S.A. ENGINEERING COLLEGE

(Autonomous)
(An Autonomous Institution, Affiliated to Anna University)
POONAMALLEE – AVADI ROAD
THIRUVERKADU POST, CHENNAI – 600 077

SYLLABUS R2020A

B.Tech. COMPUTER SCIENCE AND BUSINESS SYSTEMS

CHOICE BASED CREDIT SYSTEM

S.A. ENGINEERING COLLEGE

(Autonomous)

CHENNAI-600 077

(An Autonomous Institution, Affiliated to Anna University)

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS

S.A. ENGINEERING COLLEGE (AUTONOMOUS) – VISION AND MISSION

VISION

To transform our institution into quality technical education center imparting updated technical knowledge with character building.

MISSION

- To create an excellent teaching and learning environment for our staff and students to realize their full potential thus enabling them to contribute positively to the community.
- To significantly enhance the self-confidence level for developing creative skills of staff and students.

DEPARTMENT OF COMPUTER SCIENCE AND BUSINESS SYSTEMS – VISION AND MISSION

VISION

To produce industry ready professionals with information technology acquaintance and human values to contribute to the society at large.

MISSION

- ✓ To develop and to promote student ability thereby to compete globally through excellence in education.
- ✓ To inculcate varied skill sets that meets industry standards and to practice moral values.
- ✓ To enrich high integrity to lead and to serve the society.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

1. To ensure graduates will be proficient in utilizing the fundamental knowledge of basic sciences, mathematics, Computer Science and Business systems for the applications relevant to various streams of Engineering and Technology.
2. To enrich graduates with the core competencies necessary for applying knowledge of computer science and Data analytics tools to store, retrieve, implement and analyze data in the context of business enterprise
3. To enable graduates to gain employment in organizations and establish themselves as professionals by applying their technical skills and leadership qualities to solve real world problems and meet the diversified needs of industry, academia and research
4. To equip the graduates with entrepreneurial skills and qualities which help them to perceive the functioning of business, diagnose business problems, explore the entrepreneurial opportunities and prepare them to manage business efficiently.

PROGRAM OUTCOMES AS DEFINED BY NBA (POs)

Engineering Graduates will be able to:

1. **Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

2. **Problem analysis:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3. **Design/development of solutions:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.

4. **Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.

5. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.

6. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

7. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.

8. **Ethics:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.

9. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

10. **Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.

11. **Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.

12. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

PROGRAM SPECIFIC OUTCOMES (PSO)

PSO1: To create, select, and apply appropriate techniques, resources, modern engineering and business tools including prediction and data analytics to complex engineering activities and business solutions.

PSO2: To manage complex IT projects with consideration of the human, financial, ethical and environmental factors and an understanding of risk management processes, and operational and policy implications.

SEMESTER I

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY COURSES								
1.	HS1101A	Technical English	HS	3	3	0	0	3
2.	MA1101A	Calculus and its Applications	BS	4	3	1	0	4
3.	PH1101A	Applied Physics	BS	3	3	0	0	3
4.	CY1101A	Engineering Chemistry	BS	3	3	0	0	3
5.	CS1101A	Problem Solving and Python Programming	ES	3	3	0	0	3
PRACTICALS COURSES								
6.	BS1101A	Physics and Chemistry Laboratory	BS	4	0	0	4	2
7.	CS1102A	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8	GE1201A	Engineering Practices Laboratory	ES	4	0	0	4	2
MANDATORY COURSES								
9.	CI1101A	Indian Constitution	MC	2	2	0	0	0
10.	TA1101A	Tamilar Marabu /Heritage of Tamils	MC	1	1	0	0	1
			TOTAL	**31**	**18**	**1**	**12**	**23**

SEMESTER II

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY COURSES								
1.	HS1201A	English for Communication	HS	3	3	0	0	3
2.	MA1201A	Complex Variables and Transforms	BS	4	3	1	0	4
3.	PH1201A	Materials Science	BS	3	3	0	0	3
4.	EE1202A	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
5.	CS1201A	Programming in C	PC	3	3	0	0	3
6.	CS1202A	Fundamentals of Computing	PC	3	3	0	0	3
7	ME1101A	Engineering Graphics	ES	4	2	0	2	3
PRACTICALS COURSES								
8.	CS1203A	Programming in C Laboratory	ES	4	0	0	4	2

9.	CS1204A	Fundamentals of Computing Laboratory	PC	2	0	0	2	1
MANDATORY COURSES								
10.	CY1201A	Environmental Science and Engineering	MC	2	2	0	0	0
11	TA1201A	Tamilar Thozhil Nutpam / Tamils and Technology	MC	1	0	0	1	1
			TOTAL	**32**	**22**	**1**	**9**	**26**

SEMESTER III

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1.	MA1303A	Discrete Mathematics	HS	3	3	1	0	4
2.	IT1301A	Object Oriented programming	PC	3	3	0	0	3
3.	CS1301A	Data Structures	PC	3	3	0	0	3
4.	CW1301A	Digital Principles and Computer Organization	PC	3	3	0	0	3
5.	CW1302A	Introduction to Business Systems	PC	3	3	0	0	3
6.	CS1302A	Software Engineering	PC	3	3	0	0	3
PRACTICALS								
7.	IT1302A	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8.	CS1303A	Data Structures Laboratory	PC	4	0	0	4	2
9.	HS1301A	Interpersonal Skills Laboratory	EEC	2	0	0	2	1
			TOTAL	**28**	**18**	**1**	**10**	**24**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY COURSES								
1	HV1401A	Universal Human Values	PC	3	3	0	0	3
2	IT1401A	Database Management Systems	PC	3	3	0	0	3
3	CS1402A	Design and Analysis of Algorithms	PC	3	3	0	0	3
4	CW1401A	Fundamentals of Data science	PC	3	3	0	0	3
5	MA1406A	Optimization Techniques	HS	3	3	1	0	4
6	CW1402A	Introduction to FINTECH	PC	3	3	0	0	3
PRACTICAL COURSES								
7	CS1404A	Design and Analysis of Algorithms Laboratory	PC	4	0	0	4	2
8	IT1402A	Database Management Systems Laboratory	PC	4	0	0	4	2
9	HS1401A	Employability and Soft Skills Lab	EEC	2	0	0	2	1
TOTAL				**28**	**18**	**1**	**10**	**24**

SEMESTER V

S.NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT HOURS	L	T	P	C
THEORY								
1	CW1501A	Fundamentals of Management	PC	3	3	0	0	3
2	CS1501A	Operating Systems	PC	3	3	0	0	3
3	CW1502A	Design Thinking	PC	3	3	0	0	3
4	IT1501A	Computer Networks	PC	3	3	0	0	3
5	CW1503A	Data and Information Security	PC	3	3	0	0	3
6	OE	Open Elective - I	OE	3	3	0	0	3
PRACTICALS								
7	IT1503A	Networks Laboratory	PC	4	0	0	4	2

8	CS1503A	Operating Systems Laboratory	PC	4	0	0	4	2
			TOTAL	**26**	**18**		**8**	**22**

SEMESTER VI

Sl. No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT HOURS**	**L**	**T**	**P**	**C**
THEORY COURSES								
1	CS1603A	Artificial Intelligence	PC	3	3	0	0	3
2	CS1604A	Cryptography and Network Security	PC	3	3	0	0	3
3	CW1601A	Business Analytics	PC	3	3	0	0	3
4	CW1602A	Machine Learning for predictive Analytics	PC	3	3	0	2	4
5	PE	Professional Elective –I	PE	3	3	0	0	3
PRACTICAL COURSES								
7	CW1603A	Business Analytics Laboratory	PC	4	0	0	4	2
8	CS1606A	Security Laboratory	PC	4	0	0	4	2
9	CW1604A	Mini Project	EEC	2	0	0	2	1
			TOTAL	**25**	**15**	**0**	**12**	**21**

SEMESTER VII

Sl.No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT HOURS**	**L**	**T**	**P**	**C**
THEORY COURSES								
1	CW1701A	Services Operations & Management	ES	3	3	0	0	3
2	CW1702A	Data visualization and Analytics	PC	4	3	0	1	4
3	CW1703A	IT Project Management	PC	3	3	0	0	3
4	PE	Professional Elective-II	PE	3	3	0	0	3
5	OE	Open Elective - II	OE	3	3	0	0	3
PRACTICAL COURSES								

6	CW1705A	MATLAB for Business Analytics Lab	PC	3	1	0	2	2
7	CW1704A	Project Evaluation -I	EEC	2	0	0	2	1
			TOTAL	**21**	**16**	**0**	**5**	**19**

SEMESTER VIII

Sl. No.	**COURSE CODE**	**COURSE TITLE**	**CATEGORY**	**CONTACT HOURS**	**L**	**T**	**P**	**C**
THEORY COURSES								
1	PE	Professional Elective-III	PE	3	3	0	0	3
2	PE	Professional Elective-IV	PE	3	3	0	0	3
PRACTICAL COURSES								
3	CW1801A	Project Evaluation II	EEC	16	0	0	16	8
			TOTAL	**22**	**6**	**0**	**16**	**14**

Total Credits: 173

PROFESSIONAL ELECTIVE LIST

SEMESTER VI

PROFESSIONAL ELECTIVE – I

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	CW1611A	Conversational Systems	3	0	0	3
2	CW1612A	Cloud, Micro services and Application	3	0	0	3
3	CW1613A	Modern Web Application	3	0	0	3
4	CW1614A	Cryptocurrency and Blockchain Technologies	3	0	0	3
5	CW1615A	FINTECH REGULATION	3	0	0	3

SEMESTER VII

PROFESSIONAL ELECTIVE –II

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	CW1711A	Cognitive Science and Analytics	3	0	0	3
2	CW1712A	Introduction to IoT	3	0	0	3
3	CW1713A	Cryptology	3	0	0	3
4	CW1714A	Deep Learning	3	0	0	3
5	CW1715A	Robotics and Embedded Systems	3	0	0	3

PROFESSIONAL ELECTIVE –III

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	CW1716A	Time series Analysis	3	0	0	3
2	CW1717A	Advance Social, Text and Media Analytics	3	0	0	3
3	CW1718A	Mobile Computing	3	0	0	3

SEMESTER VIII

PROFESSIONAL ELECTIVE –IV

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	CW1811A	Behavioural Economics	3	0	0	3
2	CW1812A	Computation Finance and Modelling	3	0	0	3
3	CW1813A	Psychology	3	0	0	3
4	CW1814A	Data mining and Analytics	3	0	0	3
5	CW1815A	Image Processing and Pattern Recognition	3	0	0	3

Open Elective – I

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	OCW1511A	Storage Technologies	3	0	0	3
2	OCW1512A	Resource Management Techniques	3	0	0	3

Open Elective –II

S.NO	COURSE CODE	COURSE TITLE	L	T	p	C
1	OCW1711A	Project Report Writing	3	0	0	3
2	OCW1712A	Queueing and Reliability Modelling	3	0	0	3

SEMESTER I

COURSE TITLE	TECHNICAL ENGLISH	CREDITS	3

COURSE CODE	HS1101A	COURSE CATEGORY	HS	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL -3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts. 2. Nurture their ability in technical writing like to prepare professional job applications and effective reports. 3. Develop their speaking skills by participating in various speaking activities. 4. Strengthen their listening skill to comprehend lectures and talks in their areas of specialization. 5. Improve their ability to explicit their excellence in all modes of technical communication.
Course Outcome	Upon completion of this course, the students will be able to 1. Read technical texts and write area- specific texts effortlessly. 2. Listen and comprehend lectures and talks in their area of specialization successfully. 3. Speak appropriately and effectively in varied formal and informal contexts. 4. Write correctly, clearly and concisely with coherence and cohesion. 5. Prepare job applications and resume in an inspiring manner. 6. Communicate and interpret any idea in any form.

Prerequisites:

UNIT I:

Reading- Reading short texts Listening- Listening to different formal / informal conversations Writing- Instructions, Jumbled sentences Speaking- Self introduction Language development- Parts of speech, Prepositions Vocabulary development- Word formation- root words from foreign language and their use in English.

UNIT II:

Reading-Skimming and Scanning to find specific information Listening- Listening to INK talks Writing- Job Application – cover letter, resume writing Speaking- Asking and Giving directions Language development- Conjunctions, Types of Nouns Vocabulary development- Prefixes and Suffixes.

UNIT III:

Reading- Reading for predicting the content Listening- Listening to situational short talks Writing- Types of paragraphs- Descriptive/Analytical/ compare and contrast Speaking- Mini presentations, Expressing greeting and thanks Language development- Adjectives, Numerical Adjectives, Conditional Clauses Vocabulary development- Homophones, Homonyms.

UNIT IV:

Reading- Practice in speed reading Listening- Listening to short texts and fill the data Writing- Interpretation of Graphics / Information, Note making Speaking-Contributing for Group Discussion Language development- Active, Passive, Impersonal passive voice Vocabulary development- Definitions, Nominal Compounds.

UNIT V:

Reading- Reading short stories Listening- Listening for note taking Writing- Report writing, E-mail Writing Speaking- Picture descriptions, Speaking in familiar situations Language development- Tenses Vocabulary development- British and American Vocabulary.

