO-2
II	**Ordinary Differential Equations**: Exact differential equation, reducible to exact form by integrating factors, Equations of the first order and higher degree, Clairaut's equation, Leibniz's linear and Bernoulli's equation.	CO-3
III	**Linear Ordinary Differential Equations**: Solution of linear Ordinary Differential Equations of second and higher order, methods of finding complementary functions and particular integrals, Special methods for finding particular integrals, Method of variation of parameters, Operator method, Cauchy's homogeneous and Legendre's linear equation.	CO-4
IV	**Complex Numbers and elementary functions of complex variable:** De-Moivre's theorem and its applications, Real and Imaginary parts of exponential, logarithmic functions of complex variables, Summation of trigonometric series. (C+iS method).	CO-5
	Complex Variable: Differentiation, Cauchy-Riemann equations, analytic functions, harmonic functions, finding harmonic conjugate, elementary analytic functions, Conformal mappings.	CO-6

References:

- Thomes, G.B, Finney, R.L. Calculus and Analytic Gemetry, Ninth Edition, Peason Education Mathematical Statistics: S.C.Gupta
- Kreyszig, E., Advanced Engineering Mathematics, Eighth edition, John wiley.
- Peter. V. O‟ Nil, Advanced Engineering Mathematics, Wordsworth Publishing Company
- Jain, R.K and Lyengar, S.R.K., Advanced Engineering Mathematics, Narosa Publishing Company
- Grewal, B.S., Higher Engineering Mathematics, Khanna Publishers, New Delhi
- Taneja, H.C., Engineering Mathematics, Volume-I & Volume-II, I.K. Publisher
- Babu Ram, Advance engineering Mathematics, Pearson Education.
- Bindra,. J.S., Applied Mathematics, Volume-I, Kataria Publications

Syllabus for CSE 2021 batch onwards

2nd Semester		AGHU 21102: ENGLISH-II			
			L	**T**	**P**
Internal Marks:	40		**3**	**0**	**0**
External Marks:	60				
Total Marks:	100		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Generate their communicative skills for their forthcoming professional needs.
CO-2	Organize accurately, clearly, deeply and present well the matter/ logic/ facts/ opinion in a concrete and interesting manner.
CO-3	Understand the need to use English in their everyday life.
CO-4	Understand the language through grammatical components of English.
CO-5	Construct appropriate format and generate the capacity of explaining the views in a rational manner.
CO-6	Understand the relation between language and literature through textual reading and to enhance the reader's interest in Literature.

Part	**Content**	**CO**
I	Vocabulary Reading -The Concept of word formation, Root words from foreign language and their use in English, Synonyms & Antonyms, Homonyms, Homophones & Homographs	CO-1
II	Article Writing	CO-2
	Comprehension & Precis Writing	CO-3
III	Common Errors in English, Active & Passive Voice, Direct & Indirect Speech	CO-4
	Office Correspondence Writing (Official Letters)	CO-5
IV	The School for Sympathy by E V Lucas, The Beauty and the Beast by R K Narayan	CO-6

References:
• Practical English Usage. Michael Swan. OUP. 1995.
• Remedial English Grammar. F.T. Wood. Macmillan.2007
• On Writing Well. William Zinsser. Harper Resource Book. 2001
• Communication Skills. Sanjay Kumar and PushpLata. Oxford University Press. 2011.

2nd Semester	AGHU 21104: ENGLISH-II LAB			

			L	T	P
Internal Marks:	30		0	0	2
External Marks:	20		0	0	2
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:
CO-1	The students will learn about their strengths, weaknesses, threats and work enthusiastically to transfer weaknesses into strengths and threats into opportunities.
CO-2	They will be able to produce on their own clear and coherent texts.
CO-3	Students will be able to gain greater proficiency in English language and its technical aspects for its effective use in personal and professional life.
CO-4	Students will acquire basic proficiency in arranging the thoughts in written form and create hold on the language.
CO-5	The students will achieve greater refinement of techniques to present himself / herself before audience in an effective way.
CO-6	Students will be able to increase the memory capacity of the mind.

Part	Content	CO
I	Introduction of the Lab Activities. Description and Performance of the First Activity: Professional Self Introduction for 2 minutes	CO-1
	Self Introduction Written Document	CO-2
	Activity: Visual Extempore Description & Performance	CO-3
	Visual Extempore Written Document	CO-4
	Activity: Power Point Presentation Description, Understanding and Individual performance	CO-5
	Power Point Presentation Written Document	CO-6

References:
• The Audio CD accompanying S.P. Dhanavel's Book (Part 1 & 2)
• English Lab Software by Bureau for Health and Education Status Upliftment
• Various Video lectures on Power Point Presentation and Group Discussion

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 3rd SEM

3rd Semester	AGCS-21301: MATHEMATICS AND STATISTICS			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand the concept of Fourier series and partial differential equations.
CO-2	Understand linear system of equations, algebraic and transcendental equations.
CO-3	Gain knowledge of differential equations and curve fitting.
CO-4	Gain knowledge about the basic concepts of statistics.
CO-5	Understand the concept of probability distribution.
CO-6	Understand the concept of sampling and analysing different testing methods to solve real world problems.

Part	Content	CO
I	**Fourier Series:** Applications of Fourier series for continuous and discontinuous functions in periodic form.	CO-1
	Partial Differential Equations: Formation of partial differential equations, solution of homogeneous partial differential equations with constant coefficients.	
II	**Algebraic and Transcendental Equations:** Bisection method, Regula-Falsi method and Newton-Raphson method. **Solution of Linear Systems of Equations:** Gauss-Elimination method, Gauss Jordan method, Gauss-Seidel method, Jacobi iteration method.	CO-2
	Differential Equations: Solution of initial values problems using Euler, modified Euler's method and Runge-Kutta (up to fourth order) methods. **Curve Fitting:** Fitting a straight line, parabola, hyperbola, exponential curve and geometric curve.	CO-3
III	**Basic Statistics:** Meaning, functions and limitations of statistics. **Measures of Central Tendency:** Types of average-arithmetic mean (simple and weighted), median, mode, moments, skewness and kurtosis. **Measures of Dispersion:** Range, quartile deviation, mean deviation, standard deviation and coefficient of variation. **Correlation and Regression:** Correlations-rank correlation, coefficient of correlation Regression analysis.	CO-4
IV	**Probability Distribution:** Binomial, Poisson and Normal distribution, evaluation of statistical parameters for these three distributions.	CO-5
	Sampling & Testing of Significance: Sampling, general concepts of hypothesis, testing a statistical hypothesis, distribution of means and variance, t-distribution, F-distribution, Chi-Square distribution	CO-6

References:
- Higher Engineering Mathematics, B.S. Grewal, Khanna Grewal.
- Advanced Engineering Mathematics, E. Kreyszig, Wiley Eastern.
- A Text Book on Engineering Mathematics, Bali N. P Luxmi Publishers.
- Research Methodology: Methods and Techniques, C.R. Kothari and Gaurav Garg, New Age

3rd Semester		AGCS-21302: DATA STRUCTURES			
			L	**T**	**P**
Internal Marks:	40		3	1	-
External Marks:	60				
Total Marks:	100		**Credits**		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the concept of Dynamic memory management and complexity in algorithms.
CO-2	Implementation and usage of data structures on searching and sorting techniques.
CO-3	Usage of data structure linked list for implementation of stacks and queues for efficient memory management.
CO-4	Gain knowledge of tree data structure to organize the data.
CO-5	Apply graph data structure to solve computational problems.
CO-6	Understanding the hash function and using it for collision and its resolution.

Part	Content	CO
I	**Introduction:** Concept of data, data types, definition and brief description of various data structures, linear and non-linear data structures, operations on data structures, algorithm complexity, asymptotic notations with examples, calculating time and space complexity of an algorithm.	CO-1
	Arrays: Introduction to linear and multi-dimensional arrays and their representation, operations on arrays, row major and column major, sparse matrices and their storage. Searching & Sorting: Linear search and binary search techniques, bubble sort, selection sort, insertion sort, quick sort, merge sort, radix sort.	CO-2
II	**Linked List:** Introduction to linear linked list, operations on linear linked list, header and circularlinked list, doubly linked list, operations on doubly linked list, applications of linked lists, comparing arrays with linked lists, advantages and disadvantages of linked lists. Stacks & Queues: Sequential and linked representations, operations on stacks, application of stacks such as evaluation of postfix expressions, conversion from infix to postfix representation,implementing recursive functions, sequential representation of queue, linear queue, circular queue, operations on linear and circular queue, linked representation of a queue and operations on it, deque, priority queue, applications of queues.	CO-3
III	**Trees:** Introduction to tree, basic terminology, sequential and linked representation of a tree, treetraversal algorithms with problem sets, brief introduction to binary search trees with its operationslike searching, insertion, deletion, AVL tree, rotations in AVL tree, operations on AVL tree, B- tree, operations on B-tree, Heap, heap sort, min heap, max heap, operations on a heap.	CO-4
IV	**Graphs:** Basic terminology, representation of graph-adjacency matrix and adjacency list, traversal of a graph-breadth first search and depth first search, Floyd Wars hall's algorithm, Dijkstra's shortest path algorithm.	CO-5
	Hashing & Hash Tables: Introduction to hashing, hash functions, concept of collision, collision resolution techniques-open addressing and separate chaining, double hashing, rehashing.	CO-6

References:
• Data Structures, Seymour Lipschutz, Schaum's Outline Series, Tata McGraw Hill.
• Data Structures and Algorithms made easy, Narasimha Karamunchi by Career Monk.
• Data Structures using C and C++, Tenenbaum, Augenstein&Langsam, Prentice Hall of India.
• Data Structures & Algorithms Using C++, R. S. Salaria, Khanna Book Publishing.

Syllabus for CSE 2021 batch onwards

3rd Semester	AGCS-21303: OBJECT-ORIENTED PROGRAMMING USING C++			

			L	**T**	**P**
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		**Credits**		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Apply the various data types, operators and user-defined functions in program design.
CO-2	To understand the concept of object-oriented paradigm.
CO-3	To understand the concept of dynamic memory management techniques using pointers, constructors and destructors.
CO-4	To understand the concept of different types of inheritance.
CO-5	To understand the concept of polymorphism and overloading of operators.
CO-6	Analyse and explore various stream classes, I/O operations, exception handling and templates.

Part	Content	CO
I	**Basic Terminologies & Control Structures:** Introduction, applications, different compilers, features of object-oriented programming-abstraction, encapsulation, data-hiding, inheritance, overloading and polymorphism, concepts of an object and a class, class members and methods. **Tokens:** Keywords, identifiers, constants, operators, special characters and strings, data types, manipulators, concept of streams, input/output statements, control statements-selection (various if and switch statements), branch (break, continue and goto statements) and iterative control (for, while, do-while). **Functions:** Types of functions-standard & user-defined, advantages and disadvantages of using functions, call by value and call by reference, inline functions, difference between inline functions and macros, functions with default arguments, function overloading. **Array:** Definition and types, uses, advantages and disadvantages of using array, passing an array to a function, linear and multidimensional arrays. **Structures and Unions:** Defining a structure and a union, role of structures, self-referential structures, using unions for bit level field along with examples.	CO-1
	C++ Classes and Data Abstraction: Specifying a class, creating class objects, accessing class members, access specifiers, empty class, static data members and member functions, use of const keyword**,** friend functions, nested classes, container classes, difference between a class and structure.	CO-2
II	**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, void pointer, pointer related problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures. **Constructors and Destructors:** Definition of a constructor and a destructor, characteristics, need for constructors and destructors, types of constructors- default, parameterized and copy constructor, constructor overloading, dynamic constructors, destructors.	CO-3
III	**Inheritance:** Defining a class hierarchy, base and derived class construction, different forms of inheritance, access to the base class members, function overriding, virtual base class, order of execution of constructors and destructors.	CO-4
	Operator Overloading: Need of operator overloading, overloading unary and binary operators. **Virtual Functions and Polymorphism:** Static and dynamic binding, virtual functions, dynamic binding through virtual functions, virtual function call mechanism, pure virtual functions, abstract classes, implications of polymorphic use of classes, virtual destructors.	CO-5

Syllabus for CSE 2021 batch onwards

IV	**Templates, File and Exception Handling:** Concept of templates, function templates, class templates with illustrative examples, file streams, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files, command line arguments, exception handling in C++.		CO-6

References:

- Object Oriented Programming in C++, Lafore R., Waite Group.
- Object Oriented Programming with C++, E. Balagurusamy, Tata McGraw Hill.
- Mastering Object-Oriented Programming with C++, R. S. Salaria, Salaria Publishing House.
- The C++ Programming Language, Bjarne Stroustrup, Addison Wesley.
- Problem solving with C++: The Object of Programming, Walter Savitch, Pearson Education.

Syllabus for CSE 2021 batch onwards

3rd Semester		AGCS-21304: COMPUTER NETWORKS			
Internal Marks:	**40**		**L**	**T**	**P**
External Marks:	**60**		**3**	**0**	**0**
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basic concepts of networks and functions of different layers of OSI & TCP/IP reference models.
CO-2	Understand the working of physical layer and various transmission media.
CO-3	Understand data flow control protocols & error control mechanism.
CO-4	Understand routing and congestion in network layer, routing algorithm and addressing.
CO-5	Understand the working of TCP, UDP and Session Management.
CO-6	Explore the various application layer protocols and issues related to network security.

Part	Content	CO
I	**Introduction to Computer Networks:** Data communication system and its components, protocols and standards, line configuration, topologies (Mesh, Star, Tree, Bus, Ring and Hybrid). **Transmission Mode:** Simplex and duplex, categories of computer networks: LAN, MAN, WAN, wireless and wired networks, broadcast and point to point networks. **Network Software:** Concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP Protocol Suite.	CO-1
	Physical Layer: Concept of analog & digital signal, frequency spectrum and bandwidth, bit interval and bit rate, sampling, Nyquist formula, Shannon formula. **Transmission Media and Impairments:** Twisted pair, coaxial cable, fiber optics, wireless transmission (radio, microwave, infrared), attenuation, distortion, noise.	CO-2
II	**Data Link Layer:** Design issues, framing, checksum, error detection and correction Codes (VRC, LRC, and CRC, hamming code). **Flow Control and Error Control:** Stop and wait, sliding window protocol, ARQ, Stop & Wait ARQ, Go-back-N ARQ, selective repeat ARQ. **Data link protocols and Medium Access Sub-Layer:** HDLC and PPP, static and dynamic channel allocation. **Random Access:** ALOHA, CSMA protocols, controlled access, polling, token passing, IEEE 802.3 frame format, Ethernet cabling, collision detection in 802.3, binary exponential back off algorithm, token bus, token ring.	CO-3
III	**Switching:** Circuit switching, message switching, packet switching & their comparisons. **Network Layer:** Network and Internetworking devices, repeaters, bridges, routers and gateways. **Routing Algorithms and Congestion Control:** distance vector and link state routing, design issues, IPv4 classful and classless addressing, ARP, RARP, ICMP, IGMP, subnetting, principles of congestion control, congestion prevention policies, leaky bucket and token bucket algorithms.	CO-4
	Transport Layer: Duties of transport layer, introduction to TCP/UDP protocols and their comparison. **Session Layer:** Session and Transport layer interaction, synchronization points, sessionprotocol data unit. **Network Security:** Introduction to network security, various security techniques, Benefits of security	CO-5

Syllabus for CSE 2021 batch onwards

IV	**Presentation Layer:** Translation, encryption and decryption techniques, authentication, data compression. **Application Layer:** WWW, DNS, E-mail, Protocols-FTP, SMTP, TFTP, TELNET, DHCP, HTTP, HTTPs. **Network Security:** Introduction to network security, various security techniques, Benefits of security		CO-6

References:
- Computer Networks, Andrew S. Tanenbaum, Pearson Education.
- Data Communication & Networking, Behrouz A Forouzan, Tata McGraw Hill.
- Computer Networking, James F. Kurose and Keith W. Ross, Pearson Education.

3rd Semester	AGCS-21305: COMPUTER ARCHITECTURE			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand the basics of number system, conversions, concept of k-MAP and combinational circuits.
CO-2	Understand the concept of RTL, bus and memory transfer and the various micro-operations.
CO-3	Computer Organization, instruction formats and the design of control unit.
CO-4	Understand the working of central processing unit, RISC /CISC architecture and Input Output organization.
CO-5	Understand the concept of Input Output organization- DMA, CPU-IOP communication.
CO-6	Understand the concept of different types of memory with hardware, parallel processing and pipelining.

Part	Content	CO
I	**Number System:** Introduction to number system, conversions (binary, octal and hexadecimal),1's compliment & 2's compliment, binary addition and subtraction, Boolean algebra-logic operations, axioms and laws of Boolean algebra- complementation law, AND law, OR law, commutative law, associative law, distributive law, De Morgan's theorem, minimization of K-Map (two variables and three variables) sum of products (SOP) & product of sum (POS), combinational logic design-adders, subtractors and binary parallel adder, multiplexer, demultiplexer, introduction to flip flops, registers and counters.	CO-1
	Register Transfer and Micro operations: Register transfer language, register transfer, bus and memory transfer, arithmetic micro-operations, logic micro-operations, shift micro-operations, arithmetic logic shift unit.	CO-2
II	**Basic Computer Organisation and Design**: Instruction codes, stored program organization, direct and indirect address, basic computer registers, common bus system, computer instructions- instruction formats, instruction set. **Instruction Cycle:** Fetch & decode, determine the type of instruction, register reference instructions, memory reference instructions and its flowchart, timing and control, input/ output and interrupt with respect to 8085, control memory, design of control unit- micro programmed, hardwired and their comparative study.	CO-3
III	**Central Processing Unit:** Stack organization - register stack and memory stack, addressing modes- numerical example, program control with respect to 8085, RISC and CISC architecture. **Input-Output Organisation:** Peripheral devices, I/O Interface, asynchronous data transfer-strobe control, handshaking, modes of transfer-example of Programmed I/O, Interrupt-Initiated I/O, Priority interrupt -Daisy Chaining Priority, Interrupt Cycle.	CO-4
	Input-Output Organisation: Direct Memory Access (DMA)-DMA controller (architecture 8237A) and DMA transfer I/O processor-CPU-IOP communication.	CO-5
IV	**Memory Organisation & Advanced concepts of Computer Architecture:** Associative memory-hardware organization, cache memory-associative mapping, direct mapping, set-associative mapping, parallel processing, concept of pipeline, arithmetic pipeline, instruction pipeline(four-segment instruction pipeline), pipeline conflicts.	CO-6

References:
- Computer System Architecture, M. Morris Mano, Pearson Education.
- Computer Organization and Architecture, William Stallings, Pearson Education.
- Computer Architecture, David A Patterson, Pearson Education.
- Computer Organization and Design, P. Pal Chaudhuri, Prentice Hall India.

Syllabus for CSE 2021 batch onwards

3rd Semester		AGCS-21306: DATA STRUCTURES LAB			
Internal Marks:	**30**		**L**	**T**	**P**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Implement different sorting and searching algorithms.
CO-2	Perform different operations using arrays.
CO-3	Perform different operations using linked lists.
CO-4	Able to design & implement the stacks, queues and their applications.
CO-5	Perform basic operations on trees and graphs.
CO-6	Develop a project using various linear and non-linear data structures.

Part	Experiment	CO
A	Implementation of searching and sorting techniques using array.	CO-1
	Menu driven program that implements the following operations (using separate functions)on a linear array: • Insert a new element at end as well as at a given position. • Delete an element from a given whose value is given or whose position is given • To find the location of a given element. • To display the elements of the linear array.	CO-2
	Menu driven program that maintains a linear linked list whose elements are stored in an • ascending order and implement the following operations (using separate functions): • Insert a new element • Delete an existing element • Search an element • Display all the elements	CO-3
	Usage of Stack • Push and Pop operations. • Converting an arithmetic expression from infix notation to postfix notation • Evaluating an arithmetic expression in postfix notation • Recursion. Implementation of Insert and Delete operations in Queues.	CO-4
	Implementation of different traversals on a binary search tree and traversal of graphs.	CO-5
B	To develop a mini project based on usage of linear and non - linear data structures.	CO6

3rd Semester	AGCS-21307: OBJECT ORIENTED PROGRAMMING USING C++ LAB			

			L	T	P
Internal Marks:	30		**0**	**0**	**2**
External Marks:	20				
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:

CO-1	Understanding and applying various data types, operators, and conversions in program design.
CO-2	Apply the concepts of Classes &Objects, constructors and destructors.
CO-3	Able to design & implement various forms of inheritance.
CO-4	Apply & analyse operator overloading and runtime polymorphism.
CO-5	Usage of file handling to store and retrieve data and to explore exception handling.
CO-6	Developing an application using file handling.

Part	Experiment	CO
A	Use of control structures, functions, arrays and structures.	CO-1
	Implementation of pointers and classes & objects.	CO-2
	Implementation of constructors and destructors.	
	Usage of inheritance.	CO-3
	Usage of operator overloading and polymorphism.	CO-4
	Usage of typecasting, templates and file handling.	CO-5
B	To make a mini project that demonstrates a concept, based on the content of AGCS– 21307(OBJECT ORIENTED PROGRAMMING USING C++ LAB).	CO-6

3rd Semester	AGCS-21308: COMPUTER NETWORKS LAB			

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**				
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Identify and visualize the various components used in implementation of Computer Network.
CO-2	Prepare and test the straight and cross cable.
CO-3	Study and analyze the various network topologies.
CO-4	Plan the subnet and assign the IP addresses in a network accordingly.
CO-5	Access and monitor the remote network.
CO-6	Usage of various network tools.

