KL CENTRE FOR DISTANCE & ONLINE EDUCATION

BACHELOR OF COMPUTER APPLICATIONS

Sl No	Course Code	Course Title	Type	L	T	P	S	Cr	CH
S E M E S T E R - 1									
1	22UC1101O	Integrated Professional English (HSS1)	HSS	**0**	**0**	**4**	**0**	**2**	**4**
2	22CA1104O	Mathematics for Computer Science (BS1)	BS	**3**	**1**	**0**	**0**	**4**	**4**
3	22CA1101O	Problem Solving through Programming	PC	**3**	**0**	**2**	**4**	**5**	**9**
4	22CA1102O	Computer Organization & Architecture	PC	**3**	**1**	**0**	**0**	**4**	**4**
5	22UC0009O	Ecology & Environment (BS2)	BS	**2**	**0**	**0**	**0**	**2**	**2**
6	22CA1103O	Essentials of Information Technology	PC	**3**	**0**	**2**	**0**	**4**	**5**
Total				**14**	**2**	**8**	**4**	**21**	**28**
S E M E S T E R - 2									
1	22UC1202O	English Proficiency (HSS2)	HSS	**0**	**0**	**4**	**0**	**2**	**4**
2	22CA1205O	Operating System	PC	**3**	**1**	**0**	**0**	**4**	**4**
3	22CA1206O	Data Structures	PC	**3**	**0**	**2**	**0**	**4**	**5**
4	22CA1207O	Object Oriented Programming	PC	**3**	**0**	**2**	**4**	**5**	**9**
5	22CA1210O	Database Management Systems	PC	**3**	**0**	**2**	**4**	**5**	**9**
6	22CA1209O	Web and social media Technologies	PC	**0**	**0**	**4**	**0**	**2**	**4**
Total				**12**	**1**	**14**	**8**	**22**	**35**
Summer Break									
S E M E S T E R - 3									
1	22CA2109O	Software Engineering	PC	**2**	**1**	**0**	**0**	**3**	**3**
2	22CA2110O	Mobile Application Development	PC	**3**	**0**	**2**	**4**	**5**	**9**
3	22CA2111O	Computer Networks	PC	**3**	**0**	**0**	**0**	**3**	**3**

4	22CA2112O	Web Development using Python	PC	**3**	**0**	**2**	**4**	**5**	**9**
5	22UC2103O	Design Thinking & Innovation (HSS3)	HSS	**0**	**0**	**4**	**0**	**2**	**4**
6	22CA21N0O	Internship-1	PR	**0**	**0**	**4**	**0**	**2**	**4**
7	22CA21C1O/22CA21D1O/22CA21A1O/22CA21S1O	PE1	PE	2	0	2	0	3	4
	22GN40D1O/22GN40D4O/22CE40A5O/22ME40B4O	OE1	OE	3	0	0	0	3	3
Total				**16**	**1**	**14**	**8**	**26**	**39**
S E M E S T E R - 4									
1	22UC2105O	Essential Life Skills (HSS4)	HSS	**0**	**0**	**4**	**0**	**2**	**4**
2	22UC0010O	Universal Human Values & Professional Ethics (HSS5)	HSS	**2**	**0**	**0**	**0**	**2**	**2**
3	22CA2213O	Java Full Stack Development	PC	**3**	**0**	**2**	**4**	**5**	**9**
4	22CA2214O	Object Oriented Analysis & Design	PC	**3**	**0**	**2**	**4**	**5**	**9**
5	22CA22C1O/22CA22D2O/22CA22A2O/22CA22S2O	PE2	PE	2	0	2	0	3	4
7	22GN40D2O/22GN40D5O/22ME40B6O/22EL40B2O	OE2	OE	3	0	0	0	3	3
8	22CA22E1O	Term Paper	PR	2	0	0	0	2	2
Total				**15**	**0**	**10**	**8**	**22**	**33**
Summer Break									
S E M E S T E R - 5									
1	22FL3055O	GERMAN LANGUAGE - Foreign Language(HSS6)	HSS	**2**	**0**	**0**	**0**	**2**	**2**
2	22UC2204O	Corporate Readiness Skills(HSS7)	HSS	**0**	**0**	**4**	**0**	**2**	**4**
3	22CA31N1O	Internship-2	PR	**0**	**0**	**4**	**0**	**2**	**4**

4	22CA31C3O/22CA31D3O/22CA31S3O	PE3	PE	2	0	2	0	3	4
5	22GN40D3O/22GN40D6O/22MB4055O/22MB4051O	OE3	OE	3	0	0	0	3	3
Total				**7**	**0**	**10**	**0**	**12**	**17**
S E M E S T E R - 6									
1	22CA32E2O	Major Project	PR	**0**	**0**	**20**	**0**	**10**	**20**
2	22CA32C4O/22CA32D4O/22CA32A4O/22CA32S4O	PE4	PE	2	0	2	0	3	4
3	22CA32C5O/22CA32D5O/22CA32A5O/22CA32S5O	PE5	PE	2	0	2	4	4	8
Total				**4**	**0**	**24**	**4**	**17**	**32**
GRAND TOTAL				**68**	**4**	**80**	**32**	**120**	**184**

22UC1101O: INTEGRATED PROFESSIONAL ENGLISH (IPE)

L-T-P-S: 0-0-4-0 **CREDITS:2** **PREREQUISTITE: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the concepts of grammar to improve communication, reading, and writing skills	PO10	2
CO2	Demonstrate required knowledge over Dos and Don’ts of speaking in the corporate context. Demonstrate ability to face formal situations / interactions.	PO9	2
CO3	Understand the varieties of reading and comprehend the tone and style of the author. Skim and scan effectively and appreciate rhetorical devices	PO9	2
CO4	Apply the concepts of writing to draft corporate letters, emails and memos	PO10	3

Syllabus:

CO-1:Language Mechanics Basic Grammar - Countable and uncountable nouns, present simple and continuous, past simple and continuous – classroom practice – Understand and interpret Texts and work place situations B)Structural Pattern - Present continuous for future arrangements State verbs, Regular and irregular verbs, Voice, Modal verbs – Reporting on going tasks in the corporate world C)Descriptive

and Qualitative Patterns: Adjectives and Adverbs classroom practice) Time Expressions, Comparatives and superlatives , Pronouns, Conditionals, Phrases and clauses (Including Relative) .Interactive Listening & Speaking A) Formal contexts: Being a PA, describing changes in a company Taking orders over the phone B) Listening & Speaking: Participate in conversation with proper contextual language markers andturn taking. Classroom practice- Presenting context, reason, and problem – Case analysis (short) .C) Body Language: Dos and Don'ts of one to one interaction, Telephone interaction Video/ web conferencing. Culture specific practices') Work Etiquette- situation, ambiance, team skills, time management and leadership ability. Integrated Reading A) Understand and assimilate main ideas and specific details. (250-300 words text of moderate difficulty) B) Read for general understanding, interpreting, factual or specific information, for grammatical accuracy and information transfer.C) Understand the corporate context D) Understand office correspondence .Techniques of Business Correspondence A) Internal Correspondence. Making notes on routine matters, such as, taking/ placing orders B) Emails: Types of emails, salutations, vocabulary used in formal and informal (Including beginnings and endings) C) Writing straight-forward, routine letters of factual nature

Text books:

1. R.S. Aggarwal, Quantitative Aptitude: S. Chand publication, Third edition
2. Abhijit Guha, Quantitative Aptitude: Tata Mc-Graw Hill co. Third edition 3.R.S. Aggarwal, Verbal and Non-verbal Reasoning: Tata Mc-Graw Hill co. Third edition 4.B.S. Sijwali and InduSijwali, Reasoning: Verbal, Non-verbal and Analytical: Third edition

Reference Books:

1. Business Benchmark Book- Preliminary- 2nd edition Cambridge Press 2019.
2. Business Benchmark Book- Pre Intermediate to Intermediate- 2nd edition Cambridge Press 2019

22UC1202O:English Proficiency (EPF)

L-T-P-S: 0-0-4-0 **CREDITS:2** **PREREQUISTITE: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Demonstrating different interpersonal skills for employability.	PO4	2
CO2	Distinguishing Business essential skills	PO4	2
CO3	Classifying social media and corporate communication skills.	PO7	2
CO4	Applying analytical thinking skills.	PO3	2

Syllabus:

Job description- Advice on job applications – getting the right job- the importance of doing a job interview -Launching and promoting a new product-Persuasive and negotiation skills -Types of emails: giving information, making an enquiry, answering enquiries -Marketing Report. Becoming an entrepreneur-buying a franchise- franchising start up -presenting a business idea- signaling parts of presentation -arranging business travel- business conferences and meetings- spending sales budget. Social media and business- introducing company using social media- staff survey- survey report- offshoring and outsourcing- customer satisfaction and loyalty- communication with customers- corresponding with customers- business across cultures. Underlying assumptions, finding the conclusions, Argument strengthening, Argument weakening, finding the fallacies.

Text Books:

1. Business Benchmark Book- Upper Intermediate - 2nd edition Cambridge Press 2019.
2. Business Benchmark Book- Pre-Intermediate to Intermediate- 2nd edition Cambridge Press 2019.
3. Business Benchmark Book-Upper Intermediate: 2nd Edition Cambridge Press, 2019
4. Pillai, Sabina, et.al, Soft Skills and Employability Skills, New Delhi: CUP. 2018. Print.
5. Peterson, Reading Skill, New York: Peterson. 2007
6. Verbal and Non-Verbal Reasoning, R. S. Aggarwal, S Chand Publications.
7. R S Agarwal, S Chand, 'A modern approach to Logical reasoning' GRE Barron's, Mc Graw Hills
8. Logical Reasoning, Edgar Thorpe, Pearson Publications

22UC1203O:Design Thinking and Innovation

L-T-P-S: 1-0-0-4 **Credits: 2** **Pre-requisite: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO#	Course Outcome	BTL
CO1	Understand the importance of Design thinking process for contextualized problems	2
CO2	Analyze, define, and ideate for solutions	4
CO3	Develop and test the prototype made	3
CO4	Explore the fundamentals of entrepreneurship skills for transforming the challenge into an opportunity	2

Syllabus :

Design thinking an overview, Design Thinking for Contextualized Problem-Solving: Problem Selection/Definition Need for Cultural Relevance (Time, Space, and Environment).
Empathy: definition, Empathic research: framing interview questions, focus groups, procedure to conduct skilled interviews, Insights from Empathetic research, Define: Developing user personas, nuggets from insights, laying customer journey maps, POV statements and POV questions to define user needs. Ideate: Techniques to generate, shortlist and evaluate Ideas: Rapid Estimation form and Solution concept form. Prototyping and Testing: Products vs. Services, Rough Prototypes, Testing Techniques, User Experience, High-Fidelity Prototypes.Entrepreneurial Innovation: Innovation Management, Business Model Basics, Financial Estimation, Pitch Decks, IPR Considerations.

Reference books

1. Michael Lewrick, Patrick Link& Larry Leifer: The Design Thinking *Play Book.* Wiley Press: 2018

22UC2105O: ESSENTIAL LIFE SKILLS

L-T-P-S: 0-0-4-0 **CREDIT: 2** **PREREQUISITE: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcome (CO)	PO	Blooms Taxonomy Level(BTL)

CO1	Updating grammar concepts and receptive skills to demonstrate in placement tests	PO10	2
CO2	Enhancing their Self-awareness and character to beconfident during the Interview.	PO10	2
CO3	Distinguishing different styles and forms of writing skillsand using them while documenting	PO10	2
CO4	Able to present and communicate themselves effectively during discussions.	PO10	2

Syllabus:

Critical reading, Tenses, Active and Passive voice, Direct and Indirect speech, Spotting errors, Sentence completion, and Sentence rearrangement. Introduction to soft skills -Components of Soft Skills, Character Vs personality, Self-Awareness, Building Confidence, Resilience, Attitude, Listening Skills.Writing Skills – Paragraph writing, Product and Process description, speaking from the script, and Report writing. Emotional Intelligence, Time Management, Problem Solving-Decision Making, Etiquette, Communication Skills- Presentation skills, Public skills, Jam, Stress Management.