TEXT BOOKS

1.	Richards, C. Jack. Interchange Students' Book-2 New Delhi: CUP, 2015.
2.	Board of editors. Fluency in English A Course book for Engineering and Technology. Orient Blackswan, Hyderabad: 2016.
3.	Swan Michael, Practical English Usage. Oxford University Press, Eighth impression 2002.
REFERENCE BOOKS	
1.	Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge, 2011.
2.	Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
3.	Darlene Smith-Worthington, Sue Jefferson, Technical writing for Success, South-Western Cengage Learning,USA-2011
4.	Means, L. Thomas and Elaine Langlois, English & Communication For Colleges. Cengage Learning, USA: 2007
5.	Raman, Meenakshi and Sharma, Sangeetha- Technical Communication Principles and Practice. Oxford University Press: New Delhi, 2014
EBOOKS	
1.	bbc.co.uk/1learning English
MOOC	
1.	https://www.mooc-list.com/tags/technical-english

COURSE TITLE	**CALCULUS AND ITS APPLICATIONS**			**CREDITS**	**4**
COURSE CODE	**MA1101A**	**COURSE CATEGORY**	**BS**	**L-T-P-C**	**3-1-0-4**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL –**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To understand the concepts of limits, continuity, differentiation and use it to find maxima and minima of functions of one variable. 2. To make the student acquire sound knowledge of techniques in solving ordinary differential equations of first and second order that model in various engineering problems. 3. To familiarize the student with functions of several variables that is needed in many branches of engineering. 4. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their usage.
Course Outcome	Upon completion of this course, the students will be able to 1. Use both the limit definition and rules of differentiation to differentiate functions. apply differentiation to solve maxima and minima problems. 2. The subject helps the students to develop the fundamentals and basic concepts in ODE 3. Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.

Prerequisites:

UNIT I: DIFFERENTIAL CALCULUS **12**

Representation of functions – Limit of a function – Continuity – Derivatives – Differentiation rules Maxima and Minima of functions of one variable.

UNIT II: ORDINARY DIFFERENTIAL EQUATIONS OF FIRST ORDER WITH APPLICATIONS **12**

Basic concepts- Separable differential equations - Exact differential equations - Integrating factors - Linear differential equations - Bernoulli's equation - Geometric Applications- Orthogonal trajectories - Physical Applications - Simple electronic circuits-Newton law of cooling-Heat flow-Rate of decay of radioactive materials-Chemical reaction and solutions.
UNIT III:DIFFERENTIAL EQUATIONS 12
Higher order linear differential equations with constant coefficients - Method of variation of parameters – Homogenous equation of Euler's and Legendre's type – System of simultaneous linear differential equations with constant coefficients - Method of undetermined coefficients.
UNIT IV: FUNCTIONS OF SEVERAL VARIABLES 12
Partial differentiation – Homogeneous functions and Euler's theorem – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor's series for functions of two variables – Maxima and minima of functions of two variables – Lagrange's method of undetermined multipliers.
UNIT V: MULTIPLE INTEGRALS 12
Double integrals – Change of order of integration – Double integrals in polar co-ordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

TEXT BOOKS	
1.	Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.
REFERENCE BOOKS	
1.	Bali,N.P., Goyal,M.,Watkins,C.,Advanced Engineering Mathematics, Laxmi Publications Pvt. Limited, 2007.
2.	Boyce,W.E.,andDiPrima,R.C., Elementary Differential Equations and Boundary Value Problems, Wiley India, 2012.
3.	O'Neil. P. V., "Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4.	T.Veerarajan, Engineering Mathematics, Mc Grawhill Publications, New Delhi 2017.
EBOOKS	
1.	https://www2.math.binghamton.edu/lib/exe/fetch.php/people/mckenzie/bittinger_et_al..pdf
MOOC	
1.	https://www.coursera.org/learn/introduction-to-calculus

COURSE TITLE	**APPLIED PHYSICS**			**CREDITS**	**3**
COURSE CODE	**PH1101A**	**COURSE CATEGORY**	**BS**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.
Course Outcome	Upon completion of this course, the students will be able to 1. The students will gain knowledge on the basics of properties of matter and its applications. 2. Use the concepts of waves and optical devices and their applications in Laser and fiber optics. 3. The students will understand the properties of thermal materials and its applications.

	4. The students will get knowledge on advanced physics concepts of quantum theory and its application in one dimensional box. 5. The students will understand the different types of crystals structures and different crystal growth techniques.

UNIT I: PROPERTIES OF MATTER	**9**
Elasticity- plasticity – Different Types of Stress and Strain- concept of stress-strain diagram and its application - three types of modulus of elasticity- Poisson's Ratio – Bending of beams- Expression for bending moment –- young's modulus uniform and Non uniform bending : Theory and Experiment – I Shape girders – Torsional oscillation Theory and Experiment- Application of Elastic Materials.	
UNIT II: APPLIED OPTICS	**9**
Laser : characteristics of laser - Principle of spontaneous emission and stimulated emission – Laser action – Einstein A & B coefficients - Population inversion - Pumping – Basic requirement of laser – Types of laser : Nd-YAG and CO2 – Applications : Welding , Drilling & Cutting – Medical field Fiber optics: Introduction- Principle and propagation of light – Numerical aperture and acceptance angle – classification of optical fibers – Losses in optical fibers(Qualitative) – Fiber optics communication system (Block Diagram) – Advantages with fiber optic communication system.	
UNIT III:THERMAL PHYSICS	**9**
Modes of heat transfer- thermal conduction, convection and radiation – Specific heat capacity- thermal conductivity- Newton's law of cooling - Searle's and Lee's disc methods: theory and experiment - conduction through compound media (series and parallel) – thermal expansion of solids, liquids and gases - Applications: heat exchangers, refrigerators and solar water heaters.	
UNIT IV: WAVE AND PARTICLE PHYSICS	**9**
Inadequacy of Classical Mechanics - Development of quantum theory- Planck's Black body radiation and Distribution Laws(Qualitative) – Compton Effect (Derivation) - De Broglie wavelength – properties of matter waves – Experimental Verification (G.P Thomson experiment) – Heisenberg's uncertainty principle - Schrodinger's wave equation – time dependent – time independent wave equations – physical significance of Wave function – applications: particle in a one dimensional potential box.	
UNIT V: CRYSTALOGRAPHY	**9**
Single crystalline, polycrystalline and amorphous materials Lattice - unit cell- Crystal systems-Bravais lattices- Lattice planes- Miller indices- Interplanar- d- Spacing in cubic Lattice- calculation of number of atoms per unit cell – atomic radius – packing factor for SC, BCC, FCC and HCP structures- Crystal Defects – types.	

TEXT BOOKS	
1.	Gupta S.L. and Sanjeev Gupta, Modern Engineering Physics, Dhanpat Rai Publishers, 2015.
2.	R. K. Gaur and S.C. Gupta, Engineering Physics, Dhanpat Rai Publication (P) Ltd, New Delhi, 2014.
3.	Bhattacharya, D.K. and Poonam, T. Engineering Physics, Oxford University Press, 2015.
REFERENCE BOOKS	
1.	C. Kittel , Introduction to Solid State Physics 8th Edition , Wiley Eastern Ltd,2004.
2.	Halliday, D., Resnick, R. and Walker, J. Principles of Physics. Wiley, 2015.
3.	Tipler, P.A. and Mosca, G. Physics for Scientists and Engineers with Modern Physics, W.H.Freeman, 2007.
4.	Einstein coefficient calculation,https://youtu.be/TvfiZHXUtXg(Video lecture)
5.	Lattice structures, https://youtu.be/Rm-i1c7zr6Q(Video lecture)
EBOOKS	
1.	https://mrcet.com/downloads/digital_notes/HS/R20/APPLIED%20PHYSICS.pdf
MOOC	
1.	https://www.my-mooc.com/en/categorie/Physics

COURSE TITLE	ENGINEERING CHEMISTRY			CREDITS	3
COURSE CODE	CY1101A	COURSE CATEGORY	BS	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	• To make the students conversant with boiler feed water requirements, related problems and water treatment techniques. • To develop an understanding of the basic concepts of phase rule and its applications to single and Two component systems and appreciate the purpose and significance of alloys. • It enables the students to gain information about Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells. • It deals with the information about the types of fuels, calorific value calculations and manufacture of solid, liquid and gaseous fuels. • To impart knowledge about the nano materials synthesis, properties and applications.
Course Outcome	Upon completion of this course, the students will be able to • The knowledge gained on water treatment techniques will facilitate better understanding of engineering processes and applications for further learning. • With the help of phase rule, they could understand the various phase diagrams and able to predict the low melting alloys. • Students can get knowledge about various fuels and its applications based on its calorific value. • It provides the students to understand about conventional and non-conventional energy sources and its applications. • Students gain an insight about the recent trends in nano materials.

UNIT I: WATER TREATMENT AND TECHNOLOGY **9**

Introduction – characteristics, Water quality parameters -hardness– types, Determination-EDTA method, Alkalinity ,boiler feed water requirements-boiler troubles – scale & sludge -Caustic Embrittlement, boiler explosion -softening of hard water - external treatment process - demineralization and zeolite, internal treatment - boiler compounds (phosphate, calgon, carbonate and colloidal conditioning methods) – desalination of brackish water –reverse osmosis.

UNIT II: PHASE RULE AND ALLOYS **9**

Phase rule: Introduction, definition of terms with examples, One Component System- water system,Sulphur,CO2 system, Thermal Analysis and cooling curves, Reduced phase rule – Two Component Systems- classification – lead-silver system-problems. Alloys: Introduction- Definition- Properties of alloys- Significance of alloying, Functions and effect of alloying elements- Ferrous alloys- Nichrome and Stainless steel – heat treatment of steel.

UNIT III:ENERGY SOURCES AND STORAGE DEVICES **9**

Energy – Types – Non-renewable energy - Nuclear energy -renewable energy - solar energy conversion - solar cells. Introduction to Electrochemistry, Nernst Equation-Electrochemical cells – reversible and irreversible cells –Cell construction and representation - Batteries -types of batteries – characteristics – construction and working of primary battery (dry cell) - secondary battery(lithium-ion-battery) - fuel cells (H2-O2).

UNIT IV: FUELS AND COMBUSTION **9**

Fuel: Introduction- classification of fuels- calorific value- higher and lower calorific values- coal- analysis of coal (proximate and ultimate)- carbonization- manufacture of metallurgical coke (Otto Hoffmann method) – petroleum- manufacture of synthetic petrol (Bergius process)- knocking- octane number – diesel oil- cetane number – natural gas- compressed natural gas(CNG)- liquefied petroleum gases(LPG) producer of fuels: introduction- theoretical calculation of calorific value- ignition temperature- explosive range – flue gas analysis (ORSAT Method).
UNIT V: NANOCHEMISTRY **9**
Basics - distinction between nanoparticles and bulk materials; size- dependent properties, Nano cluster, Nano rod, nanotube(CNT)-Types of CNT and nanowire. Synthesis: precipitation, thermolysis, chemical vapour deposition, Properties, Characterization and applications.

TEXT BOOKS	
1.	Jain P.C. and Monica Jain, "Engineering Chemistry", DhanpatRai Publishing Company (P) Ltd., New Delhi, 2010.
REFERENCE BOOKS	
1.	Dara S.S, Umare S.S, "Engineering Chemistry", S. Chand & Company Ltd., New Delhi 2010
2.	Sivasankar B., "Engineering Chemistry", Tata McGraw-Hill Publishing Company, Ltd., New Delhi, 2008.
3.	Ozin G. A. and Arsenault A. C., "Nanochemistry: A Chemical Approach to Nanomaterials", RSC Publishing, 2005.
EBOOKS	
1.	https://sctevtodisha.nic.in/wp-content/uploads/2021/03/Engineering-Chemistry-1ST-YEAR-LM.pdf
MOOC	
1.	https://www.my-mooc.com/en/categorie/chemistry

COURSE TITLE	**PROBLEM SOLVING AND PYTHON PROGRAMMING**			**CREDITS**	**3**
COURSE CODE	**CS1101A**	**COURSE CATEGORY**	**ES**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To know the basics of algorithmic problem solving. 2. To read and write simple Python programs. 3. To develop Python programs with conditionals and loops. 4. To define Python functions and call them. 5. To use Python data structures –- lists, tuples, dictionaries. 6. To do input/output with files in Python.
Course Outcome	Upon completion of this course, the students will be able to • Understand the basic of algorithmic problem solving. • Be familiar with data expressions and statements. • Understand control flow and functions problems. • Comprehend lists, tuples and dictionaries. • Read and write data from/to files in Python Programs. • Understand object oriented programming concepts.