Part	Experiment	CO
A	1. Familiarization with networking components and devices: LAN adapters, Hubs, Switches, Routers.	CO-1
	2. Co-axial cable, UTP Cable, crimping tool, connectors etc. 3. Preparing straight and cross cables.	CO-2
	4. Implementation of various LAN topologies. 5. Configuration of TCP/IP protocols in windows.	CO-3
	6. Implementation of file and printer sharing. 7. Subnet planning and its implementation.	CO-4
	8. Remote access and monitoring. 9. Generating IP addresses range using subnet-mask calculator and implementation of Who-is Domain tools.	CO-5
B	To make a mini project that demonstrates a concept, based on the content of AGCS-21308 (COMPUTER NETWORKS LAB)	CO-6

3rd Semester	AGFE-21301: FUNCTIONAL ENGLISH– I

Internal Marks:	50		L	T	P
External Marks:	0		0	1	0
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:

CO-1	Self-Introduction to prepare students to face one to one interaction.
CO-2	Body Language detail to prepare students in non-verbal communication.
CO-3	Vocabulary based session to improve language proficiency of students.
CO-4	Basic Grammar to make students proficient in English correspondence.
CO-5	Book reading to improve reading skills of students.
CO-6	Formal/ Informal Letter writing to make students proficient in written correspondence.

Part	Content	CO
I	Components of Self Introduction, Exemplary Performances, Student Performances on Self Introduction along with resume.	CO-1 CO-2
II	This section includes Common Vocabulary and its usage. Synonyms and Antonyms as a part of vocabulary to be done.	CO-3
	This section includes editing, omission, gap filling, rearranging jumbled sentences to test knowledge of passive voice, reported speech, articles and the other determiners, modals, tense, etc. Basic Grammar such as Tenses, Voice, Narration shall be done.	CO-4
III	Connect The Dots by Rashmi Bansal shall be prescribed for honing reading skills and comprehension in depth.	CO-5
IV	Formal/ Informal Letter Writing, Basic Format, Example, Practice shall be done.	CO-6

References:
- www.Indiabix.com
- English Grammar by Wren and Martin
- www.freshersworld.com
- www.alison.com

3rd Semester		(Mandatory Course) AGMC-21301: INDIAN CONSTITUTION			
Internal Marks:	-		**L**	**T**	**P**
External Marks:	-		1	0	0
Total Marks:	-		Credits		0

Part	Content	CO
-	• Meaning of the constitution law and constitutionalism. • Historical perspective of the Constitution of India. • Salient features and characteristics of the Constitution of India. • Scheme of the fundamental rights. • The scheme of the Fundamental Duties and its legal status. • The Directive Principles of State Policy – Its importance and implementation. • Federal structure and distribution of legislative and financial powers between the Union and the States. • Parliamentary Form of Government in India – The constitution powers and status of the President of India. • Amendment of the Constitutional Powers and Procedure. • The historical perspectives of the constitutional amendments in India. • Emergency Provisions: National Emergency, President Rule, Financial Emergency. • Local Self Government – Constitutional Scheme in India. • Scheme of the Fundamental Right to Equality. • Scheme of the Fundamental Right to certain Freedom under Article 19. • Scope of the Right to Life and Personal Liberty under Article 21	-

Syllabus for CSE 2021 batch onwards

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 4th SEM

4th Semester	AGCS -21401: DISCRETE STRUCTURES			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the concepts of sets, relations and functions.
CO-2	Understand the concept of rings and Boolean algebra.
CO-3	Understand the concept of combinatorial mathematics.
CO-4	Gain knowledge about groups.
CO-5	Understand the concept of propositional logic and calculus.
CO-6	Gain knowledge of trees and graphs for decision making

Part	Content	CO
I	**Sets, Relations and Functions:** Introduction, proofs of general identities of sets-basic operations onsets, cartesian products, disjoint union (sum and power sets), De Morgan's Law, De Morgan's law for difference of sets, types and operations on relations, properties of relations and functions, equivalence relations, different types of function, their compositions and inverse	CO-1
	Rings: Rings, Commutative ring, ring with unity, ring with zero divisors, ring without zero divisors, Boolean algebra and Boolean ring, units, quotient ring.	CO-2
II	**Combinatorial Mathematics**: Basic counting principles, inclusion and exclusion principle, pigeon hole principle, recurrence relations, generating function.	CO-3
III	**Monoids and Groups:** Groups Semi groups and monoids, integer modulo m, order of group, abelian group, morphisms, normal subgroups, kerf.	CO-4
	Propositional Logic and Calculus: Syntax and semantics, proof system, satisfiability, validity, soundness, completeness, deduction theorem, decision problems of propositional logic, introduction of first order theory, logically equivalence, Tautologies, contradiction.	CO-5
IV	**Graph Theory and Trees:** Introduction, Directed and Undirected graphs, compliment, sub graph, path, Euler and Hamiltonian graph, regular, planar graph, Euler theorem, Graph Colouring, Isomorphism, Homomorphism, Trees, Spanning Tree, Kruskal Algorithm to find minimum spanning tree.	CO-6

References:
• Discrete Structures: C.P. Gandhi
• Discrete Structures: R.C. Joshi
• Discrete Structures: Rosen
• Discrete Mathematics: BPraba

Syllabus for CSE 2021 batch onwards

4th Semester	AGCS-21402: RELATIONAL DATABASE MANAGEMENT SYSTEMS			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the concept of Database Management System and its various applications in real life.
CO-2	Understand the different database languages i.e., (DDL, DML, DCL, and TCL) along with the usage of SQL and PL/SQL.
CO-3	Understand the concept of E-R diagrams for conceptual modelling.
CO-4	Understand the concept of normalizing tables for effective database design.
CO-5	Understand the concept of database security, concurrent transactions and handling deadlock.
CO-6	Understand the concept of distributed databases and its application in the real world.

Part	Content	CO
I	**Introduction to Database Systems:** DBMS and its definition, file systems versus a DBMS, components of a DBMS, advantages/disadvantages of a DBMS, describing and storing data in a DBMS, three-level architecture for a DBMS, data independence-physical and logical, mappings at various levels in three-level architecture.	CO-1
II	**Relational Query Languages: SQL- SQL as DML, DDL and DCL, DDL statements:** create table, create view, alter table, drop, DML statements: insert, delete and update, DCL statements: privileges-system and object privileges, Granting and revoking privileges: grant and revoke commands, roles in SQL. Basic SQL select statement, SQL data types and their usage, creating tables & views, read only and read/write views, Integrity constraints in SQL: table constraints and column constraints, Various column constraints: primary key, foreign key, check, not null, unique, default, Naming constraints and data dictionaries associated with them. SQL Functions: Numeric, character, date, general and aggregate functions, sub queries and their usage- single row and multiple row sub queries. PL/SQL: Advantages, scripts in PL/SQL and different ways to run those, data types and their usage, anonymous block along with examples, DML in PL/SQL block: select-into statement, control statements, %type and %rowtype and their usage. **Cursors and its various types:** implicit and explicit, parameterized cursors, cursor for loop. Exception handling- pre-defined and user defined exceptions. various pre-defined exceptions. Functions and procedures: argument modes in functions and procedures- in, out, in out, invoking functions and procedures. Packages: Package specification and package body, triggers and its types. examples based on packages and triggers. [Programs/applications in PL/SQL should primarily relate to table data.]	CO-2
	Data Models: Record based physical models: relational model, network model, hierarchical model, Conceptual design using the ER model, ER diagrams and the various symbols for them. Relational model: entities, attributes and entity set, relationships among entities, strong and weak entities, difference between DBMS and RDBMS, CODD's rules, ER to relational model conversion, set operators and relational algebra operators, relational algebra queries, keys in relational algebra.	CO-3
III	**Database Design:** Functional dependencies, normalization and its need, normal forms, first, second and third normal forms, BCNF, multi-valued dependency, join dependency, fourth and fifth normal forms.	CO-4

IV	**Transaction Management and Concurrency Control:** Operations associated with transactions read and write, acid properties of a transaction, life cycle of a transaction, schedules-types of schedules, serializability, concurrent transactions, advantages, lock management, lost update problem, inconsistent read problem, read-write locks, 2 phase locking protocol.	CO-5
	Distributed Databases: Distributed database concepts–replication, fragmentation, replication & fragmentation, advantages and disadvantages, data fragmentation, replicationand allocation techniques for distributed database design. Database Protection and Recovery: Database security. authorisation and authentication, threats to a database and itsprevention. Backup and Recovery: Types of database recovery, recovery techniques- deferred update, immediate update, shadow paging, checkpoints, buffer management.	CO-6

References:

- Fundamentals of Database Systems, Elmasriv Navathe, Pearson Education, 2007.
- An Introduction to Database Systems, C.J. Date, Pearson Education
- Database Management Systems, Alexis Leon, Mathews Leon, Leon Press.
- Database Systems Concepts, Design and Applications, S. K. Singh, Pearson EDUCATION

4th Semester	AGCS-21403: PROGRAMMING IN PYTHON			

Internal Marks:	40		L	T	P
External Marks:	60		3	-	-
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	To interpret the python syntax and semantics of control flow statements.
CO-2	To apply list, tuple, dictionary, functions, modules and string handling in Python to solve problems.
CO-3	To analyse the concepts of object-oriented approach to solve problems.
CO-4	To implement inheritance and multithreaded programming.
CO-5	To implement operator overloading, function overloading and visualization.
CO-6	To implement exception handling, file handling, database connectivity and GUI design.

Part	Content	CO
I	**Basics of Python Programming:** Features, History, future of python, writing and executing first python program, literal constants, variables and identifiers, data types, input operation, comments, reserved words, indentation, operators and expressions, expressions, type conversion. **Decision control statements:** Introduction, selection/conditional branching statements, basic loop structures/iterative statements, nested loops, break, continue and pass statements.	CO-1
	Functions and Modules: Introduction, function declaration and definition, function definition, function call, variable scope and lifetime, the return statement, recursive functions, lambda functions with map, reduce & filter, modules, packages in python, import and reload module, module- random, os, math, sys.	CO-2
II	**Strings:** Concatenating, appending and multiplying strings, immutability, string formatting operator, built-in string methods and function, string slicing with step size. **Lists:** access and update values in lists, nested and cloning lists, list slicing with step size, basiclist operations, list methods, using lists as stack and queues, list comprehensions, looping in lists, basic tuple operations, tuple methods. **Sets:** Creating a set and set operations, set operators, set methods, frozen sets. **Dictionaries:** Creating a dictionary, accessing values, add, modify, delete, sort items in a dictionary, looping over a dictionary. **Date and Time:** Classes in Python date time module- date, time, date time, time delta, tzinfo and time zone.	
	Classes and Objects: Introduction, classes and objects, class method and self-argument, init ()method, class and object variables, del() method, other special methods, public and private datamembers, private methods, calling a class method from another class method, built-in class attributes, garbage collection, class and static methods.	CO-3
	Inheritance: Introduction, inheriting classes in python, types of inheritance, composition/containership/complex objects, abstract classes and interfaces, meta class. **Mutli threading:** Defining a thread, Thread Control Block (thread identifier, stack pointer, program counter, thread state, thread register set, parent process pointer), threading module andthread class (methods of thread class- run, start, join, isalive, getname, setname).	CO-4

III	**Operator Overloading:** Introduction, implementing operator overloading, operator overriding, **Function Overloading, Assertions and Exception Handling:** Introduction to errors and exceptions, handling exceptions, multiple except blocks, multiple exceptions in a single block,except block without exception, the else clause, raising exceptions, built-in and user-defined exceptions, the finally block, Assertions in python.	CO-5
IV	Analysing, reading and writing a formatted file (csv or tab-separated), matplotlib module andits implementation for data visualization, regular expressions, manipulating files and directories, text files: reading/writing text and numbers from/to a file, connectivity of Pythonwith a database: CRUD operations.	CO-6

References:

- Programming Python, Mark Lutz, O`Reilly.
- Introduction to Computing and Problem-Solving Using Python, E. Balagurusamy, McGraw Hill Education.
- Python Crash Course, Eric Matthews.

4th Semester		AGCS-21404: OPERATING SYSTEMS			
Internal Marks:	40		**L**	**T**	**P**
External Marks:	60		**3**	**0**	**0**
Total Marks:	100		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basics of operating system like kernel, shell, types and views of operating system.
CO-2	Understand the concept of process, thread, concurrency and process scheduling algorithms.
CO-3	Gain knowledge about deadlock, deadlock prevention, deadlock avoidance and deadlock recovery.
CO-4	Familiarize with the concept of memory management, fragmentation, paging, segmentation, virtual memory and page replacement algorithms.
CO-5	Understand disk management and disk scheduling algorithms, file system interface.
CO-6	Gain knowledge about protection & security of operating systems.

Part	Content	CO
I	**Introduction:** Operating system and its classification -batch, interactive, multiprogramming, time-sharing, real-time system, multiprocessor systems, system call and its types, monolithic and microkernel systems, operating system components and views, operating system functions and services.	CO-1
	Processes & Process Synchronization: Process concept, process states, process state transition diagram, process control block (pcb), threads and its types, principle of concurrency, producer / consumer problem, critical section problem, semaphores, classical problem in concurrency: readers writers problem.	CO-2
II	**Process Scheduling:** Process scheduling concept, types of schedulers-long term scheduler, short term scheduler, medium term scheduler, scheduling criteria: CPU utilization, throughput, turnaround time, waiting time, response time (definition only), scheduling algorithms- pre-emptive and non-pre-emptive, FCFS, SJF, priority, round robin.	
	Deadlocks: Definition, deadlock characteristics, deadlock prevention, deadlock avoidance: banker's algorithm, deadlock detection and recovery.	CO-3
III	**Memory Management:** Concept of memory and memory hierarchy, logical and physical address map, memory allocation: contiguous and non-contiguous memory allocation, fixed and variable partition, internal and external fragmentation and compaction, paging:principle of operation, page allocation, hardware support for paging, protection and sharing , disadvantages of paging, segmentation, basics of virtual memory, locality of reference, page fault, demand paging (Concepts only), Page replacement algorithms: Optimal (OPT), First in First Out (FIFO) and Least Recently used (LRU), thrashing.	CO-4
IV	**Device Management & File System:** Disk scheduling: FCFS, SCAN, C-SCAN, LOOK, C-LOOK, SSTF, file concept, file organization and access mechanism.	CO-5
	Protection and Security: Goals and domain of protection, access matrix, program threats: virus, worms, trojan horse, trap door, denial of service attacks.	CO-6

References:
- Operating System Concepts, A Silberschatz and Peter B. Galvin, Addison Wesley PublishingCompany.
- Systems Programming & Operating Systems, Dhamdhere, Tata McGraw Hill.
- Operating Systems Concepts, Gary Nutt, Pearson.
- Operating Systems by Madnick Donovan, Tata McGraw Hill. Strength of Materials by Gere, Cengage Learning.

Syllabus for CSE 2021 batch onwards

4th Semester		AGCS-21405: WEB DEVELOPMENT			
Internal Marks:	**40**		**L**	**T**	**P**
External Marks:	**60**		**3**	**0**	**0**
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:

CO-1	Introducing the fundamentals of internet & its terminology and construction of basic websites using HTML.
CO-2	Understand design principles in CSS for making web pages presentable.
CO-3	Understanding Client-side scripting language like JavaScript.
CO-4	Understanding of Document Object Modelling and the JavaScript library.
CO-5	Understanding of server-side scripting language like AJAX.
CO-6	Developing modern interactive web applications using PHP and its database connectivity.

Part	Content	CO
I	**Internet and World Wide Web:** Introduction to internet, ISP, types of internet connections, web browsers, web servers, URLs, HTTP, web applications, tools for web site creation. **HTML5:** Introduction to HTML5, basic formatting tag, html color coding, grouping using div. span, lists, adding graphics to HTML5 page, creating tables, linking documents, forms, iframes.	CO-1
II	**Cascading Style Sheets:** Introduction and types, CSS selectors, CSS box model.	CO-2
	Client-Side Scripting with JavaScript: Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, event handler.	CO-3
III	**DOM:** Document Object- finding HTML elements, changing HTML elements, adding and deleting elements, changing HTML styles, form validations, handling cookies.	CO-4
	jQuery: Introduction, syntax, selectors, events, effects.	
IV	**AJAX:** Introduction, HTTP request, Creation of XML Http request object, methods & properties of XML Http request, Use of Get & Post method.	CO-5
	Server-Side Scripting with PHP: PHP syntax, variables, data types, operators, control structure, functions, array, working with PHP and MySQL, connecting to database.	CO-6

References:

- HTML, CSS, JavaScript, Perl, Python and PHP, Steven M. Schafer, Wiley India Textbooks.
- An Introduction to Web Design + Programming, Paul S. Wang, G. Keller, S. Katila, Cengage Learning.
- Web Technologies: A Computer Science Perspective, Jeffery C. Jackson, Pearson Education.
- Learning PHP, MySQL, and JavaScript, Robin Nixon, Shroff/O'Reilly.
- PHP and MySQL for Dynamic Web Sites: Visual QuickPro, Larry Ullman.

4ᵗʰ Semester	AGCS-21406: RELATIONAL DATABASE MANGEMENT SYSTEMS LAB			

Internal Marks:	30		L	T	P
External Marks:	20		0	0	2
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:
CO-1	Understand the concept of Database Management System and its various applications in real life.
CO-2	Understand the concept of joins and sub queries.
CO-3	Understand the concept of normalizing tables for effective database design.
CO-4	Understand the different database languages i.e., (DDL, DML, DCL, and TCL) along with the usage of SQL and PL/SQL.
CO-5	Understand the concept of concurrent transactions, database security and handling deadlocks effectively.
CO-6	Develop an application using Oracle SQL and connecting it with a front-end technology.

Part	Experiment	CO
A	Introduction to SQL and installation of SQL Server / Oracle	CO-1
	Functions: character, number, date, and general functions, aggregate functions, grouping the result of a query, set operators, nested queries, joins, sequences.	CO-2
	Designing of multiple tables using the concept of normalization.	CO-3
	DDL, DML and DCL statements Use command to compute the size of a matrix, size/length of a particular row/column, load data from a text file, store matrix data to a text file, finding out variables and their features in the current scope. Create Table, alter table, drop statements. insert, update and delete statements. Working with Null Values, matching a pattern from a table, ordering the result of a query. PL/SQL anonymous block, running scripts, select-into statement, control statements. Cursors and its various types: implicit and explicit, parameterized cursors, cursor for loop. Exception handling: pre-defined and user-defined exceptions, functions and procedures, argument modes in functions and procedures-in, out, in out. Packages: specification and body, triggers and its various types. examples based on triggers.	CO-4
	Views, database security and privileges: grant and revoke commands, commit and rollback commands.	CO5
B	List of suggested applications to be designed • E-commerce • Flight reservation system • Restaurant management system • Railway reservation system • Inventory management system • Book store management system • Cineplex management system • Hotel booking management system • Medical store management system • Library management system • Banking management system	CO6

4th Semester		AGCS-21407: PROGRAMMING IN PYTHON LAB			
Internal Marks:	30		**L**	**T**	**P**
External Marks:	20		**0**	**0**	**2**
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	To interpret the python syntax and semantics of control flow statements.
CO-2	To apply functions, modules and string handling in Python to solve problems.
CO-3	To determine the methods to create and manipulate programs with Python data structures list, tuple and dictionary.
CO-4	To analyse the concepts of object-oriented approach to solve problems.
CO-5	To design and implement GUI application and how to handle exceptions.
CO-6	To develop an application using the concepts of file handling and database connectivity.

Part	Experiment	CO
A	Use of Data Types, Integer Arithmetic, Variables and Assignment Use of Print Function, Branching programs, Strings and Input, Iteration	CO-1
	Implementation of Functions and Recursion Modules (random, math, os, sys)	CO-2
	Implementation of Tuples, List and DictionariesArray and Matrices	CO-3
	Object-oriented Programming	CO-4
	Exception Handling Analysing data using CSV module File I/O, Reading CSV and Excel Files, Reading Text Files, Writing and Saving to Files	CO-5
B	List of suggested applications to be designed • E-commerce • Flight reservation system • Restaurant management system • Railway reservation system • Inventory management system • Book store management system • Cineplex management system • Hotel booking management system • Medical store management system • Library management system • Banking management system	CO-6

4th Semester		AGCS-21408: OPERATING SYSTEMS LAB			

			L	T	P
Internal Marks:	30		0	0	2
External Marks:	20				
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand the concept of operating system and installation of operating system.
CO-2	Utilize the concept of virtualization for creating a virtual machine and installing operating system on virtual machine.
CO-3	Execute Linux commands for files and directories, creating and viewing files, File comparisons, file manipulation, program execution, and printing text.
CO-4	Understand the concept of Vi editor.
CO-5	Demonstrate shell programming by using shell variables and shell keywords for automated system tasks.
CO-6	To demonstrate the concept of CPU scheduling and page replacement algorithms used in Operating systems.