Textbooks:

1. Objective English for Competitive Examination by Hari Mohan Prasad and Uma Sinha. McGraw Hill Education, 2017.
2. English Language Communication Skills, Cengage, 2014.
3. Effective Technical Communication by M Ashraf Rizvi, Tata McGraw Hill, 2010
4. Soft Skills by Dr. Alex, S. Chand Publications.

Reference Books:

1. Developing Soft Skills by Robert M. sherfield, Rhonda J., Patrica J. Moodi; Cornerstone Publications.

22UC0010O: Universal Human Values And Professional Ethics

L-T-P-S: 2-0-0-0 **CREDIT: 2** **PREREQUISITE: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcome (CO) Description	PO/PSO	BTL
CO1	Realize and Understand the basic aspiration, harmony in the humanbeing.	PO1	1
CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.	PO2	2
CO3	Analyze the profession and his role in this existence	PO2	2
CO4	Understand the profession and his role in this existence	PO5	2

Syllabus:

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous HappinessandProsperity-TheBasicHumanAspirations,RightUnderstanding, Relationship and Physical Facilities, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations. Harmony in the Human Being: Understanding the Human Being as Co-existence of Self ('I') and Body, discriminating between the Needs of the Self and the Body, The Body

as an Instrument of 'I', Understand Harmony in the Self ('I'), Harmony of the Self ('I') with the Body, Program to Ensure Sanyam and Svasthya. Harmony in the Family and Society: Harmony in theFamily – theBasicUnitofHumanInteraction,ValuesinHuman-to-HumanRelationships,'Trust'– the Foundational Value in Relationships, 'Respect'– astheRightEvaluation,UnderstandHarmonyintheSociety,VisionfortheUniversalHumanOrder.Harmonyint he Nature (Existence):Understand Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfillment among the Four Orders of Nature, realizing 'Existence is Co-existence' at All Levels, The Holistic Perception of Harmony in Existence. Implications of the Right Understanding–a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in Professional Ethics, Holistic Technologies, Production Systems and Management Models - Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Text Books:

1. IvanIllich, Energy&Equity,TheTrinityPress, WorcesterandHarperCollins, USA.
2. EFSchumacher,1973, smallisbeautiful: AstudyofEconomicsasifPeopleMattered, Blond&Briggs, Britain
3. Sussan George, 1976, How the Other Half Dies, Penguinpress, reprinted 1986, 1991.
4. Donnelley. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, 1972, Limits to Growth Club of Rome's report, Universe Books.
5. P.L Dhār, RR Gaur, 1990, Science and Humanism, Commonwealth Publisher
6. A.N. Treaty, 2003, Human Values, New Age International Publishers
7. Sub has Palekar, 2000, How to practice Natural Farming, Preteen (Vaidya) Kristi Tanta Shod, Amravati.
8. E GSeebauer& Robert L. Berry, 2000, Fundamentals of Ethics for Scientists & Engineers, Oxford UniversityPress.
9. MGovindrajran, SNatrajan&V.S.SenthilKumar, EngineeringEthics (includingHumanValues), Eastern Economy Edition, Prentice Hall of India Ltd.
10. B P Banerjee, 2005, Foundations of Ethics andManagement,ExcelBooks
11. BLBajpai,2004,IndianEthosandModernManagement,NewRoyalBookCo.,Lucknow, Reprinted 20

22FL3055O : German Language

L-T-P-S: 2-0-0-0 **CREDIT: 2** **PREREQUISITE: NIL**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the German language, with greeting wishes, alphabets and numbers learning.	PO2	3
CO2	Comprehend the German articles and conjugation with present, past and future tense	PO10	3
CO3	Characterize to build a sentence with suitable prepositions, questions, and possessive pronouns, and the importance of four	PO4	3
CO4	Understand about how to move in public places, such as shopping centres, restaurants, tourist places, etc, and preparation of them for German A1 level examination	PO2	3

Syllabus:

Begrüssing – Alfabets-die Zahlen- die Addition-die Subtraktion-die Division-die Multiplikation - Personal Pronomen - sein form - haben form - der Infinitiv - konjugation im Präsens.Die Artekel– bestimmter Artikel – unbestimmter Artikel – Verneinung – Konjugation im Perfekt..Partizip II – Future. Präpositionen – W-Frage - possessiv Pronomen - deutsche 4 Fälle – wohnen – die Familie. Orientierung - Farben – Wochen,Monaten, Jahren, Jahreszeiten, - Einkaufen, Urlaub machen, sport, Gesundheit

Text Books :

1. Studio d A1, Deutsch als Fremdsprache Kurs und Übungsbuch, Cornelsen /Goyal SaaB, Goyl Publishers and Distributors(P) Ltd. New Delhi 110007

2.Netzwerk for A1, Goyal Publishers and Distributors

Reference Books :

1.. Deutsch ganz leicht A1, A German selfstudy course for beginners Goyal Publischers, New Delhi 110007

2. Collins, easy learning German Grammar & Practice Goyal Publishers & Distributors Pvt.Ltd.

22UC2204O: Corporate Readiness Skills (CRS)

L-T-P-S: 0-0-4-0 **CREDITS:2** **PREREQUISTITE: NIL**

COURSE OUTCOMES (COs):

CO NO	Course Outcome (CO)	PO/PSO	Blooms Taxonomy Level (BTL)
CO1	Understand the importance of business correspondence and utilize proper format, content, and tools for improved results.	PO1	2
CO2	Apply the techniques of writing and use standardized business vocabulary in formal communication.	PO5	3
CO3	Understand the properties of numbers, solving the problems on divisibility rules, unit's digit, remainders, averages. Using theconcept of Allegations, solving the problems on mixtures, Understanding the concept of surface areas and volumes, solving the 2D & 3D figures.	PO5	2
CO4	Understand the three dimensions of a cube and answer questions PC)5 2 Based on the concept of 3-D rotation. Understand the concept of Binary Logic and the techniquesused	PO5	2

Syllabus:

Error Identification, responding to Case Studies, Identifying the Business vocabulary in select Texts, Advertisement Reading/Responses/Comments/Review, Job Description, News Paper Report --Circulars, Minutes of Meeting, Agenda, Letter Writing (Business Letters): Placing an order, Enquiry letters etc Description of a product. Listening to Identify Vocabulary (Contextual): (Business, Simple, Complex), Job Interviews, Conversations & Group Discussion (Business Context), How to respond during language testing skills, Telephone Etiquette, and Importance of First Impression. Quantitative Aptitude: Numbers, Averages and Allegations, Mensuration

Reasoning: Cubes, Binary Logic, Ordering and Sequencing

Text Books:

1. Technical Report writing Today by Daniel G Riordan and Steven E Pauley. Cengage 2014

2. Soft Skills by Dr. K Alex S CHAND Publications
3. Quantitative Aptitude by R S Agarwal, S CHAND Publications.
4. Modern Approach to Verbal Reasoning, R S Agarwal, S CHAND Publications
5. Logical Reasoning for CAT by Arun Sharma McGraw Hills.

Reference Books:

1. Business Benchmark Book- Upper Intermediate- 2nd Edition Cambridge University Prcss:2014.
2. Pillai, Sabina, ct.al, Soft Skills and Employability Skills, New Delhi: CUP. 2018. Print.
3. Peterson, Reading Skill, New York: Peterson. 2007. Print. 11
4. Howard Williams, Cynthia Deirdre Herd Business words Heinemann International: 1992 print.
5. Simon Sweeny, English for Business Communication, Cambridge University Press: 2010
6. Quantitative Aptitude - Abhijit Guha, Mc Graw Hills.
7. Logical Reasoning, Arun Sharma, Mc Graw Hill.
8. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications.
9. https://www.catsyllabus.com/logical-reasoning/binary-logic

BASIC SCIENCES

22CA1104O: Mathematics for Computer Science

L-T-P-S: 3-1-0-0Credits:4 **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Understand fundamental concepts to solve problems ofmatrices	PO2	2
CO2	Demonstrate differential calculus, differentiation rules and identify a method for solving and interpreting the results.	PO2	2
CO3	Develop physical laws and relations mathematically in the form of second/higher order differential equations and identify a method for solving and interpreting the results.	PO2	3
CO4	Apply partial differential equations and identify method for solving PDE's	PO2	3

Syllabus:

Matrices: A quick review of the fundamental concepts, Rank of a Matrix, Non-Singular and Singular matrices, Elementary Transformations, Inverse of a Non-Singular Matrix, Canonical form, Normal form. Systems of Linear equations: Homogeneous and Non Homogeneous Equations, Characteristic equation of a matrix. (Relevant sections of Text 1). (proof of all the theorems are to be excluded.)**Differential Calculus:** A quick review of limits of function, rules for finding limits, extensions of limit concepts, derivative of a function, differentiation rules, chain rule, rate of change and simple applications of the rules. Extreme values of a function Rolle's Theorem, Mean Value Theorem.**Ordinary Differential Calculus:** Introduction, Formation of ODE by elimination of arbitrary constants & functions. Solving first order ODE by variable-separable method, linear equation & Bernoulli's equation for non-linear. Solving second and higher order ODE with constant coefficient. Complimentary functions and Particular Integrals like e^{ax}, sinax, x^n. Solving

by the method of Variation of Parameters.**Partial Differential Equations:** Introduction, formulation of Partial Differential Equation by elimination of arbitrary constants and by elimination of arbitrary function. Solution of the first order equations using Lagrange's method.

Text Books:

1. Dr. B. S. Grewal – Higher Engineering Mathematics
2. S.K . Stein – Calculus and analytic Geometry , (McGraw Hill)
3. Shanti Narayan - Matrices (S. Chand & Company)

Reference Books:

1. Zubair Khan, Shadab Ahmad Khan - Mathematics – 1 and Mathematics – II (Ane Books)
   N.P.Bali, Dr.N.Ch.Narayana Iyengar-Engineering mathematics – L
2. Matrices, Frank Ayres JR Schaum's Outline Series, TMH Edition
3. Thomas and Finney - Calculus and analytical geometry (Addison-Wesley)

22UC0009O: Ecology And Environment

L-T-P-S: 2-0-0-0 **CREDIT: 2** **PREREQUISITE: NIL**

Course Outcomes:

CO No	Course Outcome (CO) Description	PO/PSO	BTL
CO1	Understanding the importance of Environmental education and conservation of natural resources	PO2,PO3	2
CO2	Understanding the Ecosystems ,biodiversity and their	PO3,PO1	2
CO3	Understand global Environmental issues, pollution	PO1,PO3	2
CO4	Understand the knowledge on solid waste management, disaster management and EIA process	PO1,PO3	2

Syllabus:

The Multidisciplinary nature of Environmental Studies - Natural Resources - Forest resources –Mining its impact on environment - Water resources – Mineral resources – Food resources – Energy resources - Land resources - Soil erosion – Ecosystems - Biodiversity and its Conservation -Environmental Pollution –Solid waste Management- Electronic waste management – Biomedical waste management - Disaster management –Environmental Legislation - Environmental Impact Assessment Process.

Text books:

1. ErachBharucha, 2010 "Text Book of Environmental Studies", United Grants Commission, Universities Press (India) Pvt Ltd., Hyderabad
2. Anubha Kaushik, C.P. Kaushik, 2007Environmental Studies, New Age International
3. Benny Joseph, 2009 Environmental Studies, TheMcGraw-Hill companies, New Delhi

Reference Books:

1. DeekshaDeve and S.S. Kateswa, 2009 "Textbook of Environmental Studies", Cengage learning India pvt ltd, New Delhi
2. P.D. Sharma, 2009.Environmental Biology, Rastogi Publications, Meerut.