Prerequisites: C Programming Language	
UNIT I: ALGORITHMIC PROBLEM SOLVING	**9**
Algorithms, building blocks of algorithms (statements, state, control flow, functions), notation (pseudo code, flow chart, programming language), algorithmic problem solving, simple strategies for developing algorithms (iteration, recursion). Illustrative problems: find minimum in a list, insert a card in a list of sorted cards and guess an integer number in a range, Towers of Hanoi.	
UNIT II: DATA EXPRESSIONS, STATEMENTS	**9**
Python interpreter and interactive mode; values and types: int, float, boolean, string, and list; variables, expressions, statements, tuple assignment, precedence of operators, comments; modules and functions, function definition and use, flow of execution, parameters and arguments; Illustrative programs: exchange the values of two variables, circulate the values of n variables, distance between two points.	
UNIT III:CONTROL FLOW, FUNCTIONS	**9**
Conditionals: Boolean values and operators, conditional (if), alternative (if-else), chained conditional (if-elif-else); Iteration: state, while, for, break, continue, pass; Fruitful functions: return values, parameters, local and global scope, function composition, recursion; Strings: string slices, immutability, string functions and methods, string module; Lists as arrays. Illustrative programs: square root, gcd, exponentiation, sum an array of numbers, linear search, binary search.	
UNIT IV: LISTS, TUPLES, DICTIONARIES	**9**
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Dictionaries: operations and methods; advanced list processing - list comprehension; Illustrative programs: selection sort, insertion sort, merge sort, histogram.	
UNIT V: FILES, MODULES, PACKAGES &TURTLE	**9**
Files and exception: text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, packages; Illustrative programs: word count, copy file- Case study: Simple Graphics using Turtle: Draw a Random Pattern of Circle, Square and Rectangle; Draw a Pattern of Straight Lines, Plotting Graphs in Python: Menu Driven Program to Create Mathematical 3D Objects.	
TEXT BOOKS	
1.	Allen B. Downey, `Think Python: How to Think Like a Computer Scientist', 2nd edition, Updated for Python Shr off/ O'Reilly Publishers, 2016(http://greenteapress.com/wp/thinkpython/)
2.	Reema Thareja, Problem Solving and Programming with python, 2ndedition, Oxford University press, 2019.
3.	Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.
REFERENCE BOOKS	
1.	Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem- Solving Focus, Wiley India Edition, 2013.
2.	John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press, 2013.
3.	Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
4.	Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.
5.	Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
EBOOKS	
1.	https://static.realpython.com/python-basics-sample-chapters.pdf
2.	https://cfm.ehu.es/ricardo/docs/python/Learning_Python.pdf
MOOC	
1.	https://www.classcentral.com/course/independent-python-programming-mooc-2023-207344
2.	https://programming-23.mooc.fi/

COURSE TITLE	PHYSICS AND CHEMISTRY LABORATORY			CREDITS	2
COURSE CODE	BS1101A	COURSE CATEGORY	BS	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	PHYSICS LABORATORY 1. To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids. CHEMISTRY LABORATORY 1. To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
Course Outcome	Upon completion of this course, the students will be able to PHYSICS LABORATORY 1. Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications. CHEMISTRY LABORATORY 1. The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

Prerequisites:

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments) 30

1. Determination of rigidity modulus – Torsion pendulum
2. Determination of Young‘s modulus by non-uniform bending method
3. Determination of wavelength, and particle size using Laser
4. Determination of acceptance angle in an optical fiber.
5. Determination of thermal conductivity of a bad conductor – Lee‘s Disc method.
6. Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer
7. Determination of wavelength of mercury spectrum – spectrometer grating
8. Determination of band gap of a semiconductor
9. Determination of thickness of a thin wire – Air wedge method

LIST OF EXPERIMENTS: CHEMISTRY LABORATORY (Any seven experiments to be conducted) 30

1. Estimation of HCl using Na2CO3 as primary standard and Determination of alkalinity in water sample.
2. Determination of total, temporary & permanent hardness of water by EDTA method.
3. Determination of DO content of water sample by Winkler‘s method.
4. Determination of TDS of water sample.
5. Determination of strength of acids in a mixture of acids using conductivity meter.
6. Estimation of iron content of the given solution using potentiometer.
7. Estimation of iron content of the water sample using spectrophotometer (1, 10- Phenanthroline / thiocyanate method).
8. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
9. Conductometric titration of strong acid vs strong base.

COURSE TITLE	PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY			CREDITS	2
COURSE CODE	CS1102A	COURSE CATEGORY	ES	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 4

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To study python programs with conditionals and loops. 2. To use functions for python structured programs. 3. Use strings for structuring Python programs. 4. Represent compound data using Python lists, tuples and dictionaries. 5. To read and write data from and to files in python.
Course Outcome	Upon completion of this course, the students will be able to 1. Design simple programs using conditionals and loops. 2. Write functions to solve mathematical problems. 3. Use strings for structuring Python programs. 4. Represent compound data using Python lists, tuples and dictionaries. 5. Identify to read and write data from and to files in python.

Prerequisites: C Programming Language

LIST OF EXPERIMENTS: **60**

1. Write a program to display the largest number among three numbers.
2. Write a program to display the Fibonacci series by using looping constructs.
3. Write a function to compute the GCD of two numbers.
4. Explore String Functions
5. With the help of strings, array or list, display a simple calendar in python program without using the calendar module.
6. With the help of list perform linear search and Binary search.
7. Write a program to perform Selection sort, Insertion sort, Merge sort
8. Create a text file using python file I/O. Read the content of the file and change them from lower to upper case characters.
9. Programs that take command line arguments (word count)
10. Find the most frequent words in a text read from a file
11. Simulate bouncing ball using Pygame

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

1.	HARDWARE: 30 terminals
2.	SOFTWARE: Python 3 interpreter for Windows/Linux

COURSE TITLE	ENGINEERING PRACTICES LABORATORY			CREDITS	2
COURSE CODE	GE1201A	COURSE CATEGORY	ES	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.
Course Outcome	Upon completion of this course, the students will be able to 1. Fabricate carpentry components and pipe connections including plumbing works. 2. Use welding equipment's to join the structures. 3. Carry out the basic machining operations 4. Make the models using sheet metal works 5. Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundry and fittings 6. Carry out basic home electrical works and appliances 7. Measure the electrical quantities 8. Elaborate on the components, gates, soldering practices.

Prerequisites:

GROUP A (CIVIL & MECHANICAL)

CIVIL ENGINEERING PRACTICE **13**

Buildings:
Study of plumbing and carpentry components of residential and industrial buildings. Safety aspects.
Plumbing Works:
Study of pipeline joints, its location and functions: valves, taps, couplings, Unions, reducers, elbows in household fittings.
Study of pipe connections requirements for pumps and turbines.
Preparation of plumbing line sketches for water supply and sewage works.
Hands-on-exercise: Basic pipe connections – Mixed pipe material connection –.pipe connections with different joining components.
Demonstration of plumbing requirements of high-rise buildings.
Carpentry using Power Tools only:
Study of the joints in roofs, doors, windows and furniture.
Hands-on-exercise: Wood work, joints by sawing, planning and cutting.

MECHANICAL ENGINEERING PRACTICE **18**

Welding:
Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
Gas welding Practice basic
Machining:
Simple Turning and Taper turning
Drilling Practice Sheet Metal Work:
Forming & Bending:
Model making – Trays and funnels.
Different type of joints.
Machine assembly practice:
Study of centrifugal pump
Study of air conditioner Demonstration on:
Smithy operations, upsetting, swaging, setting down and bending. Example – Exercise – Production of

Hexagonal headed bolt.
Foundry operations like mould preparation for gear and step cone pulley.
Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP -B (ELECTRICAL & ELECTRONICS)

ELECTRICAL ENGINEERING PRACTICE **13**

Residential house wiring using switches, fuse, indicator, lamp and energy meter.
Fluorescent lamp wiring.
Stair case wiring
Measurement of electrical quantities – voltage, current, power & power factor in RLC circuit.
Measurement of energy using single phase energy meter.
Measurement of resistance to earth of electrical equipment.

ELECTRONICS ENGINEERING PRACTICE **16**

Study of Electronic components and equipment's – Resistor, color coding measurement of AC Signal parameter (peak-peak, rms period, frequency) using CR.
Study of logic gates AND, OR, EX-OR and NOT.
Generation of Clock Signal.
Soldering practice – Components Devices and Circuits – Using general purpose PCB.
Measurement of ripple factor of HWR and FWR.

COURSE TITLE	**INDIAN CONSTITUTION**			**CREDITS**	**0**
COURSE CODE	**CI1101A**	**COURSE CATEGORY**	**MC**	**L-T-P-C**	**2-0-0-0**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 2**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To realize the significance of constitution of India to students from all walks of life and help them to understand the basic concepts of Indian constitution. 2. To identify the importance of fundamental rights as well as fundamental duties. 3. To understand the functioning of Union, State and Local Governments in Indian federal system. 4. To learn procedure and effects of emergency, composition and activities of election commission and amendment procedure.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand and explain the significance of Indian Constitution as the fundamental law of the land. 2. Exercise his fundamental rights in proper sense at the same time identifies his Responsibilities in national building. 3. Analyze the Indian political system, the powers and functions of the Union, State and Local Governments in detail 4. Understand Electoral Process, Emergency provisions and Amendment procedure.

UNIT I:

The Constitution of India is the supreme law of India. Parliament of India cannot make any law which violates the Fundamental Rights enumerated under the Part III of the Constitution. The Parliament of India has been empowered to amend the Constitution under Article 368, however, it cannot use this power to change the "basic structure" of the constitution, which has been ruled and

explained by the Supreme Court of India in its historical judgments. The Constitution of India reflects the idea of "Constitutionalism" – a modern and progressive concept historically developed by the thinkers of "liberalism" – an ideology which has been recognized as one of the most popular political ideology and result of historical struggles against arbitrary use of sovereign power by state. The historic revolutions in France, England, America and particularly European Renaissance and Reformation movement have resulted into progressive legal reforms in the form of "constitutionalism" in many countries. The Constitution of India was made by borrowing models and principles from many countries including United Kingdom and America.

The Constitution of India is not only a legal document but it also reflects social, political and economic perspectives of the Indian Society. It reflects India's legacy of "diversity". It has been said that Indian constitution reflects ideals of its freedom movement; however, few critics have argued that it does not truly incorporate our own ancient legal heritage and cultural values. No law can be "static" and therefore the Constitution of India has also been amended more than one hundred times. These amendments reflect political, social and economic developments since the year 1950. The Indian judiciary and particularly the Supreme Court of India have played an historic role as the guardian of people. It has been protecting not only basic ideals of the Constitution but also strengthened the same through progressive interpretations of the text of the Constitution. The judicial activism of the Supreme Court of India and its historic contributions has been recognized throughout the world and it gradually made it "as one of the strongest court in the world".

Course content

1. Meaning of the constitution law and constitutionalism
2. Historical perspective of the Constitution of India
3. Salient features and characteristics of the Constitution of India
4. Scheme of the fundamental rights
5. The scheme of the Fundamental Duties and its legal status
6. The Directive Principles of State Policy – Its importance and implementation
7. Federal structure and distribution of legislative and financial powers between the Union and the States
8. Parliamentary Form of Government in India – The constitution powers and status of the President of India
9. Amendment of the Constitutional Powers and Procedure
10. The historical perspectives of the constitutional amendments in India
11. Emergency Provisions: National Emergency, President Rule, Financial Emergency
12. Local Self Government – Constitutional Scheme in India
13. Scheme of the Fundamental Right to Equality
14. Scheme of the Fundamental Right to certain Freedom under Article 19
15. Scope of the Right to Life and Personal Liberty under Article 21

EBOOKS

1.	https://legislative.gov.in/constitution-of-india/
2.	https://lddashboard.legislative.gov.in/sites/default/files/COI...pdf
3.	https://www.iitk.ac.in/wc/data/coi-4March2016.pdf

MOOC

1.	https://legalaffairs.nalsar.ac.in/
2.	https://learn.finology.in/courses/legal/the-constitution-of-india-part-1

COURSE TITLE	TAMILAR MARABU/HERITAGE OF TAMILS			CREDITS	1
COURSE CODE	TA1101A	COURSE CATEGORY	MC	L-T-P-C	0-0-1-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 1

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment	Third Internal Assessment	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)

	(Theory)	**(Theory)**			
Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.				
UNIT I: LANGUAGE AND LITERATURE					
Language Families in India - Dravidian Languages – Tamil as aClassical Language - Classical Literature in Tamil – Secular Nature of Sangam Literature – Distributive Justice in Sangam Literature - Management Principles in Thirukural - Tamil Epics and Impact of Buddhism & Jainism in Tamil Land - Bakthi Literature Azhwars and Nayanmars - Forms of minor Poetry - Development of Modern literature in Tamil - Contribution of Bharathiyar and Bharathidhasan.					
UNIT II: HERITAGE - ROCK ART PAINTINGS TO MODERN ART – SCULPTURE					
Hero stone to modern sculpture - Bronze icons - Tribes and their handicrafts - Art of temple car making - - Massive Terracotta sculptures, Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai, Veenai, Yazh and Nadhaswaram - Role of Temples in Social and Economic Life of Tamils.					
UNIT III: FOLK AND MARTIAL ARTS					
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leatherpuppetry, Silambattam, Valari, Tiger dance - Sports and Games of Tamils					
UNIT IV: THINAI CONCEPT OF TAMILS					
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature - Aram Concept of Tamils - Education and Literacy during Sangam Age - Ancient Cities and Ports of Sangam Age - Export and Import during Sangam Age - Overseas Conquest of Cholas					
UNIT V: CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE					
Contribution of Tamils to Indian Freedom Struggle - The Cultural Influence of Tamils over the other parts of India – Self-Respect Movement - Role of Siddha Medicine in Indigenous Systems of Medicine – Inscriptions & Manuscripts – Print History of Tamil Books.					
TEXT BOOKS					
1.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.				
2.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).				
3.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)				
REFERENCE BOOKS					
1.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation,Tamil Nadu)				
2.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)				
3.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Bookand Educational Services Corporation, Tamil Nadu)				
4.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.				
EBOOKS					
1.	https://drive.google.com/file/d/1vGQl05SylsYkPSkzPbw8F0isM4UCLA5l/view				

SEMESTER II

COURSE TITLE	ENGLISH FOR COMMUNICATION			CREDITS	3
COURSE CODE	HS1201A	COURSE CATEGORY	HS	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. Improve their language ability to improve the four basic skills of communication (LSRW). 2. Enhance the skills and methods to enrich their reading and comprehending ability. 3. Strengthen their skills to listen to the lectures and talks related to their fields of studies. 4. Foster their ability to write effectively in all contexts. 5. Cultivate their oral presentation skills through technical presentations and contribution in group discussions.
Course Outcome	Upon completion of this course, the students will be able to 1. Read for comprehending and responding in general and professional settings. 2. Demonstrate the communication skills (LSRW) in academic, professional and social Environment. 3. Participate effectively in formal and informal conversations and express findings and opinions with proper language ability. 4. Comprehend conversations and short talks delivered in English. 5. Use the language effectively to write with clarity and accuracy in general and technical contexts. 6. Enhance their skills in any kind of elucidation.