Part	Experiment	CO
A	1. Installation of operating systems	CO-1
	2. Concept of Virtualization, Installation of Virtual Machine Software and Installation of Operating System on Virtual Machine.	CO-2
	3. Introduction to UNIX/Linux: Architecture, Features. Introductory Commands: date, cal, banner, write, mesg, who, passwd etc. Files and directories: pwd, mkdir, cd, ls, rmdir, chmod, chgrp, chown, cat, cp, mv, rm, cmp. Pipes, Filters and Redirection: Pipes, filters, redirection, tees, head, tail, wc, sort, grep etc. Processes: ps, kill etc.	CO-3
	4. Vi editor: Introduction, entering text, deleting text, modifying text.	CO-4
	5.Shell Programming-I: Features of the shell, Shell as a programming language, creating andexecuting shell scripts, shell variables, arithmetic and logical operators, tests, decision making: if…fi, if….else….fi.	CO-5
B	To demonstrate the concept of CPU scheduling and page replacement algorithms used in Operating systems, based on the content of AGCS-21408 (OPERATING SYSTEMS LAB)	CO-6

4th Semester		AGCS-21409: WEB DEVELOPMENT LAB			
Internal Marks:	30		**L**	**T**	**P**
External Marks:	20		**0**	**0**	**2**
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Develop the Web pages using HTML.
CO-2	Design principles in CSS for beautification of Web Pages.
CO-3	Design the Interactive Web Pages using Client-Side Scripting Language.
CO-4	Creation of web pages using JQuery Library.
CO-5	Development using server-side Scripting Language.
CO-6	Develop the web site with Frontend & Backend Connectivity.

Part	Experiment	CO
A	**1. Creation of Web pages using HTML, DHTML** ➢ Basic HTML tags (font, heading, bold, italic, underline etc.) ➢ HTML Ordered List tags. ➢ HTML Unordered List tags. ➢ HTML Definition List tags. ➢ HTML List tags to create nested list. ➢ Insert images in web pages. ➢ HTML Table tag and its attributes. ➢ HTML form tags and its attributes. ➢ HTML frame tags.	CO-1
	➢ Web pages with CSS (inline, internal and external).	CO-2
	2. Creation of Web pages using JavaScript ➢ Embedding of JavaScript into a webpage (Internal and external). ➢ Using various Dialog boxes. ➢ Changing webpage background. ➢ Changing text of HTML element. ➢ Event handling. ➢ Create a calculator utility. ➢ Validating user input. ➢ Using DOM objects. ➢ Creating and destroying of Cookies.	CO-3
	3. Creation of Web pages using jQuery ➢ Event handling. ➢ Applying various effects to HTML elements.	CO-4
	4. Creation of Web pages using AJAX ➢ To retrieve text from a file and update a part of webpage.	CO-5
B	To make a mini project that demonstrates a concept, based on the content of **AGCS-21409**.	CO-6

Syllabus for CSE 2021 batch onwards

4th Semester	AGAP-21401: ENGINEERING APTITUDE-I			

Internal Marks:	50		L	T	P
External Marks:	0		0	1	0
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:	
CO-1	Develop a Proper Understanding of the Number system
CO-2	Understand the Concept of HCF &LCM to solve problems related to Racetracks, Traffic lights etc.
CO-3	Recognize parts and wholes both visually and numerically
CO-4	Recognize and apply Ratios, Proportions and Percentage to solve real-life problems
CO-5	Recognize company's revenues and expenditures over a specified period of time
CO-6	Understand the concept of time value of money

Part	Content	CO
I	**Number System:** Various types of numbers, Face Value & Place value of a digitin a numeral, Divisibility Tests **Problems on Numbers:** To find Unknown numbers	CO-1
II	**HCF &LCM:**Factors and multiples to find Highest Common Factor and Least Common Multiple of fractions, Comparison of Fraction	CO-2
	Decimal and Fractions: Operations on Decimal and Fractions	CO-3
III	**Ratio & Proportion**: Tricks to Find ratio and Proportions	CO-4
	Percentage: Concept of Percentage, Tricks to find Percentage	
IV	**Profit & loss:** Cost Price, Selling Price, Profit, Loss, Profit Percentage and Loss Percentage	CO-5
	Simple Interest and Compound Interest: Interest computed annually, half yearly and Quarterly	CO-6

References:
- Quantitative Maths: Arihant Publishers.
- Objective Mathematics : R S Aggarwaal.
- Quantitative Maths : TMH Publications

Syllabus for CSE 2021 batch onwards

4th Semester		AGFE-21402: FUNCTIONAL ENGLISH-II			
Internal Marks:	50		L	T	P
External Marks:	0		0	1	0
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:

CO-1	Self Introduction and Body Language to prepare students to face one to one interaction.
CO-2	Spoken Activity such as Topic Presentation or extempore to hone spoken skills of students.
CO-3	Vocabulary based session to improve language proficiency of students.
CO-4	Basic Grammar to make students proficient in English correspondence.
CO-5	Book reading to improve reading skills of students.
CO-6	Formal/ Informal Letter writing to make students proficient in written correspondence.

Part	Content	CO
I	Components of Self Introduction, Exemplary Performances, Student Performances on Self Introduction along with resume.	CO-1
II	This section includes Spoken Activity such as Topic Presentation or extempore to hone spoken skills of students.	CO-2
	This section includes Root words and its usage.	CO-3
III	This section includes editing, omission, gap filling, rearranging jumbled sentences to test knowledge of passive voice, reported speech, articles and the other determiners, modals, tense, etc. Basic Grammar such as Tenses, Voice, Narration shall be done.	CO-4
IV	IKIGAI shall be prescribed for honing reading skills and comprehension in depth.	CO-5
	Formal/ Informal Letter Writing, Basic Format, Example, Practice shall be done.	CO-6

References:

- www.Indiabix.com
- English Grammar by Wren and Martin
- www.freshersworld.com
- www.alison.com

4th Semester	(Mandatory Course) AGMC-21401: ESSENCE OF INDIAN KNOWLEDGE TRADITION			

		L	T	P
Internal Marks:	-	**1**	**0**	**0**
External Marks:	-			
Total Marks:	-	**Credits**		**0**

Part	Content	CO
-	**INTRODUCTION TO TRADITIONAL KNOWLEDGE:** Define traditional knowledge, nature and characteristics, scope and importance, kinds of traditional knowledge, the physical and social contexts in which traditional knowledge develop, the historical impact of social change on traditional knowledge systems. Indigenous Knowledge (IK), characteristics, traditional knowledge vis-à-vis indigenous knowledge, traditional knowledge Vs western knowledge traditional knowledge vis-à-vis formal knowledge **PROTECTION OF TRADITIONAL KNOWLEDGE:** Protection of traditional knowledge: The need for protecting traditional knowledge Significance of TK Protection, value of TK in global economy, Role of Government to harness TK. **LEGAL FRAMEWORK AND TK:** The Scheduled Tribes and Other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006,Plant Varieties Protection and Farmer's Rights Act, 2001 (PPVFR Act); The Biological Diversity Act 2002 and Rules 2004, the protection of traditional knowledge bill, 2016.Geographical indicators act 2003. **TRADITIONAL KNOWLEDGE AND INTELLECTUAL PROPERTY** Certain non IPR mechanisms of traditional knowledge protection, Patents and traditional knowledge, Strategies to increase protection of traditional knowledge, global legal FORA for increasing protection of Indian Traditional Knowledge. **TRADITIONAL KNOWLEDGE IN DIFFERENT SECTORS:** Traditional knowledge and engineering, Traditional medicine system, TK and biotechnology, TK in agriculture, Traditional societies depend on it for their food and healthcare needs, Importance of conservation and sustainable development of environment, Management of biodiversity, Food security of the country and protection of TK. 139.	-

References:

- Traditional Knowledge System in India, by Amit Jha, 2009.
- Traditional Knowledge System and Technology in India by Basanta Kumar Mohanta and Vipin KumarSingh, Pratibha Prakashan 2012.
- Knowledge Traditions and Practices of India, Kapil Kapoor1, Michel Danino2

Syllabus for CSE 2021 batch onwards

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 5th SEM

5th Semester	AGCS-21501: DESIGN AND ANALYSIS OF ALGORITHMS			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		**Credits**		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the concept of asymptotic notations and analysis of algorithms.
CO-2	Gain practical experience in implementing searching and sorting techniques.
CO-3	Acquire skills to implement efficient algorithms using the dynamic programming strategy.
CO-4	Learn and apply various algorithmic techniques such as greedy method and backtracking strategy to solve computational problems.
CO-5	Develop the ability to understand techniques for traversing the graphs to finds shortest path.
CO-6	Classify the problems into class P or NP and explore efficient algorithms for the pattern matching.

Part	Content	CO
I	**Introduction:** Basics of algorithms, time and space complexity of an algorithm, comparing the performance of different algorithms for the same problem, asymptotic notations and order of growth.	CO-1
II	**Sorting and searching techniques:** Merge sort, quick sort and randomized quick sort using divide and conquer strategy, heap sort, counting sort, radix sort, bucket sortand bubble sort with analysis of their running times. Recurrence relations. Linear and binary search in an ordered array, hashing.	CO-2
	Dynamic programming: Matrix chain multiplication, longest common subsequence, 0/1 knapsack problem, fractional knapsack problem, travelling salesman problem.	CO-3
III	**Greedy Strategy:** Minimum spanning trees using Kruskal's and Prim's technique. **Backtracking:** 0/1 knapsack, N queens problem, graph colouring problem.	CO-4
	Graph Algorithms: Graph traversals: Breadth-first search (BFS) and depth-first search (DFS), applications of BFS and DFS, topological sorting, single sourceshortest paths in graphs: Dijkstra and Bellman-Ford, all pair shortest path in graphs: Floyd Warshall's algorithm.	CO-5
IV	**NP-Completeness:** Definition of class NP, NP-hard and NP-complete problems, proving a problem to be NP-complete using polynomial-time reductions, examples of NP complete problems: 3SAT, vertex cover problem, Hamiltonian cycle, clique problem. **Pattern matching algorithms:** Naive String Matcher, Knuth-Morris-Pratt algorithm, Rabin Karp algorithm.	CO-6

References:
• Introduction to Algorithms 2nd Edition by Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, and Clifford Stein, The MIT Press Cambridge , McGraw-Hill Book Company.
• Fundamentals of Computer Algorithms 2nd Edition by Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, Silicon Press, 2008.
• The Design and Analysis of Algorithms by Nitin Upadhyay, S. K. Kataria& Sons, 2008.
• The Design and Analysis of Algorithms, 3rd Edition by Gajendra Sharma, Khanna Book Publishing Company, Delhi

5th Semester	AGCS-21502: SOFTWARE ENGINEERING			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the processes and models involved in SDLC lifecycle.
CO-2	Understand software requirements specification and design.
CO-3	Understand the role of project management planning.
CO-4	Implement different coding standards and software testing approaches such as unit testing and integration testing.
CO-5	Understand the basics software quality strategies.
CO-6	Understand the role of project risk management, ethical and professional issues.

Part	Content	CO
I	Evolution and impact of Software engineering, introduction to agile software development, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study.	CO-1
II	Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification. Function-oriented software design: DFD and Structure chart, Object modeling using UML, Object-oriented software development, user interface design, Basic issues in software design, modularity, cohesion, coupling and layering. Coding standards and Code review techniques and tools. Integrated development environments (IDEs).	CO2
	Software project management, Project planning and control, size and cost estimation, project scheduling using PERT and Gantt chart.	CO-3
III	Fundamentals of testing, White-box, and black-box testing, test case design techniques, bug tracking system, mutation testing,Automated build and deployment tools, Tool: Selenium. Static and dynamic analysis, verification and validation, Software reliability metrics, reliability growth modelling.	CO4
	Software quality assurance: quality concepts, quality control, quality assurance, SQA activities, Software reviews, Formal Technical Reviews, Review guidelines. Quality Assurance Standards: ISO 9000, 9001:2000, CMM, TQM and Six Sigma.	CO-5
IV	Introduction to SCM, Version Control and Change Management, Risk Mitigation, Monitoring and Management (RMM), Computer aided software engineering, software maintenance, Integrated Change Control, software reuse, Component-based software development. Software engineering ethics and professionalism- ethical and legal issues in software engineering, intellectual property rights and plagiarism, professional code of conduct, social and economic impact of software.	CO-6

References:
- Roger Pressman, "Software Engineering: A Practitioners Approach,(6th Edition), McGrawHill,1997.Sommerville," Software Engineering, 7th edition", Adison Wesley, 1996.
- Watts Humphrey," Managing software process", Pearson education, 2003.
- James F. Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", Wiley.
- Mouratidis and Giorgini. "Integrating Security and Software Engineering–Advances and Future",
- IGP. ISBN – 1-59904-148-0.
- Pankaj Jalote, "An integrated approach to Software Engineering", Springer/Narosa.

5th Semester		AGCS-21503: PROGRAMMING IN JAVA			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand Object-Oriented Programming constructs, Byte codes, basics of java console and programming concepts.
CO-2	Implementation of Classes, Inheritance, and Packages.
CO-3	Developing logic for problem solving with String handling and Exception handling.
CO-4	Developing simple java applications with JDBC connectivity.
CO-5	Understand and utilize Java Graphical User Interface in the program writing.
CO-6	Utilize the knowledge of Multithreading and Networking to develop java applications.

Part	Content	CO
I	**Overview of Java:** Object oriented programming concepts and features, Introduction to Java, Features of Java, Bytecode, Lexical Issues, Java class libraries. **Data types and Variables:** Integers, Floating-point types, Characters, Boolean, Java Literals-Integer, Floating Point, Boolean, Character, String, Variable, Data types, Type Conversion and Casting, Automatic type promotion in expressions. **Operators, Control Statements and arrays:** Arithmetic operators, Modulus Operator, Increment, Decrement, Bit wise operators, Relational operators, Boolean logical operators?: Operators, Operator precedence, Java's selection statements, Iteration statements, Jump statements, Arrays in Java (1 D and 2 D).	CO-1
	Introduction to Classes: Class fundamentals, Declaring object, reference variable, Introducing methods, Constructors, this keyword, Garbage collection, Finalize () method. **Methods and Classes:** Overloading methods and constructors, Using objects as parameters, Recursion. Access Control, Usage of static keyword, Nested Classes, Command-Line arguments, Variable-Length arguments **Inheritance:** Inheritance basics, using super, method overriding, dynamic method dispatch, Abstract Classes, Using final keyword. **Package and Interfaces-** Creating a package, Importing a package, Defining and Implementing interfaces, Extending interfaces.	CO-2
II	**String Handling:** The string constructors, String length, Special string operations-String Literal, Concatenation, Conversion Character extraction, String comparison, Searching Strings, Modifying string, Data conversion, Changing the case of characters, Joining Strings, StringBuffer class, StringBuffer constructors, StringBuffer methods- length(), capacity(), ensureCapacity(), setLength(), setLength(), charAt(), setCharAt(), getChars(), append(), insert(), reverse(), , delete(), deleteCharAt(), , replace(), substring(). **Exception Handling:** Exception handling fundamentals, Exception types, Uncaught exceptions Using try and catch, Multiple catch clauses, Nested try statements, Throw, Finally Java 's built-in exceptions, Creating your own exception, Chained Exceptions, Assertions.	CO-3
III	**Database Connectivity:** JDBC drivers, Driver Manager Class, Connection interface, Statement interface, ResultSet interface, Query Execution.	CO-4
	Event Handling: Delegation event model, Sources of Events, Event listener interfaces, Adapter classes.	CO-5

	Swings: Introduction to Swings, JFrame, JApplet, JPanel, Components in Swings, Layout managers- Springlayout, Boxlayout, JList, JScrollPane, Split Pane, JTabbedPane, JTree, JTable	
IV	**Multithreaded Programming:** The java thread model, The main thread, Creating threads, Using isalive() and join(), Thread priorities, Synchronization; Inter thread communications, Suspending,Resuming and Stopping threads. **Networking:** Networking basics, Java and Net, Datagram, TCP/IP Client Sockets, TCP/IP Server Sockets, URL, URL Connection.	CO-6

References:
• Herbert Schildt, The Complete Reference Java 2, McGraw-Hill.
• Joycee Farrell, Java For Beginners, Cengage Learning
• Deitel and Deitel, Java: How to Program, 6th Edition, Pearson Education

Syllabus for CSE 2021 batch onwards

5th Semester	AGCS- 21505: ARTIFICIAL INTELLIGENCE			
Internal Marks: 40		**L**	**T**	**P**
External Marks: 60		**3**	**0**	**0**
Total Marks: 100		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basics of AI and its ethical considerations, problem solving and state space search.
CO-2	Understand, classify and implement various search techniques.
CO-3	Understand the game playing algorithm and the significance of planning in AI.
CO-4	Understand and represent knowledge using logic and structures
CO-5	Understand the concept of reasoning & inferencing and get acquainted to natural language processing.
CO-6	Understand the significance of neural network and learning in developing AI systems

Part	Content	CO
I	**Introduction to AI:** Definition of Intelligence, Definition, history and importance of Artificial Intelligence, components of AI, categories of AI machines, Turing Test, Recent AI Applications, **Ethical Considerations in AI:** Bias and fairness in AI system, privacy and security concerns, accountability and transparency, social and economic impact of AI **Problem Solving**: Definition & Characteristics of problem, formulating problems, problem solving agents, problem types, states and operators, state space search, Common Problems: Water Jug Problem, Travelling Salesman Problem, Tower of Hanoi, Tic Tac Toe, 8 puzzle game, Chess.	CO-1
	Heuristic Based Search: search strategies, uninformed search, Breadth first search, Depth first search, informed search, Heuristic Search, heuristic function, Generate and Test, Best first search, A* algorithm, Problem Reduction, AO* Search, Hill Climbing, Constraint Satisfaction Problem, Crypt arithmetic problems, Means End Analysis.	CO-2
II	**Game Playing** - Perfect decision game, imperfect decision game, components of game, game tree, evaluation function, MinMax Algorithm, problem in MinMax algorithm, alpha-beta pruning. **Planning** - Definition, linear & non linear planning, reactive & non reactive systems, Components of planning, planning in the blocks world, partial order planning, hierarchical planning, conditional planning, resource constraints, temporal constraints blocks world problem	CO-3
III	**Knowledge Representation using Propositional and First Order Predicate Logic:** syntax and semantics for propositional logic, syntax and semantics for FOPL, properties of WFFs, conversion to casual form, inference rules, resolution using proposition logic and predicate logic. **Knowledge Representation using Structures**: Semantic nets, frames, conceptual dependency, scripts.	CO-4
	Inferencing & Reasoning: logical reasoning, Modus Ponen Rule, Modus Tollen Rule, inductive reasoning, deductive reasoning, formal reasoning, analogical reasoning, mono tonic and non monotonic reasoning, probabilistic reasoning, forward chaining, backward chaining, resolution, unification. **Uncertainty -** Basic probability, Bayes rule, Belief networks, Markov Decision processes **Natural Language Processing:** Introduction to natural language processing, applications of NLP, techniques used in NLP, components of NLP: natural language generation and natural	CO-5

Syllabus for CSE 2021 batch onwards

	language understanding, phases of NLP: lexical analysis, syntactic analysis, semantic analysis, disclosure integration, pragmatic analysis.	
IV	**Neural Networks and Learning:** Basics, comparison of human brain and machine, biological neuron, need of Artificial Neural Network(ANN), artificial neuron model, fundamentals of ANN, architectures of ANN: feed forward network, single layer and multilayer feed forward networks, recurrent network **Learning Methods in Neural Networks:** Introduction to Supervised learning, unsupervised learning and reinforcement learning.	CO-6

References:

- Stuart Russell and Peter Norvig. Artificial Intelligence – A Modern Approach, Pearson Education 2 Press, 2001.
- Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, 2008.
- George F. Luger, Artificial Intelligence, Pearson Education, 2001.
- Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman, 2002

5th Semester	AGCS-21506: DESIGN AND ANALYSIS OF ALGORITHMS LAB

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**				
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the trade-offs involved in various sorting algorithm techniques.
CO-2	Improve efficiency of searching and sorting algorithms using Divide and Conquer strategy.
CO-3	Develop the ability to apply dynamic programming algorithms for various computational problems.
CO-4	Acquire skills to design minimum spanning tree using various techniques.
CO-5	Understand the implementation of string-matching Algorithms.
CO-6	Develop an application using various algorithms studied in the course.

Part	Experiment	CO
A	Code and analyse insertion sort for best and worst case as an implementation for algorithm analysis. Code and analyse heap sort, counting sort, radix sort.	CO-1
	Code and analyse quick sort as an implementation for divide and conquer strategy. Code and analyse randomized quick Sort as an implementation for divide and conquer strategy. Code and analyse merge sort as an implementation for divide and conquer strategy.	CO-2
	Code and analyse optimal matrix chain multiplication, LCS as an implementation for dynamic programming.	CO-3
	Code and analyse Kruskal's technique and Prim's technique for finding a minimum spanning tree as an implementation for greedy strategy.	CO-4
	Code and analyse for finding occurrences of pattern in a string using brute force approach and Rabin Karp approach.	CO-5
B	Implementation of sum of subsets problem, knapsack problem, travelling salesman problem, N queen problem, graph colouring problem, Dijkstra's algorithm, Bellman Ford algorithm ,Floyd Warshall's algorithm.	CO-6

5th Semester		AGCS-21507 SOFTWARE ENGINEERING LAB			
Internal Marks:	**30**		**L**	**T**	**P**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Use Openproj tool to track the progress of project.
CO-2	Prepare SRS document, design document.
CO-3	Implement different software designs using suitable software tools.
CO-4	Prepare test cases and implement different testing techniques
CO-5	Prepare Software configuration management and risk management related document.
CO-6	Make a mini project that demonstrates a concept, based on Software Engineering.