PROFESSIONAL CORE

22CA1101O: Problem Solving through Programming

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain different concepts of C programming, used to create programs.	PO1	2
CO 2	Discuss about different data types and control structures	PO1	2
CO 3	Demonstrate the working of functions, arrays and pointers	PO2	2
CO 4	Identify the working of different file handling methods	PO1,PO6	3
CO 5	Evaluate programs using basic and advanced concepts of Clanguage	PO2,PO3,PO4	5

Syllabus:

Overview of Programming: Introduction, Program design and implementation, Flowcharts & Algorithms, Programming environment – Machine language, assembly language, high level languages, Assemblers, Compilers, Interpreters. **Fundamentals of C programming:** Overview of C, Data Types, Constants & Variables, Operators & Expressions, Control constructs-if then.Basic I/O-formatted and Unformatted I/O, Type modifiers and storage class specifiers, Type casting, type conversion. **Advanced programming techniques:** Control constructs- for, while, Do while, Switch statement, break and continue, exit() function, go to and label , Functions, Scope rules, call by value and reference, calling functions with arrays, argc and argv, recursion- basic concepts, Arrays- single & multidimensional arrays.**Pointers**- Pointer expression, Pointer operations, malloc vs calloc, arrays of pointers, pointers to pointers, pointers to functions, function retuning pointers, **Structures**- Basics, referencing structure elements, array of structures, passing structures to functions, structure pointers, arrays and structures within structures, Unions, enumerated data-types, typedef.**Additional features:** File Handling – The file pointer, file accessing functions, C Preprocessor commands, Conditional compilation directives, C standard library and header files: Header files, string functions

Text Books:

1. The C programming Language by Richie and Kenninghan, 2004, BPB Publication

Reference Books: Programming in ANSI C by Balaguruswamy, 3rd Edition, 2005, Tata McGraw Hill .

1.Let us C by Yashwant Kanetkar, 6th Edition, PBP Publication

2. Chemical Engineering Thermodynamics, Y.V.C. Rao, University Press.

22CA1102O: Computer Organization & Architecture

L-T-P-S: 3-1-0-0 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain different logic gates and K-maps of variable length	PO1,PO2	2

CO 2	Discuss the functionality of combinational and sequential circuits	PO1,PO2	3
CO 3	Demonstrate the working of registers in computerorganization and design	PO1,PO2	3
CO 4	Organize the working of micro programmed control and CPU with memory organization	PO1,PO2	3

Syllabus:

Boolean Algebra - Boolean Algebra, Properties of Boolean Algebra and De Morgan's Theorem , Operations of Boolean Algebra. Logic Gates, Truth Table and Logic Design.Karnaugh Map (K-Map) and Simplification of Boolean functions.Karnaugh Map- 2, 3 and 4 Variable K Maps. Minimization Techniques – Min-terms and Max-terms, Sum of Product (SOP), Product of Sum (POS).**Combinational Circuits** - Half Adder, Full Adder, Half Subtractor, Full Subtractor, Multiplexer andDe-multiplexer. Conversion Sequential Circuits – Flip Flops, Types of Flip Flop – SR Flip Flop, J K Flip Flop, D flip flop, TFlip flop,Master-Slave JK Flip Flop , Conversion . **Register Transfer & Micro -Operations:** Register Transfer Language, Register Transfer, Bus & memory Transfers, Arithmetic Micro-operations, Logic Micro Operations, Shift Micro-operation, Arithmetic Logic Shift Unit.**Basic Computer Organization and Design**: introduction codes, Computer Registers, Computer instructions, Timing and Control, Instruction Cycle, Memory-Reference Instruction, Input-Output and interrupt, Design of Basic Computer, Design of accumulator Logic**, MICRO Programmed Control:** Control Memory, Address Sequencing, Micro-Programexample, Design of Control Unit.**Central Processing Unit:** General registers Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, Reduced instruction Set Computer (RISC). **Memory Organization:** Memory Hierarchy, Main Memory, Associative Memory, Cache Memory, Virtual Memory

Text Books:

1. Computer System Architecture by Morris Mano, PHI
2. Computer Organization and Architecture by William Stallings

Reference Books:

1. Stephen Brown and ZvonkoVrane "Fundamentals of Digital Logic with Verilog Design" SecondEdition, McGraw-Hill.
2. M. Morris Mano, "Digital Logic and Computer Design", Pearson

22CA1103O: Essentials of Information Technology

L-T-P-S: 3-0-2-0 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Understand the architectural design of a computer, hardware peripherals and various concepts of Operating systems	PO1	2
CO 2	Outline Programming fundamentals and User interface designs	PO1,PO2,PO3	3

CO 3	Summarize the fundamentals of Computer networks.	PO1	2
CO 4	Construct Software attributes, Specifications and Software Requirement Specification Document	PO1,PO2,PO3,PO10	3
CO 5	Analyze and Explore data through Word Processing, Spreadsheet applications and Presentations	PO1,PO2,PO5, PO10	4

Syllabus:

Hardware Essentials: Fundamentals of Computers, block diagram of Computer, Central Processing Unit (CPU), Execution cycle, Instruction Categories, Measures of CPU performance, Memory, Input/output devices, BUS and addressing modes. System Software types, Operating System concepts, Memory management, Process management, Scheduling, Threads.**Programming Essentials:**Problem solving with algorithms, flowchart, Programming styles, Programming Fundamentals, Testing and Debugging, Coding Standards and Best practices, User Interface Design introduction, Elements of UI design & reports.**Network Essentials:**Network Types, Network terms, Network models, Network Architectures, Network Topologies, Transmission media, WWW and Protocols, Email, Telnet, DNS.**Software Development Essentials:**Software and its types, Software development Life Cycle, Problem identification and Feasibility analysis, Requirement's determination, Requirement's Specifications, Software Requirement Specification Document, System design, System implementation, System evaluation, System modification, Role of systems analyst and administrator.

Text Books:

1. Dromey R.G., How to solve it by Computers PHI,1994
2. Siberschatzand Galvin, Operating System Concepts, 4th ed., Addision-Wesley,1995 3. Kernighan, Ritchie, ANSI C language PHI,1992

Reference Books :

1. Alfred V Aho,EHoproft, Jeffrey D Ullman, Design and Analysis of computer algorithms, Addison Wesley publishing Co..;1998
2. Andrew S. Tanenbaum, Structured Computer Organization,PHI,3rd ed.,1991

22CA1205O: Operating System

L-T-P-S: 3-1-0-0 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain overview of Operating System and basic Operating systems	PO1	2
CO 2	Discover Process state and scheduling with different algorithms	PO1,PO2, PO3,PO4	4
CO 3	Apply Process Synchronization and Dead lock prevention and avoidance.	PO1,PO2,PO3	3
CO 4	Organize various paging concepts and it's algorithms	PO1, PO2, PO3	3

Syllabus:

Overview of Operating Systems: What is an OS, Brief history, **Background and Basics Computer System review:** Architecture, Instruction cycle, Process Control Block, **Basic Oss:** Batch, Multi-

programmed batch, Timesharing, Computer System Structures, Operating System Structures.**Processes:** Definition, Process States, 5 state model, **Process structure:** PCB and components, Operations on Processes, **Threads CPU Scheduling:** I/O burst cycle, Context Switching, **Scheduling:** Short Term, Long Term and Scheduling Criteria, **Algorithms:** First Come First Serve, Shortest Job First, Priority Scheduling, Round Robin. **ProcessSynchronization:** Critical Section, Problem, Mutual Exclusion, Races, Semaphores, Deadlocks and Starvation, Classic Synchronization Problems, Readers/Writers, Dining Philosophers. **Deadlocks:** System Model, Necessary Conditions for a deadlock,Mutual Exclusion, Hold and Wait, No Preemption, Circular wait, Resource Allocation Graphs, Handling Deadlocks, Prevention, Avoidance, Bankers Algorithm.**Memory Management:** Address Binding,Compile time, Load time, Execution time, Logical versus Physical Address Space,**Swapping:**Contiguous Allocation, Single Partition, Multiple Partition-First Fit-Best Fit-Worst Fit, Internal and External Fragmentation**, Paging and Virtual Memory:**Basics, Demand Paging, Page Replacement, Page_Replacement_Algorithms: FIFO, Belady's, anomal, Optimal, LRU, MFT, Thrashing.

Text Book:

1. "Operating Systems Concepts", Fifth Edition; Silberschatz and Galvin

Reference Book:

1. Milan Milonkovic, Operating System Concepts and design, II Edition, McGraw Hill 1992.
2. Tanenbaum, Operation System Concepts, 2nd Edition, Pearson Education.
3. H. M. Deitel, Operating systems, 2nd Edition ,Pearson Education

22CA1206O: Data Structures

L-T-P-S: 3-0-2-0 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain various data structures and memory management of different types of data structure.	PO1	2
CO 2	Summarize the working of linear data structure like Link list, Stack and Queue	PO1, PO2,PO3	2
CO 3	Compare linear and non-linear data structure	PO1, PO2,PO3	4
CO 4	Summarize the working of different searching technique and sorting technique and their application.	PO1,PO2,PO3,PO4	3
CO 5	Evaluate programs to demonstrate the functionality of different data structures, sorting algorithms, searching algorithms, etc.	PO1,PO2,PO3,PO4,PO5	5

Syllabus:

Introduction to Data structures: Definition, Classification of data structures, Time andspace complexity, Static and Dynamic memory management, Dynamic Memory allocation functions. Pointers, Array and its type. **Linked List:** Definition, Representation, Types of linked lists, creation, insertion, deletion, search and display.**Stack and Queue:** Stack – Definition, Array Operations on stack: PUSH, POP, peek Applications of stacks- Infix, prefix and postfix notations and recursion. Queue: Definition, enqueue and dequeue operation, Types of queue: Simple queue, Circular queue, Double

ended queue (deque), Priority queue, Application of queue.**Trees and Graph:** Definition, Binary tree and its terminology, Traversal of Binary Tree, Binary search tree, AVL Tree, Graphs: Definition, Graph terminology, Depth First search, Breadth First search, Application of Graphs. **Searching and Sorting**: Sequential and binary search. Sort: Classification of sorting technique , Bubble sort, Selection sort, Insertion sort, Merge sort, Quick sort, Heap sort.

Text Books:

1. Weiss, Data Structures and Algorithm Analysis in C, II Edition, Pearson Education, 2001

Reference Books:

1. Lipschutz: Schaum's outline series Data structures Tata McGraw-Hill 2.
Data Structures by E. Balagurusamy, McGraw Hill Education
3. Tenenbaum, Data Structures. Pearson Education, 200
4. Kamthane: Introduction to Data Structures in C. Pearson Education 2005.

22CA1207O: Object Oriented Programming

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Understand the behavior of programs involving the basic programming constructs of Java.	PO1	2
CO 2	Explain the concept of class and objects with access control to represent real world entities.	PO1	2
CO 3	Identify the different predefined classes and methods in packages	PO2 ,PO3	3,4
CO 4	Apply thread concepts to establish develop inter process communication	PO2 ,PO3,PO7	4
CO 5	Develop applications using java concepts.	PO3,PO4,PO5	5

Syllabus:

Introduction to Java History, Overview of Java, Features and Advantages, Object Oriented Programming, A Simple Program, Using Blocks of Codes, Lexical Issues - White Space, Identifiers, Literals, Comments, Separators, Java Key Words. Data Types, Variables, Type Conversion and Casting, Operators, Operator Precedence. Control Statements: Selection Statements - If, Switch: Iteration Statements - While, Do-While, For Nested Loops, Jump Statements, Using Command Line Arguments. **Classes and objects** Class Fundamentals, Declaring Objects, Assigning Object Reference Variables, Methods, Constructors, "This" Keyword, Finalize ( ) Method, Functions, Over Loading Methods, Using Objects As Parameters, Argument Passing, Returning Objects, Recursion, Access Control, Introducing Final, Understanding Static, Introducing Nested And Inner Classes.**Inheritance**: Inheritance Basics, Using Super, Method Overriding, Dynamic Method Dispatch, Using Final with Inheritance, Polymorphism, Access Modifiers**,** Interfaces: Definition, Using Abstract Classes , Implementing Interfaces.**Java Packages** : Definition, Access Protection , Creating a Package, the import Keyword, Directory Structure of Packages, Built-in Packages. Exception Handling: Fundamental, Exception Types, Using Try And Catch, Multiple Catch Clauses, Nested Try Statements, Throw, Throws, Finally, Java's Built - In Exception, Using Exceptions. **Multithreaded**

Programming In Java The Java Thread Model, The Main Thread, Creating A Thread, Creating Multiple Thread, Isalive() And Join(), Thread - Priorities, Synchronization, Inter Thread Communication, Suspending, Resuming And Stopping Threads, Using Multi Threading. I/0 Basics, Reading Control Input, Writing Control Output, Reading And Writing Files.

Text Book:

1.Programming with Java, by E. Balagurusamy, McGraw Hill Education

Reference Books:

1. The complete reference Java –2: V Edition By Herbert Schildt Pub. TMH.
2. SAMS teach yourself Java – 2: 3rd Edition by Rogers Cedenhead and Leura Lemay Pub. Pearson Education.