Prerequisites:

UNIT I:	**9**
Reading- Reading for detailed comparison Listening- Listening to interviews Writing- Developing hints, summarizing Speaking- Talk about future plans, arrangements intensions Language development- Sentence structures Vocabulary development- Synonyms, Antonyms, Adverbs.	
UNIT II: :	**9**
Reading-Extended reading Listening- Listening to telephonic conversations Writing- Formal Letter Writing - Letters for bona fide certificate - to the principal for permission for in plant training, industrial visit, paper presentations, inter college events, Letter to the Editor, Recommendations Speaking- Formal conversation Language development-Use of Punctuation, Modal verbs Vocabulary development- One word substitutes, Common Phrasal verbs	
UNIT III::	**9**
Reading- Identify topic sentences by reading a passage Listening- Listening to TED talks Writing- Process/product description Speaking- Formal Conversations Language development-Relative Clauses, Concord, Error correction Vocabulary development- Idioms & Phrases, Minimal pair.	
UNIT IV: :	**9**
Reading- Reading newspaper articles Listening- Listening to inspirational speeches Writing- Essays, Checklist Speaking- Technical Presentations Language development- Degrees of Comparison Vocabulary development- Articles, Cause and Effect Expressions	
UNIT V: :	**9**
Reading- Close reading Listening- Listening for summarizing Writing- Dialogue conversations Speaking- Movie/ Book Review Language development- Wh Questions, Yes/ no Questions Vocabulary development- Foreign Expressions and its applications, Reference words	

TEXT BOOKS	
1.	Booth-L. Diana, Project Work, Oxford University Press, Oxford: 2014
2.	Grussendorf, Marion, English for Presentations, Oxford University Press, Oxford: 2007
REFERENCE BOOKS	
1.	Kumar, Suresh. E. Engineering English. Orient Blackswan: Hyderabad,2015
2.	Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013
3.	Means,L. Thomas and Elaine Langlois. English & Communication for Colleges. Cengage Learning USA: 2007.
RECCOMENDED WEBSITES:	
TED.com learningenglish.voanews.com islcollective.com examenglish.com englishclass101.com	
MOOC	
1.	https://www.britishcouncil.in/english/online/resources-websites/moocs

COURSE TITLE	**COMPLEX VARIABLES AND TRANSFORMS**			**CREDITS**	**4**
COURSE CODE	**MA1201A**	**COURSE CATEGORY**	**BS**	**L-T-P-C**	**3-1-0-4**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. Understand the concept of Divergence and curl and use it in evaluating Line, Surface and Volume integrals. 2. Understand C-R equations and use it in the construction of Analytic Functions. 3. Understand the methods of Complex Integration using Cauchy's Integral Formula and Cauchy Residue theorem, finding Taylor's and Laurent's Series expansions. 4. Find the Laplace Transforms of standard Functions and to find the Inverse Laplace Transform of a function and use it in solving Differential Equations. 5. To introduce the effective mathematical tools for the solutions of partial differential equations that model several physical processes and to develop Z transform techniques for discrete time systems
Course Outcome	Upon completion of this course, the students will be able to 1. Solve problems using divergence and curl and evaluate line, Surface and Volume integrals. 2. Solve problems in Analytic functions and construction of analytic functions using C-R Equations. 3. Evaluate problems using Cauchy's integral formula and Cauchy residue theorem and find Taylor's and Laurent's series expansion of a given function. 4. Obtain the Laplace Transforms of standard functions. 5. Use the effective mathematical tools for the solutions of partial differential equations by using Z transform techniques for discrete time systems.

UNIT I: VECTOR CALCULUS **12**

Gradient and directional derivative – Divergence and curl – Vector identities – Irrotational and Solenoidal vector fields – Line integral over a plane curve – Surface integral – Area of a curved surface – Volume integral – Green's, Gauss divergence and Stoke's

theorems – Verification and application in evaluating line, surface and volume integrals-simple applications involving cubes and rectangular parallelopipeds.
UNIT II: ANALYTIC FUNCTIONS **12**
Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates – Properties – Harmonic conjugates – Construction of analytic function – Conformal mapping – Mapping by functions (w 1 z , wz2, wez, w sinhz, w coshz) – Bilinear transformation.
UNIT III: COMPLEX INTEGRATION **12**
Line integral – Cauchy's integral theorem – Cauchy's integral formula – Taylor's and Laurent's series – Singularities – Residues – Residue theorem – Application of residue theorem for evaluation of real integrals – Use of circular contour and semicircular contour.
UNIT IV: LAPLACE TRANSFORMS **12**
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems -Transforms of derivatives and integrals – Initial and final value theorems – Inverse transforms – Convolution theorem –Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.
UNIT V: Z - TRANSFORMS AND DIFFERENCE EQUATIONS **12**
Z-transforms - Elementary properties – Inverse Z-transform (using partial fraction and residues) – Initial and final value theorems - Convolution theorem - Formation of difference equations – Solution of difference equations using Z - transform.

TEXT BOOKS	
1.	Grewal, B.S., Higher Engineering Mathematics, 43rd Edition, Khanna Publishers, 2016.
2.	Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, John Wiley & Sons, Inc., 2016.
REFERENCE BOOKS	
1.	Bali,N.P.,Goyal,M.,Watkins,C.,AdvancedEngineeringMathematics,Laxmi Publications Pvt. Limited, 2007.
2.	Boyce,W.E.,and DiPrima, R.C.,Elementary Differential Equation sand Boundary Value Problems, Wiley India, 2012.
3.	O'Neil. P. V."Advanced Engineering Mathematics", 7th Edition, Cengage Learning India Pvt., Ltd, New Delhi, 2011.
4.	T. Veerarajan, Engineering Mathematics, Tata Mcgraw Hill publications co. ltd, New Delhi.2017.
EBOOKS	
1.	https://vemu.org/uploads/lecture_notes/16_02_2021_160211905.pdf
MOOC	
1.	https://www.udemy.com/course/complex-variables-and-transforms/

COURSE TITLE	**MATERIALS SCIENCE**			**CREDITS**	**3**
COURSE CODE	**PH1201A**	**COURSE CATEGORY**	**BS**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL –**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To enrich the understanding of various types of materials and their applications in engineering and technology.

Course Outcome	Upon completion of this course, the students will be able to 1. The students will gain knowledge of conducting materials and variation of its properties with Temperature. 2. Acquire knowledge on basics of semiconductor physics and its applications in various devices. 3. Get knowledge on magnetic and superconducting materials properties and their various applications. 4. The students will understand the basics of dielectric materials, properties and applications of dielectric materials. 5. The students will get knowledge about new engineering materials and its applications in social applications.

UNIT I: CONDUCTING MATERIALS	**9**
Conductors – classical free electron theory of metals – Electrical and thermal conductivity –Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory –Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states –carrier concentration in metals.	
UNIT II: SEMICONDUCTING MATERIALS	**9**
Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination –Elemental and Compound Semiconductors – N-type and P-type semiconductor (Qualitative) – Hall effect –Determination of Hall coefficient – Applications.	
UNIT III: MAGNETIC AND SUPERCONDUCTING MATERIALS	**9**
Origin of magnetic moment – Bohr magneton – comparison of Dia, Para and Ferro magnetism –Domain theory – Hysteresis – soft and hard magnetic materials – antiferromagnetic materials –Ferrites and its applications. Electro static Discharge (ESD)-Superconductivity: properties – Type I and Type II superconductors–BCS theory of superconductivity (Qualitative) - High Tc superconductors – Electrical, medical, magnetic and computer application of superconductors.	
UNIT IV: DIELECTRIC MATERIALS	**9**
Electrical susceptibility – dielectric constant – electronic, ionic, orientation and space charge polarization – frequency and temperature dependence of polarisation – Clausius mosotti relation - dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer).	
UNIT V: ADVANCED ENGINEERING MATERIALS	**9**
Metallic glasses - melt spinning process, applications - shape memory alloys: Ni-Ti alloy, applications – nano materials: preparation (bottom up and top-down approaches), properties and applications- Bio materials – introduction- properties of bio materials-examples- medical applications- Ophthalmology- bio sensors- characteristics.	

TEXT BOOKS	
1.	S.Mohan, Principles of Materials Science, MJP Publishers, 2018.
2.	Jasprit Singh, Semiconductor Devices, Basic Principles, Wiley 2012.
REFERENCE BOOKS	
1.	Wahab, M.A. Solid State Physics: Structure and Properties of Materials‖, Narosa Publishing House, 2009.
2.	William D.Callister Jr, David G. Rethwisch, Materials Science and Engineering, An Introduction, Wiley India (P) Ltd., 8th Edition, 2009.
3.	Pillai S.O., Solid State Physics, New Age International (P) Ltd., Publishers, 2009.
4.	Semiconductor Introduction, https://youtu.be/k6ZxP9Yr02E(Video lecture)
5.	Superconductivity, https://youtu.be/D-9M3GWOBrw(Video lecture)
EBOOKS	
1.	https://gateformme.files.wordpress.com/2017/04/material-science-kakani.pdf
MOOC	
1.	https://www.mooc-list.com/tags/materials-science
2.	https://www.coursera.org/courses?query=material%20science

COURSE TITLE	BASIC ELECTRICAL, ELECTRONICS & MEASUREMENT ENGINEERING			CREDITS	3
COURSE CODE	EE1202A	COURSE CATEGORY	ES	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL –3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To learn the fundamental laws, theorems of electrical circuits and also to analyze them 2. To study the basic principles of electrical machines and their performance 3. To study the different energy sources, protective devices and their field applications 4. To understand the fundamentals of electronic circuit constructions 5. To understand the principles and operation of measuring instruments and transducers
Course Outcome	Upon completion of this course, the students will be able to 1. Discuss the essentials of electric circuits and analysis 2. Discuss the basic operation of electric machines and transformers 3. Introduction of renewable sources and recent trends in illumination 4. Discuss the basics of electronics components 5. Introduction to measurement and metering for electric circuits

UNIT I: ELECTRICAL CIRCUITS ANALYSIS **9**

Ohms Law, Kirchhoff's Law-Instantaneous power- series and parallel circuit analysis with resistive, capacitive and inductive network - nodal analysis, mesh analysis- network theorems –Thevenin's theorem, Norton theorem and superposition theorem, three phase supply-Instantaneous, Reactive and apparent power-star delta conversion.

UNIT II: ELECTRICAL MACHINES **9**

DC and AC rotating machines: Types, Construction, principle, Emf and torque equation, application - Speed Control- Basics of Stepper Motor – Brushless DC motors- Transformers-Introduction- types and construction, working principle of Ideal transformer-Emf equation

UNIT III: UTILIZATION OF ELECTRICAL POWER **9**

Overview of "Renewable Energy Sources". (Wind and Solar). Illumination by lamps- Energy Saving lamps (Compact Fluorescent Lamp, Cold Cathode Tube, LED bulbs). Domestic refrigerator and air conditioner-Electric circuit, construction and working principle. Li-Ion Battery's Operation & Maintenance. Protection-need for earthing, fuses and circuit breakers – MCB, RCB and ELCB. Energy Tariff calculation for domestic loads.

UNIT IV: ELECTRONIC CIRCUITS **9**

Introduction to Electron Devices – PN Junction diode, Zener Diode, Transistor)-. Op-amps- Amplifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC. Voltage regulator IC using LM 723, LM 317.

UNIT V: ELECTRICAL MEASUREMENT **9**

Characteristics of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification- RTD, Strain gauge, LVDT, LDR and piezoelectric. Functional Block diagram of DSO

TEXT BOOKS

1.	D.P. Kothari and I.J Nagrath, Basic Electrical and Electronics Engineering, McGraw Hill, 2016, Third Edition.
2.	M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCE BOOKS

1.	S.B. LalSeksena and Kaustuv Dasgupta, fundaments of Electrical Engineering, Cambridge,2016.
2.	B.L. Theraja, Fundamentals of Electrical Engineering and Electronics, Chand & Co, 2008.
3.	S.K.Sahdev, Basic of Electrical Engineering, Pearson 2015.
4.	John Bird,-Electrical and electronic principles and Technology, Fourth Edition, Elsevier, 2010.
5.	Mittle, Mittal, Basic Electrical Engineering, 2nd edition, Tata McGraw-Hill Edition, 2016.
6.	C.L.Wadhwa, "Generation, Distribution and utilization of Electrical Energy", New Age international pvt ltd .2003.
EBOOKS	
1.	https://padeepz.net/be8255-notes-basic-electrical-electronics-and-measurement-engineering/
MOOC	
1.	https://www.coursera.org/learn/electronics
2.	https://onlinecourses.nptel.ac.in/noc21_ee55/preview

COURSE TITLE	**PROGRAMMING IN C**			**CREDITS**	**3**
COURSE CODE	**CS1201A**	**COURSE CATEGORY**	**ES**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To develop C Programs using basic programming constructs. 2. To develop C programs using arrays and strings. 3. To develop applications in C using functions and pointers. 4. To develop applications in C using structures. 5. To do input/output and file handling in C.
Course Outcome	Upon completion of this course, the students will be able to 1. Develop simple applications in C using basic constructs 2. Design and implement applications using arrays and strings 3. Design and implement applications in C using functions and pointers. 4. Develop applications in C using structures. 5. Develop applications using sequential and random access file Processing. 6. Discover the advanced concepts in dynamic memory allocation.