Part	Experiment	CO
A	Study and usage of OpenProj or similar software to draft a project plan Study and usage of OpenProj or similar software to track the progress of a project	CO-1
	Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents for some problems	CO-2
	Study and usage of any Design phase CASE tool (UML Diagrams, DFD)	CO-3
	To perform unit testing and integration testing. To perform various white box and black box testing techniques. Testing of a web site.	CO-4
	Preparation of Software Configuration Management and Risk Management related documents	CO-5
B	To make a mini project that demonstrates a concept, based on the content of AGCS-21507(Software Engineering Lab)	CO-6

5th Semester		AGCS-21508: PROGRAMMING IN JAVA LAB			

			L	T	P
Internal Marks:	30		0	0	2
External Marks:	20		0	0	2
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:	
CO-1	Gain knowledge about Java Runtime Environment and basic concepts
CO-2	Applying Object-Oriented Programming (OOP) Concepts
CO-3	Implement String and Exception handling.
CO-4	Learn about developing Graphical User Interface and Java Database Connectivity
CO-5	Implement multithreading and networking in Java
CO-6	Develop an application deploying java concepts

Part	Content	CO
A	Installation of Java, Setting of Environment variables, Implementation of Java on different IDEs (Eclipse/NetBeans/VS Code) Executing basic java programs using decision statements and Loops, Type Casting , Operators and Arrays	CO-1
	Implementing the concept of Classes and Objects, Constructor, Constructor Overloading Usage of static keyword, Nested classes, Command Line Arguments Implementation of Inheritance, Method overriding, Abstract classes and Interfaces Creating own packages, Importing Packages	CO-2
	Exploring String and String Buffer class and their methods. Implement Exception handling and creating own exceptions	CO-3
	Implementation of Java Database Connectivity Exploring Swing components and its classes	CO-4
	Implement Multithreading Explore java.net package to develop networking based applications.	CO-5

B	**Students are required to build one application based on the concepts implemented inPart-A. The applications can be (but not limited to):**
	   ➢ GUI based with Java Database Connectivity
	   • Student Database Management System
	   • Library Management System
	   • Any other using similar concepts
	   ➢ Develop Notepad/Paint
	   ➢ Menu Driven GUI based application
	   ➢ Chat based application
		CO-6

5th Semester		AGCS- 21509: ARTIFICIAL INTELLIGENCE LAB			
Internal Marks:	30		**L**	**T**	**P**
External Marks:	20		**0**	**0**	**2**
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand and implement uninformed search techniques.
CO-2	Understand and implement informed search techniques.
CO-3	Understand and solve crypt arithmetic problems.
CO-4	Understand and implement common AI problems.
CO-5	Understand and implement common gaming problems.
CO-6	Develop AI based applications.

Part	Experiment	CO
A	• To implement Breadth First Search • To implement Depth First Search	CO-1
	• To implement Best First Search • To implement A* algorithm • To implement Hill Climbing algorithm	CO-2
	• To solve the crypt arithmetic problems	CO-3
	• To implement Water Jug problem • To implement Tower of Hanoi	CO-4
	• To implement n-queens problem • To implement Tic Tac Toe • To implement 3x3 puzzle/8 puzzle problem	CO-5
B	To make a mini project on AI based application/ Gaming application	CO-6

5th Semester		AGAP-21502: ENGINEERING APTITUDE - II			
			L	T	P
Internal Marks:	50		0	1	0
External Marks:	0				
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:	
CO-1	Learn and practice Aptitude questions based on *"Problems on Ages"* and improve their skills in order to face the interview, competitive exams.
CO-2	Understand the relationships among things or finite groups of things.
CO-3	Outline the various formulas for calculating area , volume and surface area.
CO-4	Use a calendar to determine a Date and Day.
CO-5	Use a time schedule to determine ending time of a given event.
CO-6	Find out missing part of an element by subsequent comparison.

Part	Content	CO
I	**Problem on Ages**: Shortcut method to simplify questions based on Age	CO-1
	Venn Diagrams: Applications of Sets	CO-2
II	**Area , volume and surface area** : Cuboid, Cube, Parallelepiped, Cylinder, Sphere	CO-3
III	**Calendar and Time** :To find odd days in an ordinary year, Leap year, Days of week related to odd days	CO-4
	Clocks : Hands of Clock, Angle Traced by Hands	CO-5
IV	**Chain Rule** :Direct Proportion **,**Indirect Proportion	CO-6

References:
- Quantitative Maths: Arihant Publishers.   - Objective Mathematics: R S Aggarwal.   - Quantitative Maths: TMH Publications

Syllabus for CSE 2021 batch onwards

5th Semester		AGCS-21504A: THEORY OF COMPUTATIONS(PEC-1)			
Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:

CO1	Understand the basic concepts, design of finite automata and their applications.
CO2	Illustrate the formal languages and grammar types.
CO3	Demonstrate the relationship between regular sets and regular grammar.
CO4	Understand the concepts of context-free languages and different types in normal forms.
CO5	Familiarize and design pushdown automata and Turing machines for performing tasks of moderate complexity.
CO6	Outline the formal properties and definition of LL (k) and LR (k) grammars, Decidability, Recursively Enumerable Languages and PCP.

Part	Content	CO
I	**Basics of Strings and Alphabets**- Definition of string, null string, substring, alphabet, power of alphabet, The Kleene Star, languages. **Finite Automata:** Applications of automata theory, Introduction to DFA, Transition Diagram, Transition table, String acceptability by FA, non-deterministic FA, Conversion of NDFA to DFA, Comparison of DFA and NDFA, Design of Finite Automata, Mealy and Moore Machines and its conversion, Comparison of Mealy and Moore Machine, Two-way Finite automata (2DFA), Definition of dead state and unreachable state, Minimization of FA.	CO-1
II	**Formal Languages:** Definition of grammar, Derivation & language generated by grammar, Chomsky Classification of Languages, Languages and automata.	CO-2
II	**Regular Sets & Regular Grammar:** Definition of Regular expressions and regular sets, Identities of regular expressions, Proof of Arden's Theorem, Finite Automata and Regular Expressions - Transition Systems and Regular Expressions, Conversion of Non deterministic Systems to Deterministic Systems, Algebraic Method using Arden's Theorem, Construction of finite automata equivalent to a regular expression, Equivalence of two finite automata, Equivalence of two regular expressions, Regular sets and regular grammar – Construction of a Regular grammar generating T(M) for a given DFA, Construction of a transition system accepting L(G) for a given regular grammar.	CO-3
III	**Context Free Languages (CFG):** Definition of Derivation tree, Leftmost and Rightmost derivation, ambiguity in CFG, Simplification of CFG - Construction of Reduced Grammars, Elimination of Null Productions, Elimination of Unit Productions, Normal forms for CFG- Chomsky Normal Form, Greibach Normal Form, Kuroda Normal Form, Conversion of CFG to CNF, Conversion of CFG to GNF.	CO-4
III	**Pushdown Automata (PDA):** Definition of PDA, Acceptance by PDA, Definition of PDA with two stacks, context free languages and PDA, Design of PDA. **Turing Machines (TM):** Turing Machine Model, Definition of TM, Types of TM, String acceptability by Turing Machine, Representation of Turing Machine, Design of Turing Machine.	CO-5
IV	**Recursive And Recursively Enumerable Languages:** Definition of LL(k) Grammar and LR(k) Grammar, Properties of LL(k) Grammar and LR(k) Grammar, Difference between LL(k) & LR(k) grammar, Decidability, Recursively Enumerable Languages and Post Correspondence Problem.	CO-6

References:

- K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science, Third Edition", PHI Learning Private Limited, 2011.
- John E. Hopcroft, Rajeev Motwani, Jeffrey D. Ullman, "Introduction to Automata Theory", Languages and Computation, Pearson Education.
- M. Sipser, "Introduction to the Theory of Computation", Second Edition, Cengage Learning.
- K. V. N. Sunitha, N. Kalyani, "Formal Languages and Automata Theory", McGraw-Hill, 2010.

5th Semester	AGCS-21504B: COMPILER DESIGN(PEC-1)			
		L	**T**	**P**
Internal Marks: 40		3	1	0
External Marks: 60				
Total Marks: 100		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Demonstrate the knowledge of patterns, tokens & regular expressions for lexical analysis.
CO-2	Use lex & yacc tool for developing a scanner and parser.
CO-3	Understand syntax directed translation.
CO-4	Analyse different representations of intermediate code.
CO-5	Apply type checking in values.
CO-6	Understand code optimization and code generation.

Part	Content	CO
I	**Introduction to compilers:** Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyzer, regular expressions, finite automata, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator. **Parsing:** Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing, top down parsing - backtracking, recursive descent parsing, predictive parsers, LL(1) grammars.	CO-1
II	**Bottom-up parsing:** Definition of bottom-up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR(CLR) and Look Ahead LR (LALR) parsers, error recovery in parsing, parsing ambiguous grammars, YACC-automatic parser generator.	CO-2
	Syntax directed translation: Syntax directed definition, construction of syntax trees, S-attributed and L-attributed definitions, translation schemes, emitting a translation.	CO-3
III	**Intermediate code generation:** intermediate forms of source programs abstract syntax tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of-control statements.	CO-4
IV	**Type checking:** Definition of type checking, type expressions, type systems, static and dynamic checking of types, specification of a simple type checker, equivalence of type expressions, type conversions, overloading of functions and operators. **Run time environments:** Source language issues, Storage organization, storage-allocation strategies, access to non-local names, parameter passing, symbol tables and language facilities for dynamic storage allocation.	CO-5
	Code optimization: Organization of code optimizer, basic blocks and flow graphs, optimization of basic blocks, the principal sources of optimization, the directed acyclic graph (DAG) representation of basic block, global data flow analysis. **Code generation:** Machine dependent code generation, object code forms, the target machine, a simple code generator, register allocation and assignment, peephole optimization.	CO-6

References:
- Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India.
- Andre W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press, UK

Syllabus for CSE 2021 batch onwards

5th Semester		AGCS-21504C: SOFT COMPUTING(PEC-1)			
Internal Marks:	40		**L**	**T**	**P**
External Marks:	60		**3**	**1**	**0**
Total Marks:	100		**Credits**		**4**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Elucidate the basics of soft computing.
CO-2	Understand Genetic Algorithms concepts and its applications.
CO-3	Analyze various Neural Network architectures
CO-4	Apply Fuzzy logic to solve real world problems.
CO-5	Integrate neural networks and fuzzy logic systems to develop intelligent hybrid models.
CO-6	Design a solution for multi-objective optimization algorithms.

Part	Content	CO
I	**Introduction to Soft Computing:** Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing, methods of soft computing, Some applications of soft computing techniques.	CO-1
II	**Introduction to Genetic Algorithms-** Introduction to Genetic Algorithms (GA), Representation, Operators in GA, Fitness function, population, building block hypothesis and schema theorem. Genetic algorithms operators- methods of selection, crossover and mutation, simple GA(SGA), other types of GA, generation gap, steady state GA, applications of GA	CO-2
	Artificial Neural Networks: Biological neurons and its working, Simulation of biological neurons to problem solving, Different ANNs architectures, Training techniques for ANNs, activation functions, feed forward and feedback networks, Supervised learning- Perceptron learning, single layer/multilayer perceptron, Adaptive resonance architecture, applications of neural networks to pattern recognition systems such as character recognition, face recognition, Application of Neural networks in Image processing.	CO-3
III	**Fuzzy logic:** Introduction to Fuzzy logic, Fuzzy sets and membership functions, Operations on Fuzzy sets, Fuzzy relations, rules, propositions, implications and inferences, Fuzzy Expert Systems, Fuzzy Decision Making Some applications of Fuzzy logic.	CO-4
IV	**Neuro-Fuzzy modeling-** Adaptive Neuro-Fuzzy Inference Systems (ANFIS), Coactive Neuro-Fuzzy Modeling, Classification and Regression Trees, Data Clustering Algorithms, Rule base Structure Identification	CO-5
	Multi-objective Optimization Problem Solving: Concept of multi-objective optimization problems (MOOPs) and issues of solving them, Single-Objective optimization using genetic algorithms; Multi-Objective Evolutionary Algorithm (MOEA), Non-Pareto approaches to solve MOOPs, Pareto-based approaches to solve MOOPs, Some applications with MOEAs.	CO-6

Syllabus for CSE 2021 batch onwards

References:
• S.N. Shivanandam, Principle of soft computing, Wiley. ISBN13: 9788126527410, 2011. • Jyh-Shing Roger Jang, Chuen-Tsai Sun, Eiji Mizutani, "Neuro-Fuzzy and Soft Computing", PrenticeHall of India, 2003. • George J. Klir and Bo Yuan, "Fuzzy Sets and Fuzzy Logic-Theory and Applications", Prentice Hall, 1995. • James A. Freeman and David M. Skapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Pearson Edn., 2003. • Mitchell Melanie, "An Introduction to Genetic Algorithm", Prentice Hall, 1998. • 6. David E. Goldberg, Genetic Algorithms in Search, Optimization & Machine Learning, Addison Wesley, 1997

5th Semester	AGCS-21504D: DISTRIBUTED SYSTEMS(PEC-1)			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60		3	1	0
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the foundations of a Distributed System.
CO-2	Implement inter process communication in distributed environment.
CO-3	Learn issues related to clock synchronization and need of global state in distributed systems.
CO-4	Manage transactions and concurrency control.
CO-5	Understand distributed deadlock and transaction recovery.
CO-6	Design and implement shared memory management in distributed computing.

Part	Content	CO
I	**Characterization of Distributed Systems:** Introduction, Examples of Distributed systems, Resource sharing and web, challenges, System models -Introduction, Architectural and Fundamental models. Networking and Internetworking.	CO-1
II	**Interprocess Communication, Distributed objects, and Remote Invocation:** Introduction, Communication between distributed objects, RPC, Events and notifications, Case study-Java RMI **Operating System Support**- Introduction, OS layer, Protection, Processes and Threads, Communication and Invocation, Operating system architecture.	CO-2
	Peer to Peer Systems: Introduction, Napster and its legacy, Peer to Peer middleware, Routing overlays, Overlay case studies, Tapestry, Application case studies: Squirrel and Ocean Store. **Time and Global States:** Introduction, Clocks, Events, and Process states, Synchronizing physical clocks, logical time and logical clocks, global states, distributed debugging. **Coordination and Agreement:** Introduction, Distributed mutual exclusion, Elections, Multicast communication, consensus, and related problems.	CO-3
III	**Distributed File Systems:** Introduction, File Service architecture. **Transactions and Concurrency Control:** Introduction, Transactions, Nested Transactions, Locks, Optimistic concurrency control, Timestamp ordering.	CO-4
IV	**Distributed Transactions:** Introduction, Flat and Nested Distributed Transactions, Atomic commit protocols, Concurrency control in distributed transactions, Distributed deadlocks, Transaction recovery.	CO-5
	Replication: Introduction, System model and group communication, Fault-tolerant services, Transactions with replicated data. Distributed shared memory, Design and Implementation issues, and Consistency models.	CO-6

References:

- Distributed Systems Concepts and Design, G Coulouris, J Dollimore and T Kindberg, Fourth Edition, Pearson Education.
- Distributed Systems, S.Ghosh, Chapman & Hall/CRC, Taylor & Francis Group, 2010.
- Distributed Systems – Principles and Paradigms, A.S. Tanenbaum and M.V. Steen, Pearson Education.
- Distributed Computing, Principles, Algorithms and Systems, Ajay D. Kshemakalyani and Mukesh Singhal, Cambridge, rp 2010

Syllabus for CSE 2021 batch onwards

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 6th SEM

6th Semester		AGCS-21601: MACHINE LEARNING			

Internal Marks:	40		L	T	P
External Marks:	60		3	1	0
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Learn about applications areas of machine learning.
CO-2	Implement supervised machine learning algorithms.
CO-3	Evaluate the performance of supervised machine learning algorithms.
CO-4	Implement unsupervised machine learning algorithms.
CO-5	Understand the concept of neural networks.
CO-6	Understand new trends in the field of machine learning.

Part	Content	CO
I	**Introduction**: Introduction to machine learning, artificial intelligence vs machine learning vs deep learning, types of machine learning: supervised, unsupervised, and reinforcement learning, Applications of machine learning. Statistical Learning: Bayesian method, Naive Bayes classifier.	CO-1
II	**Supervised Learning:** Regression vs classification, linear regression with one variable, multiple linear regression, polynomial regression, logistic regression, nearest neighbours (k-NN), decision trees, random forests, support vector machine.	CO-2
	Techniques for evaluating the performance of supervised learning models: Mean absolute error (MAE), RSquare, mean squared error (MSE), root mean squared error (RMSE), confusion matrix, precision score, accuracy score, F1 score and recall. **Optimization algorithm:** Working of gradient descent, batch gradient descent vs stochastic gradient descent.	CO-3
III	**Unsupervised learning:** Need and application of clustering-means clustering, hierarchical clustering, principal component analysis (PCA). **Regularization:** l1 and l2 regularization and their applications in linear and logistic regression, bias and variance trade-off. **Ensemble methods:** bagging, boosting, and stacking.	CO-4
IV	**Neural networks:** Introduction, model representation, activation function, perceptron training, multilayer perceptron's, multiclass representation, backpropagation algorithm.	CO-5
	Trends in machine learning: Multitask learning, online learning and sequence prediction, data streams and active learning, introduction to convolutional neural networks (CNN), recurrent neural networks (RNN) and reinforcement learning.	CO-6

References:

- Ethem Alpaydin, "Introduction to Machine Learning" 2nd Edition, The MIT Press, 2009.
- Tom M. Mitchell, "Machine Learning", First Edition by Tata McGraw-Hill Education, 2013.
- Christopher M. Bishop, "Pattern Recognition and Machine Learning" by Springer, 2007.
- Mevin P. Murphy, "Machine Learning: A Probabilistic Perspective" by The MIT Press, 2012

6th Semester		AGCS-21602: CLOUD COMPUTING			
Internal Marks:	**40**		**L**	**T**	**P**
External Marks:	**60**		**3**	**0**	**0**
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the core concepts of the cloud computing paradigm and the driving factors towards Cloud.
CO-2	Understand the Cloud computing Architecture, its Services and Deployment Models.
CO-3	Apply the fundamental concepts in cloud infrastructures to understand the trade-offs in power, efficiency, and cost to build and deploy cloud applications that are resilient, elastic and cost-efficient.
CO-4	Understand the Different types of Virtualizations, Virtual Machine creation and deployment, Hypervisors and Multitenancy.
CO-5	Understand the security issues and their impact on cloud computing.
CO-6	Understand the various real-life implementation of Cloud Computing like GCP, IBM Cloud, Amazon Web Services and Microsoft Azure.

Part	Content	CO
I	**Introduction:** Overview of Existing Hosting Platforms, Cluster Computing, Grid Computing, Utility Computing, Autonomic Computing, Introduction to Cloud Computing, Cloud Computing history and evolution, practical applications of cloud computing for various industries, economics and benefits of cloud computing, Driving factors towards cloud, Selection criteria for cloud deployment.	CO-1
II	**Cloud Computing Architecture:** Cloud architecture model, Cloud deployment models, public clouds, Hybrid clouds, Community, Virtual private clouds, Cloud based services-IAAS, PAAS, SAAS,	CO-2
	Cloud Computing Concepts: Introduction to virtualization techniques, Characteristics of virtualization, Pros and Cons of virtualization Technology, Hypervisors, Types of hypervisors, Multitenancy, Application programming interfaces (API), Elasticity and scalability.	CO-3
III	**CLOUD SERVICE MODELS:** Cloud service models, Infrastructure as a service (IaaS) architecture- details and example, Platform as a service (PaaS) architecture- details and example, Software as a service (SaaS) architecture-- details and example, Comparison of cloud service delivery models.	CO-4
IV	**Security In Cloud Computing:** Cloud security, understanding security risks, Threats and Attacks, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Detection and forensics, Identity management, Benefits of identity, SLA, Resource Management, Encryption techniques, Encryption & Encrypting data, Symmetric key encryption, Asymmetric key encryption, Digital signature, SSL.	CO-5
	Case Studies: IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, a comparison of Cloud Computing Platforms, Common building Blocks.	CO-6

References:

- Raj Kumar Buyya, James Broberg, Andrezei M.Goscinski, Cloud Computing: Principles and paradigms, 2011
- Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper,Cloud Computing for dummies, 2009.
- Barrie Sosinsky, Cloud Computing Bible, Wiley, 2011.
- Borko Furht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer, 2010.