22CA1210O: Database Management Systems

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Demonstrate the importance of creating and maintaining an error free database.	PO1	2
CO 2	Apply different SQL commands to manipulate a database	PO3,PO4	4
CO 3	Apply normalization methods in database	PO1,PO2,PO3,PO4,PO7	4
CO 4	Apply transaction concepts in a database	PO3,PO4,PO5	4
CO 5	Create database tables and manipulate them using SQL queries	PO2,PO3,PO4,PO5	4,5

Syllabus:

Purpose of Database System, Views of data, Database Languages, Database System Architecture – Database users and Administrator, E-R model, The relational Model, Domain Relational Calculus, Tuple Relational Calculus , Fundamental operations – Additional Operations, SQL fundamentals, Constraints, working with Tables.SQL : Integrity Constraints , Range Searching, Pattern Matching, Grouping, Manipulation of data. Joining tables ,Union, intersect & Minus Clause, Views, , Granting Permissions, Creating Indexes, Creating and managing User, Triggers – Security.Embedded SQL– Dynamic SQL-Functional Dependencies – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form-Multi-valued Dependencies and Fourth Normal Form ,Fifth Normal Form. **Transactions :** Transaction Concepts - Transaction Recovery – ACID Properties.Concurrency – Need for Concurrency – Locking Protocols – Two Phase Locking – Intent Locking – Recovery Isolation Levels – SQL Facilities for Concurrency.

Text Books:

1.An Introduction to Database Systems, by C.J. Date, Pearson

Reference Books:

1. RamezElmasri, Shamkant B. Navathe, “Fundamentals of Database Systems”, Fourth Edition, Pearson/Addision Wesley

2. Raghu Ramakrishnan, “Database Management Systems”, Third Edition, McGraw Hill

22CA1209O: Web and Social Media Technologies

L-T-P-S: 0-0-4-0 **Credits:2** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Understand semantics of web page, its elements and attributes.	PO1	2
CO 2	Outline the basic concepts of CSS and utilize them for making of static web pages.	PO2,PO3,PO5	3
CO 3	Demonstrate the various social media platforms and their usages	PO2, PO3,PO8,PO9,PO10	3
CO 4	Understand the usage of outcasts of social media	PO8,PO9,PO10, PO2	3
CO 5	Develop web pages using HTML, CSS and makes use of social media platforms for creating accounts.	PO2,PO3,PO5,PO8,PO9	5

Syllabus:

HTML: Syntaxes, HTML structure, Basic Text Markup Language, HTML styles, Element Attributes, Heading, Layouts, I-frame Images, Hypertext Links, List, tables, forms, GET and POST method, Frames.**CSS:** Introduction to CSS, Levels, Style Specification formats, Selector forms, the box model, Conflict resolution, CSS3.**Social Media:** Definition of Social Media, Evolution of Social Media, types of social media, positive and negative influence of social media on individuals, businesses and society as a whole, identifying the uses of social media platforms. **LinkedIn:** Opening accounts in LinkedIn, Authentication and Security issues, strategically build network on LinkedIn, searching connections and developing tracking sheet for network connection, adding recruiter and people from the company to work, review and update profile, achieving academic and professional realms strategies for LinkedIn Platform. **Facebook & Twitter:** Introduction, Evolution of Facebook & Twitter,Uses of the platforms in personal, academic and professional realms, creating accounts in each platforms, Guidelines and security features for each platform, strategies for achieving academic andprofessional goals using Facebook and Twitter. **The Outcasts of Social Media: Blogs, Videos, Wikis and more:** Introduction to various outcasts of social media platforms, history and evolution of each social media outcasts – its usage- implementation, overall impact of social media outcasts on academics, professions and society in general.

TextBooks:

1. Programming the World Wide Web, Robet W Sebesta, 7ed, Pearson.
2. Web Technologies, 1st Edition 7th impression, Uttam K Roy, Oxford, 2012 **3.**
Tuten, Tracy, L. Social Media Marketing. First Edition. ISBN -10: 0132551799

Reference Books:

1. Social Networks and the Semantic Web, Peter Mika, Springer, 2007.
2. Web Technologies, Uttam K Roy, Oxford
3. An Introduction to Web Design, Programming, Paul S Wang, Sanda S Katila, Cengage

22CA2109O: Software Enginnering

L-T-P-S: 2-1-0-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Demonstrate the requirement of software development for various applications.	PO1,PO2	2
CO 2	Explain how to reduce the complexity to transition from one phase in software development to another.	PO2,PO3,PO7	3
CO 3	Summarize different testing concepts	PO3,PO4	3
CO 4	Develop and manage a software development project	PO1,PO2,PO3,PO4,PO5,PO6, PO10	4,5

Syllabus:

Processing, Reverse Engineering User Interfaces.Understanding Requirements: Identify stakeholders, recognizing multiple viewpoints, eliciting requirements, Building requirement model, negotiating requirements, validating requirements, SRS Vs User Stories. Agile Modeling, Extreme Programming, Scrum, Kanban, SAFe Methodology. Test Driven Development: Basics, A strategic approach to software testing, strategic issues, test strategies for conventional software, Black-Box and White-Box testing, validation testing, system testing.

TEXT BOOKS:

1. Roger S.Pressman, “Software Engineering – A Practitioner’s Approach” 7th Edition, Mc Graw Hill,(2014).
2. Ian Sommerville, “Software Engineering”, Tenth Edition, Pearson Education, (2015).
3. Agile and Iterative Development: A Manager's Guide, Craig Larman, Addison-Wesley

Reference Books:

1. Craig Larman, “Applying UML and Patterns: An introduction to OOAD and design and interface deployment”, Pearson, (2005).
2. Stephen R.Schach, “Software Engineering”, Tata McGraw-Hill Publishing Company

22CA2110O: Mobile Application Development

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain various concepts of mobile programming that make it unique from programming for other platforms.	PO1	2

CO 2	Classify mobile applications on their design pros and cons	PO1	3
CO 3	Utilize rapid prototyping techniques to design and develop sophisticated mobile interfaces,	PO1	3
CO 4	Summarize mobile applications for the Android operating system that use basic and advanced phone features.	PO1,PO3,PO8	2
CO 5	Evaluate applications to the Android marketplace for distribution.	PO1,PO4,PO5,PO7	5

Syllabus:

Introduction to Android: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.Android Application Design Essentials: Anatomy of an Android applications, Android terminologies, Application fundamentals for android. Android design guidelines.Android User Interface Design Essentials: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation.Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

TEXT BOOKS:

1. T1. Lauren Darcey and Shane Conder, "Android Wireless Application Development", Pearson Education, 2nd ed. (2011)

REFERENCE BOOKS:

1. R1. Reto Meier, "Professional Android 2 Application Development", Wiley India Pvt Ltd
2. R2. Mark L Murphy, "Beginning Android", Wiley India Pvt Ltd
3. R3. Android Application Development All in one for Dummies by Barry Burd, Edition: I

22CA2111O: Computer Networks

L-T-P-S: 3-0-0-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Demonstrate how to establish a connection among various devices. Explain the different networking concepts and devices that are used today for establishing connectivity.	PO3	2
CO 2	Outline the functionalities of different network protocols	PO2	2
CO 3	Explain different WAN technologies, topologies and other basic networking concepts.	PO2	2
CO 4	Show how to troubleshoot a network.	PO3	2

Syllabus:

Networking Fundamentals: Basics of Network & Networking, Advantages of Networking, Types of Networks, Network Topologies, Transmission Media, Communication Modes, Wiring Standards and Cabling.**Introduction of OSI model**, OSI model, TCP/IP Model, TCP, UDP, IP, ICMP, ARP/RARP, Comparison between OSI model & TCP/IP model. **Basics of Network Devices** Network Devices- NIC- functions of NIC, installing NIC, Hub, Switch, Bridge, Router, Gateways, And Other Networking Devices, Repeater, CSU/DSU, and modem.**Data Link Layer**: Ethernet, PPP, PPP standards, ARP, Message format, Wireless Technology, Wireless Access Points, Wireless NICs, wireless LAN standards: wireless LAN modulation techniques, wireless security Protocols:**Network Layer:** Internet Protocol (IP), IP standards, versions, functions, IPv4 addressing, Subnet Mask, Default Gateway, methods of assigning IP address, Ipv6 address, types, assignment.**Application Layer:** DHCP, DNS, HTTP/HTTPS, FTP, TFTP, SFTP, Telnet, Email: SMTP, POP3/IMAP, NTP.**WAN Technology** WAN Switching techniques ,Circuit Switching, Packet Switching etc., Connecting to the Internet : PSTN, ISDN, DSL, CATV, Satellite-Based Services, Last Mile Fiber, Cellular Technologies.**Connecting LANs :** Leased Lines, SONET/SDH, Packet Switching, Remote Access: Dial-up Remote Access, Virtual Private Networking, SSL VPN, Remote Terminal Emulation,**Network and Internet Troubleshooting**, Troubleshooting Model, identify the affected area, probable cause, implement a solution,Using Network Utilities: ping, traceroute, tracert, ipconfig, arp, nslookup, netstat, nbtstat, Hardware trouble shooting tools, system monitoring tools.

Text Book:

1. CCNA Cisco Certified Network Associate: Study Guide (With CD), by Todd Lammle, Wiley India,

Reference Books:

1. CCENT/CCNA ICND1 640-822 Official Cert Guide 3 Edition (Paperback), Pearson, 2013
2. Routing Protocols and Concepts CCNA Exploration Companion Guide (With CD) (Paperback), Pearson, 2008
3. CCNA Exploration Course Booklet : Routing Protocols and Concepts, Version 4.0 (Paperback), Pearson, 2010

22CA2112O: Web Development using Python

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Understand basic programming skills in core Python	PO2	2
CO 2	Apply basic principles of Python programming language	PO1,PO2,PO3	3
CO 3	Solve database and GUI applications.	PO1,PO4,PO5	3
CO 4	Develop program Python applications	PO3,PO5	3
CO 5	Evaluate the skill of designing Graphical user Interfaces in Python	PO3,PO4,PO5	5

Syllabus:

Introduction to Python Environment : History and development of Python, Introduction , Features

,Syntax, Comments, Variables, DataTypes, Booleans, Operators, Lists, Tuples, Sets, Dictionaries , Conditional and iterative statements, Functions , Lambda , Arrays , Classes/Objects , Inheritance , Scope , Modules , Dates , Math , JSON , Regular Expressions , PIP , Exception Handling , UserInput , String Formatting, Dictionaries.**Libraries:** SciPy, NumPy, Scikit-learn, matplotlib.**Data Management :** Sampling data, File Handling, Accessing Data from Relational Databases, **Python MongoDB :** Features, MongoDB Create Database , Create Database, Create Collection, Insert, Find, Sort ,Delete ,Drop Collection, Update, Limit.**Python Client Programming** :Web Page Structure , Using urllib , Parsing HTML
, Screen Scraper.**Web server programming** : Web Crawler , SimpleHTTP And BaseHTTP Servers , CGI Programming ,Form Processing, Writing XML File , Parsing XML , Finding XML Elements.**Web/Database Applications in Python** :Database Web Programming, HTML Database Data , Input Database Data , Update Database Data.**Django Web Application Framework**: Installing and Setting Up Django ,Django API , Django Admin App , Django Views , Django Templates , Add Remove Data, Django Forms / Templating, Building some full stack applications

Text Books:

1. Python: The Complete Reference by Martin C. Brown

Reference Books:

1. Fluent Python: Clear, Concise, and Effective Programming
2. Python Cookbook, Third edition by David Beazley and Brian K. Jones.
3. How To Think Like A Computer Scientist: Learning With Python, by Allen Downey, Jeff Elkner and Chris Meyers

22CA2213O:Java Full Stack Development

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Apply JDBC API, JUnit Testing Framework and XML Concepts to build Console and Web Applications	PO1,PO2	3
CO 2	Solve Servlets, JSP, Hibernate, Spring and Spring Boot to build web applications and Enterprise Level applications.	PO2,PO3,PO4	3
CO 3	Analyze the design of linear data structures for real world problems	PO2,PO3	4
CO 4	Analyze alternate algorithm techniques to solve optimization related problems in the real-world scenario.	PO3,PO2,PO7	5
CO 5	Evaluate applications using JDBC and JSP	PO2,PO3,PO5	5