UNIT I: BASICS OF C PROGRAMMING	**9**
Introduction to programming paradigms - Structure of C program - C programming: Identifiers- Keywords-Data Types - Variables - Constants. Operators: Precedence and Associativity - Expressions- Input/ Output statements - Decision making statements - Switch statement - Looping statements - Pre-processor directives - Compilation process	
UNIT II: ARRAYS AND STRINGS	**9**
Introduction to Arrays: Declaration, Initialization - One dimensional array - Example Program: Computing Mean, Median and Mode - Two dimensional arrays - Example Program: Matrix Operations (Addition, Scaling, Determinant and Transpose) - String-String operations – String Arrays.	
UNIT III:FUNCTIONS AND POINTERS	**9**

Introduction to functions: Function prototype,-function definition,- function call,- Built- in functions (string functions, math functions) - Recursion-Types of Recursion - Example Program: Computation of Sine series, Scientific calculator using built-in functions, Binary Search using recursive functions-Storage Classes - Pointers - Pointer operators - Null Pointers- Pointer arithmetic - Arrays and pointers - Array of pointers - Example Program: Sorting of names - Parameter passing: Pass by value, Pass by reference- Example Program: Swapping of two numbers and changing the value of a variable using pass by reference.
UNIT IV: STRUCTURES **9**
Structures-Introduction – need for structure data type – structure definition – Structure declaration – Structure within a structure – Passing structures to functions – Array of structures – Pointers to structures – Union - Programs using structures and Unions, Enumerated data type-Dynamic Memory Allocation.
UNIT V: FILEPROCESSING **9**
Files-Types of file processing: Sequential access, Random access- Sequential access file - Example Program: Finding average of numbers stored in sequential access file - Random access file - Example Program: Payroll System and Transaction processing using random access files - Command line arguments

TEXT BOOKS	
1.	Reema Thareja,"Programming in C", Oxford University Press, Second Edition, 2016.
2.	Kernighan, B.W and Ritchie, D.M, "The C Programming language", Second Edition, Pearson Education,2006
REFERENCE BOOKS	
1.	Paul Deitel and Harvey Deitel,"C How to Program", Seventh editin, Pearson Publication
2.	Juneja,B.L and Anita Seth ,"Programming in C",CENGAGE Learning India pvt.Ltd., 2011
3.	Pradip Dey ,Manas Ghosh, "Fundamentals of Computing and Programming in C" ,First Edition,OxfordUniversityPress,2009.
4.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India)Pvt.Ltd.,PearsonEducationinSouthAsia,2011.
5.	Anita Goel and Ajay Mittal, "Computer Fundamentals and Programming in C", Dorling Kindersley(India)Pvt.Ltd.,PearsonEducationinSouthAsia,2011.
EBOOKS	
1.	https://www.vssut.ac.in/lecture_notes/lecture1424354156.pdf
MOOC	
1.	https://www.mooc-list.com/tags/c-programming
2.	https://onlinecourses.nptel.ac.in/noc22_cs40/preview

COURSE TITLE	**FUNDAMENTALS OF COMPUTING**			**CREDITS**	**3**
COURSE CODE	**CS1202A**	**COURSE CATEGORY**	**ES**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To learn the basics of a computer system. 2. To gain the knowledge of fundamentals of database. 3. To matriculate the various Programming Languages and Operating System. 4. To design and develop web pages using HTML and CSS. 5. To acquire the basic knowledge of networking.

Course Outcome	Upon completion of this course, the students will be able to 1. Understand the major components of a computer system and architecture. 2. Compare and contrast various indexing strategies in different database systems. 3. Envisage the programming languages and Operating System concepts. 4. Design websites that meet specified needs and interests using basic elements to control layout . 5. Comprehend the basic concepts of networking. 6. Understand the basic concepts of network topologies.
UNIT I: COMPUTERBASICS	**9**
Problem Solving Using Computers- Data Representation- Representation of Characters in Computers, Integers, Fractions- Hexadecimal Representation of Numbers - Decimal to Binary Conversion- Error Detecting Codes- Computer Architecture: Interconnection of Units -Processor to Memory Communication - I/O Devices to Processor Communication - Interrupt Structures - Bus Architecture of Personal Computers – Multiprogramming.	
UNIT II: DATABASE	**9**
Introduction–Database–Characteristics of Database–Conceptual Data Model–Representation of Data Models–Database System-Database Languages–Database System Architecture–Database Applications.	
UNIT III:PROGRAMMING LANGUAGES AND OPERATING SYSTEM	**9**
Need for programming language-assembly language-higher level programming languages- compiling a high level language -Need for OS-batch operating system-multiprogramming operating system- timesharing operating system-online and real-time systems-personal computer operating system-Unix operating system.	
UNIT IV: WEB AND SCRIPTING ESSENTIALS	**9**
Communication Protocols- LAN/WAN/WWW-Internet Basics – Browser Fundamentals – Authoring Tools – Introduction to HTML5 – HTML5 Tags – HTML5 Forms – Cascading Style Sheets (CSS3) Fundamentals – Need for Scripting Languages – Introduction to JavaScript/ Angular JS	
UNIT V: NETWORKING	**9**
Internet Security- Mobile Technology-Architecture of GSM Cellular Mobile Phone System- Wireless LAN- Personal Area Network—Bluetooth- WiMAX- Mobile Communication Among Portable Computers. Network Computing: Current Computing Scenario - Peer to Peer Computing Grid Computing -Cloud Computing.	
TEXT BOOKS	
1.	V. Raja Raman, Neeharika Adabala ―Fundamentals of Computers, PHI, 6thEdition2015.
2.	Robin Nixon, Learning PHP, MySQL,JavaScript, CSS&HTML5:AStep-by- Step Guide to Creating Dynamic Websites, O'Reilly Media, Inc,2014.
REFERENCE BOOKS	
1.	Ashok Arora, Computer Fundamentals and applications, Vikas Publishing house pvtLtd.(2007).
2.	P. K. SINGH, Computer Fundamentals, VkGlobal Publications, 2015.
3.	Anita Goel, Computer fundamentals, Pearson Education (India).
EBOOKS	
1.	https://ashishmodi.weebly.com/uploads/1/8/9/7/18970467/computer_fundamental.pdf
MOOC	
1.	https://www.coursera.org/specializations/computer-fundamentals
2.	https://www.mooc-list.com/tags/fundamentals-computer-science-xseries

COURSE TITLE	ENGINEERING GRAPHICS			CREDITS	3
COURSE CODE	ME1101A	COURSE CATEGORY	ES	L-T-P-C	2-0-2-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	1. To develop in students, graphic skills for communication of concepts, ideas and design of engineering products. 2. To expose them to existing national standards related to technical drawings.
Course Outcome	Upon completion of this course, the students will be able to 1. Familiarize with the fundamentals and standards of Engineering graphics. 2. Perform freehand sketching of basic geometrical constructions and multiple views of objects. 3. Project orthographic projections of lines and plane surfaces. 4. Draw projections and solids and development of surfaces. 5. Visualize and to project isometric and perspective sections of simple solids.

Prerequisites:

CONCEPTS AND CONVENTIONS (Not for Examination)

Importance of graphics in engineering applications –Use of drafting instruments – BIS conventions and specifications – Size and layout of drawing sheets – Lettering and dimensioning.

UNIT I: PLANE CURVES AND ORTHOGRAPHIC PROJECTIONS **12**

Basic Geometrical constructions, Curves used in engineering practices: Conics – Construction of ellipse, parabola and hyperbola by eccentricity method – Construction of cycloid – construction of involutes of square and circle – Drawing of tangents and normal to the above curves. Visualization principles – Layout of views- Orthographic projection of multiple views(Free Hand Sketching) from pictorial views of objects-Principal planes-Projection of points-Demo using CAD software for above topics.

UNIT II: PROJECTION OF POINTS STRAIGHT LINES AND PLANE SURFACES **12**

Orthographic projections-principles-Principal planes-First angle projection-Projection of points- Projection of straight lines (only First angle projections) inclined to one of the principal planes - Determination of true lengths and true inclinations - Projection of planes (polygonal and circular surfaces) inclined to one of the principal planes - Demo using CAD software for above topics.

UNIT III:PROJECTION OF SOLIDS **12**

Projection of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one of the principal planes by rotating object method-Demo using CAD software for above topics.

UNIT IV: PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF SURFACES **12**

Sectioning of above solids in simple vertical position - the cutting plane is inclined to the one of the principal planes and perpendicular to the other – obtaining true shape of section. Development of lateral surfaces of simple and sectioned solids – Prisms, pyramids cylinders and cones-Demo using CAD software for above topics.

UNIT V: ISOMETRIC AND PERSPECTIVE PROJECTIONS **12**

Principles of isometric projection – isometric scale –Isometric projections of simple solids and truncated solids - Prisms, pyramids, cylinders, cones- combination of two solid objects in simple vertical positions –Perspective projection of simple solids-Prisms, pyramids and cylinders by visual ray method-Demo using CAD software for above topics.

TEXT BOOKS

1.	NatrajanK.V., “A text book of Engineering Graphics”, Dhanalakshmi Publishers,Chennai,2009.
2.	Venugopal K. and Prabhu Raja V., “Engineering Graphics”, New Age International (P) Limited, 2008.
3.	Bhatt N.D. and PanchalV.M., “Engineering Drawing”, Charotar Publishing House, 50th Edition,2010.
REFERENCE BOOKS	
1.	Basant Agarwal and Agarwal C.M., “Engineering Drawing”, Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.
2.	Gopalakrishna K.R., “Engineering Drawing” (Vol. I&II combined), Subhas Stores,Bangalore, 2007.
3.	Luzzader, Warren.J. and Duff, John M., “Fundamentals of Engineering Drawing with an introduction to Interactive Computer Graphics for Design and Production, Eastern Economy Edition, Prentice Hall of India Pvt. Ltd, New Delhi,2005.
4.	N S Parthasarathy and Vela Murali, “Engineering Graphics”, Oxford University, Press, NewDelhi, 2015.
5.	Shah M.B., and Rana B.C., “Engineering Drawing”, Pearson, 2ndEdition, 2009.
EBOOKS	
1.	https://mrcet.com/downloads/digital_notes/HS/R20/ENGINEERING%20GRAPHICS.pdf
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc21_me128/preview
2.	https://www.mygreatlearning.com/academy/learn-for-free/courses/engineering-graphics-drawing

COURSE TITLE	**PROGRAMMING IN C LABORATORY**			**CREDITS**	**2**
COURSE CODE	**CS1203A**	**COURSE CATEGORY**	**ES**	**L-T-P-C**	**0-0-4-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Model Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance		

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	• To develop programs in C using basic constructs. • To develop programs in C using control statements. • To develop applications in C using arrays, strings, pointers. • To develop applications in C using functions, structures. • To develop applications in C using file processing
Course Outcome	Upon completion of this course, the students will be able to • Develop C programs for simple applications making use of basic constructs • Develop C programs for control statements. • Develop C programs involving arrays, strings and pointers. • Develop C programs involving functions, and structures. • Design applications using sequential and random access file processing.
Prerequisites:	

LIST OF EXPERIMENTS

1. Input and Output statements.
2. Control statements – Branching &Looping.

• Write a C program to generate Pascal's triangle.

• Write a C program, which takes two integer operands and one operator from the user, performs the operation and then prints the result. (Consider the operators +,-,*,/,% and use Switch Statement)

• Write a C program to find the sum of individual digits of a positive integer.

• A Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence.

• Write a C program to generate the first n terms of the sequence.

• Write a C program to generate all the prime numbers between 1 and n, where n is a value supplied by the user.

• Write a C program to swap Numbers Using Temporary Variables.

3.Arrays

• Write a C program to search an array element using linear search.

• Write a C program to find both the largest and smallest number in a list of integers.

• Write a C program that uses functions to perform the following:

• Addition of Two Matrices

• Multiplication of Two Matrices

• Write a C program to implement Bubble Sort.

4.Strings

• Write a C program that uses functions to perform following operations

(i)To insert a sub-string in to given main string from a given position.

(ii)To delete n Characters from a given position in a given string.

• Write a C program to determine if the given string is a palindrome or not

5.Functions &Pointers:

● Write C programs that use recursive functions

(i) To find factorial of given number

(ii)To solve Towers of Hanoi Problem.

(iii)To swap the variables using call by value and call by reference.

6. Generate mark sheet of students using structures.

7. Compute Salary Slip for five employees using structures and functions Insert, Update, delete and append telephone details of an individual or a company into a telephone directory using random access file.

LIST OF EQUIPMENTS FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals

SOFTWARE:C compiler

COURSE TITLE	FUNDAMENTALS OF COMPUTING LABORATORY			CREDITS	1
COURSE CODE	CS1204A	COURSE CATEGORY	ES	L-T-P-C	0-0-2-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	• Be familiar with the use of Office software. • Be exposed to presentation and visualization tools. • Learn to design a static webpage. • Learn to create and use a database in SQL and Network protocols. • Be familiar with the configuration of CPU.
Course Outcome	Upon completion of this course, the students will be able to • Use MS-Office for designing a Document, Presentations and Excel sheet. • Design and develop static web pages by using the Mark up languages that meet the specified needs and interests. • Understand the Networking Concepts. • Extract data from database using SQL Commands. • Assemble Computer Hardware and Install software. • Mini project in Fundamentals of Computing.