6th Semester	ACGS-21603: BIG DATA ANALYTICS			

			L	T	P
Internal Marks:	**40**				
External Marks:	**60**		**3**	**0**	**0**
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:
CO-1	Understand Ecosystem of Hadoop and Hadoop installation for carrying out Analytics on Big Data
CO-2	Understand HDFS and its usage in storage of Big Data
CO-3	Implement the HDFS commands for managing operations on huge files in a Hadoop cluster
CO-4	Explore tools like Pig and Map reduce for analyzing Big Data
CO-5	Explore various operators in Apache Pig for performing analytics
CO-6	Explore various functions in Apache Pig for performing analytics

Part	Content	CO
I	An Overview of Big Data and Big Data Analytics, Characteristics, and properties of Big Data, 7 Vs of Big Data, various Big Data sources, Application areas of Big Data. Setting up and understanding a Hadoop cluster. Discussing in detail the various configuration files and properties therein: .bashrc, core-site.xml, hdfs-site.xml, hadoop-env.sh, mapred-site.xml. Hadoop WebUI settings. Hadoop Web interface, various steps in setting up the .Trash folder in Hadoop. Configuring the various properties for the .Trash folder. Apache Software Foundation, Introduction to Hadoop and its Ecosystem, Hadoop core components, Hadoop ecosystem projects, Commercial Hadoop landscape, typical Hadoop use cases. Understanding the role of Hadoop in big data processing, Introduction to the various Hadoop Ecosystem components: Hadoop Distributed File System (HDFS), MapReduce, YARN, HBase, Hive, Pig, Sqoop, ZooKeeper, Flume, Oozie, Ambari.	CO-1
II	Introduction to Ubuntu and its various commands like cat, pwd, mkdir, cd, ls etc. Overview of HDFS. Architecture of HDFS, Advantages and disadvantages of HDFS, HDFS Daemons: Namenode, secondary Namenode and datanode, HDFS Blocks, huge block size in HDFS and its importance, HDFS file write and read operations, NameNode as a single point of failure (SPOF), Safemode of Namenode, dfsadmin commands to handle safemode, Hadoop High Availability (HA). Heartbeats, block reports and rereplication in HDFS.	CO-2
	Hadoop fs commands: cat, cp, ls, lsr, put, get, rm, df, count, fsck, balancer, mkdir, mv, rm rmr, du, dus copyFromLocal, copyToLocal, moveFromLocal, moveToLocal, chmod, chown, chgrp, setrep, stat, tail, test, text, touchz.	CO-3
III	Introduction to Apache Pig and its need. Mapreduce and its processing paradigm. Differences between Apache Pig and MapRedtce. Installation of Apache Pig, Pig Architecture, Pig Use cases, Pig Philosophy. Invoking the grunt shell in various mode: local, mapreduce, tez, tez_local. fs and sh commands in grunt shell. Running piglatin code using: grunt shell, pig-e and pig-f. Basic utility commands: help, history, quit, kill, set, clear. Wordcount example inApache Pig. Differentiation between run and exec commands along with the pram andparam_file switches. Data types and Operators in Pig, Pig operators for Data analysis: load, store, and dump. Usage of GLOBS in Apache Pig.	CO-4
	Pig Operators filter, distinct, foreach generate, various join operators (inner and outer), group, cogroup, cross, order, limit, union, split, describe, explain, illustrate, rank, sample.	CO-5

IV	Functions in Pig Eval functions: AVG, BagToString, CONCAT, COUNT, COUNT_STAR, IsEmpty, MAX, MIN, SIZE, SUBTRACT, SUM, TOKENIZE. Load and store functions: Pig Storage, TextLoader, BinStorage. Bag and tuple functions: ToBag, TOP, ToTuple, ToMap. String functions: ENDSWITH, STARTSWITH, SUBSTRING, EqualsIgnoreCase, INDEXOF, LAST_INDEXOF, LCFIRST, UCFIRST, LOWER, UPPER, REPLACE, TRIM, LTRIM, RTRIM. Date time functions: ToDate, CurrentTime, GetDay, GetHour, GetMilliiSecond, GetMinute, GetMonth, GetSecond, GetWeek, GetYear, DaysBetween, HoursBetween, MilliSecondsBetween, MinutesBetween, MonthsBetween, SecondsBetween, WeeksBetween, YearsBetween. Math functions: ABS, CBRT, CEIL, FLOOR, EXP, LOG, LOG10, RANDOM, ROUND, SQRT. Case Studies (at least 2) To perform analytics on real-world datasets like weather dataset, movie review dataset, employee dataset etc. using Apache Pig.		CO-6

References:

- Big Data, Black Book by DT Editorial Services, Dreamtech Press.
- Hadoop – The Definitive Guide 3rd Edition, Tom White/OReilly- Yahoo press
- Hadoop in Action, Chuck Lam/Manning
- Hadoop – Beginner's Guide, Garry Turkington/Packt Publishing.

6th Semester	AGCS-21605: MOBILE APPLICATION DEVELOPMENT			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60		3	1	0
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the Android Architecture, Anatomy, Components and tools required to develop an android application
CO-2	Work with Intents, Intent Filter Collision, Fragments and Notification.
CO-3	Develop and Design various Android applications related to layouts and using interactive user interfaces
CO-4	Design interface using different Menus and List Views
CO-5	Work with different Storage Options available in Android System.
CO-6	Implement the Working of SMS, Gmail, Location based, services including JSON.

Part	Content	CO
I	**Introduction:** Introduction to Android, Android Versions, Features of Android, Architecture of Android, Android SDK, Installing the Android SDK Tools, build tools, Gradle script, Android Development Tools (ADT), ART, AAPT, DVM, ADB, DDMS, Creating Android Virtual Devices (AVDs), Types of Android Application- Native, Hybrid and web apps, Anatomy of an Android Application, Components of Android application, Journey of Android APK to target machine.	CO-1
II	**Activities, Fragments And Intents:** Understanding Activities, Activity lifecycle, Introduction to Intent and its types, Creating Activities, Linking Activities Using Intents, Resolving Intent Filter Collision, Returning Results from an Intent, Bundle Intents, Pending intent and Sticky Intent, Fragments, Life Cycle of a Fragment , Static and Dynamic fragment and its implementation, Using Category filter and Action filter, Displaying Notifications.	CO-2
III	**Android User Interface:** Working with UI components Toast, Edit Text, Text View, buttons Understanding the Components of a Screen, Screen Orientation, Layouts, Date picker, time picker, Action Bar, Progress bar, Rating bar, Seek bar.	CO-3
III	**Android User Interface:** Using List Views to Display Long Lists, Using Image Views to Display Pictures, Image switcher, Implementation of Menu- Context menu, Option menu, Pop up menu, Implementation of Adapter -list adapter and custom adapter.	CO-4
IV	**Databases, Content Providers and Messaging:** Saving and Loading User Preferences, Persisting data to Internal and External storage, Creating and Using Databases, Content Providers, Content Resolver, Working of Content Provider in Android.	CO-5
	Services: SMS Messaging, Sending E-mail, Displaying Location on Maps, Introduction to Services and its types, implementation of Services, Consuming JSON Services.	CO-6

References:
• Wei - Meng Lee, "Beginning Android 4 Application Development", John Wiley & Sons, Inc,6 2012.
• Reto Meier, "Professional Android 4 Application Development", John Wiley & Sons, Inc, 2012.

6th Semester	AGCS-21606: MACHINE LEARNING LAB			

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:
CO-1	Gain knowledge about basic concepts of machine learning.
CO-2	Perform data visualization using machine learning libraries.
CO-3	Explore different data preprocessing and data cleaning methods.
CO-4	Gain practical experience in implementing algorithms using supervised machine learning techniques.
CO-5	Solve the problems using unsupervised machine learning techniques.
CO-6	Design an application using machine learning techniques studied in the subject.

Part	Experiment	CO
A	Import and extract the datasets in different formats from online repositories or websites using python libraries.	CO-1
	For a given set of training data samples stored in a .CSV file, implement and demonstrate the exploratory data analysis and visualization using matplotlib and seaborn libraries.	CO-2
	Data Preprocessing: Handling missing data: Imputation of data with mean, median,mode and specific values, handling of categorical data using different Encoding methods, feature selection and scaling. Deploy simple linear regression and multiple linear regression with performance evaluation.	CO-3
	Simulate decision tree and random forest classification.	CO-4
	Implement k-nearest neighbour algorithm to classify the iris data set.	CO-5
B	Design and implement a project using supervised and un-supervised machine learning algorithms.	CO-6

6th Semester		AGCS-21607: CLOUD COMPUTING LAB			
Internal Marks:	30		**L**	**T**	**P**
External Marks:	20		**0**	**0**	**2**
Total Marks:	50		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Configure various virtualization tools such as Virtual Box, VMware workstation.
CO-2	Design and deploy a web application in a PaaS environment.
CO-3	Learn how to simulate a cloud environment to implement new schedulers.
CO-4	Install and use a generic cloud environment that can be used as a private cloud.
CO-5	Implement the security aspects of Cloud.
CO-6	Implement the storage on Amazon Web Services.

Part	**Experiment**	**CO**
A	➤ Install VirtualBox/VMware Workstation on different OS. ➤ Install different operating systems in VMware. ➤ Install a C compiler in the virtual machine created using virtual box and execute Simple Programs.	CO-1
	➤ Install Google App Engine. Create hello world app and other simple web applications using python/java. ➤ Use GAE launcher to launch the web applications	CO-2
	➤ Simulate a cloud scenario using simulator.	CO-3
	➤ Implement scheduling algorithms.	CO-4
	➤ To study cloud security management. ➤ To study and implementation of identity management	CO-5
B	Case Study - Amazon Web Services/Microsoft Azure/Google cloud services.	CO-6

6th Semester	AGCS-21608: BIG DATA ANALYTICS LAB			

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	To install the relevant software for setting up a Hadoop cluster
CO-2	To install the relevant software for setting up Apache Pig and to understand its architecture
CO-3	To implement the various commands of Hadoop distributed file systems (HDFS)
CO-4	To explore various operators in Apache Pig for performing analytics
CO-5	To explore various functions in Apache Pig for performing analytics
CO-6	To create a project that demonstrates storage and subsequent analysis of a given dataset using ApachePig

Part	Experiment	CO
A	Installation of Apache Hadoop and working of various configuration files like .bashrc, core-site.xml, hdfs-site.xml, hadoop-env.sh and mapred-site.xml.	CO-1
	Installation of Apache Pig. Understanding Apache Pig architecture and its processing paradigm	CO-2
	Running HDFS commands like cat, cp, ls, lsr, put, get, rm, df, count, fsck, balancer, mkdir, mv,rm rmr, du, dus copyFromLocal, copyToLocal, moveFromLocal, moveToLocal, chmod,chown, chgrp, setrep, stat, tail, test, text, touchz.	CO-3
	To implement the working of Apache Pig operators: filter, distinct, foreach generate, various join operators (inner and outer), group, cogroup, cross, order, limit, union, split, describe, explain, illustrate, rank, sample.	CO-4
	To implement the working of Apache Pig functions: Eval functions: AVG, BagToString, CONCAT, COUNT, COUNT_STAR, IsEmpty, MAX, MIN, SIZE, SUBTRACT, SUM, TOKENIZE.	CO-5
	Load and store functions: PigStorage, TextLoader, BinStorage.	
	Bag and tuple functions: ToBag, TOP, ToTuple, ToMap.	
	String functions: ENDSWITH, STARTSWITH, SUBSTRING, EqualsIgnoreCase, INDEXOF, LAST_INDEXOF, LCFIRST, UCFIRST, LOWER, UPPER, REPLACE, TRIM, LTRIM, RTRIM.	
	Date time functions: ToDate, CurrentTime, GetDay, GetHour, GetMilliiSecond, GetMinute, GetMonth, GetSecond, GetWeek, GetYear, DaysBetween, HoursBetween, MilliSecondsBetween, MinutesBetween, MonthsBetween, SecondsBetween, WeeksBetween, YearsBetween.	
	Math functions: ABS, CBRT, CEIL, FLOOR, EXP, LOG, LOG10, RANDOM, ROUND, SQRT.	
B	To create a project that demonstrates storage and subsequent analysis of huge datasets using Apache Pig operators, functions and HDFS.	CO-6

6th Semester	AGCS-21609: MOBILE APPLICATION DEVELOPMENT LAB			

			L	T	P
Internal Marks:	**30**		**0**	**0**	**2**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Install the Android Studio and Understand the design of Android Program.
CO-2	Implement Intents, Intent Filter Collision, Fragments and Notification.
CO-3	Develop and design layout of various Android applications.
CO-4	Design user interface using different Menus and List Views
CO-5	Implement SMS, Gmail, Location based services including JSON.
CO-6	Design and develop an application using SQLite and other Storage Options available in Android System

Part	Experiment	CO
A	Installing Android Studio on ubuntu & WindowsCreating New Project on Android Studio Open, Re-open and Close existing project on Android studioCreating Android Virtual Devices Creating Hello World application	CO-1
	Linking Activities using Intent Passing Data and result Back using an Intent ObjectImplicit intents Familiarization Intent Filter Collision and its Resolution Implementation of Fragments and Notifications	CO-2
	Understanding different layouts in android Implementation of different views buttons, toast, image, image switcher Implementation of Picker Views	CO-3
	Create a simple list view Implementation of Menus and Action Bar Create a list view with image and text Integrate a website inside the application using WebView	CO-4
	Implementation of SMS Implementation of Gmail Implementation of Location Marker Implementation of JSON and Service	CO-5
B	Developing a Small Application Using SQLite and UI Design elements available in Android.	CO-6

6th Semester	AGCS-21604A: INFORMATION SECURITY(PEC-2)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Elucidate the CIA triad of Confidentiality, Integrity and Availability and various encryption techniques.
CO-2	Implement symmetric and asymmetric encryption systems, public key cryptography and RSA.
CO-3	Implement the various authentication protocols used for the protection of information.
CO-4	Understand the concept of network security and security architecture.
CO-5	Illustrate the concept of web security and SET.
CO-6	Implement system security concepts.

Part	Content	CO
I	Symmetric Ciphers - Overview: Services, Mechanisms and Attacks, the OSI Security Architecture, A Model of Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography. Block Cipher and the Data Encryption Standard: Simplified DES, Block Cipher Principles, the DES,the Strength of DES, Differential and Linear Cryptanalysis. Symmetric Ciphers: Triple DES, Blowfish. Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.	CO-1
II	Public Key Encryption, Number Theory, Prime Numbers Formats and Eulers Theorems, Testing for Primality. Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management.	CO2
III	Authentication Protocols - Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards.	CO-3
IV	Network Security - Authentication Applications: Kerberos, X.509 Directory Authentication Service. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload.	CO4
	Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction.	CO-5
	System Security- Intruders, Malicious Software, Viruses and Related Threats, Counter Measures, Firewalls and its Design Principles.	CO-6

References:

- William Stallings, Network Security Essentials, Applications and Standards Pearson Education.
- William Stallings, Cryptography and Network Security Principles and practice. 2nd Edition, Pearson Education.
- Bishop, Matt, Introduction to Computer Security. Addison-Wesley, Pearson Education, Inc.
- Michael. E. Whitman and Herbert J. Mattord Principles of Information Security, Cengage Learning.

Syllabus for CSE 2021 batch onwards

6th Semester	AGCS-21604B: CYBER SECURITY(PEC-2)			

			L	T	P
Internal Marks:	**40**		**3**	**-**	**-**
External Marks:	**60**				
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:

CO-1	Analyze the cyber security needs of an organization.
CO-2	Explore various types of attacks.
CO-3	Understand various cyber security regulation and roles of Cyber Laws.
CO-4	Examine software vulnerabilities and security solutions to reduce the risk of exploitation.
CO-5	Identify the tools for mitigating cyber-attacks.
CO-6	Apply intrusion prevention techniques.

Part	Content	CO
I	**Introduction to Cyber Security:** Defining cyberspace and overview of computer and web- technology, architecture of cyberspace, layers of security, communication and web technology, internet, World Wide Web, advent of internet, internet infrastructure for data transfer and governance, CIA trade, regulation of cyberspace, concept of cyber security, issues and challenges of cyber security.	CO-1
II	**Cybercrimes:** Cybercrimes targeting computer systems and mobiles- data diddling attacks, spyware, logic bombs, DoS, DDoS, advanced persistent threat, virus, trojans, ransomware, data breach. Online scams and frauds-email scams, phishing, vishing, smishing, online job fraud, debit/ credit card fraud, online payment fraud, cyberbullying, website defacement, cyber- squatting, pharming, cyber espionage, crypto jacking, darknet- illegal trades, drug trafficking, human trafficking. Social media scams & frauds-impersonation, identity theft, job scams, misinformation, fake news cyber. Crime against persons- cyber grooming, cyber stalking, social engineering attacks, cyber police stations, crime reporting procedure, Case Studies- Pune Citibank MphasiS Call Center Fraud, Parliament Attack Case.	CO-2
	Cyber Laws: Cybercrime and legal landscape around the world, IT act, 2000 and its amendments. limitations of IT act, 2000. cybercrime and punishments, cyber laws and legal and ethical aspects related to new technologies- AI/ML, IOT, Blockchain, Darknet and social media, cyber laws of other countries, case studies.	CO-3
III	**Cyber Security Management, Compliance and Governance:** cyber security plan-cybersecurity policy, business continuity, risk assessment, types of security controls and their goals, cyber security audit and compliance, national cyber security policy and strategy.	CO-4
IV	**Cyber Security Tools and Techniques:** Digital devices security, tools and technologies for cyber security, end point device and mobile phone security, password policy, security patch management, data backup, downloading and management of third-party software, device security policy, cyber security best practices, significance of ant-virus, Wi-Fi security, configuration of basic security policy and permissions.	CO-5
	Intrusion Detection: Host based intrusion detection, network -based intrusion detection, distributed or hybrid intrusion detection, intrusion detection exchange format, Honeypots. **Firewalls and Intrusion Prevention Systems: need** for firewalls, firewall characteristics and access policy, types of firewalls, firewall basing, firewall location and configurations, intrusion prevention systems, example unified threat management products.	CO-6

Syllabus for CSE 2021 batch onwards

References:

- William Stallings, Lawrie Brown,"Computer Security Principles and Practice", 3rd Edition, Pearson
- Nina Godbole, Sunit Belapure, Cyber Security- Understanding cyber-crimes, computer forensics and legal perspectives, Wiley Publications, 2016.
- Andrew Vladimirov Michajlowski, Konstantin, Andrew A. Vladimirov, Konstantin V. Gavrilenko, Assessing Information Security: Strategies, Tactics, Logic and Framework, IT Governance Ltd, O'Reilly, 2010

6th Semester	AGCS-21604C: BLOCKCHAIN TECHNOLOGY			

			L	T	P
Internal Marks:	40		3	-	-
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand emerging abstract models for Block chain Technology.
CO-2	Identify major research challenges and technical gaps existing between theory and practice in crypto currency domain.
CO-3	Understand Bitcoin Consensus and Issues in permissioned blockchain.
CO-4	Understand Distributed Consensus and its method.
CO-5	Apply hyperledger Fabric and Etherum platform to implement the Block chain Application.
CO-6	Learn the application of Blockchain technology in various fields.

Part	Content	CO
I	**INTRODUCTION TO BLOCKCHAIN:** Blockchain-Public Ledgers, Blockchain as Public Ledgers-Bitcoin, Blockchain 2.0, Smart Contracts, Block in a Blockchain, Transactions-Distributed Consensus, The Chain and the Longest Chain-Cryptocurrency to Blockchain 2.0-Permissioned Model of Blockchain, Cryptographic-Hash Function, Properties of a hash function-Hash pointer and Merkle tree	CO-1
II	**BITCOIN AND CRYPTOCURRENCY:** A basic crypto currency, Creation of coins, Payments and double spending, FORTH-the precursor for Bitcoin scripting, Bitcoin Scripts, Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay, Consensus introduction, Distributed consensus in open environment, Consensus in a Bitcoin network	CO-2
	BITCOIN CONSENSUS: Bitcoin Consensus, Proof of Work (PoW)-Hash cash PoW, Bitcoin PoW, Attacks on PoW, monopoly problem-Proof of Stake-Proof of Burn-Proof of Elapsed Time-Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases, Design issues for Permissioned Blockchains, Execute Contracts-Consensus models for permissioned blockchain-Distributed consensus in closed environment Paxos	CO-3
III	**DISTRIBUTED CONSENSUS:** -Raft Consensus-Byzantine general problem, Byzantine fault tolerant system-Agreement Protocol, Lamport-Shostak-Pease BFT Algorithm-BFT over Asynchronous systems, Practical Byzantine Fault Tolerance	CO-4
IV	**HYPER LEDGER FABRIC & ETHERUM:** Architecture of Hyperledger fabric v1.1-Introduction to Hyperledger fabric v1.1, chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity, Smart contracts, Truffle Design and issue Crypto currency, Mining, DApps, DAO.	CO-5
	BLOCKCHAIN APPLICATIONS: Internet of Things-Medical Record Management System-Block chain in Government and Block chain Security-Block chain Use Cases -Finance	CO-6

References:

- Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks by Bashir, Imran,2017.
- Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
- Joseph Bonneau et al, SoK: Research perspectives and challenges for Bitcoin and cryptocurrency, IEEE Symposium on security and Privacy, 2015.

Syllabus for CSE 2021 batch onwards

6th Semester	AGCS-21604D: ETHICAL HACKING			

			L	T	P
Internal Marks:	40		3	-	-
External Marks:	60		3	-	-
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basics of computer-based vulnerabilities.
CO-2	Explore different foot printing, reconnaissance and scanning methods.
CO-3	Expose the enumeration and vulnerability analysis methods.
CO-4	Learn hacking options available in Web and wireless applications.
CO-5	Explore the options for network protection.
CO-6	Study various tools and website to perform ethical hacking to expose the vulnerabilities.