Syllabus:

JDBC API - Introduction to JDBC API, Type of Drivers in JDBC, Statement, Prepared Statement, Callable Statement, ResultSet MetaData, Database MetaData, Scrollable & Updatable ResultSet, Transaction Management in JDBC. JUnit - Introduction to JUnit framework, JUnit Environment Setup, Features of

Junit Framework, Junit Framework and its Implementation. XML - Introduction to XML, Advantages of XML, XML Tree, XML Attributes, XML DOM, DTD, XSD, XML with CSS, XSLT. Servlets - Introduction to Servlets, Lifecycle, Init and context parameters, Servlet Collaboration, Session Tracking Techniques, Servlet CRUD Operations. JSP – Servlets Vs JSP, JSP Architecture and Lifecycle, JSP Scripting Elements, Session Tracking Techniques, JSP Implicit Objects, JSP Directive Elements, JSP Action Tags, JSP MVC Architecture, JSP CRUD Operations. Hibernate – JDBC Vs Hibernate, Introduction to Hibernate Framework, Advantages, XML & Annotation based Hibernate CRUD Operations, Generator Classes in Hibernate, HQL, HCQL. Spring and Spring Boot – Introduction to Spring, Spring Architecture, Spring Vs Spring Boot, Maven Repository, Introduction to Spring Boot, Advantages of Spring Boot over Spring, Dependency Injection (DI), Inversion of Control (IoC), Creating Spring starter project, Hello World Application using Spring Boot, Spring Boot Autowire, Web Application MVC using Spring Boot, Spring Boot CRUD Operations with Spring MVC, Spring Boot with RESTful Web Service, Spring Boot and RESTful API Vs REST API with JSON, Spring Boot and Hibernate CRUD Operations, Microservices with Spring – monolithic vs micro-service Architecture, SOA vs Microservices, Spring Boot Microservices with Spring Cloud.

Reference Books :

1. Java The Complete Reference - Eleventh Edition, Herbert Schildt
2. J2EE: The complete reference by James Keogh, publisher: McGraw-Hill Osborne Media, 1st Edition, 2002.
3. Spring in Practice by Willie Wheeler with Joshua White, publisher: Manning, shelter Island
4. Java Persistence with Hibernate, Manning Publications,2nd edition, Christian Bauer, Gavin King, Gary Gregory
5. Introduction to Java Spring Boot: Learning by Coding, Dave Wolf, Afua Ankomah, Jennifer Le
6. Full Stack Java Development with Spring MVC, Hibernate, jQuery, and Bootstrap - Mayur Ramgir

22CA2214O:Object Oriented Analysis & Design

L-T-P-S: 3-0-2-4 **Credits:5** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	understand the fundamentals of object modeling	PO2	2
CO 2	understand and differentiate Unified Process from other approaches.	PO1,PO2,PO3	2
CO 3	Compare static and dynamic UML diagrams with implementation.	PO1,PO2,PO3,PO5	4
CO 4	Develop the software design with design patterns.	PO3,PO4,PO5,PO8	4
CO 5	Evaluate the software against its requirements specification	PO3,PO4,PO5,PO9,PO10	5

Syllabus:

UNIFIED PROCESS AND USE CASE DIAGRAMS: Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases.**STATIC AND DYNAMIC UML DIAGRAMS:**Class Diagram— Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams, UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modelling –When to use State Diagrams - Activity diagram – When to use activity.**DESIGN PATTERNS:**Designing objects with responsibilities – Creator – Information expert – Low Coupling – High Cohesion – Controller **Design Patterns – creational** – factory method – **structural** – Bridge – Adapter – **behavioural** – Strategy – observer –Applying GoF design patterns – Mapping design to code.**TESTING:**Object Oriented Methodologies – Software Quality Assurance – Impact of object orientation on Testing – Develop Test Cases and Test Plans

Text Books:

1. Craig Larman, —Applying UML and Patterns: An Introduction to Object-Oriented Analysis and Design and Iterative Development‖, Third Edition, Pearson Education, 2005.
2. Ali Bahrami - Object Oriented Systems Development - McGraw Hill International Edition 1999

Reference Books:

1. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, —Design patterns: Elements of Reusable Object-Oriented Software‖, Addison-Wesley, 1995.
2. Martin Fowler, —UML Distilled: A Brief Guide to the Standard Object Modeling Language‖, Third edition, Addison Wesley, 2003. www.padeepz.net

PROFESSIONAL ELECTIVES

Cloud Technology and Information Security(CTIS) Stream

22CA21C1O: Cloud Architecture

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Classify cloud computing importance and services	PO1	2
CO2	Relate cloud services & models.	PO1, PO2	2
CO3	Explain Virtualization and its applications.	PO3	2
CO4	Apply cloud services using web services Cloud to utilize cloud resources.	PO3	3
CO5	Measure various cloud services using web services Cloud for building and deploying applications.	PO4	5

Syllabus:

Overview of Cloud Computing - Brief history and Evolution of Cloud Computing, Traditional vs. Cloud Computing, Importance of Cloud Computing, Benefits and Challenges of Cloud Computing.**Cloud Computing Architecture:** Cloud computing stack Comparison with traditional computing architecture (client/server), Services provided at various levels, How Cloud Computing Works, Role of Networks in Cloud computing, protocols used, Role of Web services Service Models (XaaS) Infrastructure as a Service(IaaS), Platform as a Service(PaaS), Software as a Service(SaaS) Deployment Models Public cloud, Private cloud, Hybrid cloud, Community cloud.**Infrastructure as a Service(IaaS)**: Introduction to virtualization, Different approaches to virtualization, Hypervisors, Machine Image, Virtual Machine(VM) **Platform as a Service(PaaS):** Introduction to PaaS What is PaaS, Service Oriented Architecture (SOA) Cloud Platform and Management Computation Storage.**Software as a Service (SaaS:)** Introduction to SaaS, Web services, Web 2.0, Web OS.**Overview of Multi-Cloud Management Systems** - Explain concept of multi- cloud management, Challenges in managing heterogeneous clouds, benefits of multi-cloud management systems.**Overview of Cloud Security -** Security concerns in Traditional IT, Challenges in Cloud Computing in terms of Application, Server, and Network Security.**Service Management in Cloud Computing:** Service Level Agreements (SLAs).

Text Books:

1.Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski (2011), Cloud Computing: Principles and paradigms.

Reference Book:

1.Krutz, Ronald L.; Vines, Russell Dean, Cloud Security, A comprehensive Guide to Secure Cloud Computing.

22CA21C2O: Cloud Information Security

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Explain importance of Information Security in the Cloud Context	PO2	2
CO 2	Demonstrate various concepts of cloud security	PO3, PO4, PO8, PO9	3
CO 3	Develop the cloud vulnerabilities and threats	PO3, PO4,PO7, PO8, PO9	3
CO 4	Identify how cloud and Security works in a seamless model	PO3, PO4,PO5, PO7, PO8, PO9	3
CO 5	Measure Cloud Information security issue in Cloud	PO6,	5

	Computing		

Syllabus:

Introduction to Virtualization & Cloud : Virtualization and Cloud computing concepts, Private cloud Vs Public cloud, IAAS, PAAS & SAAS concepts, Virtualization security concerns, Hypervisor Security, Host/Platform Security, Security communications, Security between Guest instances, Security between Hosts and Guests.**Cloud Controls Matrix &Top Cloud Threats :** Introduction to Cloud Controls Matrix & Top Cloud Threats, Cloud Controls Matrix, Trusted Cloud Initiative architecture and reference model, requirements of Security as a Service (Secaas) model and Top Security threats to the cloud model.**Cloud Security :**Cloud Security vulnerabilities and mitigating controls, Cloud Trust Protocol, Cloud Controls Matrix. Complete Certificate of Cloud Security Knowledge (CCSK).**Cloud Trust Protocol &Transparency :**Introduction to Cloud Trust Protocol & Transparency, Cloud Trust Protocol and Transparency, Transparency as a Service, Concepts, Security, Privacy & Compliance aspects of cloud.

Text Books:

1.Cloud Security – A comprehensive Guide to Secure Cloud Computing by Ronald L. Krutz and Russel Dean Vines

Reference Books:

1. Visible Ops Private Cloud – Andi Mann, Kurt Miline and Jeanne Morain, IT Process Institute, Inc.; first edition (April 8, 2011)
2. Cloud Computing Explained – John Rhoton 2009

22CA31C3O: Ethical Hacking

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Demonstrate the concepts and types of Ethical Hacking	PO3	2
CO 2	Demonstrate tools to create hack in scenarios	PO2,PO5	4
CO 3	Model how to perform web hacking	PO3,PO3,PO8, PO9	3
CO 4	Develop report writing and mitigation	PO4, PO10	3
CO 5	Evaluate the components of ethical hacking using tools and techniques	PO2, PO3, PO4, PO5, PO6, PO7	5

Syllabus:

Introduction to Ethical Hacking: Hacking Methodology, Process of Malicious Hacking, and Foot printing and scanning: Foot printing, scanning. Enumeration: Enumeration. System Hacking and Trojans: System

Hacking, Trojans and Black Box Vs. White Box Techniques.**Hacking Methodology:** Denial of Service, Sniffers, Session Hijacking and Hacking Web Servers: Session Hijacking, Hacking Web Servers. Web Application Vulnerabilities and Web Techniques Based Password Cracking: Web Application Vulnerabilities, Web Based Password Cracking Techniques.**Web and Network Hacking :** SQL Injection, Hacking Wireless Networking, Viruses, Worms and Physical Security: Viruses and Worms, Physical Security. Linux Hacking: Linux Hacking. Evading IDS and Firewalls: Evading IDS and Firewalls.**Report writing & Mitigation :** Introduction to Report Writing & Mitigation, requirements for low level reporting & high level reporting of Penetration testing results, Demonstration of vulnerabilities and Mitigation of issues identified including tracking

Text Books:

1. Gray Hat Hacking The Ethical Hackers Handbook, 3rd Edition Paperback – 1 Jul 2017 by Allen Harper, Shon Harris, Jonathan Ness, Chris Eagle, McGraw Hill Education; 3 ed (1 July 2017)
2. CEH v9: Certified Ethical Hacker Version 9 Study Guide by Sean-Philip Oriyano, Sybex; Stg edition (17 June 2016)

Reference Books:

1. Hacking for Beginners: Ultimate 7 Hour Hacking Course for Beginners. Learn Wireless Hacking, Basic Security, Penetration Testing by Anthony Reynolds, CreateSpace Independent Publishing Platform (10 April 2017)
2. An Ethical Guide To WI-FI Hacking and Security by SwaroopYermalkar, BecomeShakespeare.com; First edition (15 August 2014) Hands-On Ethical Hacking and Network

22CA32C4O: Cloud Web Services

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Summarize the model of Cloud Computing As A Service	PO4	2
CO 2	Illustrate the Networking Basics required for cloud services	PO5	2
CO 3	Demonstrate the Control of workflow in cloud services	PO2,PO3,PO4	3
CO 4	Explain the method of fault tolerance in cloud	PO2, PO3, PO4, PO5	3
CO 5	Experiment with the AWS Cloud	PO3, PO4, PO5	3

Syllabus:

Cloud Web concepts : Search engine, Apache Hadoop, Grid Computing, Amazon Web Services, REST APIs, SOAP API, Query API, User Authentication, Connecting to the Cloud, Open SSH Keys, Tunneling /

Port Forwarding, Image (glance), Object Storage (swift), ACL,Logging,Signed URI, Compute (nova),Cloud value proportion, Cloud economics, cloud architecture and design principles, AWS Cloud basic services.**Networking & Storage :** Overview, Key pairs, Network Types, LAN, Gateways and Router, IP Classes and Subnets, CIDR, Utilities, Instances Management, Image Management, direct connect, hybrid deployments, VPN,Security groups, Block Storage (cinder), Ubuntu in the Cloud, Installation, Utilities, File system, basic concepts of storage and databases, various storage services, storage solutions, database services.**Global Infrastructure and Security:** Methods of deploying and operating cloud, global infrastructure, availability zone, benefits of CloudFront and Edge locations.AWS Corer services, resources for technology support, methods for provisioning services, Benefits of shared responsibility model, layers of security, Multi Factor Authentication, Identity Access Management Security levels, security policies, benefits of compliance, security services.**Monitoring & Pricing:** Approaches for monitoring, benefits of Cloud watch, CloudTrial, Trust Advisor, Pricing and support model, free tire, benefits of organization and consolidated billing, Budgets, Explorer, AWS pricing calculator, various AWSsupport plans, AWS market place.