Prerequisites:

LIST OF EXPERIMENTS

1. Use MS office
2. Document creation, Text manipulation with Scientific Notations
3. Table creation, Table formatting and Conversion using MS-Office
4. To design a E-book cover pages and back page using Insert Menu include header and footer.
5. Create a new document and perform the Mail Merge.
6. Presentation and Visualization of graph and charts.
7. Practice hyperlink and create links between word document, Play songs from Microsoft word text, create the link between internal and external files.
8. Design power point presentation with animation.
9. Create an excel sheet for storing students marks and perform basic operations by analyzing the results and also Create a chart to show the mark comparison among the students.
10. Demonstrates the client and server connectivity using network protocols.
11. Design of webpage using various HTML formatting tags.
12. Apply the inline and block level elements to identify the difference in the layout.
13. Design the HTML forms (text boxes, text areas, radio buttons, check boxes and other elements by understanding the input types and specified needs).
14. Include image/audio and video elements in the webpages.
15. Create tables and implement the SQL commands.
16. Create Business Cards using Shapes, text, and colours using Adobe Photoshop.
17. Components of computer hardware and assembling.
18. Installation of an Operating system (formatting, partitioning), drivers for peripheral Devices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

HARDWARE: 30 terminals
SOFTWARE: MS Word,My SQL

COURSE TITLE	ENVIRONMENTAL SCIENCE AND ENGINEERING			CREDITS	0
COURSE CODE	CY1201A	COURSE CATEGORY	MC	L-T-P-C	2-0-0-0
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	• To understand nature and the facts about the environment. • To find and implement scientific, technological, economic and political solutions to environmental problems. • To study the interrelationship between living organism and environment. • To appreciate the importance of environment by assessing its impact on the human world; envision the surrounding environment, its functions and its value. • To study the dynamic processes and understand the features of the earth's interior and surface. • To study the integrated themes and biodiversity, natural resources, pollution control and waste management
Course Outcome	Upon completion of this course, the students will be able to • Students will be able to understand the functions of ecosystems and appreciate the bio diversity. • Students will be able to know the measures to control environmental pollution. • Students will be able to understand the usage as well as the effects of over exploitation of natural resources. • Students will have knowledge about finding technological, economic and political solutions to environmental problems with various Environmental Protection Act in mind. • Students will be able to understand the interrelationship between population explosion and the environment and also role of IT in environment and human health. • Students will be able to understand that Environmental problems can only be solved by Public participation in all aspects and cannot be solved by mere laws.

Prerequisites:

UNIT I: ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY **14**

Definition, scope and importance of environment – need for public awareness – concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of major ecosystem – Introduction to biodiversity definition: genetic, species and ecosystem diversity – value of biodiversity – Biodiversity at global, national and local levels – India as a mega- diversity nation – hot-spots of biodiversity – threats to biodiversity – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

UNIT II: ENVIRONMENTAL POLLUTION **8**

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – solid waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

UNIT III:NATURAL RESOURCES **10**

Forest resources: Use and over-exploitation, deforestation, case studies- dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water – Mineral resources: environmental effects of extracting and using

mineral resources, case studies – Food resources: changes caused by agriculture and overgrazing, effects of modern agriculture, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – 12 Principles of Green chemistry, role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

UNIT IV: SOCIAL ISSUES AND THE ENVIRONMENT **7**

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies – environment protection act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act –- central and state pollution control boards.

UNIT V: HUMAN POPULATION AND THE ENVIRONMENT **6**

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health

TEXT BOOKS

1.	Environmental Science and Engineering by AnubhaKaushik and C.P.Kaushik-New Age International Publishers. New Delhi, 2017.
2.	

REFERENCE BOOKS

1.	Benny Joseph, Environmental Studies, Tata mcgraw-Hill Publishing Company, Ltd., New Delhi, 2006.
2.	Dr.B.S.Chauhan,. Environmental Studies, University Science Press, New Delhi, 2011.

COURSE TITLE	**TAMILAR THOZHIL NUTPAM/TAMILS AND TECHNOLOGY**			**CREDITS**	**1**
COURSE CODE	**TA1201A**	**COURSE CATEGORY**	**MC**	**L-T-P-C**	**0-0-1-1**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 1**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

UNIT I: WEAVING AND CERAMIC TECHNOLOGY **3**

Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) – Graffiti on Potteries.

UNIT II: DESIGN AND CONSTRUCTION TECHNOLOGY **3**

Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)- Thirumalai Nayakar Mahal - Chetti Nadu Houses, Indo - Saracenic architecture at Madras during British Period

UNIT III:MANUFACTURING TECHNOLOGY **3**

Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting,steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads -Glass beads Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram

UNIT IV: AGRICULTURE AND IRRIGATION TECHNOLOGY	3
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry- Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.	
UNIT V: SCIENTIFIC TAMIL & TAMIL COMPUTING	**3**
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.	
TEXT BOOKS	
1.	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
2.	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies.
REFERENCE BOOKS	
1.	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
2.	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
3.	Keeladi - 'Sangam City C ivilization on the banks of river Vaigai' (Jointly Published by: Department ofArchaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
4.	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
5.	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
6.	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.
EBOOKS	
1.	https://drive.google.com/file/d/1vGQl05SylsYkPSkzPbw8F0isM4UCLA5l/view

SEMESTER III

COURSE TITLE	DISCRETE MATHEMATICS			CREDITS	4
COURSE CODE	MA1303A	COURSE CATEGORY	PC	L-T-P-C	3-1-0-4
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Objective	• To extend student's logical and mathematical maturity and ability to deal with abstraction. • To introduce most of the basic terminologies used in computer science courses and application of Ideas to solve practical problems. • To understand the basic concepts of combinatory and graph theory. • To familiarize the applications of algebraic structures
Course Outcome	• Applying the basic concepts of logics that needed to test the program. • Be aware of a class of functions which transform a finite set into another finite set which relates to input and output functions in computer science • Be aware of the counting principles. • Able to model and solve real world problems using graph theory concepts • Be exposed to concepts and properties of algebraic structures such as groups, rings and fields

Prerequisites:

UNIT I: LOGIC AND PROOFS (12L)

Propositional logic – Propositional equivalences - Predicates and quantifiers – Nested quantifiers – Rules of inference - Introduction to proofs – Proof methods and strategy

UNIT II: SET THEORY (12L)

Basic concepts – Notations – Subset – Algebra of sets – The power set – Ordered pairs and Cartesian product – Relations on sets –Types of relations and their properties – Relational matrix and the graph of a relation – Partitions – Equivalence relations – Partial ordering – Poset – Hasse diagram – Lattices and their properties – Sub lattices – Boolean algebra – Homomorphism

UNIT III:COMBINATORICS (12L)

Mathematical induction – Strong induction and well ordering – The basics of counting – The pigeonhole principle – Permutations and combinations – Recurrence relations – Solving linear recurrence relations – Generating functions – Inclusion and exclusion principle and its applications

UNIT IV: GRAPHS (12L)

Graphs and graph models – Graph terminology and special types of graphs – Matrix representation of graphs and graph isomorphism – Connectivity – Euler and Hamilton paths.

UNIT V: ALGEBRAIC STRUCTURES (12L)

Algebraic systems – Definitions-Examples-Properties-Semi groups and monoids–Homomorphism'sGroups – Subgroups – Normal subgroup and cosets – Lagrange 's theorem – Codes and group codes – Basic notions of error correction-Error recovery in group codes.

TEXT BOOKS

1.	Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw..
2	Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011
3	Tremblay, J.P. and Manohar. R, " Discrete Mathematical Structures with Applications To Computer Science", Tata McGraw Hill Pub. Co. Ltd, New Delhi, 30th Reprint, 2011
REFERENCE BOOKS	
1.	Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition.
2.	Pearson Education Asia, Delhi, 2007.
3.	Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum ‘s Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
4.	Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

COURSE TITLE	**OBJECT ORIENTED PROGRAMMING**			**CREDITS**	**3**
COURSE CODE	**IT1301A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To understand Object Oriented Programming concepts and basic characteristics of Java • To know the principles of packages, inheritance and interfaces • To define exceptions and use I/O streams • To develop a java application with threads and generics classes • To design and build simple Graphical User Interfaces
Course Outcome	• Develop Java programs using OOP principles • Develop Java programs with the concepts of inheritance and interfaces • Build Java applications using exceptions and I/O streams • Develop Java Programs /applications with Threads, Generic classes and JDBC. • Develop Standalone /Desktop Applications using Swing and JDBC. • Learn the fundamental concepts of Collections in Java.

Prerequisites:

UNIT I: INTRODUCTION TO OOP AND JAVA FUNDAMENTALS (9L)

Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java –Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays, Packages.

UNIT II: INHERITANCE AND INTERFACES (9L)

Inheritance – Super classes- sub classes –Protected members – constructors in sub classes- the Object class – abstract classes and methods- final methods and classes – Interfaces – defining an interface, implementing interface, differences between classes and interfaces and extending interfaces - Object cloning -inner classes, ArrayLists - Strings

UNIT III : EXCEPTION HANDLING AND I/O (9L)

Exceptions - exception hierarchy - throwing and catching exceptions – built-in exceptions, creating own exceptions, Stack Trace Elements. Input / Output Basics – Streams – Byte streams and Character streams – Reading and Writing Console – Reading and Writing Files
UNIT IV: MULTITHREADING AND GENERIC PROGRAMMING (9L)
Understanding Threads, Thread Priorities, Synchronizing Threads, Thread life cycle, Inter-thread communication. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations-Introduction to JDBC, JDBC Drivers and Architecture, Accessing Databse with JDBC
UNIT V: EVENT DRIVEN PROGRAMMING (9L)
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes -actions - mouse events - Introduction to Swing –Swing GUI Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes. Swing packages-Swing Control classes and Methods

TEXT BOOKS	
1.	Herbert Schildt, ―Java The complete reference‖, 8th Edition, McGraw Hill Education, 2011
2	Cay S. Horstmann, Gary cornell, ―Core Java Volume –I Fundamentals‖, 9th Edition, Prentice Hall, 2013
REFERENCE BOOKS	
1.	Paul Deitel, Harvey Deitel, ―Java SE 8 for programmers‖, 3rd Edition, Pearson, 2015
2.	Steven Holzner, ―Java 2 Black book‖, Dreamtech press, 2011
3.	Timothy Budd, ―Understanding Object-oriented programming with Java‖, Updated Edition, Pearson Education, 2000
EBOOKS	
1.	**https://www.e-booksdirectory.com/Object-Oriented Programming with ANSI-C**
2.	http://fac.ksu.edu.sa/sites/default/files/ObjectOrientedProgramminginC4thEdition.pdf
MOOC	
1.	https://www.udemy.com/topic/object-oriented-programming
2.	https://www.coursera.org/

COURSE TITLE	**DATA STRUCTURES**			**CREDITS**	**3**
COURSE CODE	**CS1301A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To Study the concepts of ADTs. • To Acquire linear data structures – lists, stacks, and queues. • To learn non-linear data structures and apply Tree and Graph structures. • To understand sorting, searching and hashing algorithms

Course Outcome	At the end of the course, the students should be able to: • Apply the concept and operations of List ADT • Understand and apply the concept and operations of Stack and Queue ADT • Gain the knowledge about Tree ADT and its applications. • Apply Graph data structures in real world scenarios. • Execute the implementation of sorting, searching and hashing Techniques. • Comprehend Minimum Spanning Trees – and algorithms (Kruskal and Prims algorithm).
UNIT I: LINEAR DATA STRUCTURES – LIST **(9L)**	
Abstract Data Types (ADTs) – List ADT – array-based implementation – linked list implementation — singly linked lists-doubly-linked lists – circularly-linked list-applications of lists –Polynomial Manipulation	
UNIT II: LINEAR DATA STRUCTURES – STACKS, QUEUES **(9L)**	
Stack ADT – Operations – Evaluating arithmetic expressions- Other Applications-Conversion of Infix to postfix expression – Queue ADT – Operations – Circular Queue –Double Ended Queues – applications of queues	
UNIT III : NON LINEAR DATA STRUCTURES – TREES **(9L)**	
Introduction to Tree ADT – Implementations of trees- Binary Tree ADT -tree traversals -expression trees — binary search tree ADT –Threaded Binary Trees- AVL Trees –Multi-way Search Trees-B-Tree – B+ Tree- Heap-Priority Queue	
UNIT IV: GRAPHS AND HASHING **(9L)**	
Graph and their representations-Graph Traversal Techniques: Breadth First Search (BFS) and Depth First Search (DFS)-Topological Sort- Hashing- Hash Functions – Collision in hashing-Separate Chaining – Open Addressing-Rehashing-Applications of Hashing.	
UNIT V: SEARCHING AND SORTING **(9L)**	
Searching- Linear Search – Binary Search. Sorting – Bubble Sort – Selection Sort – Insertion Sort – Quick Sort-Merge Sort-Shell Sort – Radix Sort-Heap Sort.	
TEXT BOOKS	
1.	Mark Allen Weiss, “Data Structures and Algorithm Analysis in C”, 2nd Edition, Pearson Education, 1997.
2	Reema Thareja, “Data Structures Using C”, Second Edition, Oxford University Press, 2011
REFERENCE BOOKS	
1.	Thomas H. Cormen, Charles E. Leiserson, Ronald L.Rivest, Clifford Stein, “Introduction to Algorithms", Second Edition, Mcgraw Hill, 2002
2.	Aho, Hopcroft and Ullman, “Data Structures and Algorithms”, Pearson Education, 1983
3.	Stephen G. Kochan, “Programming in C”, 3rd edition, Pearson Education.
4.	Ellis Horowitz, Sartaj Sahni, Susan Anderson-Freed, “Fundamentals of Data Structures in C”, Second Edition, University Press, 2008.
EBOOKS	
1.	**https://www.e-booksdirectory.com / Data Structures and Algorithms**
MOOC	
1.	https://www.udemy.com/topic/object-oriented-programming
2.	https://www.coursera.org/

COURSE TITLE	**DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION**			**CREDITS**	**3**
COURSE CODE	**CW1301A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**
ASSESSMENT SCHEME					

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To analyze and design combinational circuits. • To analyze and design sequential circuits • To understand the basic structure and operation of a digital computer. • To study the design of data path unit, control unit for processor and to familiarize with the hazards. • To understand the concept of various memories and I/O interfacing.
Course Outcome	• Analyze and design various combinational circuits logic gates. • Analyze and design various sequential circuits using logic gates. • Understand the basic fundamentals and functions of a digital computer. • Understand the design of data path unit, control unit for processor and to familiarize • with the hazards • Apply the concept of memory map and memory interfaces which enables connection between application device. • Implement electronic circuits using logic gates.