Part	Content	CO
I	**Introduction:** Ethical Hacking Overview, Role of Security and Penetration Testers, Penetration Testing Methodologies, Laws of the Land, Overview of TCP/IP, The Application Layer, The Transport Layer, The Internet Layer, IP Addressing, Network and Computer Attacks, Malware, Protecting Against Malware Attacks, Intruder Attacks, Addressing Physical Security	CO-1
II	**Foot printing, Reconnaissance and Scanning Networks:** Foot printing Concepts, Foot printing through Search Engines, Web Services, Social Networking Sites, Website, Email, Competitive Intelligence, Foot printing through Social Engineering, Foot printing Tools, Network Scanning Concepts, Port-Scanning Tools, Scanning Techniques, Scanning Beyond IDS and Firewall.	CO-2
	Enumeration and Vulnerability Analysis: Enumeration Concepts, NetBIOS Enumeration, SNMP, LDAP, NTP, SMTP and DNS Enumeration, Vulnerability Assessment Concepts, Desktop and Server OS Vulnerabilities, Windows OS Vulnerabilities, Tools for Identifying Vulnerabilities in Windows, Linux OS Vulnerabilities, Vulnerabilities of Embedded Oss	CO-3
III	**System Hacking:** Hacking Web Servers, Web Application Components, Vulnerabilities, Toolsfor Web Attackers and Security Testers Hacking Wireless Networks, Components of a Wireless Network, Wardriving, Wireless Hacking, Tools of the Trade.	CO-4
IV	**Network Protection Systems:** Access Control Lists, Cisco Adaptive Security Appliance Firewall, Configuration and Risk Analysis Tools for Firewalls and Routers, Intrusion Detectionand Prevention Systems, Network Based and Host-Based IDSs and IPSs, Web Filtering, Security Incident Response Teams, Honeypots.	CO-5
	Real World Scenario: Study of various tools and website to perform ethical hacking to exposethe vulnerabilities in real world environment.	CO-6

References:
- Authors: Dafydd Stuttard and Marcus Pinto "The Web Application Hacker's Handbook: Finding and Exploiting Security Flaws", Wiley.
- Jon Erickson "Hacking: The Art of Exploitation", No Starch Press
- Allen Harper, Daniel Regalado, Ryan Linn, Stephen Sims, Branko Spasojevic, and Linda Martinez "Gray Hat Hacking: The Ethical Hacker's Handbook", McGraw-Hill Education

6th Semester	AGFE-21603: FUNCTIONAL ENGLISH-III			

		L	T	P
Internal Marks:	50	**0**	**1**	**0**
External Marks:	0			
Total Marks:	50	**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Self-Introduction and Body Language to prepare students to face one to one interaction.
CO-2	Spoken Activity such as Group Discussion to hone spoken skills and interpersonal communication of students.
CO-3	Vocabulary based session to improve language proficiency of students.
CO-4	Resume writing and cover letter writing to make students proficient in English correspondence.
CO-5	Book reading to improve reading skills of students.
CO-6	Corporate Profile Report to make students aware of companies of their stream and their selection criteria.

Part	Content	CO
I	Mock interview to provide one (students) with an opportunity to practice one's interviewing skills in an environment similar to an actual interview.	CO-1
II	This section includes Group discussion is a task, which is generally aimed at understanding and evaluating candidate's behavior in a group.	CO-2
	This section includes word power, analogies, sentence correction and verbal reasoning.	CO-3
III	Resume writing and cover letter writing to make students proficient in English correspondence.	CO-4
IV	Rich Dad Poor Dad shall be prescribed for honing reading skills and comprehension in depth.	CO-5
	Corporate Profile Report to make students aware of companies of their stream and their selection criteria.	CO-6

References:
• www.Indiabix.com
• English Grammar by Wren and Martin
• www.freshersworld.com
• www.alison.com

6th Semester	AGAP-21603: ENGINEERING APTITUDE-III			

Internal Marks:	50		L	T	P
External Marks:	0		0	1	0
Total Marks:	50		Credits		1

Course Outcomes: After studying the course, students will be able to:	
CO-1	Enhance the logical thinking of students
CO-2	How likely events could happen and so the risks could be determined and resolved professionally
CO-3	Understand the time taken by an individual or a group of individuals to complete a piece of work
CO-4	Understand different relations among the members of a family
CO-5	Determine if a system of linear equations has no solution, one solution, or infinitely many solutions
CO-6	Use Quadratic equations in real life

Part	Content	CO
I	**Problem on Ages**: Shortcut method to simplify questions based on Age	CO-1
	Venn Diagrams: Applications of Sets	CO-2
II	**Area , volume and surface area** : Cuboid, Cube, Parallelepiped, Cylinder, Sphere	CO-3
III	**Calendar and Time** :To find odd days in an ordinary year, Leap year, Days of week related to odd days	CO-4
	Clocks : Hands of Clock, Angle Traced by Hands	CO-5
IV	**Chain Rule** :Direct Proportion **,**Indirect Proportion	CO-6

References:

- Quantitative Maths: Arihant Publishers.
- Objective Mathematics : R S Aggarwaal.
- Quantitative Maths: TMH Publication

Syllabus for CSE 2021 batch onwards

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CSE): 7th/8th SEM

7th/8th Semester		AGCS-21701: DATA SCIENCE			

			L	T	P
Internal Marks:	40		3	1	0
External Marks:	60				
Total Marks:	100		Credits		4

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understanding the foundations and applications of data science
CO-2	Mastering data acquisition and preparation techniques
CO-3	Refining data for analysis and harnessing exploratory insights
CO-4	Analyzing data through probabilistic inference and statistical methods
CO-5	Evaluating and fine-tuning predictive models for real-world application
CO-6	Exploring cutting-edge trends and crafting insights through data visualization

Part	Content	CO
I	**Introduction to data science:** Evolution, need and components of data science, data science process. difference between data science and business intelligence, applications of data science in various fields. ethical issues in data science, data privacy and security, responsible data use.	CO-1
II	**Data collection**: Data collection sources, data collection methods – interviews, questionnaires, databases, web scraping, apis. **Data cleaning techniques**: Handling missing values, data transformation, data normalization and standardization.	CO-2
	Data preprocessing: Data integration – data reduction data transformation and data discretization. exploratory data analysis –basic tools (plots, graphs and summary statistics) of eda, philosophy of eda – the data science process.	CO-3
III	**Probability and statistics:** Basic probability concepts, probability distributions (normal, binomial, poisson), bayes' theorem, inferential statistics, hypothesis testing, confidence intervals. **Understanding data analytics:** Need, characteristics, descriptive (mean, median, mode, variance, and standard deviation) predictive, diagnostic, prescriptive.	CO-4
IV	**Model evaluation and validation:** Linear regression, logistic regression, decision trees, k-nearest neighbors (k-nn), clustering (k-means), model evaluation metrics (RMSE, MAE, r^2), evaluation metrics (accuracy, precision, recall, f1score), train-test split, cross-validation, overfitting and underfitting, model tuning and hyperparameter optimization.	CO-5
	Recent trends: Benefits and best practices, data visualization: introduction to data visualization, acquiring and visualizing data, applications of data visualization, data visualization tools and techniques, **Real world applications:** Object Detection, Plagiarism Detection.	CO-6

References:
- "An Introduction to Statistical Learning: with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- "The Elements of Statistical Learning: Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
- "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney
- "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

Syllabus for CSE 2021 batch onwards

7th/8th Semester		AGCS-21703: DATA SCIENCE LAB			
Internal Marks:	**30**		**L**	**T**	**P**
External Marks:	**20**		**0**	**0**	**2**
Total Marks:	**50**		**Credits**		**1**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Performing manipulation of data using Pandas.
CO-2	Performing basic web scraping and apply data cleaning techniques.
CO-3	Implement Exploratory Data Analysis (EDA) and advanced visualizations using matplotlib and seaborn.
CO-4	Applying various probability concepts.
CO-5	Evaluation of supervised learning models.
CO-6	Development and execution of Data Science project

Part	Content	CO
I	Writing Python scripts for basic data manipulation tasks. Importing and exporting data with Pandas. Performing basic data manipulation operations such as filtering, sorting, and grouping.	CO-1
II	Basic web scraping with Beautiful Soup Data Cleaning: Handling missing values, Data transformation and normalization, removing duplicates and dealing with outliers.	CO-2
	Exploratory Data Analysis (EDA) • Descriptive Statistics and Visualization ◦ Calculating summary statistics (mean, median, standard deviation). ◦ Creating basic plots (histograms, box plots) with matplotlib and seaborn. • Advanced Data Visualization ◦ Creating scatter plots, line plots, and bar charts. ◦ Customizing plots (titles, labels, legends, colors).	CO-3
III	Probability and Statistics • Basic Probability ◦ Simulating coin flips and dice rolls. ◦ Calculating probabilities and visualizing probability distributions. • Inferential Statistics ◦ Performing hypothesis tests. ◦ Creating and interpreting confidence intervals.	CO-4
IV	Introduction to Machine Learning • Supervised Learning Basics ◦ Implementing linear regression with scikit-learn. ◦ Evaluating model performance (R^2, MAE, RMSE). • Classification with Logistic Regression ◦ Building a logistic regression model. ◦ Evaluating classification performance (confusion matrix, accuracy, precision, recall). • Decision Trees and k-NN ◦ Implementing decision trees and k-nearest neighbors classifiers. ◦ Visualizing decision boundaries. • Model Evaluation ◦ Performing cross-validation. ◦ Hyperparameter tuning with GridSearchCV.	CO-5

Syllabus for CSE 2021 batch onwards

References:

- "An Introduction to Statistical Learning: with Applications in R" by Gareth James, Daniela Witten, Trevor Hastie, and Robert Tibshirani
- "The Elements of Statistical Learning: Data Mining, Inference, and Prediction" by Trevor Hastie, Robert Tibshirani, and Jerome Friedman
- "Python for Data Analysis: Data Wrangling with Pandas, NumPy, and IPython" by Wes McKinney
- "Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow" by Aurélien Géron

7th/8th Semester	AGCS-21702A: SOFTWARE TESTING (PEC-3)			
Internal Marks:	**40**	**L**	**T**	**P**
External Marks:	**60**	**3**	**0**	**0**
Total Marks:	**100**	**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:
CO-1	Understand the need of software testing
CO-2	Prepare test cases for different types and levels of testing
CO-3	Verify the intended functionality of software
CO-4	Create test plan for variety of applications
CO-5	Test software for specialized environment
CO-6	Understand best practices and industry standards in testing

Part	Content	CO
I	**Introduction to Software Testing -** Importance of software testing, Objectives of testing Types- Functional vs. Non-functional testing, Manual vs. Automated testing, Black-box vs. White-box testing, Regression, Integration, System, Acceptance testing, Test Planning and strategy, Test plan components, Writing and managing test cases, Traceability matrix and Documentation.	CO-1
II	**Techniques and algorithms for functional testing-**Black box testing -Equivalence Partitioning, Boundary Value Analysis, Decision Table Testing, State Transition Testing, Use Case Testing, Exploratory Testing, Model-Based Testing, Graphs based testing- Control Flow Graph, Data Flow Graph (DFG), State Transition Testing, Finite State Machine (FSM), Control Dependency Graph (CDG), Use Case Graph, Graph Matrix Methods, structural coverage criteria, Algorithms for test case design- Random Testing, Combinatorial Testing (Pairwise Testing), Genetic Algorithms, Model-Based Testing (MBT), Constraint-Based Testing, State Transition Testing, Classification Tree Method.	CO-2
	Techniques and algorithms for structural testing - Logic based Testing with predicates, Logic coverage criteria, Path testing, Graph metrices, Loop testing, Data flow testing, Mutation Testing, Specification based Logic Coverage- Predicate coverage, Clause coverage, Combinatorial coverage, Decision Coverage, Condition Coverage, Logic Coverage on Finite State Machines (FSMs)- State Transition Coverage, Path Coverage.	CO-3
III	**Input space partitioning:** Input domain modeling, Combination strategies criteria- Selection from each partition, pairwise testing, Orthogonal Arrays, Mixed strategy testing, Syntax based testing: Coverage criteria based on syntax -Statement Coverage, Branch coverage, Condition Coverage, Multiple condition coverage, path coverage, loop coverage, Mutation testing- Primary and Secondary mutants, mutation testing process.	CO-4
IV	**Testing for specialized environment:** Testing object-oriented software, web-based systems, Agile based software	CO-5
	Emerging Trends in Testing, Industry Best Practices and Standards: AI and machine learning in testing, testing for mobile applications, Cloud-based testing, Testing standards and certifications (e.g., ISTQB), Best practices for effective testing, Emerging trends in software testing, Case studies and real-world examples	CO-6

References:
• Software Testing: Principles and Practices, Srinivasan Desikan, Pearson
• Software Testing Principles and Practices, Naresh Chauhan, Oxford University Press
• Software Testing Techniques, 2nd edition, Boris Beizer, 1990
• Software Testing and Quality Assurance: Theory and Practice by Kshirasagar Naik and Priyadarshi Tripathy, Wiley-Spektrum
• Foundations of Software Testing, Dorothy Graham, Erik van Veenendaal, Isabel Evans, and Rex Black, Cengage

7th/8th Semester	AGCS-21702B: DEEP LEARNING (PEC-3)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	To understand the basic principles and mathematical foundations of deep learning.
CO-2	To learn and apply neural networks for training deep learning models.
CO-3	To apply autoencoders and generative models for suitable applications.
CO-4	To analyse regularization in deep learning approaches.
CO-5	To provide a more scalable approach to visual detection and recognition tasks using CNN.
CO-6	To understand the vanishing gradient problem present in traditional RNNs

Part	Content	CO
I	**Introduction:** Historical context and motivation for deep learning; Advantages of deep learning over machine learning, Structure and working of deep learning, Detailed explanation of Perceptron, McCulloch Pitts Neuron, Thresholding Logic, Perceptron Learning Algorithm Optimization Techniques- Optimizing logistic classifier using gradient descent, stochastic gradient descent, momentum, adaptive sub-gradient method, Batch Optimization	CO-1
II	**Neural Networks:** Layers in the neural network, Multilayer Perceptron model deep networks, Feedforward and backpropagation, regularizing a deep network, model exploration, and hyper parameter tuning.	CO-2
	Autoencoders: Undercomplete autoencoders, regularized autoencoders, sparse autoencoders, Contractive autoencoders, Principal Component Analysis (PCA) and its interpretations, Autoencoders and relation to PCA, Regularization in autoencoders, denoising autoencoders, stochastic encoders and decoders.	CO-3
III	**Regularization:** Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout.	CO-4
IV	**Convolutional Neural Networks:** Introduction to convolution neural networks: stacking, striding and pooling, applications like image, and text classification, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet, Visualizing Convolutional Neural Networks, Guided Backpropagation, Deep Dream, Deep Art.	CO-5
	Sequence Modeling: Recurrent Nets: Unfolding computational graphs, recurrent neural networks (RNNs), bidirectional RNNs, encoder-decoder sequence to sequence architectures, deep recurrent networks, LSTM networks.	CO-6

References:
● Ian Goodfellow, Yoshua Bengio and Aaron Courville, Deep Learning, MIT Press, 2016 ● Bunduma, N. (2017). Fundamentals of Deep Learning ● Heaton, J.(2015). Deep Learning and Neural Networks, Heaton Research Inc. ● James A Freeman, David M S Kapura, "Neural Networks Algorithms, Applications, and Programming Techniques", Addison Wesley, 2003. ● Francois Chollet, "Deep Learning with Python", Second Edition, Manning Publications, 2021.

7th/8th Semester	AGCS-21702C: COMPUTER VISION (PEC-3)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60		**3**	**0**	**0**
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Identify basic terminology and analyse the image theories.
CO-2	Study the foundation of image formation and measurement.
CO-3	Analyse the geometric and other image features and methods.
CO-4	Extract meaningful representations from high-dimensional time series data.
CO-5	Study processing and analysing discrete data of image.
CO-6	Assess the methods to solve and analyse the accuracy of the methods.

Part	Content	CO
I	**Fundamentals of Image Processing:** 2-D projective geometry, homogeneous coordinates, Projective Transformations, Invariant Properties, Duality Principle, homography, properties of homography, computer imaging systems, Components of Computer Imaging Systems, Processes in Computer Imaging Systems, Applications of Computer Imaging Systems.	CO-1
II	**Image Formation and Representation:** Image formation and sensing, Image analysis, Image pre-processing, Image Preprocessing Techniques, Edges, Importance of Edges, Edge Detection Methods Lines, Line Detection Methods, Line Representation, Segmentation, Types of Segmentation, Active contours, Split and merge, Mean shift and mode finding, Normalized cuts, Graph cuts and energy-based methods.	CO-2
	Image Transformations: Camera geometry, components of camera geometry, Stereo geometry, key concepts and components of stereo geometry, feature detection and description, feature matching and model fitting, colour processing.	CO-3
III	**Image Processing Techniques:** Range image processing, clustering and classification, dimensionality reduction and sparse representation, Morphological filtering, Fourier transform.	CO-4
IV	**Feature Extraction:** Shape, histogram, colour, spectral, texture, CVIP tools, Feature analysis, feature vectors, distance/similarity measures, data pre-processing.	CO-5
	Pattern Analysis: Clustering: K-Means, K-Medoids, Mixture of Gaussians Classification: Discriminant Function, Supervised, Un-supervised, Semi- supervised. Classifiers: Bayes, KNN, ANN models. **Dimensionality Reduction:** PCA, LDA, ICA, and Non- parametric methods, Sparse representation, Recent trends in Activity Recognition, computational photography, Biometrics.	CO-6

References:

- Multiple View Geometry in Computer Vision: R. Hartley and A. Zisserman, Cambridge University Press.
- Computer Vision: Algorithms & Applications, R. Szeleski, Springer.
- Computer vision: A modern approach: Forsyth and Ponce, Pearson.

7th/8th Semester	AGCS-21702D: ADVANCED COMPUTER NETWORKS (PEC-3)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Analyze some of the most advanced routing and switching techniques.
CO-2	Understand Packet classification methods and techniques for data transfer.
CO-3	Understand the architecture of SDN and NFV for security in Softwarized Networks.
CO-4	Analyze various Data Planes, P4 Switches in Programmable Networks.
CO-5	Understand the concept of Data Center Networking and its technologies used
CO-6	Understand the concept of content distribution and delivery over internet

Part	Content	CO
I	**High Performance Switching and Routing:** Introduction, performance considerations, IP address lookup, Advanced Switching Techniques, High-Speed Routing Protocols, Algorithms for IP address lookup and optimization, hardware implementation of address lookup.	CO-1
II	**Packet Classification:** Introduction to Packet Classification, Need for packet classification and methods for packet classification, Algorithms and Techniques, Quality of Service, Traffic Polishing, Traffic Shaping, Case Studies and Real-World Applications.	CO-2
	Network Softwarization: Introduction, Software Defined Networking (SDN), Architecture and Concepts, Working with Mininet, Network Function Virtualization (NFV) - Architecture and Concepts, Network Automation and Orchestration, Service Function Chaining (SFC), Security in Softwarized Networks.	CO-3
III	**Programmable Networks:** Introduction to P4, Programmable Data Planes, Smart NICS and P4 switches, Service Function Chaining (SFC), Security in Programmable Networks, Industry Standards and Protocols in P4, Case Study.	CO-4
IV	**Data Center Networking (DCN):** Introduction, Data Center Network Architectures, Data Center Network Topologies, Container Network Interfaces, Data center Network Virtualization, Software-Defined Networking (SDN) in Data Centers, Data Center Interconnect (DCI), High-Performance Networking Technologies, Network Security in Data Centers, Load Balancing and Traffic Management in DCN, Future Trends in DCN.	CO-5
	Content Distribution on the Internet: Introduction, Content Delivery Networks (CDNs), Peer-to-Peer (P2P) Networks, Internet Protocols for Content Distribution, Security in Content Distribution, Information Centric Networking- Introduction, Architectures for Information Centric Networking, Content Naming, Routing and Caching, Security in Named Data Networking.	CO-6

References:

- Information-Centric Networks: A New Paradigm for the Internet (Focus Series in Networks and Telecommunications), Gabriel M. de Brito, Pedro B. Velloso, Igor M. Moraes, Wiley-ISTE; 1st edition, 2013, ISBN: 9781848214491
- Information-Centric Networking (ICN): Content Centric Networking (CCNx) and Named Data Networking (NDN) Terminology, B. Wissingh, C. Wood, A. Afanasyev, L. Zhang, D. Oran and C. Tschudin, RFC 8793, June 2020
- Software-Defined Networks: A Systems Approach, Peterson, Cascone, O'Connor, Vachuska, and Davie, Cloud Networking: Understanding Cloud-based Data Centre Networks, Gary Lee (Author), Morgan Kaufmann (Publisher), 2014, ISBN-139780128007280

7th/8th Semester	AGCS-21702E: BUSINESS INTELLIGENCE AND ANALYTICS (PEC-3)		

Internal Marks:	40			**L**	**T**	**P**
External Marks:	60			3	0	0
Total Marks:	100			**Credits**		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand the role of business intelligence and analytics in decision-making processes.
CO-2	Understand the concepts of data warehousing, data mining, and data visualization.
CO-3	Understand statistical techniques to analyze and interpret business data.
CO-4	Use BI tools to extract, transform, and load (ETL) data from various sources.
CO-5	Utilize predictive analytics techniques to forecast future trends and outcomes.
CO-6	Understand the ethical and privacy implications of using business intelligence and analytics.