Text Books:

1. Cloud Computing: Principles and Paradigms, Editors: RajkumarBuyya, James Broberg, Andrzej M. Goscinski, Wiley, 2011
2. OpenStack Essentials by Dan Radez (Author)

22CA32C5O: Design and Development of Cloud Application

L-T-P-S: 2-0-2-4 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO 1	Understand the basic concept of hybrid cloud	PO1	2
CO 2	Understand the management of hybrid cloud in terms of development and deployment	PO4	2
CO 3	Plan the establishment of hybrid plan	PO2, PO3	3
CO 4	Apply the usage of Azure as a platform for hybrid cloud	PO4, PO5, PO7, PO9,	3
CO5	Evaluate Applications using AWS cloud	PO3, PO4, PO5	5

Syllabus:

Services : Compute, Storage, Database: Compute: EC2,Lightsail,Lamba,batch,EBS,Serverless,AWS Outposts, Storage: S3,EFS,FSx,S3 Glacier, Storage gateway, AWS Backup, Database: RDS, DynamoDB, ElasticCache, Neptune, Amazon QLDB, Amazon DocumentDB, Keyspaces, Timestream.**Services: Migration and Transfer, Network, IAM:**Migration and transfer: AWS Migration Hub, Database & Server

Migration service. Network & Content Delivery: VPC,CloudFront, Route53, API Gateway, Direct Connect, Global Accelerator. Management & Governance: AWS organizations, CloudWatch, AWS Auto Scaling, CloudFormation,Config. Security, Identity & Compliance: IAM, Resource Access manager, AWS Single Sign-on, Key Management Services.**Identity access Management & S3:**Identity access management, S3 Bucket, S3 pricing Tire, S3 Security and encryption, Versioning control, S3 lock policies and vault lock,S3 Performance, AWS Organizations, Sharing s3 buckets between accounts, Cross region Replication, Transfer Acceleration, Data sync overview, CloudFront, Snowball, Storage gateway.**Amazon EC2 & Network Security:**EC2, Security group, Elastic Bean Stalk(EBS), Volumes and Snapshots, AMI Types, ENI vs ENA vs EFA, Encrypted Root Device volumes & Snapshots, EC2 Hibernate, Cloud Watch, AWS Command line, IAM roles with EC2, Bootstrap Scripts, Elastic File System, FSx for Windows and FSx for Lustre, EC2 Placement Groups, HPC on AWS, AWS Web Application Firewall, VPC's, HA Architecture, Security and Serverless.

Text Books:

1.Judith Hurwitz , Marcia Kaufman , Fern Halper , Daniel Kirsch, " Hybrid Cloud for Dummies", John Wiley & Sons Inc., 2nd Edition, 2012

Reference Books:

1.Danny Garber, "Windows Azure Hybrid Cloud", ", John Wiley & Sons Inc., 2013

Data Science(DS) Stream

22CA21D1O: Data Warehousing & Mining

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Understand stages in building a Data Warehouse	PO1	2
CO2	Apply pre-processing techniques for data cleaning	PO3	3
CO3	Analyze and evaluate performance of algorithms for Association Rules.	PO4	4
CO4	Analyze Classification and Clustering algorithms	PO4	4
CO5	Evaluate mining techniques like classification, clustering and association rules on data objects	PO9, PO5	5

Syllabus:

KDD Process, Introduction to Data Warehouse, Data Pre processing- Data Cleaning methods, Descriptive Data Summarization, Data Reduction, Data Discretization and Concept hierarchy generation, Overview of ETL and OLAP OLTP integration – comparison of OLAP with OLTP systems, ROLAP, MOLAP and DOLAP, Data Cube Computation methods, Advanced SQL support for OLAP, multi-dimensional modelling, Attribute-oriented Induction, Data Warehouse architecture and implementation - Parallel execution, Materialized views. Data Mining Techniques: Basic concepts of Association Rule Mining, Frequent Item set mining, Mining various kinds of association rules, Classification by decision tree induction, Bayesian

Classification, Rule-based Classification, Classification Back-propagation, Associative Classification, Lazy Learners, Rough set approach, Clustering methods, Data Objects and Attribute Types, Basic Statistical Descriptions of Data, Measuring Data Similarity and Dissimilarity Partitioning-Based Clustering Methods; Hierarchical Clustering Methods; Density Based and Grid-Based Clustering Methods

Text Books:

1. Han J &Kamber M, "Data Mining: Concepts and Techniques", third Edition, Elsevier, 2011.

2.Pang-Ning Tan, Michael Steinback, Vipin Kumar, "Introduction to Data Mining", Pearson Education, 2008

Reference Books :

1.M.Humphires, M.Hawkins, M.Dy,"Data Warehousing: Architecture and Implementation", Pearson Education, 2009.

2. Anahory, Murray, "Data Warehousing in the Real World", Pearson Education, 2008.

3. Kargupta, Joshi,etc., "Data Mining: Next Generation Challenges and Future Directions", Prentice Hall of India Pvt Ltd, 2007.

22CA21D2O Statistics for Data Science:

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Explain the basic concepts of statistics and explains the various methods of descriptive data collection and analysis	PO1	2
CO2	Show the probability distribution of a random variable, based on real-world situation, and use it to compute expectation and variance	PO3	2
CO	Construct the linear and non-linear regression lines for the given data.	PO1	3
CO4	Apply basic concepts of statistics and explains the various methods of descriptive data collection and analysis	PO2	3
CO5	Measure Statistical data using SPSS or Minitab tools	PO6	5

Syllabus:

Basic Statistics: Importance of Statistics-Primary and secondary data-Data collection methods Presentation of numerical and categorical data. Concepts of central tendency and dispersion-Mean, median and mode-Partition values-Quartiles for grouped and ungrouped data-Range-Quartile deviation-Standard deviation and coefficient of variation for grouped and ungrouped data.**Probability Distribution:** Random Variable- Discrete Random and Continuous Random variable, Probability Distribution of a Random Variable, Mathematical Expectation Types: Binomial, Poisson, Normal

Distribution, Mean and Variance of Binomial, Poisson, and Normal Distribution.**Correlation:** Introduction, Types, Properties, Methods of Correlation: Karl Pearson's Coefficient of Correlation, concept of point biserial correlation, Rank Correlation and Phi-coefficient.**Regression:** Introduction, Aim of Regression Analysis, Types of Regression Analysis, Lines of Regression, Properties of Regression Coefficient and Regression Lines, Comparison with Correlation.**Working on Statistical data with Ms- Excel**: Working with Data using MS-Excel, Importing Data Sort, Data Filter, Advance Filter, Data Validation, Data Consolidation, What-If Analysis, Data Grouping, Subtotal, Data regression, Working with function; statistical functions.**Index numbers-**Laspeyere-Passche-Fisher's price and quantity index numbers Time reversal and factor reversal tests.

Text Books:

1. Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.

Reference Books :

1. B. Sooryanarayana : "A textbook of probability and statistics" , S. Chand 2003

22CA31D3O: Machine Learning

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	understand the basic concepts of statistical learning methods and models	PO 1	2
CO2	understand the importance of supervised learning in classifying class labels for prediction	PO 3	2
CO3	Identify different algorithms related to classification techniques	PO2, PO5	3
CO4	Develop assumptions in estimating regression coefficients using OLS method	PO3, PO4	3
CO5	Evaluate applications using classification techniques	PO4, PO5	5

Syllabus:

Introduction to Machine Learning Algorithms: Introduction to Machine learning – Statistical Learning – types of Machine Learning –learning models: geometric, probabilistic and logistic models, introduction to supervised, unsupervised and reinforcement learning – model evaluation – model implementation – model accuracy indicators.**Supervised Learning – Simple Linear Regression Analysis :**Introduction to parametric machine learning method, assumptions of parametric machine learning methods, linear model and its assumptions, simple linear regression, scatter diagram, Simple linear Regression parameter estimation, properties of regression parameters, testing the significance of regression parameters using ANOVA and t test, estimation of σ^2, Interval Estimation of the Mean Response, R Square, Adjusted R Square, Normality of response variable, prediction of new observations, Confidence

interval for β_0, β_1 and σ^2.**Supervised Learning – Multiple Linear Regression Analysis I :**Multiple linear regression model, assumptions of Multiple linear regression variables – multicollinearity, homoscedasticity, autocorrelation, effects of multicollinearity, effect of homoscedasticity and auto autocorrelation in parameter estimation, Least - Squares Estimation of the Regression Coefficients, Geometrical Interpretation of Least Squares, Properties of the Least - Squares Estimators, Estimation of σ^2, Inadequacy of Scatter Diagrams in Multiple Regression.**Supervised Learning – Multiple Linear Regression Analysis II :**testing the general linear hypothesis, Test for Significance of Regression, Tests on Individual Regression Coefficients and Subsets of Coefficients, Special Case of Orthogonal Columns in X, Confidence Intervals on the Regression Coefficients, CI Estimation of the Mean Response, Simultaneous Confidence Intervals on Regression Coefficients, predicting new observations, residual analysis, model adequacy and validation.**Supervised Learning – Non Linear Regression Analysis:**Introduction to non-linear regression models, non-linear least square method to estimating the regression parameters, transformation of non-linear model to linear model, linearization, other parameter estimation methods, starting values, statistical inference in non-linear regression models.

Text Books:

1. Introduction to Linear Regression Analysis, Fifth Edition - DOUGLAS C. MONTGOMERY, ELIZABETH A. PECK, G. GEOFFREY VINING, A JOHN WILEY & SONS, INC., PUBLICATION
2. Introduction to Machine Learning - EthemAlpaydm, The MIT Press

Reference Books:

1. Python Machine Learning - Sebastian Raschka, PACKT Publishing
2. Using Multivariate Statistics - Barbara G. Tabachnick, Linda S. Fidell, Pearson Education Inc

22CA32D4O: Big Data Analytics

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO#	Course Outcome	PO/PSO	BTL
CO1	understand the basic concept of BigData, different types of Data	PO 1	2
CO2	understand architecture of Hadoop and YARz	PO3	2
CO3	Outline Processing and Storage Layer of Hadoop, internal concept of MapReduce	PO2,PO3PO 5 , PO7	3
CO4	Demonstrate the concept of Master and Slave Architecture	PO4, PO5	2
CO5	Evaluate cluster management using YARN	PO4, PO5	5

Syllabus:

Understanding BigData : Defining Data, Types of Data, Structured Data, Semi Structured Data, Unstructured Data, How data being Generated, Different source of Data Generation, Rate at which Data is being generated, Different V's, Volume, Variety, Velocity, Veracity, Value, How single person is contributing towards BigData, Significance for BigData, Reason for BigData, Understanding RDBMS and why it is failing to store BigData. Future of BigData, BigData use cases for major IT Industries.**Introduction to Hadoop:**What is Hadoop, Apache Community, Cluster, Node, Commodity Hardware, Rack Awareness, History of Hadoop, Need for Hadoop, How is Hadoop Important, Apache Hadoop Ecosystem, Different Hadoop offering , Hadoop 1.x Architecture, Apache Hadoop Framework, Master- Slave Architecture, Advantages of Hadoop.**Storage Unit:**Hadoop Distributed File System, Design of HDFS, HDFS Concept, How files are stored in HDFS, Hadoop File system, Replication factor, Name Node, Secondary Name Node, Job Tracker, Task tracker, Data Node, FS Image, Edit-logs, Check-pointing Concept, HDFS federation, HDFS High availability Architectural description for Hadoop Cluster, When to use or not to use HDFS, Block Allocation in Hadoop Cluster, Read operation in HDFS, Write operation in HDFS, Hadoop Archives, Data Integrity in HDFS, Compression & Input Splits.**Processing Unit:**What is MapReduce, History of MapReduce, How does MapReduce works, Input files, Input Format types Output Format Types, Text Input Format, Key Value Input Format, Sequence File Input Format, Input split, Record Reader, MapReduce overview, Mapper Phase, Reducer Phase, Sort and Shuffle Phase, Importance of MapReduceData Flow, Counters, Combiner Function, Partition Function, Joins, Map Side Join, Reduce Side Join, MapReduce Web UI, Job Scheduling, Task Scheduling, Fault Tolerance, Writing MapReduce Application, Driver Class, Mapper Class, Reducer Class, Serialization, File Based Data Structure, Writing a simple MapReduce program to Count Number of words, MapReduce Work Flows**YARN &Hadoop Cluster:**YARN, YARN Architecture, YARN Components, Resource Manager, Node Manager, Application Master, Concept of Container, Difference between Hadoop 1.x and 2.x Architecture, Execution of Job in Yarn Cluster, Comparing and Contrasting Hadoop with Relational Databases Cluster Specification, Cluster Setup and Installation, Creating Hadoop user, Installing Hadoop, SSH Configuration, Hadoop Configuration, Hadoop daemon properties, Different modes of Hadoop, Standalone Mode, Pseudo Distributed Mode, Fully Distributed Modes,