UNIT I: COMBINATIONAL LOGIC (9L)

Combinational Circuits – Karnaugh Map - Analysis and Design Procedures – Binary Adder – Subtractor –Decimal Adder - Magnitude Comparator – Decoder – Encoder – Multiplexers – Demultiplexers.

UNIT II: SYNCHRONOUS SEQUENTIAL LOGIC (9L)

Introduction to Sequential Circuits – Flip-Flops – operation and excitation tables, Triggering of FF, Analysis and design of clocked sequential circuits – Design – Moore/Mealy models, state minimization, state assignment,circuit implementation - Registers – Counters.

UNIT III:COMPUTER FUNDAMENTALS (9L)

Functional Units of a Digital Computer: Von Neumann Architecture – Operation and Operands of Computer-Hardware Instruction – Instruction Set Architecture (ISA): Memory Location, Address and Operation –Instruction and Instruction Sequencing – Addressing Modes, Encoding of Machine Instruction – Interactionbetween Assembly and High Level Language.

UNIT IV: PROCESSOR (9L)

Instruction Execution – Building a Data Path – Designing a Control Unit – Hardwired Control,Microprogrammed Control – Pipelining – Data Hazard – Control Hazards.

UNIT V: MEMORY AND I/O (9L)

Memory Concepts and Hierarchy – Memory Management – Cache Memories: Mapping and Replacement Techniques – Virtual Memory – DMA – I/O – Accessing I/O: Parallel and Serial Interface – Interrupt I/O – Interconnection Standards: USB, SATA

TEXT BOOKS

1.	M. Morris Mano, Michael D. Ciletti, “Digital Design : With an Introduction to the Verilog HDL, VHDL, and System Verilog”, Sixth Edition, Pearson Education, 2018..
2	David A. Patterson, John L. Hennessy, “Computer Organization and Design, The Hardware/Software Interface”, Sixth Edition, Morgan Kaufmann/Elsevier, 2020

REFERENCE BOOKS

1.	Carl Hamacher, Zvonko Vranesic, Safwat Zaky, Naraig Manjikian, “Computer Organization and Embedded Systems”, Sixth Edition, Tata McGraw-Hill, 2012.
2.	William Stallings, “Computer Organization and Architecture – Designing for Performance”, Tenth Edition, Pearson Education, 2016.
3.	M. Morris Mano, “Digital Logic and Computer Design”, Pearson Education, 2016.

MOOC	
1.	NPTELHRD /DPCO

COURSE TITLE	INTRODUCTION TO BUSINESS SYSTEMS			CREDITS	3
COURSE CODE	CW1302A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To understand the overview of business systems. • To comprehend the types business organizations • To analyze the functions of the business units. • To study the procedure and functions of business and its controlling techniques • To understand the application of computer tools in business.
Course Outcome	**The Students will be able to** • Analyze and understand the overview of business systems. • Understand the types business organizations • Analyze the functions of the business units. • Understand the business performance • Study the procedure and functions of business and its controlling techniques. • Comprehend the application of computer tools in business

UNIT I: OVERVIEW OF BUSINESS SYSTEM (9L)

Business environmental factors - Internal and External. System approach of management Process - Input for the business, Transformational process and output. Objectives of the business system. System model of business management. Management functions – Planning, Organizing, Staffing, Directing and Controlling

UNIT II: OUTLINE OF BUSINESS ORGANISATION (9L)

Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises, Multinational and Global companies. Managing Global environment. Management levels and types

UNIT III:FUNCTIONS OF BUSINESS (9L)

Functions and Objectives – Production, Marketing, Finance, Human Resource, quality control and Research & development.

UNIT IV: MEASURING BUSINESS PERFORMANCE AND CONTROL PROCESS (9L)

Key performance indicators. Financial statement analysis- Cash flow analysis, ROI, working capital, cost volume profit analysis. Customer - satisfaction Retention and acquisition. Employee Performance - Benchmarking, employee retention. Controlling Techniques - Budgetary and Non- Budgetary control measures.
UNIT V: COMPUTER APPLICATIONS IN BUSINESS (9L)
Introduction to business Software- Enterprise application and Business application. Overview on types of Business software. ERP. Business Intelligence, e-business and e-governance.
TEXT BOOKS

1.	Harold Koontz, Heinz Weihrich, Mark V. Cannice, "Essentials of Management", Tata McGraw-Hill, 11th Edition, 2020
2	Stephen P. Robbins and David A. Decenzo, "Fundamentals of Management", PearsonEducation,8th Edition, 2012.

REFERENCE BOOKS	
1.	James A. O'Brien, "Management Information Systems: Managing Information Technology inthe Business Enterprise", Tata McGraw Hill, 2004.
2.	Corey Schou and Dan Shoemaker, "Information Assurance for the Enterprise: A Roadmap toInformation Security", Tata McGraw Hill, 2007.
3.	Bateman Snell, "Management: Competing in the new era", McGraw-Hill Irwin, 5th Edition,2002.
EBOOKS	
1.	Introduction to Business Systems, By Rolf T. Wigand.,Peter Mertens.Wolfgang

COURSE TITLE	**SOFTWARE ENGINEERING**			**CREDITS**	**3**
COURSE CODE	**CS1302A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To understand the basic concepts of software engineering applied in developing various software development life cycle models and agile process models. • Understand the software requirements and the SRS documents for software projects. • Understand the software design engineering, user-interface design and component level design. • Learn various testing approaches applied in software development. • Learn the methods of software project management: estimation, scheduling, planning and software risk management.
Course Outcome	At the end of the course, the students should be able to: • Outline the features of various life cycle models and agile process models. • Explain the principle involved in gathering and validating software requirements. • Make use of suitable models through analysis of requirements and arrive at an appropriate software design. • Choose suitable testing strategy for testing software during software development. • Explain software project management and software Maintenance practices. • Explain the latest concept applied in industry for software development like Kanban, DevOps.
Prerequisites:	

UNIT I: SOFTWARE PROCESS AND AGILE DEVELOPMENT	**(9L)**
Introduction: The Nature of Software, Software Engineering, The Software Process, Software Engineering practice, Software Myths, Process models: Prescriptive Process Perspective and Specialized Process Models, Agile development: Introduction to Agility - Agile Process Models: Scrum, Dynamic system development and Agile unified process-Tool Set for the Agile Process-Extreme programming Process	
UNIT II: REQUIREMENT ENGINEERING PROCESS AND MODELING	**(9L)**
Software Requirements: Functional and Non-Functional, User requirements, System requirements, Software Requirements Document – Requirement Engineering Process: Feasibility Studies, Requirements elicitation and analysis, requirements validation, requirements management. Requirements Modeling: Behavior, patterns, and web/mobile apps, Case Study: SRS-Library Management, Student Fee Registration Details.	
UNIT III : SOFTWARE DESIGN	**(9L)**
Design engineering: Design Process, Design Concepts, Design Model. Architectural design: Software Architecture, Architectural Genres, Architectural Styles, Architectural Design, Architectural Mapping using Data Flow. User-Interface Design: The Golden Rules, User Interface Analysis and Design, Interface Analysis, Interface Design Steps. Component level Design: Designing Class based componentsComponent-Level Design for WebApps and Mobile App	
UNIT IV: TESTING STRATEGIES	**(9L)**
Software testing strategies: A Strategic Approach to Software Testing, Test Strategies for Conventional Software and Object Oriented Software, Validation Testing, White- Box Testing, Basis Path Testing, Black-Box Testing, System Testing. Software Implementation Techniques: Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.	
UNIT V: PROJECT AND RISK MANAGEMENT	**(9L)**
Software Project Management: Estimation – LOC, FP Based Estimation, Make/Buy Decision COCOMO I & II Model – Project Scheduling – Scheduling, Earned Value Analysis Planning – Project Plan, Planning Process, Risk management: Reactive versus Proactive Risk Strategies, Software Risks, Risk Identification, Risk Projection, Risk Refinement, RMMM, RMMM Plan-Case Study: Risk ManagementManufacturing Company, Banks.	
TEXT BOOKS	
1.	Roger S. Pressman, “Software Engineering - A Practitioner’s Approach”, 6thEdition, TMH, 2010.
2	Sommerville, “Software Engineering”, 9th Edition, Pearson Education, 2011.
REFERENCE BOOKS	
1.	K.K.Agarwal & Yogesh Singh, “Software Engineering”, 3rd Edition, New Age International Publishers, 2008.
2.	Shely Cashman Rosenblatt, “System Analysis and Design”, 2nd Edition, Thomson Publications, 2011
3.	PankajJalote, “An Integrated Approach to Software Engineering”, 3rd Edition, Narosa Publishing House, 2011.
MOOC	
1.	https://www.udemy.com/
2.	https://www.coursera.org/

COURSE TITLE	OBJECT ORIENTED PROGRAMMING LABORATORY			CREDITS	2
COURSE CODE	IT1302A	COURSE CATEGORY	PC	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To build software development skills using java programming for real-world applications. • To understand and apply the concepts of classes, packages, interfaces, array list, exception handling and file processing. • To develop applications using generic programming and event handling
Course Outcome	• Develop and implement Java programs for simple applications that make use of classes, packages and interfaces. • Develop and implement Java Programs with Array list and exception handling. • Develop and implement Java programs using concept of multithreading. • Design and develop the applications file processing, generic programming. • Design and develop the applications using event handling mechanism. • Develop the mini-project using the concepts of kotlin programming

LIST OF EXPERIMENTS:

1.	Develop a java application using classes & objects
2.	Develop a java application using packages
3.	Develop a java application using Inheritance.
4.	Design a Java interface for ADT Stack. Provide necessary exception handling
5.	Write a program to perform string operations using Array List. Write functions for the following a. Append-add at end b. Insert–add at particular index c. Search d. List all string starts with given letter
6.	Write a Java Program to create an abstract class named and demonstrate polymorphism.
7.	Write a Java program to implement user defined exception handling.
8.	Write a Java program that reads a filename from the user, displays information about whether the file exists, whether the file is readable, or writable, the type of file and the length of the file in bytes
9.	Write a java program that implement multi-threading.
10.	Write a java program to create generic function.
11	Design a calculator using event-driven programming paradigm of Java with the following options. a) Decimal manipulations b) Scientific manipulations
12	Develop a simple student database management system using event-driven and concurrent programming paradigms of Java. Use JDBC to connect a back-end database.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE: 30 Terminals

SOFTWARE:

JAVA

COURSE TITLE	DATA STRUCTURES LABORATORY			CREDITS	2
COURSE CODE	CS1303A	COURSE CATEGORY	PC	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To implement linear and non-linear data structures • To understand the different operations of search trees • To implement graph algorithms • To get familiarized to sorting, searching and hashing algorithms
Course Outcome	At the end of the course, the students should be able to: • Implement the operations and applications of List, Stack and Queue using array. • Implement the operations of List, Stack and Queue using Linked List • Determine the different operations of various Trees. • Execute graph traversal algorithms and techniques. • Examine various sorting, searching and hashing algorithms. • Determine Minimum spanning trees algorithm

LIST OF EXPERIMENTS:

1.	Array implementation of List ADT
2.	Implement the following data structures Singly Linked List & Doubly Linked List
3.	Array implementation of Stack and Queue ADTs
4.	Applications of List, Stack and Queue ADTs
5.	Implementation of Binary Search Trees
6.	Implementation of AVL Trees.
7.	Implementation of heaps using priority queues.
8.	Programs for implementation of graph traversals BFS & DFS
9.	Implementation of searching algorithms
10.	Implementation of Insertion Sort, Merge Sort, Quick Sort and Heap Sort algorithms
11	Programs to implement hashing Separate Chaining & Open Addressing

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:
HARDWARE: 30 Terminals

SOFTWARE:

C COMPILER

COURSE TITLE	INTERPERSONAL SKILLS LABORATORY			CREDITS	1
COURSE CODE	HS1301A	COURSE CATEGORY	EEC	L-T-P-C	0 0 2 1
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills. • Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities. • Improve general and academic listening skills. • Make effective presentation.
Course Outcome	• Listen and respond appropriately. • Participate in group discussions • Make effective presentations • Participate confidently and appropriately in conversations both formal and informal • Persuade through conversations. • Improve pronunciation clearly.

Prerequisites:

UNIT I: COMMUNICATION **(6L)**

Listening As A Key Skill- Its Importance- Speaking- Give Personal Information- Ask For Personal Information- Improving Pronunciation- Pronunciation Basics- Taking Lecture Notes- Preparing To Listen To A Lecture- Listen to TED/INK Talks - Articulate A Complete Idea

UNIT II: INTERPERSONAL SKILLS **(6L)**

Interpersonal Skills- Nurturing- Empathetic- Self-Control- Patient- Sociability- Warmth- Social SkillsTeam Work-Work Ethic- Willing To Work- Initiative- Self-Motivated - Integrity

UNIT III:SPEAKING NUANCES **(6L)**

Factors Influence Fluency- Deliver A Five-Minute Informal Talk- Greet- Respond To Greetings-Describe Health And Symptoms-Invite And Offer- Accept- Decline- Take Leave- Listen For And Follow The GistListen For Detail – Book/ Movie/Newspaper Articles Review

UNIT IV: GROUP DISCUSSION **(6L)**

Being An Active Listener: Giving Verbal And Non-Verbal Feedback- Participating In A Group Discussion- Asking And Getting Clarifications-Summarizing Academic Readings And LecturesConversational Speech- Listening To And Participating In Conversations- Persuade.