Part	Content	CO
I	**Introduction to Business Intelligence:** Introduction to Business Intelligence & Analytics (BIA), drivers of BIA. Types of analytics: descriptive to prescriptive, vocabulary of business analytics. Technical architecture of BIA, fundamentals of data management, OnLine Transaction Processing (OLTP), design process of databases, Relational databases, normalization, SQL queries.	CO-1
II	**Data Warehousing:** Introduction to data warehousing concepts, Data modeling and schema design, Extract, transform, and load (ETL) processes, Data Mining and Machine Learning, Introduction to data mining techniques, Association analysis, clustering, and classification, Introduction to machine learning algorithms for BI, Data Visualization-Principles of data visualization, Choosing the right chart types, Tools for data visualization (e.g., Python, Tableau, Power BI).	CO-2
	Statistical Analysis for BI: Descriptive and inferential statistics, Hypothesis testing and confidence intervals, Regression analysis for predictive modeling	CO-3
III	**BI Tools and Software:** Overview of popular BI tools and software, Hands-on experience with a BI tool (e.g., Tableau, Power BI) to extract, transform, and load (ETL) data from various sources. Building dashboards and reports.	CO-4
IV	**Advanced Analytics Techniques:** Analytics Techniques to forecast future trends and outcomes. Time series analysis and forecasting, Text analytics and sentiment analysis, Spatial analytics and GIS integration.	CO-5
	Ethics and Privacy in BI: Ethical considerations in BI and analytics, Privacy regulations (e.g. GDPR, HIPAA), Handling sensitive data and ensuring data security. Case Studies and Applications-Real-world case studies in BI and analytics, Applications of BI across different industries.	CO-6

References:

- "Business Intelligence Guidebook: From Data Integration to Analytics" by Rick Sherman
- "The Data Warehouse Toolkit: The Definitive Guide to Dimensional Modeling" by Ralph Kimball & Margy Ross
- "Data Mining: Concepts and Techniques" by Jiawei Han, Micheline Kamber, and Jian Pei
- "Building the Agile Enterprise: With Capabilities, Collaborations and Values" by Fred Cummins
- "Competing on Analytics: The New Science of Winning" by Thomas H. Davenport and Jeanne G. Harris

7th/8th Semester	AGCS-21702F: INTRODUCTION TO INTERNET OF THINGS (PEC-4)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Understand the concept of IoT and its Architecture.
CO-2	Learn the function of various components and the communication modules.
CO-3	Understand the physical and application layer protocols for IoT.
CO-4	Implement the interface between hardware and Arduino board using Python Programming.
CO-5	Implementing the various python packages on Raspberry pi Board
CO-6	Analyse applications of IoT in real time scenario.

Part	Content	CO
I	**Introduction**: Characteristics of IoT, Components of IoT, Architecture of IoT, IoT Applications, Functional Blocks of an IoT Ecosystem, Sensors Classes-Vector, Scalar, Analog and Digital, Sensor Types, Actuators and its types- Hydraulic actuators, Pneumatic, Electrical actuators, Thermal actuators, Magnetic actuators and Mechanical actuators, and Smart Objects, Control Units.	CO-1
II	**Communication in IoT:** Internet based communication, IP Addressing in IoT, M2M Communication reasons, features, Six pillars of M2M, Applications and Communication modules- Bluetooth, ZigBee, GPS, GSM, Wi-Fi.	CO-2
	Techniques in IoT: Overview of RFID technology, Types of RFID tags and readers, RFID frequency bands and standards (LF, HF, UHF) HF), RFID Middleware, Applications, MQTT Architecture and operation, QoS Levels, CoAP Architecture and features, AMQ Architecture and use case,6LoWPAN in IoT, IEEE 802.15.4 features	CO-3
III	**Introduction to Arduino:** Introduction to Arduino and Arduino UNO, Pin Configuration, Installing the Software, Sketch structure, Arduino function libraries, Fundamentals of Arduino Programming. Operators in Arduino: Control Statement, Loops, Arrays, String, Math Library, Random Number, Interrupts	CO-4
IV	**Raspberry Pi and IoT:** Introduction to Raspberry, About the Raspberry pi Board: Hardware Layout, Operating Systems on Raspberry, Using GPIO pins, PiCaM, Configuring Raspberry, Programming Raspberry pi with Python Packages XML, JSON, HTTPLib, URLlib, SMTPLib,	CO-5
	IoT Applications: Smart Metering, E-health, Smart City and Home Automation, IoT in Agriculture, Automotive Applications, Smart Energy Management, Smart vehicles parking, communicating data with H/W units, mobiles, tablets.	CO-6

References:
- Robert Barton, Patrick Grossetete, David Hanes, Jerome Henry, Gonzalo Salgueiro, "IoT Fundamentals: Networking Technologies, Protocols, and Use Cases for the Internet of Things", CISCO Press, 2017
- Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT, 2014. (ISBN: 978-8173719547)
- Raj Kamal, "Internet of Things: Architecture and Design Principles", 1st Edition, McGraw Hill Education, 2017. (ISBN: 978-9352605224)

7th/8th Semester	AGCS-21702G: SOCIAL NETWORK ANALYSIS (PEC-4)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Analyze a social network using various visualization tools.
CO-2	Illustrate large-scale network data and mechanisms used for network growth models.
CO-3	Understand the signed networks and applications of the Link Analysis
CO-4	Acquaint with the community detection and Link Prediction ways
CO-5	Examine social networks analysis and prediction using case studies.
CO-6	Apply appropriate anomaly detection and graph representation method on a network

Part	Content	CO
I	**Society & Network:** Introduction, Use of social networks, defining a network, types of networks (link-centric, node and link centric, local view, temporal view, generalization, real-world network), levels of social network analysis, graph visualization tools (web-based and standalone), applications. **Network Measures:** Network basics, node centrality, assortative, transitivity and reciprocity, similarity, degeneracy	CO-1
II	**Network Growth Models:** Properties of real-world networks, Random Network Model: Degree Distribution of Random Network, Binomial to Poisson Distribution, Evolution of a Random Network, Average Path Length, Clustering Coefficient, Random Network vs. Real-world Network, Ring Lattice Network Model, WattsStrogatz Model: Network Formation, Preferential Attachment Model: Network Formation, Degree Dynamics, Limitations of BA Model	CO-2
	Link Analysis: Application of link analysis, Signed networks: Balance Theory of Undirected Signed Networks, Status Theory of Signed Networks, Triad Balance vs Status, Strong and Weak Ties: Strength of a Tie, Triadic Closure, Dunbar Number, Local Bridges and Importance of Weak Ties, PageRank, Personalized PageRank, DivRank, SimRank, PathSim	CO-3
III	**Community Detection:** Application of community detection, types of communities, community detection methods, Disjoint Community Detection: Node-centric community detection, modularity and community detection, Overlapping Community 08 Detection: Clique Dynamics, Local Community Detection. **Link Prediction:** Applications of link prediction, Evaluating Link Prediction methods, Heuristic models, Probabilistic models, Supervised Random Walk	CO-4
IV	**Cascade Behaviours & Network Effects:** Preliminaries and Important Terminologies, Cascade Models, Probabilistic Cascades, Epidemic Models, Independent Cascade Models, Cascade Prediction.	CO-5
	Anomaly Detection in Networks: Anomaly in Static Networks: Plain and attributed networks, relational learning, Anomaly in Dynamic Networks: Preliminaries, feature and decomposition-based approaches. **Graphical Representation Learning:** Criterion of graph representation learning, pipeline, representation learning methods.	CO-6

References:
- Xiaoming Fu, Jar-Der Luo, Margarete Boos, 'Social Network Analysis Interdisciplinary Approaches and Case Studies', 1 st Edition, CRC Press, 2020.
- Dr. Krishna Raj P.M., Mr. Ankith Mohan, Dr. Srinivasa K.G, "Practical Social Network Analysis with

Syllabus for CSE 2021 batch onwards

Python (Computer Communications and Networks)", First Edition, Springer, 2019.
- John Scott, "Social Network Analysis", Fourth Edition, SAGE Publications Ltd, 2017.

7th/8th Semester	AGCS-21702H: REINFORCEMENT LEARNING (PEC-4)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:
CO-1	Gain a foundational understanding of deep reinforcement learning principles.
CO-2	Make use of various exploration and exploitation strategies.
CO-3	Understanding eligibility traces and their role in temporal difference learning.
CO-4	Delve into Bellman Optimality and its significance in reinforcement learning algorithms.
CO-5	Explore value-based reinforcement learning approaches with function approximation.
CO-6	Demonstrate various Policy based Reinforcement Learning Algorithms.

Part	Content	CO
I	**Introduction:** Reinforcement Learning, Suitability of RL, Components of Reinforcement Learning -Agent, Environment, Observations, Actions, Example-The Bandit Walk Environment, Agent-Environment interaction cycle, MDP (Markov Decision Process): The engine of the Environment-States, Actions, Transition Function, Reward Signal.	CO-1
II	**Bandit algorithms**: Median Elimination, Policy Gradient, Single-state decision problem (Multi-Armed Bandit (MAB) problem), The cost of exploration, approaches to solve MAB environments, Greedy Strategy, Random Strategy, Epsilon-Greedy Strategy, Decaying Epsilon-Greedy Strategy, Optimistic Initialization strategy, Strategic exploration, Softmax exploration strategy, Bandit algorithms – UCB, Upper confidence bound (UCB), PAC	CO-2
	Bellman Optimality and function approximation: Introduction to Bellman Optimality, Bellman Optimality Equation, Bellman Optimality in Policy Iteration and in value iteration, Least Squares Temporal Difference, Least Squares Policy Iteration.	CO-3
III	**Dynamic Programming and TD methods:** Monte Carlo Prediction (MC), First-Visit MC (FVMC), Every-Visit MC (EVMC), Temporal Difference Learning (TD), Learning to estimate from multiple steps, N-step TD learning, Forward-view TD(λ), Backward-view TD(λ), Generalized policy iteration(GPI), Monte Carlo control, SARSA: On-Policy TD control, Q-learning: Off-Policy TD control, Double Q-learning, SARSA(λ), Watkins's Q(λ). Model Based Reinforcement Learning: Dyna-Q, Trajectory sampling.	CO-4
IV	**Value Based Reinforcement Learning:** Deep reinforcement learning agents with sequential feedback, evaluative feedback, sampled feedback, Function Approximation for Reinforcement Learning- high-dimensional state and action spaces, continuous state and action spaces, state-value function and action-value function with and without function approximation, Neural Fitted Q (NFQ), Deep Q-Network (DQN), Double Deep-Q Networks (DDQN), Dueling DDQN, Prioritized Experience Replay (PER).	CO-5
	Policy Based Reinforcement Learning: Policy Gradient and Actor-Critic Methods— REINFORCE Algorithm and Stochastic Policy Search, Vanilla Policy Gradient(VPG), Asynchronous Advantage Actor-Critic (A3C), Generalized Advantage Estimation (GAE), Advantage Actor-Critic(A2C), Deep Deterministic Policy Gradient (DDPG), Twin-Delayed DDPG (TD3), Soft Actor-Critic (SAC), proximal policy optimization (PPO),representation and solution methods of POMDPs.	CO-6

References:
- Richard S. Sutton and Andrew G. Barto, Reinforcement learning: An Introduction, Second Edition, MIT Press, 2019.

- Marco Wiering, Martijn van Otterlo(Ed),Reinforcement Learning, State-of-the-Art, Adaptation, Learning, and Optimization book series, ALO, volume 12, Springer, 2012.
- 3. Keng, Wah Loon, Graesser, Laura, Foundations of Deep Reinforcement Learning: Theory and Practice in Python, Addison Wesley Data & Analytics Series, 2020.

Syllabus for CSE 2021 batch onwards

7th/8th Semester	AGCS-21702I: OBJECT ORIENTED ANALYSIS & DESIGN USING UML (PEC-4)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:
CO-1	Exploring Object-Oriented Design and Unified Modeling Language (UML).
CO-2	Understanding Use Case Diagrams and Prioritization Techniques.
CO-3	Mastering Class and Sequence Diagrams along with Advanced Concepts.
CO-4	Delving into State Chart Diagrams, Design Processes, and Anti-Patterns.
CO-5	Introduction to Design Patterns and Addressing Common Pitfalls.
CO-6	Implementing GRASP Patterns and Exploring GoF Patterns in Depth.

Part	Content	CO
I	**Introduction:** Overview of Object-Oriented Design (OOD), Key concepts of OOD: Objects, Classes, Methods, and Attributes, Benefits of OOD in software development, Comparison of OOD with Procedural Programming, Introduction to UML (Unified Modeling Language), Conceptual model of UML, building blocks of UML, Mechanisms in UML, Architecture.	CO-1
II	**Use Case Diagram:** Purpose and benefits of Use Case Diagrams, Factoring Use Cases, Use Case Guidelines, Elements of Use Case Diagrams - Actors, Use Cases, System Boundaries, Relationships in Use Case Diagrams - Include, Extend, and Generalization, Steps to create a Use Case Diagram, Example Use Case Diagrams for various systems.	CO-2
	Use Case Prioritization: Discuss techniques for prioritizing use cases based on business value, risk, and feasibility, Methods for validating and verifying the correctness and completeness of use case diagrams.	
	Class Diagram and Sequence Diagrams: Purpose and structure of Class Diagrams, Elements - Classes, Attributes, Methods, Relationships, Unary and binary Associations, Aggregation, Composition, and Inheritance, Implementation of association in General Case, Qualified Association, Dependency relation, Simple Class Diagram examples. Advanced concepts in Class Diagrams, Abstract classes and interfaces, Polymorphism, Realization relationships, Multiplicity in associations, Refining and elaborating Class Diagrams with practical examples	CO-3
	Sequence Diagram: Purpose of Sequence Diagrams, Synchronous and Asynchronous Messages, Creating Sequence Diagrams for system interactions.	
III	**State Chart Diagram and Design Process:** Purpose of State Chart Diagrams, States, Transitions, Events, and Actions, Initial and Final States, Guard Conditions, Practical examples of State Chart Diagrams for various scenarios, State Machine Diagrams - Features of State Machine Model, encoding a State Machine-I, encoding a State Machine -II, Interaction Diagrams.	CO-4
	Design Process: Detailed steps in the design process, Requirement Analysis, System Design vs. Detailed Design, Use of UML in the design process, Case Study - Designing a software system from requirements to detailed design. common anti-patterns and pitfalls in software design, contrasting them with design patterns.	
IV	**Introduction to Design Patterns:** Importance of design patterns, Types of design patterns- Creational, Structural, Behavioral. Benefits and limitations of using design patterns.	CO-5

Syllabus for CSE 2021 batch onwards

	GRASP Patterns and GoF Patterns: Introduction to the Gang of Four (GoF) design patterns, General Responsibility Assignment Software Patterns (GRASP), Key GRASP patterns- Information Expert, Creator, Controller, Low Coupling, High Cohesion, Applying GRASP patterns to improve software design, Pure Fabrication, Law of Demeter, Case studies and examples of GRASP patterns **GoF Pattern:** In-depth study of GoF design patterns, Creational Patterns: Singleton, Factory Method, Abstract Factory, Builder, Prototype, Structural Patterns- Adapter, Decorator, Proxy, Composite, Practical implementation and examples, Continuation of GoF design patterns, Behavioral Patterns - Strategy, Observer, Command, Template Method, State, Application and benefits of Behavioral Patterns in software design, Real-world examples and implementation strategies	CO-6

References:

- Frederick Eddy, James Rumbaugh, Michael Blaha, Willliam Premerlani, William Lorensen: Object-Oriented Modeling and Design, Pearson Education.
- James Rumbaugh, Michael R. Blaha: Object-Oriented Modeling and Design with UML, Pearson Education.
- Meilir Page-Jones: Fundamentals of Object-Oriented Design in UML, Pearson Education.
- Appling UML and Patterns: An introduction to Object – Oriented Analysis and Design and Unified Process, Craig Larman, Pearson Education.

7th/8th Semester	AGCS-21702J: FOUNDATIONS OF CRYPTOGRAPHY (PEC-4)

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basics paradigms and principles of Cryptography
CO-2	Understand and Implement Symmetric Key Cryptography
CO-3	Apply message authentication functions in secure communication scenario
CO-4	Understand and Implement Asymmetric Key Cryptography
CO-5	Analyze Public Key Cryptosystems
CO-6	To understand various protocols for network security to protect against the threats in the networks.

Part	Content	CO
I	**Introduction to Cryptography:** Course Overview, Symmetric-key Encryption, Historical Ciphers, Perfect Security and Its Limitations, Computational Security, Semantic Security and Pseudorandom Generators (PRGs) **Mathematical Foundations:** Number theory (modular arithmetic, prime numbers, greatest common divisor), Introduction to finite fields and groups, Basic probability theory in cryptographic contexts	CO-1
II	**Cryptosystems and Symmetric key Cryptography:** Stream Ciphers, Provably-secure Instantiation of PRG, Practical Instantiation of PRG, CPA-security and Pseudo-random Functions (PRFs), CPA-Secure Ciphers from PRF, Modes of Operations of Block Ciphers, Theoretical Constructions of Block Ciphers and Practical Constructions of Block Ciphers, DES, AES and Message Authentication Codes (MAC)	CO-2
	Cryptographic Hash Functions: Information-theoretic Secure MAC, Cryptographic Hash Functions, Ideal-Cipher Model, Davies-Meyer construction and Merkle-Damgård Paradigm Birthday Attacks on Cryptographic Hash Functions, Applications of Hash Functions, Random Oracle Model and Authenticated Encryption	CO-3
III	**Asymmetric Key Cryptography:** Generic Constructions of Authenticated Encryption Schemes, Key-exchange Problem, One-way Trapdoor Functions and Cyclic Groups Discrete-Logarithm Problem, Computational Diffie-Hellman Problem, Decisional Diffie-Hellman Problem, Elliptic-Curve Based Cryptography and Public-Key Encryption	CO-4
IV	**Public Key Cryptosystem:** El Gamal Encryption Scheme, RSA Assumption, RSA Public-key Cryptosystem, KEM-DEM Paradigm and CCA-security in the Public-key Domain, CCA-secure Public-key Hybrid Ciphers Based on Diffie-Hellman Problems and RSA-assumption	CO-5
	Digital Signature: Digital Signatures, RSA Signatures and Schnorr Identification Scheme, Schnorr Signature **Web Security:** Overview of TLS/SSL, Interactive Protocols, Firewall	CO-6

References:

- Cryptography and Network Security, William Stallings, 2nd Edition, Pearson Education Asia
- Cryptography & Network Security, Atul Kahate, TMH.
- Cryptography and Network security Principles and Practices, William Stallings, Pearson/PHI.
- Introduction to Cryptography with coding theory, Wade Trappe, Lawrence C Washington, Pearson
- Information Security, Principles, and Practice: Mark Stamp, Wiley India
- Behrouz A Ferouzan, "Cryptography and Network Security" Tata Mc Graw Hill

7th/8th Semester	AGCS-21702K: NATURAL LANGUAGE PROCESSING (PEC-4)

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the basic principles, techniques, and applications of Natural Language Processing.
CO-2	Analyse words based on Morphology and CORPUS.
CO-3	Create CORPUS linguistics based on digestive approach.
CO-4	Use of statistical approaches to machine translation.
CO-5	Perform Part-of-speech tagging technique based on the structure of the language.
CO-6	Understand the techniques for text-based processing.

Part	Content	CO
I	**Introduction:** Basic concepts of Natural language Processing, evolution of NLP, issues and challenges in NLP, basic concepts of phases of natural language processing morphological analysis, syntactic analysis, semantic analysis, pragmatic analysis, tools and techniques used for performing these analysis, ambiguities, Types of ambiguities.	CO-1
II	**Text Preprocessing and Morphology:** Character Encoding, Word Segmentation, Sentence Segmentation, Introduction to Corpora, Corpora Analysis. Inflectional and Derivation Morphology, Morphological analysis and generation using Finite State Automata and Finite State transducer.	CO-2
	Language Modelling: Statistical Hypothesis Tests for NLP, Hypothesis testing of differences, The t Test, Pearson's chi-square test, Likelihood ratios. **Statistical Inference:** N -gram Model, Importance of order of words in text & NLP, Classification of N-gram Model, N-gram Analysis and Visualization.	CO-3
III	**Word Sense Disambiguation:** Evaluation of WSD, Approaches and Methods to Word Sense Disambiguation (WSD), Applications of Word Sense Disambiguation (WSD), Difficulties in Word Sense Disambiguation (WSD) Disambiguation based on sense, Thesaurus-based disambiguation, Disambiguation based on translations in a second-language corpus.	CO-4
IV	**Markov Model and POS Tagging:** Markov Model: Hidden Markov model, Fundamentals, Probability of properties, Parameter estimation, Variants, Multiple input observation. The Information Sources in Tagging: Markov model taggers, Viterbi algorithm, Applying HMMs to Part-of-speech tagging, Applications of Tagging.	CO-5
	Probabilistic Context Free Grammars and Probabilistic parsing: The Probability of a String, Problems with the Inside-Outside Algorithm, Parsing for disambiguation, Treebanks, Parsing models vs. language models, Phrase structure grammars and dependency, Lexicalized models using derivational histories, Dependency-based models	CO-6

References:
• Nitin Indurkhya, Fred J. Damerau "Handbook of Natural Language Processing". 2nd Edition, CRC Press,2010.
• James Allen "Natural Language Understanding". Pearson Publication 8th Edition.2012. Hobson lane Cole Howard, Hannes Hapke, "Natural Language Processing in action" MANNING Publications,2019.

Syllabus for CSE 2021 batch onwards

- Rajesh Arumugam, Rajalingappa Shanmugamani "Hands-on natural language processing with python: A practical guide to applying deep learning architectures to your NLP application". PACKT publisher, 2018.

7th/8th Semester	AGOE-21701: AIR POLLUTION AND CONTROL (OE)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:
CO-1	Identify the impacts of air pollution on humans, animals, water bodies, and soil.
CO-2	Analyse the lapse rate and air quality monitoring.
CO-3	Understand the emissions inventory and applications of remote sensing.
CO-4	Understand indoor air pollution, its sources, types, and health impacts.
CO-5	Know air pollution control devices and equipment.
CO-6	Know the emerging technologies and strategies to mitigate air pollution.

