AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

STUDY SCHEME & DETAILED SYLLABUS

Bachelor of Technology

In

Computer Engineering

(Batch 2023 onwards)

Study Scheme for B.Tech. CoE

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**	**320**	**380**	**700**	**24**
		Contact Hours = 31 hrs						

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**	**450**	**400**	**850**	**24**
		Contact Hours = 28 hrs						

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						

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
AGCoE-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	0	50	1
AGCS - 21510	Summer Training	-	1	-	60	40	100	1
		15	**5**	**8**	**430**	**420**	**850**	**23**
		Contact Hours = 28 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
AGCoE - 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 = 28 hrs						

X	PEC-1	PEC-2
A	Theory of Computations	Information Security
B	Compiler Design	Cyber Security
C	Soft Computing	Natural Language Processing
D	Parallel Computing	Ethical Hacking

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CoE): 1st/2nd SEM

1st Semester	AGAM 21101: ENGINEERING MATHEMATICS -I				
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	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				
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 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				
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 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				
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	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				
Internal Marks:	**40**		**L**	**T**	**P**
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				
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	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

References:

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

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/2ndSemester	AGCS-21102: PROGRAMMING FOR PROBLEM SOLVING LAB				
Internal Marks:	**30**		**L**	**T**	**P**
External Marks:	**20**		**0**	**0**	**4**
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

1st/2nd Semester	AGPH 21101: ENGINEERING PHYSICS				
Internal Marks:	**40**		**L**	**T**	**P**
External Marks:	**60**		**4**	**1**	
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 its 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.
- 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.

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

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 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				
Internal Marks:	**30**		**L**	**T**	**P**
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

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

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	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				
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	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

2nd Semester	AGAM 21102: ENGINEERING MATHEMATICS II				
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	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

2nd Semester	AGHU 21102: ENGLISH-II				
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	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				
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	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. (CoE): 3rd SEM

3rd Semester	AGCS-21301: MATHEMATICS AND STATISTICS				
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	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				
Internal Marks:	**40**		**L**	**T**	**P**
External Marks:	**60**		**3**	**1**	**-**
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.

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

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	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

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.

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

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				
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	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.

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

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	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. Implementation of constructors and destructors.	CO-2
	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				
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	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	-

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CoE): 4th SEM

4th Semester	AGCS -21401: DISCRETE STRUCTURES				
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	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

4th Semester	AGCS-21402: RELATIONAL DATABASE MANAGEMENT SYSTEMS				
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	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
	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.

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 RecursionModules (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				
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 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

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 **Percentage:** Concept of Percentage, Tricks to find Percentage	CO-4
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

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

Internal Marks:	**-**		**L**	**T**	**P**
External Marks:	**-**		**1**	**0**	**0**
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 physicaland 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 andengineering, 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, Foodsecurity 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

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CoE): 5th SEM

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

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 & nonlinear planning, reactive & non-reactive systems, Components of planning, planning in the blocks world, partial order planning, hierarchical planning, conditional planning, resource constraints, temporal constraints block 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

	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				
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 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				
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	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				
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	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

5th Semester	AGCoE-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
	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
	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	AGCoE-21504B: COMPILER DESIGN(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	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

5th Semester	AGCoE-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

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	AGCoE-21504D: PARALLEL 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:	
CO1	Understand the need and foundations of parallel computing.
CO2	Identify suitable parallel architectures and memory models.
CO3	Design and implement parallel programs using OpenMP, MPI, and GPU programming.
CO4	Design efficient and scalable parallel algorithms.
CO5	Implement and analyze classic parallel algorithms and understand real world applications.
CO6	Evaluate the performance and scalability of parallel systems.

Part	Content	CO
I	**Introduction to Parallel Computing:** Motivation and need for parallel computing, Types of parallelism: data, task, instruction-level, Flynn's taxonomy: SISD, SIMD, MISD, MIMD, Challenges in parallel computing: synchronization, communication, granularity, Speedup and efficiency, Amdahl's and Gustafson's Laws.	CO-1
II	**Parallel Architecture and Interconnection Networks:** Shared memory vs. distributed memory architecture, Multicore processors, GPUs, clusters, and grids, Interconnection networks: topology (mesh, hypercube, torus, tree, etc.), Memory models: UMA, NUMA, Communication and synchronization primitives.	CO-2
	Parallel Programming Models and Tools: Parallel programming paradigms: data-parallel, task-parallel, Message Passing Interface (MPI): communication primitives, process groups, OpenMP: parallel directives, work-sharing constructs, GPU programming basics: CUDA or OpenCL, Threads and multithreading using Pthreads.	CO-3
III	**Parallel Algorithm Design Strategy:** Design strategies: divide-and-conquer, pipelining, data partitioning, Decomposition and mapping techniques, Load balancing and scheduling, Performance metrics: speedup, efficiency, scalability, overhead, Parallel programming patterns: map-reduce, fork-join.	CO-4
	Parallel Algorithms and Applications: Parallel sorting algorithms: bitonic sort, parallel merge sort, Matrix operations: multiplication, transposition, Graph algorithms: parallel BFS, DFS, Search algorithms: parallel binary search, branch and bound, Scientific computing applications and real-world case studies.	CO-5
IV	**Performance Analysis, Debugging, and Optimization:** Tools for debugging and profiling parallel programs, Performance bottlenecks and optimization strategies, Scalability analysis and memory optimization, Case studies of parallel systems, Introduction to cloud-based parallel computing and future trends.	CO-6

AMRITSAR GROUP OF COLLEGES

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

SYLLABUS

B. Tech. (CoE): 6th SEM

Proceedings of 13th BoS Meeting held on 12.12.25

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				
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 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 MapReduce. 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
	<u>Pig Operators</u> 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				
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	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				
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	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				
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 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. 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.	CO-5
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				
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	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 studio Creating 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	AGCoE-21604A: INFORMATION SECURITY(PEC-2)				
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
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.

6th Semester	AGCoE-21604B: CYBER SECURITY(PEC-2)				
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	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 andaccess policy, types of firewalls, firewall basing, firewall location and configurations, intrusion prevention systems, example unified threat management products.	CO-6

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	AGCoE-21604C: NATURAL LANGUAGE PROCESSING				
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	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.
- 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.publisher, 2018.

6th Semester	AGCoE-21604D: ETHICAL HACKING				
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	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				
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 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