Text Book:

1.Hadoop: The Definitive Guide, By: Tom White, O'REILLY

Reference Books:

1. Hadoop for Dummies, By: Dirk deRoos, Paul C. Zikopoulos, Bruce Brown, Rafael Coss, and Roman B. Melnyk, A Wiley brand
2. Hadoop in Action, Writer: Chuck Lam Published By: Manning Publications

22CA32D5O: Data Visualization

L-T-P-S: 2-0-2-4 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO#	Course Outcome	PO/PSO	BTL

CO1	Understand the need of visualization techniques	PO1	2
CO2	explain Static Graphical Techniques	PO2	2
CO3	apply Multivariate Graphical Techniques	PO4, PO5, PO10	3
CO4	Model the concept of Graphical Validation and customization	PO2,PO4, PO5,	3
CO5	Evaluate programs on data visualization using Tableau or JupyteR tool	PO6,PO10	5

Syllabus:

Introduction to Data Visualization: Brief history of data visualization, scientific design choices in data visualization- choice of graphical form, grammar of graphical techniques of large amount of data, crucial need of visualization techniques, challenges in visualization techniques, classification of visualization techniques for qualitative and quantitative data, power of visualization techniques, introduction to different visualization techniques.**Static Graphical Techniques – 1 :**Introduction to bar graph, basic understanding of making basic bar graph, grouping bars together, bar graphs on counts, customization of bar graphs by changing colour, size, title, axis units, changing width and spacing of the bar chart, adding labels to bar graph, application of bar graph in business.**Multivariate Graphical Techniques :I**ntroduction to correlation matrix, application of correlation matrix in the multivariate analysis, network graph, basics of heat map, difference between heat map and tree map, introduction to higher dimensional scatter plot, axis adjustment in the higher dimensional scatter plot, addition of prediction surface of higher dimensional scatter plot.**Graphical Validation :** Basics of multivariate statistical visual representations and its results, dendrogram, importance of dendrogram in grouping (cluster analysis), Scree Plot, importance of Scree Plot, application of Scree Plot in determining number of clusters and factors, QQ plot, importance of QQ plot in distribution of data for the further quantitative analysis, PP plot, applications and usage of PP Plot for distribution detection.**Customization:** Introduction to annotations – adding : text, mathematical expression , lines, arrows, shaded shapes, highlighting the texts and items, adding error bars, introduction to axis, swapping x and y axis, changing the scaling ration in the axis, positioning of axis and arranging tick marks and labels, changing the appearance of axis labels, circular graphs, using themes, changing the appearance of theme elements, creating the own themes, legends : removing the legends, position of legends, legend title, labels in legends.

Text Books:

1. Munzner, Visualization Analysis and Design, 2014, ISBN 1466508914
2. Ware, Information Visualization: Perception for Design, 3rd ed. Morgan Kaufmann, 2012, ISBN 0123814642 (available electronically through the Clemson University libraries)

Reference Books:

1.Visualizing Data. O'Reilly Media, 2008, ISBN 0596514557

Artificial Intelligence(AI) Stream

22CA22CA1O: Artificial Intelligence

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Introduction to AI, Understand about intelligence, knowledge and Artificial Intelligence, techniques of AI as a State space search, Production Systems.	PO1	2
CO2	Problem solving by Search, Heuristic Search, Randomized search techniques and Finding Optimal paths	PO2, PO3, PO4	3
CO3	Application of the appropriate methodologies for problem decompositions, planning and constraint data constraint satisfactions.	PO2,PO3,PO9	3
CO4	Understand Knowledge Representation using Predicate Logic, Representing Knowledge using Rules, Semantic Nets, Frames and Conceptual dependencies.	PO1, PO4, PO5	3
CO5	Experiment the theoretical concepts to conduct various experiments on Search Techniques and Language Representation and processing using AI .	PO1, PO2, PO3, PO4,PO5, PO9	5

Syllabus:

Introduction: Overview and Historical Perspective, Turing test, Physical Symbol Systems and the scope of Symbolic AI, Agents. State Space Search: Depth First Search, Breadth First Search, DFID. Heuristic Search: Best First Search, Hill Climbing, Beam Search, Tabu Search. Randomized Search: Simulated Annealing, Genetic Algorithms, Ant Colony optimization. Finding Optimal Paths: Branch and Bound, A*, IDA*, Divide and Conquer approaches, Beam Stack Search. Problem Decomposition: Goal Trees, AO*, Rule Based Systems, Rete Net. Game Playing: Planning and Constraint Satisfaction: Domains, Forward and Backward Search, Goal Stack Planning, Plan Space Planning, Graph plan, Constraint Propagation. Logic and Inferences: Propositional Logic, First Order Logic, Soundness and Completeness, Forward and backward chaining.

Text Books :1. Deepak Khemani.A First Course in Artificial Intelligence, McGraw (India), 2013. Hill Education

Reference Books :1. Stefan Edelkamp and Stefan Schroedl. Heuristic Search: Theory and Applications, Morgan Kaufmann, 2011.

2. John Haugeland, Artificial Intelligence: The Very Idea, A Bradford Book, The MIT Press, 1985.

22CA22A2O: Data Mining in Business Intelligence

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Explain the concepts of Business Intelligence and data warehouse	PO3	2
CO2	Summarize trends in data warehousing and data Mining	PO2,PO3	2
CO3	Outline classification, Cleaning and description of Data Mining and know where they apply in Business	PO2, PO4	3
CO4	Apply basic concepts, Market basket analysis and algorithm and generating rules	PO4, PO5, PO9, PO10	4
CO5	Estimate Business Intelligence data using data mining methods	PO5, PO7, PO8, PO9	5

Syllabus:

Overview and Concepts of Business Intelligence: Why reporting and Analyzing data, Raw data to valuable information. Lifecycle of Data - What is Business Intelligence? BI and DW in today's perspective. What is data warehousing? The building Blocks: Defining Features - Data warehouses and data marts - Overview of the components - Metadata in the data warehouse - Need for data warehousing -Basic elements of data warehousing – trends in data warehousing. The Architecture of BI and DW: BI and DW architectures and its types - Relation between BI and DW Introduction to Data Mining (DM): Motivation for Data Mining - Data Mining-Definition and Functionalities – Classification of DM Systems - DM tasks primitives - Integration of a Data Mining system with a Database or a Data Warehouse - Issues in DM – KDD Process. Data Pre-processing: Why to pre-process data? - Data cleaning: Missing Values, Noisy Data. Data Integration and transformation, Data Reduction: Data cube aggregation, Dimensionality reduction, Data Compression, Data Mining Primitives, and Languages. Concept Description and Association Rule Mining: What is concept description? Data Generalization and summarization-based characterization, Attribute relevance, class comparisons Association Rule Mining: Market basket analysis, basic concepts, finding frequent item sets: A prior algorithm, generating rules, Incremental ARM, Associative Classification – Rule Mining.

Text Books :

1.Business Intelligence : Data mining and optimisation for decision Making : Anil K Maheswari Business Express Press Publications

Reference Books :

1. Data Mining Concepts and Techniques, J. Han, M. Kamber
2.Data mining: Concepts, models, methods and algorithms, M. Kantardzic, Wiley & Son

22CA32A4O: Robotic Process Automation

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Explain the RPA Foundations and RPA Skills.	PO1	2
CO2	Understand the Process Methodologies and Requirements for RPA Environment Planning.	PO2, PO10	2
CO3	Demonstrate the Process and Methodology of BOT Development.	PO3, PO7	2
CO4	Outline the Deployment, Monitoring and Data Preparation Methodologies.	PO3, PO4, PO5	2
CO5	Implementation of BOT Development Process and Verification using the RPA Tools [UI Path].	PO3, PO4, PO5	5

Syllabus:

RPA Foundations, RPA Skills: RPA Foundations, What Is RPA, Flavours of RPA, History of RPA, The Benefits of RPA, The Downsides of RPA, RPA Compared to BPO, BPM, and BPA Consumer Willingness for Automation the Workforce of the Future. On-Premise Vs. the Cloud Web Technology Programming Languages and Low Code OCR (Optical Character Recognition), Databases APIs (Application Programming Interfaces), AI (Artificial Intelligence) Cognitive Automation Agile, Scrum, Kanban, and Waterfall, DevOps, Flowcharts. Process Methodologies and Planning: Lean Six Sigma, how to Implement Six Sigma, Six Sigma Roles and Levels Lean Six Sigma, Finding the Right Balance, Applying Lean and Six Sigma to RPA. The Preliminaries, use a Consulting Firm, RPA Consulting: Some Case Studies What to Automate, ROI for RPA, RPA Use Cases the Plan. BOT Development: Preliminaries. Installation of UiPath, Getting Started, Activities, Flowcharts and Sequences, Log Message, Variables, Loops and Conditionals, For Each Loop, Do While Loop and While Loop, IF/THEN/ELSE Conditionals, Switch, Debug, Common UiPath Functions, The UiPath Orchestrator, Best Practices for Bot Development. Deployment and Monitoring, Data Preparation: Testing, Going into Production Monitoring, Security, Scaling and Types of Data, Big Data, The Issues with Big Data, The Data Process, Types of Algorithms, The Perils of the Moonshot, Bias.

Text Books :

1. The Robotic Process Automation Hand Book (A Guide to Implementing RPA Systems) by Tom Taulli. 2. Learning Robotic Process Automation: Create Software robots and automate business processes with the leading RPA tool - UiPath: Create Software robots. with the leading RPA tool – UiPath Kindle Edition

Reference Books :

1. Robotic Process Automation A Complete Guide - 2020 Edition Kindle Edition
2. The Practitioner's Guide to RPA: A Practical Guide for Deploying Robotics Process Automation (Practioner's Guide) by Jonathon Sireci.

22CA32A5O: Deep Learning

L-T-P-S: 2-0-2-4 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Explain the concepts of Perception, Back Propagation, PCA, Singular Value Decomposition	PO1	2
CO2	Compare Autoencoders, Regularization, Denoising, Convolutional Neural Networks,	PO2	3
CO3	Construct Long Short Term Memory (LSTM) Restricted Boltzmann Machines, Deep Dream, GRU, Neural style transfer,	PO3	3
CO4	Build Markov models, Markov networks, Markov chains, Variational autoencoders, Autoregressive Models, and Generative Adversarial Networks (GANs).	PO2	3
CO5	Implement basic neural networks, optimization algorithms, engine vector decomposition, various types of autoencoders, batch normalization, convolutional neural networks	PO6, Po4, PO5, PO9, PO10	5

Syllabus:

Syllabus : History of Deep Learning, McCulloch Pitts Neuron, Thresholding Logic, Perceptron's, Perceptron Learning Algorithm and Convergence, Multilayer Perceptron's (MLPs), Representation Power of MLPs, Sigmoid Neurons, Feedforward Neural Networks, Backpropagation, Gradient Descent (GD), Momentum Based GD, Eigenvalues and eigenvectors, Eigenvalue Decomposition, Principal Component Analysis, Singular Value Decomposition. Autoencoders, Denoising autoencoders, Sparse autoencoders, Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Batch Normalization, Convolutional Neural Networks, LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, ResNet Object Detection, RCNN, Fast RCNN, Faster RCNN, YOLO. Long Short Term Memory (LSTM) Restricted Boltzmann Machines, Deep Dream, GRU, Neural style transfer, Deep learning for computer vision, text and sequences. Markov models, Markov networks, Markov chains, Variational autoencoders, Autoregressive Models: NADE, MADE, PixelRNN, Generative Adversarial Networks (GANs), how to train DCGAN, limitations of deep learning

Text Books :

1. Deep learning with python – Francois Chollet, Manning publishers, 2018, ISBN-9781617294433
2. Grokking deep learning, Andrew w Trask, 2019, Manning publishers, ISBN-9781617293702

Reference Books :

1. Deep Learning with PyTorch: A practical approach to building neural network models using PyTorch by Vishnu bramanian
2. Neural Networks: A Systematic Introduction, Raúl Rojas, 1996 Pattern Recognition and Machine Learning, Christopher Bishop, 2007.