Part	Content	CO
I	**Air Pollution:** Introduction and impacts of air pollution on human health, vegetation, animals, building materials, structures, and atmosphere, soil and water bodies. Sources, classification and formation/transformation of air pollutants: Meteorology and Atmospheric Stability. **Lapse Rate,** Plume Behaviour, and Air Quality Monitoring, Air Quality Index (AQI). Air Quality Modelling, Gaussian dispersion models: point, line, and area source models	CO-1 & CO-2
II	**Emissions Inventory:** Transport, Industrial, Agricultural, Residential and Commercial sectors. Application of Remote sensing/Satellite data in emission inventory and source apportionment using receptor modelling.	CO-3
III	**Indoor air pollution:** Sources, types and health impacts. Sampling, assessment and evaluation of Indoor air quality. Global and regional environmental issues of air pollution: Ozone depletion, Climate change, Global warming, Acid rain. **Air pollution control devices, and equipment:** Air pollution emission standards, National and international policies, acts, rules, and regulations.	CO-4 & CO-5
IV	**Emerging technologies and strategies** to mitigate air pollution, Current challenges and way forward. Lab-based measurements of air pollutants.	CO-6

References:
- Wark, K., Warner, C.F., and Davis, W.T., "Air Pollution: Its Origin and Control", Addison-Wesley Longman. 1998.
- Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C., "Fundamentals of Air Pollution", Academic Press. 2005.
- Seinfeld, J.H., Pandis, S.N., "Atmospheric Chemistry and Physics", John Wiley. 2006.
- Lodge, J.P. (Ed.), "Methods of Air Sampling and Analysis", CRC Press. 1988.
- Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), "Air Pollution: Health and Environmental Impacts", CRC Press. 2010.

7th/8th Semester	AGOE-21702: DISASTER MANAGEMENT (OE)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:
CO-1	Students will be able to understand different level of disasters in various regions.
CO-2	To able to understand the prevent and preparedness against the disaster.
CO-3	To be able to understand the risk and management for disaster.
CO-4	Know about the various government and non-government agencies role in management.
CO-5	To be able to understood the various tools and techniques to identify the level of disaster.
CO-6	To be able to understand about the method of dissemination and learn from experiences.

Part	Content	CO
I	**Introduction to Disaster Management:** Define and describe disaster, hazard, emergency, vulnerability, risk and disaster management; Identify and describe the types of natural and non-natural disasters. Important phases of Disaster Management Cycle. **Disaster Mitigation and Preparedness:** Natural Hazards: causes, distribution pattern, consequences and mitigation measures for earth quake, tsunami, cyclone, flood, landslide drought etc. **Man-made hazards:** causes, consequences mitigation measures for various industrial hazards/disasters, Preparedness for natural disasters in urban areas.	CO-1 & CO-2
II	**Hazard and Risk Assessment:** Assessment of capacity, vulnerability and risk, vulnerability and risk mapping, stages in disaster recovery and associated problems. **Emergency Management Systems (EMS):** Emergency medical and essential public health services, response and recovery operations, reconstruction and rehabilitation.	CO-3
III	**Capacity Building:** Gender sensitive disaster management approach and inculcate new skills and sharpen existing skills of government officials, voluntary activists, development of professional and elected representative for effective disaster management, role of media in effective disaster management, overview of disaster management in India, role of agencies like NDMA, SDMA and other international agencies, organizational structure, role of insurance sector, DM act and NDMA guidelines. **Application of Geoinformatics and Advanced Techniques:** Use of Remote Sensing Systems (RSS) and GIS in disaster Management, role of knowledge based expert systems in hazard scenario, using risks-time charts to plan for the future, early warning systems.	CO-4 & CO-5
IV	**Integration of public policy**: Planning and design of infrastructure for disaster management, Community based approach in disaster management, methods for effective dissemination of information, ecological and sustainable development models for disaster management. **Case Studies:** Lessons and experiences from various important disasters with specific reference to Civil Engineering.	CO-6

References:
- Natural Hazards in the Urban Habitat by Iyengar, C.B.R.I., Tata McGraw Hill.Pub
- Natural Disaster management, Jon Ingleton (Ed), Published by Tudor Rose, Leiceste

7th/8th Semester	AGOE-21703: PRODUCT DESIGN AND DEVELOPMENT (OE)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Describe the product design and role of designer in product design.
CO-2	Explain the basic principle of value engineering in product design.
CO-3	Discuss the various types of fasteners and joining details.
CO-4	Classify various design tools and understand the concept of ergonomics in product design.
CO-5	Explain the design guidelines, manufacturing and economics aspects.
CO-6	Develop proficiency in 3D printing techniques and identify real-world applications of 3D printing.

Part	Content	CO
I	**Introduction to product design:** Introduction to course, product life-cycle, product policy of an organization. selection of a profitable product, product design process, product analysis. **Value engineering and functional analysis:** Value engineering in product design; advantages, applications in product design, problem identification and selection, anatomy of function, functional analysis system technique (FAST).	CO-1 & CO-2
II	**Product detailing:** Standard fastening and joining details in different materials, temporary and permanent joints, detailing for plastic products and fabricated products in sheet metal.	CO-3
III	**Product design tools:** Introduction to product design tools, QFD, Computer Aided Design, Robust design, DFX, DFM, DFA, ergonomics in product design. **Design guidelines:** DFMA guidelines, Product design for manual assembly, Design guidelines for metallic and non-metallic products to be manufactured by different processes such as casting, machining, injection molding etc.	CO-4 & CO-5
IV	Rapid prototyping, needs, advantages, working principle of SLA, LOM and SLS.	CO-6

References:

- W.H. Mayal, Industrial Design for Engineers, London Liifee Books Ltd.
- Huchingson R. Dale, New Horizons for Human Factors in Design, McGraw Hill.
- N.L. Svensson, Engineering Design, London: Pitman.
- R. Matousek, Engineering Design, Blackie & Son.
- K.J. Mccormick (Ed), Human Factor Engineering, McGraw Hill.

7th/8th Semester	AGOE-21704: MATERIAL MANAGEMENT (OE)		

				L	T	P
Internal Marks:	40			3	0	0
External Marks:	60					
Total Marks:	100			Credits		3

Course Outcomes: After studying the course, students will be able to:

CO-1	Describe the concept of material management.
CO-2	Explain the basic techniques of material planning.
CO-3	Identify and analyze the key factors that influence consumer purchase decisions.
CO-4	Provide students with a comprehensive understanding of fundamental principles and concepts of inventory control and management.
CO-5	Familiarize students with inventory management tools that aid in monitoring of physical inventory.
CO-6	Design efficient storage layouts to maximize space utilization and improve workflow in warehouses.

Part	Content	CO
I	**Introduction:** Meaning, definition, functions of materials management, concept of integrated material management, relationship of material management with other organizational functions. **Material planning & budgeting:** Need for material planning, factors affecting material planning, techniques of material planning, material classification, codification and standardization, material budgeting - meaning and need, techniques of material budgeting.	CO-1 & CO-2
II	**Purchasing:** Purchasing principles, procedures and systems, functions of purchasing, make-or-buy decision, vendor development and vendor rating, factors affecting purchase decisions, legal aspects of purchasing, documentation and procedure for import.	CO-3
III	**Inventory control:** Need and meaning of inventory, types of inventory, functions of inventory control, inventory costs. **Physical control of inventory:** fixed order, two bin and Kardex systems - material requirement planning (MRP-I), spare parts control for maintenance purposes, evaluation of inventory control performance. concept of just-in-time (JIT), use of computers for inventory control.	CO-4 & CO-5
IV	**Storage:** Functions and importance of store keeping, types of stores, store accounting and store verification, legal aspects of store keeping, management of surplus, scrap and obsolete items, importance of material handling in store keeping, handling equipment.	CO-6

References:
• M.M. Verma, Materials Management, S. Chand and Co.
• Gopal Krishnan and Sundaresan, Material Management - An Integrated Approach, Prentice Hall
• Dobbler and Burt, Purchasing and materials management, Tata McGraw Hill
• M. Starr and D. Miller, Inventory control, Prentice Hall.

7th/8th Semester	AGOE-21705: NON-CONVENTIONAL ENERGY

		SOURCES (OE)			
Internal Marks:	40		**L**	**T**	**P**
External Marks:	60		**3**	**0**	**0**
Total Marks:	100		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Focus on the non - conventional resources that are available for electric power generation.
CO-2	Study principle, types and application of MHD generator.
CO-3	Study principle, types and application of thermoelectric generator.
CO-4	Explore photovoltaic effect and solar collector, solar furnaces and its application.
CO-5	Study principle, description, types and application of fuel cell.
CO-6	Application and description of various sources like geothermal, wind power, tidal.

Part	Content	CO
I	**INTRODUCTION:** Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation. **MHD GENERATORS:** Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of magneto - hydro - dynamic (MHD) generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.	CO-1 & CO-2
II	**THERMO - ELECTRIC GENERATORS:** Thermoelectric effects, Seeback effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.	CO-3
III	**PHOTOVOLTAIC EFFECT AND SOLAR ENERGY:** Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.	CO-4 & CO-5
IV	**FUEL CELLS:** Principle of action, Gibb's free energy, general description of fuel cells, types, construction, operational characteristics and application. **MISCELLANEOUS SOURCES:** Geothermal system, hydro - electric plants, wind power, tidal energy, Bio -mass energy.	CO-6

References:
• Gupta B. R., Generation of Electrical Energy, S. Chand.
• Rai, G.D., Non-Conventional Energy Sources, Khanna Publishers (2005).
• Rao, S. and Parulekar, B.B., Energy Technology: Non-Conventional, Renewable and Conventional, Khanna Publishers (2005).

7th/8th Semester	AGOE-21706: ELECTRICAL POWER UTILIZATION (OE)			

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:
CO-1	Understand various types of industrial drives and PLC based drives.
CO-2	Identify the various traction systems.
CO-3	Use various welding and heating techniques in real life.
CO-4	Explore the knowledge gained for project work related to design of lighting schemes.
CO-5	Use techniques, skills related to refrigeration system for engineering practice.
CO-6	Understand the applications of different motors and drives in industries and domestic life.

Part	Content	CO
I	**Electric Drives:** Electrical drives and Mechanical drives, Concept of electrical drives, Basic features of industrial drives, review of operating and starting characteristics of different types of electric motors for various drives (AC and DC motors). Estimation of rating and heating of motors, Load equalization (Fly wheel effect), Drives for particular services.	CO-1 & CO-2
II	**Electric Traction:** Introduction to Indian railways system, Electric Locomotive Classes, Various types of Traction system, single phase feeding arrangement prevalent in India. Substation. arrangements, Different Types of Catenary construction and line insulation, Span and dropper design Calculations. **Electric Heating and Welding:** Methods of electric heating, types of electric heating, constructional details and performance of resistance heating furnace. Dielectric heating. Alternating current (AC).and Direct current (DC) Welding, Resistance and Arc Welding. Electric Beam Welding, Laser Welding. Typical construction of electrical welding AC and DC set.	CO-3 & CO-4
III	**Illumination:** Production of light by different methods, terms used, laws of illumination, Different Artificial light sources, their construction and operating principles, Design of lighting schemes and equipment used for indoor, industrial and flood lighting.	CO-5
IV	**Refrigeration and Air conditioning:** Refrigeration system, Domestic refrigeration, Air conditioner, Comfort Air conditioning, Effective temperature. **Electrolysis:** Laws of Electrolysis, Process voltage, current, energy, efficiency, Applications of electrolysis.	CO-6

References:
- Wark, K., Warner, C.F., and Davis, W.T., "Air Pollution: Its Origin and Control", Addison-Wesley Longman. 1998.
- Boubel, R.W., Fox, D.L., Turner, D.B., Stern, A.C., "Fundamentals of Air Pollution", Academic Press. 2005.
- Seinfeld, J.H., Pandis, S.N., "Atmospheric Chemistry and Physics", John Wiley. 2006.
- Lodge, J.P. (Ed.), "Methods of Air Sampling and Analysis", CRC Press. 1988.
- Gurjar, B.R., Molina, L., Ojha, C.S.P. (Eds.), "Air Pollution: Health and Environmental Impacts", CRC Press. 2010.

7th/8th Semester	AGOE-21707: SOFTWARE ENGINEERING METHODOLOGIES (OE)			

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Understand the processes and models involved in SDLC lifecycle.
CO-2	Understand software requirements specification and design.
CO-3	Understand the role of project management planning.
CO-4	Implement different coding standards and software testing approaches such as unit testing and integration testing.
CO-5	Understand the basics software quality strategies.
CO-6	Understand the role of project risk management, ethical and professional issues.

Part	Content	CO
I	Evolution and impact of Software engineering, introduction to agile software development, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study.	CO-1
II	Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification. Function-oriented software design: DFD and Structure chart, Object modeling using UML, Object-oriented software development, user interface design, Basic issues in software design, modularity, cohesion, coupling and layering. Coding standards and Code review techniques and tools. Integrated development environments (IDEs). Software project management, Project planning and control, size and cost estimation, project scheduling using PERT and Gantt chart.	CO-2 & CO-3
III	Fundamentals of testing, White-box, and black-box testing, test case design techniques, bug tracking system, mutation testing,Automated build and deployment tools, Tool: Selenium. Static and dynamic analysis, verification and validation, Software reliability metrics, reliability growth modelling. Software quality assurance: quality concepts, quality control, quality assurance, SQA activities, Software reviews, Formal Technical Reviews, Review guidelines. Quality Assurance Standards: ISO 9000, 9001:2000, CMM, TQM and Six Sigma.	CO-4 & CO-5
IV	Introduction to SCM, Version Control and Change Management, Risk Mitigation, Monitoring and Management (RMM), Computer aided software engineering, software maintenance, Integrated Change Control, software reuse, Component-based software development. Software engineering ethics and professionalism- ethical and legal issues in software engineering, intellectual property rights and plagiarism, professional code of conduct, social and economic impact of software.	CO-6

References:
- Roger Pressman, "Software Engineering: A Practitioners Approach, (6th Edition), McGraw Hill, 1997.Sommerville," Software Engineering, 7th edition", Adison Wesley, 1996.
- Watts Humphrey," Managing software process", Pearson education, 2003.
- James F. Peters and Witold Pedrycz, "Software Engineering – An Engineering Approach", Wiley.
- Mouratidis and Giorgini. "Integrating Security and Software Engineering–Advances and Future",
- IGP. ISBN – 1-59904-148-0.
- Pankaj Jalote, "An integrated approach to Software Engineering", Springer/Narosa.

Syllabus for CSE 2021 batch onwards

7th/8th Semester	AGOE-21708: FUNDAMENTALS OF INFORMATION SECURITY (OE)

Internal Marks:	40		L	T	P
External Marks:	60		3	0	0
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Elucidate the CIA triad of Confidentiality, Integrity and Availability and various encryption techniques.
CO-2	Implement symmetric and asymmetric encryption systems, public key cryptography and RSA.
CO-3	Implement the various authentication protocols used for the protection of information.
CO-4	Understand the concept of network security and security architecture.
CO-5	Illustrate the concept of web security and SET.
CO-6	Implement system security concepts.

Part	Content	CO
I	Symmetric Ciphers - Overview: Services, Mechanisms and Attacks, the OSI Security Architecture, A Model of Network Security. Classical Encryption Techniques: Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Steganography. Block Cipher and the Data Encryption Standard: Simplified DES, Block Cipher Principles, the DES, the Strength of DES, Differential and Linear Cryptanalysis. Symmetric Ciphers: Triple DES, Blowfish. Confidentiality using Conventional Encryption: Placement of Encryption Function, Traffic Confidentiality, Key Distribution, Random Number Generation.	CO-1 & CO-2
II	Public Key Encryption, Number Theory, Prime Numbers Formats and Eulers Theorems, Testing for Primality. Public Key Cryptography and RSA: Principles of Public Key Cryptosystems, The RSA Algorithm, Key Management.	CO-3
III	Authentication Protocols - Message Authentication: Authentication Requirements, Authentication Functions, Message Authentication Codes, MD5 Message Digest Algorithms, Digital Signatures and Authentication Protocols: Digital Signatures, Authentication Protocols, Digital Signature Standards.	CO-4 & CO-5
IV	Network Security - Authentication Applications: Kerberos, X.509 Directory Authentication Service. IP Security: Overview, IP Security Architecture, Authentication Header, Encapsulation Security Payload. Web Security: Web Security Requirements, Secure Sockets Layer and Transport Layer Security, Secure Electronic Transaction. System Security- Intruders, Malicious Software, Viruses and Related Threats, Counter Measures, Firewalls and its Design Principles.	CO-6

References:
- William Stallings, Network Security Essentials, Applications and Standards Pearson Education.
- William Stallings, Cryptography and Network Security Principles and practice. 2nd Edition, Pearson Education.
- Bishop, Matt, Introduction to Computer Security. Addison-Wesley, Pearson Education, Inc.
- Michael. E. Whitman and Herbert J. Mattord Principles of Information Security, Cengage Learning.

Syllabus for CSE 2021 batch onwards

7th/8th Semester	AGOE-21709: MANAGEMENT OF HUMAN RESOURCES (OE)

			L	T	P
Internal Marks:	40		3	0	0
External Marks:	60				
Total Marks:	100		Credits		3

Course Outcomes: After studying the course, students will be able to:	
CO-1	Develop the understanding of the concept of human resource management and HRP to understand its relevance in organizations.
CO-2	Understand the concept of Recruitment and take systematic steps for adoption of Selection and Training process.
CO-3	Analyse the strategic issues and strategies required to select and develop manpower resources.
CO-4	Develop necessary skill set for application of various HR issues by Motivating and handling cordial relations among employees. .
CO-5	Integrate the knowledge of HR concepts to manage Industrial disputes and take correct business decisions.
CO-6	Acquaintance with the fundamental contracts of Human Resource Management and understands future challenges in HRM.

Part	Content	CO
I	**Introduction to Human Resource Management** and its definition, functions of Human Resource Management & its relation to other managerial functions. Nature, Scope and Importance of Human Resource Management in Industry, Procurement and Placement: Need and Process of Human Resource Planning. **Methods of Recruitment;** Psychological tests and interviewing; Meaning and Importance of Placement and Induction, The Contract Labour (Regulation & Abolition) Act 1970.Training & Development: Difference between training and Development; Principles of Training	CO-1 & CO-2
II	**Employee Development**; Promotion-Merit v/s seniority Performance Appraisal, Career Development &Planning. Job analysis & Design: Job Analysis: Job Description & Job Specification and Job Satisfaction	CO-3
III	**Motivation,** Factors affecting motivation, and its Theories, Workers ' Participation, Quality of work life. The Compensation Function: Basic concepts in wage administration, company's wage policy. Job Evaluation, Issues in wage administration, Bonus & Incentives, Payment of Wages Act-1936, Minimum Wages Act-1961, Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry. **Employee, Employer relationship** Causes and Effects of Industrial disputes; Employe Grievances &their Redressal, Absenteeism, Labour Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining;	CO-4 & CO-5
IV	**Role of Trade unions** in maintaining cordial Industrial Relations, Fringe &retirement terminal benefits, administration of welfare amenities. **Meaning and Importance of Employee Safety**, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948; Welfare of Employees and its Importance, Social security, Family Pension Scheme, ESI act 1948, Workmen's Gratuity Act 1972, Future challenges for Human Resource Management	CO-6

References:
- Lowin B. Flippo – Principles of personnel Management (Mc Graw-Hill)T.N.Chhabra
- Human Resource Management (Dhanpat Rai & Co.)Strength of Materials: Rajput

7th/8th Semester	AGOE-21710: BASICS OF MANAGEMENT (OE)			

			L	T	P
Internal Marks:	**40**		**3**	**0**	**0**
External Marks:	**60**				
Total Marks:	**100**		**Credits**		**3**

Course Outcomes: After studying the course, students will be able to:	
CO-1	Describe Evolution and fundamental concepts of management. Role and responsibility of managers and various approaches of management.
CO-2	Learn about the functions of management including planning and its concepts, Different approaches of management such as MBO and decision making.
CO-3	Analyze various organizational structure, departmentalization and teamwork.
CO-4	Understand the importance of staffing, recruitment, concept of directing and motivation.
CO-5	Explain about authority and responsibility and the concept of centralization vs decentralization
CO-6	Understand the various controlling techniques in management.

Part	Content	CO
I	**INTRODUCTION:** Meaning, Definition, Nature, Scope, Importance, Functions & Principles of management, Managerial roles and skills. Evolution of management thought: Contribution of F.W. Taylor and Henry Fayol. Quantitative approach, behavioral approach, system approach, contingency approach. **PLANNING:** Meaning, Need & Importance, Types of Plans, Steps in Planning process. MBO: concept and process. Decision Making: meaning, types and process.	CO-1 & CO-2
II	**ORGANIZING:** Concept, Importance, Process, Formal VS Informal organizing, Organizational Structure, Types of organizational structure, factors affecting organization structure, features of good organization. **DEPARTMENTALIZATION:** concept and basis. Teamwork: meaning, types and stages of team building. **STAFFING:** Nature & Scope of Staffing, Recruitment, Selection, Training & development and performance management. Directing: Meaning, Nature & Scope. Motivation: Meaning, Importance and motivational theories.	CO-3 & CO-4
III	**AUTHORITY & RESPONSIBILITY:** Definition, types, responsibility and accountability, delegation, decentralization v/s centralization, determinants of effective decentralization.	CO-5
IV	**CONTROLLING:** Need, Nature, Process, Techniques of controlling and significance. Trends and challenges of management in global scenario, emerging issues in management: Introduction to Total Quality Management (TQM), Just in Time (JIT), Business process reengineering (BPR).	CO-6

References:
• Principles and practices of Management: L.M. PRASAD (S. Chand publishers) • Management: Stephen Robbins (Pearson publishers) • VSP Rao & V H Krishna, Management, Excel books. • Harold Koontz, and Heinz Weihrich, Essentials of Management: An International Perspective, New Delhi, McGraw-Hill, 2010. • Richard L Daft, The New Era of Management, New Delhi, Thomson, 2007 Stephen P Robbins, Mary Coulter and Neharika Vohra, Management, New Delhi, Pearson, 2011.