Internet of Things(IOT) Stream

22CA21I1O: Essentials of IOT

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
1	Explain the fundamental principles of Internet Of Things with Raspberry PI	PO2	2
2	Summarize knowledge in OSI Network Layers and versions of internet protocols	PO3	3
3	Outline IOT design components	PO3	3
4	Understand IOT technologies and deployment models	PO4, PO5, PO7	2
5	Evaluate and establish communication among IOT devices	PO5, PO6, PO7, PO8, PO9	5

Syllabus:

Introduction to IOT: Definition, Characteristics, things in IOT, Challenges of IOT based Systems, IOT Device: Building Blocks, Raspberry Pi as an IOT device, Raspberry PI components, Porting LINUX on Raspberry PI, Raspberry PI frequently used commands, Raspberry PI interfaces: Serial, SPI and I2C, OtherIOT devices.**IOT Communication model and Protocols:** Link Layer: 802.3 Ethernet, 802.11 WiFi, 802.16 WiMax, 802.15.4 LR-WPAN, 2G/3G/4G Mobile Communication, Network/Internet Layer: IPv4, IPv6, IPv6 Low power, Transport Layer: TCP, UDP, Application Layer: HTTP, CoAP, Web Socket, MQTT, XMPP, DDS, AMQP.**IOT Design Components:** Function Blocks, Communication Models, Communication API.**IOT Enabling Technologies:** Wireless sensor networks, Cloud Computing, Big data Analytics, Embedded Systems, Communication protocols.**IOT Topologies and deployment models:** IOT Deployment components (Devices, resources, controller service, database, web services (stateless/Stateful, Unidirectional / Bi Directional, Request-response/Full duplex, TCP Connections, Header Overhead **,** Scalability**),** Analysis Components, Applications, Communication Topologies**:** Level-1, Level-2, Level-3, Level-4, Level-5, Level-6

Text Book:

1.Arshdeep Bahga and Vijay Madisetti,, Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547

Reference Books:

1.Wolfram Donat “Learn Raspberry Pi programming in python”, Apress (2014), ISBN – 9781430264255

2.Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014, ISBN: 9789350239759.

22CA22I2O: Microprocessor and Microcontroller

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
1	Understanding the architecture and instruction set of 8086 microprocessor	PO1	2
2	Identify a detailed software and hardware structure of the microprocessor.	PO3	2
3	**Illustrate how the different peripherals are interfaced with microprocessor**.	PO2, PO7, PO9	3
4	Analyze merits and demerits of various applications of the microprocessors	PO4, PO7, PO9	3
5	Evaluate applications of microprocessor 8086 instruction set	PO6, PO8, PO9, PO10	5

Syllabus:

Introduction to 8086 Microprocessor – Microprocessor architecture – Addressing modes – Instruction set and assembler directives – **Assembly language programming** – Modular Programming – Linking and Relocation – Stacks – Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – **Introduction to Multiprogramming** – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors. Memory Interfacing and I/O interfacing – Parallel communication interface – Serial communication interface – D/A and A/D Interface – Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications **Case studies:** Traffic Light control,LED display , LCD display, Keyboard display interface and Alarm Controller. **:**Architecture of 8051 – Special Function Registers(SFRs) – I/O Pins Ports and Circuits – Instruction set – Addressing modes – Assembly language programming.

Text Books:

1.Yu-Cheng Liu, Glenn A.Gibson, -Microcomputer Systems: The 8086 / 8088 Family - Architecture,ProgrammingandDesign‖,SecondEdition,PrenticeHallofIndia,2007.(UNITI-III)
2.MohamedAli Mazidi, JaniceGillispie Mazidi, Rolin McKinlay, -The 8051Microcontrollerand Embedded Systems:UsingAssembly and C‖,Second Edition,Pearson education,2011.(UNITIV-V)

Reference Books:

1.DoughlasV.Hall,-MicroprocessorsandInterfacing,Programmingand Hardware‖,TMH,2012
2.A.K.Ray,K.M.Bhurchandi,‖Advanced Microprocessors and Peripherals-3rdedition,Tata McGrawHill,2012

22CA31I3O: Electronics and Sensor Technology

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Understandtheroleofsensorandactuatorsinrealtimeaspects and Analog and Digital Actuators.	PO2	2
CO2	ConstructtheroleofsignalconditioningcircuitsandImpedance Matching circuits	PO3	3
CO3	Understanddifferentgenerationofsensorsforthedevelopmentof IoT based Networks	PO2, PO7	2
CO4	AnalyzetheroleofdifferentEnergy management in IoT	PO4, PO9, PO7	3
CO5	Evaluate IoT application with sensors and actuators	PO4	6

Syllabus:

Introduction to Sensors and Actuators: Role of sensors and actuators, Sensors and Actuators in Automobile Systems, Sensors, and Actuators in the feedback control system the importance of sensing,InnovativeSensortechnologies,Applicationscenarios, Analog anddigitaltransducersandActuators Components interconnections and signal conditioning: Component interconnection. Signalmodification conditioning,ImportanceofImpedanceMatchinginComponentInterconnection,Impendencematching methods Generation of IoT sensors – Description & Characteristics–First Generation – Description & Characteristics–AdvancedGeneration–Description&Characteristics–IntegratedIoTSensors–Description& Characteristics– Polytronics Systems – Description & Characteristics–Sensors' Swarm – Description &Characteristics–Printed Electronics – Description & Characteristics–IoT Generation Roadmap. Energy sources andpowermanagementPowermanagement:Energyharvesting,solarharvesting,Piezo-mechanicalharvesting, RF energy harvesting, Energy storage: Energy and power models, Batteries, Super capacitors, radioactive power sources.

TextBooks:

1.Sensorsandactuators,EngineeringSystemforinstrumentation,2ndEdition,ClarenceWdSelva,CRCPress2.Dr.GuillaumeGirardin,AntoineBonnabel,Dr.EricMounier,'Technologies & Sensors for the Internet of Things Businesses & Market Trends 2014 - 2024', Yole Dévelopment

Reference Books:

1.Internet of things for architects by PerryLea,Packt Publishing ltd.,2018.2.Smart SensorsandSystems:InnovationsforMedical,Environmental,andIoTAplicationeditedbyChong-Min Kyung, Hiroto Yasuura, Yongpan Liu, Youn-Long LinCopyrights, 2014

22CA32I4O: IoT Design and Development

L-T-P-S: 2-0-2-0 **Credits:3** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
CO1	Explain IoT, Enabling Technologies, (IoTWF) Standardized Architecture, Core IoT Functional Stack, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects	PO1,PO2	2
CO2	Illustrating IoT Protocols, Physical and MAC layers, Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer, Application Transport Methods	PO2	2
CO3	Demonstrating IoT Design and Development, Overview of IoT supported Hardware, IoT applications in home, infrastructures, buildings, security, Industries, Home appliances	PO4, PO9, PO7	3
CO4	Solving and Scheduling IoT Data Analytics. IoT Data Analytics Challenges, Organizing in IoT/M2M, Supporting Services-Computing Using a Cloud Platform for IoT/M2M Applications/Services	PO2,PO4, PO5, PO7	3
CO5	Evaluate IOT Applications	PO5, PO6, PO8, PO9	5

Syllabus:

Internet of Things Evolution (IoT), Enabling Technologies, M2M Communication, IoT World Forum (IoTWF) Standardized Architecture, Simplified IoT Architecture, Core IoT Functional Stack, Fog, Edge and Cloud in IoT, Functional blocks of an IoT ecosystem, Sensors, Actuators, Smart Objects and Connecting Smart Objects. IoT Protocols-IoT Access Technologies, Physical and MAC layers, Topology and Security of IEEE 802.15.4, 802.11ah and Lora WAN, Network Layer: IP versions, Constrained Nodes and Constrained Networks,6LoWPAN, Application Transport Methods: SCADA, Application Layer Protocols: CoAP and MQTT IoT Design and Development-Design Methodology, Embedded computing logic, Microcontroller, System on Chips, IoT system building blocks IoT Platform overview: Overview of IoT supported Hardware platforms such as: Raspberry pi, Arduino Board details, IoT applications in home, infrastructures, buildings, security, Industries, Home appliances, other IoT Electronic Equipment's, Industry 4.0 concepts. IoT Data Analytics Introduction, Structured Versus Unstructured Data, Data in Motion versus Data at Rest, IoT Data Analytics Challenges, Data Acquiring, Organizing in IoT/M2M, Supporting Services- Computing Using a Cloud Platform for IoT/M2M Applications/Services, Everything as a service and Cloud Service Models.

Text Books :

1. IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, Cisco Press, 2017
2.Internet of Things – A hands-on approach, Arshdeep Bahga, Vijay Madisetti, Universities Press, 2015

22CA32I5O:Advance Embedded System

L-T-P-S: 2-0-2- 4 **Credits:4** **Prerequisite: Nil**

Mapping of Course outcomes (CO) with program outcomes (PO):

CO No	Course Outcomes	PO	BTL
1	Understanding the key features of embedded systems	PO1	2
2	Understanding the Hardware fundamentals of Embedded systems	PO3	2
3	Comprehending multithreaded programs on arduino software package under Linux platform	PO2, PO7, PO9	3
4	Applying the peripheral interfacing in embedded system environment	PO4, PO7, PO8, PO9	3
5	Evaluate and develop a applications of Embedded systems	PO5, PO7, PO8, PO10	5

Syllabus:

Introduction to Embedded Systems: Definition, Comparison with Loaded Systems, Challenges of Embedded systems, Application of Embedded Systems. Reading through an Embedded Board, terminology, symbols and notations considering Arduino board.**Hardware fundamentals:** Power and decoupling, open collector out puts, Tristate outputs, Signal loading related issues, Memories type and selection, Processor types and selection**Introduction to Embedded programming:** Languages that can be used to develop firmware. Differences between C and Embedded C especially related to address mapping, Relevance to Header files included into the embedded C programs in relation to Arduino board. **IDE:** Introduction to IDE, Downloading and installing Arduino IDE, Setting environment for development of applications using Arduino board. Sample program.Testing and Debugging Techniques, Testing and Debugging Tools (Beyond Syllabus). General discussion on Atmega 328, Timers, Counters, watchdog timer, Pulse width Modulation, Interrupts.**Overview on device interfacing with Atmega 328:** LCD, Key Pad Stepper motor, A/D Converters.**Writing on to LCD at function Level:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, Developing sample application to write on to LCD.**Reading analog inputs (Flow) through A/D converters:** Block diagrams, Layout, principalof operation, interfacing with a Micro controller, sample application. **Reading analog inputs (Temperature) through A/D converters:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application. **Reading analog inputs (Humidity) through A/D converters:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application.**Reading from Matrix Keyboards:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application.**Pulse with modulation:** The primary concepts **Use of pulse width modulators for speed control of stepper Motors:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application,**Use of pulse width modulators for speed controlof DC motors:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application **Basic Interfacing:** Interfacing through Ports and PINS, Implementing Memory based and I/O based and BUS based Addressing, Interrupt based I/O, Interrupt latency.**Measuring time through timers:** Block diagrams,

Layout, principal of operation, interfacing with a Micro controller, Developing sample application using timers. **Using counters:** Block diagrams, Layout, principal of operation, interfacing with a Micro controller, sample application.

Text Books:

1. An Embedded Software Premier - David E- Simon, PEARSON Education,2009.
2. Embedded System Design - Frank Vahid / Tony Givargis, WILEY India,2009.

Referenc Books:

1. Embedded Systems - Raj – Kamal, Second Edition TMH,2009.
2. The 8051 Microcontroller and Embedded Systems-Mazidi and Mazidi, 2 Edition