UNIT V: PRESENTATIONS **(6L)**

Formal And Informal Talk- Listen To Follow And Respond To Explanations, Directions And Instructions In Academic And Business Contexts- Strategies For Formal Presentations And Interactive Communication- Group/Pair Presentations.

TEXT BOOKS

1.	Brooks, Margret. Skills for Success. Listening and Speaking. Level 4 Oxford University Press, Oxford: 2011.
2	Richards, C. Jack. & David Bholke. Speak Now Level 3. Oxford University Press, Oxford: 2010

REFERENCE BOOKS

1.	Bhatnagar, Nitin and Mamta Bhatnagar. Communicative English for Engineers and Professionals. Pearson: New Delhi, 2010
2.	Hughes, Glyn and Josephine Moate. Practical English Classroom. Oxford University Press: Oxford, 2014.
3.	Ladousse, Gillian Porter. Role Play. Oxford University Press: Oxford, 2014
4.	Richards C. Jack. Person to Person (Starter). Oxford University Press: Oxford, 2006.
5.	Vargo, Mari. Speak Now Level 4. Oxford University Press: Oxford, 2013

SEMESTER IV

COURSE TITLE	UNIVERSAL HUMAN VALUES			CREDITS	3
COURSE CODE	HV1401A	COURSE CATEGORY	PC	L-T-P-C	2-1-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Universal Human Values: Understanding Harmony
Course Objective	The objective of the course is fourfold: • Development of a holistic perspective based on self-exploration about themselves (human being), family, society and nature/existence. • Understanding (or developing clarity) of the harmony in the human being, family, society and nature/existence • Strengthening of self-reflection. • 4. Development of commitment and courage to act
Course Outcome	• Understand and analyze the essentials of human values and skills, self-exploration, happiness and prosperity. • Evaluate harmony in human being. • Identify and evaluate the role of harmony in family, society and universal order. • Understand and associate the holistic perception of harmony at all levels of existence. • Develop appropriate technologies and management patterns to create harmony in professional and personal lines. • Able to understand the real-life situation and able to live with right understanding by realizing universal human values.

UNIT I: Course Introduction - Need, Basic Guidelines, Content and Process for Value Education (**9L)**

1. Purpose and motivation for the course, recapitulation from Universal Human Values-I 2. Self-Exploration–what is it? - Its content and process; 'Natural Acceptance' and Experiential Validation- as the process for self-exploration 3. Continuous Happiness and Prosperity- A look at basic Human Aspirations 4. Right understanding, Relationship and Physical Facility- the basic requirements for fulfillment of aspirations of every human being with their correct priority 5. Understanding Happiness and Prosperity correctly- A critical appraisal of the current scenario 6. Method to fulfill the above human aspirations: understanding and living in harmony at various levels. Include practice sessions to discuss natural acceptance in human being as the innate acceptance for living with responsibility (living in relationship, harmony and co-existence) rather than as arbitrariness in choice based on liking-disliking

UNIT II: Understanding Harmony in the Human Being - Harmony in Myself **(9L)**

7. Understanding human being as a co-existence of the sentient 'I' and the material 'Body' 8. Understanding the needs of Self ('I') and 'Body' - happiness and physical facility 9. Understanding the Body as an instrument of 'I' (I being the doer, seer and enjoyer) 10. Understanding the characteristics and activities of 'I' and harmony in 'I' 11. Understanding the harmony of I with the Body: Sanyam and Health; correct appraisal of Physical needs, meaning of Prosperity in detail 12. Programs to ensure Sanyam and Health. Include practice sessions to discuss the role others have played in making material goods available to me. Identifying from one's own life. Differentiate between prosperity and accumulation. Discuss program for ensuring health vs dealing with disease.

UNIT III : Understanding Harmony in the Family and Society- Harmony in Human Relationship **(9L)**

13. Understanding values in human-human relationship; meaning of Justice (nine universal values in relationships) and program for its fulfillment to ensure mutual happiness; Trust and Respect as the foundational values of relationship 14. Understanding

the meaning of Trust; Difference between intention and competence 15. Understanding the meaning of Respect, Difference between respect and differentiation; the other salient values in relationship 16. Understanding the harmony in the society (society being an extension of family): Resolution, Prosperity, fearlessness (trust) and co-existence as comprehensive Human Goals 17. Visualizing a universal harmonious order in society- Undivided Society, Universal Order- from family to world family. Include practice sessions to reflect on relationships in family, hostel and institute as extended family, real life examples, teacher-student relationship, goal of education etc. Gratitude as a universal value in relationships. Discuss with scenarios. Elicit examples from students' lives.
UNIT IV : Understanding Harmony in the Nature and Existence -Whole existence 9 as Coexistence **(9L)**
18. Understanding the harmony in the Nature 19. Interconnectedness and mutual fulfilment among the four orders of nature recyclability and selfregulation in nature 20. Understanding Existence as Co-existence of mutually interacting units in all pervasive space 21. Holistic perception of harmony at all levels of existence. Include practice sessions to discuss human being as cause of imbalance in nature (film "Home" can be used), pollution, depletion of resources and role of technology etc.
UNIT V : Implications of the above Holistic Understanding of Harmony on Professional Ethics **(9L)**
22. Natural acceptance of human values 23. Definitiveness of Ethical Human Conduct 24. Basis for Humanistic Education, Humanistic Constitution and Humanistic Universal Order25. Competence in professional ethics: a. Ability to utilize the professional competence for augmenting universal human order b. Ability to identify the scope and characteristics of people friendly and ecofriendly production systems, c.Ability to identify and develop appropriate technologies and management patterns for above production systems. 26. Case studies of typical holistic technologies, management models and production systems 27. Strategy for transition from the present state to Universal Human Order: a. At the level of individual: as socially and ecologically responsible engineers, technologists and managers b. At the level of society: as mutually enriching institutions and organizations 28. Sum up. Include practice Exercises and Case Studies will be taken up in Practice (tutorial) Sessions e.g. discuss the conduct as an engineer or scientist etc

TEXT BOOKS	
1.	Human Values and Professional Ethics by R R Gaur, R Sangal, G P Bagaria, Excel Books, New Delhi, 2010
REFERENCE BOOKS	
1.	JeevanVidya: EkParichaya, A Nagaraj, Jeevan Vidya Prakashan, Amarkantak,1999.
2.	Human Values, A.N. Tripathi, New Age Intl. Publishers, New Delhi, 2004.
3	The Story of Stuff (Book).
4	The Story of My Experiments with Truth - by Mohandas Karamchand Gandhi
5	Small is Beautiful - E. F Schumacher
6	Slow is Beautiful - Cecile Andrews
7	Economy of Permanence - J C Kumarappa
8	Bharat Mein Angreji Raj – PanditSunderlal
9	Rediscovering India - by Dharampal
10	Hind Swaraj or Indian Home Rule - by Mohandas K. Gandhi
11	India Wins Freedom - Maulana Abdul Kalam Azad 12. 13.
12	Vivekananda - Romain Rolland (English)
13	Gandhi - Romain Rolland (English)

COURSE TITLE	DATABASE MANAGEMENT SYSTEMS			CREDITS	3
COURSE CODE	IT1401A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To learn the fundamentals of data models, relational algebra and SQL • To represent a database system using ER diagrams and to learn normalization techniques • To understand the fundamental concepts of transaction, concurrency and recovery processing • To understand the internal storage structures using different file and indexing techniques which will help in physical DB design • To have an introductory knowledge about the Distributed databases, NOSQL and database security
Course Outcome	**The students will be able to** • Model an Application's data requirements using conceptual modeling and design database schemas based on the conceptual model and Formulate solutions to a broad range of query. • Understand normalization theory and apply such Knowledge to the normalization of the database. • Develop transaction and estimate the procedure for controlling the consequences of concurrent data access. • Understand basic database storage structures, access techniques and query Processing. • Categorize distributed, semi-structured and unstructured database system. • Appraise how advanced databases differ from Relational Databases and find a suitable database for the given requirement.

UNIT I: RELATIONAL DATABASES **(9L)**

Purpose of Database System – Views of data – Data Models – Database System Architecture – Introduction to relational databases – Relational Model – Keys – Relational Algebra – SQL fundamentals – Advanced SQL features – Embedded SQL– Dynamic SQL

UNIT II: DATABASE DESIGN **(9L)**

Entity-Relationship model – E-R Diagrams – Enhanced-ER Model – ER-to-Relational Mapping – Functional Dependencies – Non-loss Decomposition – First, Second, Third Normal Forms, Dependency Preservation – Boyce/Codd Normal Form – Multi-valued Dependencies and Fourth Normal Form – Join Dependencies and Fifth Normal Form

UNIT III : TRANSACTIONS **(9L)**

Transaction Concepts – ACID Properties – Schedules – Serializability – Transaction support in SQL – Need for Concurrency – Concurrency control –Two Phase Locking- Timestamp – Multiversion – Validation and Snapshot isolation– Multiple Granularity locking – Deadlock Handling – Recovery Concepts – Recovery based on deferred and immediate update – Shadow paging – ARIES Algorithm

UNIT IV: IMPLEMENTATION TECHNIQUES **(9L)**

RAID – File Organization – Organization of Records in Files – Data dictionary Storage – Column Oriented Storage– Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for Selection, Sorting and join operations – Query optimization using Heuristics - Cost Estimation.

UNIT V: ADVANCED TOPICS **(9L)**

Distributed Databases: Architecture, Data Storage, Transaction Processing, Query processing and optimization – NOSQL Databases: Introduction – CAP Theorem – Document Based systems – Key value Stores – Column Based Systems – Graph

Databases. Database Security: Security issues – Access control based on privileges – Role Based access control – SQL Injection – Statistical Database security – Flow control – Encryption and Public Key infrastructures – Challenges	
TEXT BOOKS	
1.	Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Seventh Edition, McGraw Hill, 2020.
2	Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Seventh Edition, Pearson Education, 2016
3	
REFERENCE BOOKS	
1.	C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006
2.	Sathish Salunkhe, Visali P.Jadhav, "GUI and Database Management", Dorling Kindersley(India)Private limited,Pearson Education,2012
3.	Database Systems,The Complete Book,By Hector Garcia-Molina, Jeffrey D. Ullman, Jennifer Widom · 2001
EBOOKS	
1.	Fundamentals of Database Systems Seventh Edition (amirsmvt.github.io)
2.	asolanki.co.in/wp-content/uploads/2019/02/Fundamentals_of_Database_Systems_6th_Edition-1.pdf
3.	
MOOC	
1.	Free DBMS Online Course with Certificate (scaler.com)
2.	Best Database Management Courses & Certificates Online [2023] | Coursera
3.	Best Database Management Courses Online | Beginner → Advanced (udemy.com)

COURSE TITLE	**DESIGN AND ANALYSIS OF ALGORITHMS**			**CREDITS**	**3**
COURSE CODE	**CS1402A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To analyze and apply algorithm analysis technique. • To acquire and analyze knowledge to solve problems. • To Design and Implement efficient algorithm for a specified Application. • Strength the ability to identify and apply the suitable algorithm for the real world problem. • To Understand and Analyze the Approximation Algorithms.
Course Outcome	At the end of the course, the students be able to : • Design algorithms for various computing problems. • Understand different algorithm to solve problem. • Implement efficient algorithms for a specified application. • Identify and Apply the suitable algorithm for the given real world problem.

	• Understand the approximation algorithms.

UNIT I: INTRODUCTION **(9L)**

Notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types –Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework - Asymptotic Notations and their properties – Empirical analysis - Mathematical analysis of Recursive and Nonrecursive algorithms – Visualization

UNIT II: BRUTE FORCE AND DIVIDE AND CONQUER **(9L)**

Brute Force – String Matching - Exhaustive Search - Traveling Salesman Problem - Knapsack Problem - Assignment problem. Divide and Conquer Methodology – Multiplication of Large Integers and Strassen's Matrix Multiplication – Closest-Pair and Convex - Hull Problems. Decrease and Conquer: - Topological Sorting – Transform and Conquer: Presorting – Heaps and Heap Sort

UNIT III : DYNAMIC PROGRAMMING AND GREEDY TECHNIQUE **(9L)**

Dynamic programming – Principle of optimality - Coin changing problem – Warshall's and Floyd's algorithms – Optimal Binary Search Trees - Multi stage graph - Knapsack Problem and Memory functions. Greedy Technique – Dijkstra's algorithm - Huffman Trees and codes - 0/1 Knapsack problem.

UNIT IV: ITERATIVE IMPROVEMENT **(9L)**

The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.

UNIT V: LIMITATIONS OF ALGORITHM POWER **(9L)**

Lower - Bound Arguments - P, NP, NP- Complete and NP Hard Problems. Backtracking – NQueen problem - Hamiltonian Circuit Problem – Subset Sum Problem. Branch and Bound – LIFO Search and FIFO search - Assignment problem – Knapsack Problem – Traveling Salesman Problem - Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem – Knapsack problem.

TEXT BOOKS

1.	Anany Levitin, Introduction to the Design and Analysis of Algorithms, Third Edition, Pearson Education, 2012

REFERENCE BOOKS

1.	Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, Computer Algorithms/ C++, Second Edition, Universities Press, 2019.
2.	Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, Introduction to Algorithms, Third Edition, PHI Learning Private Limited, 2012
3.	S. Sridhar, Design and Analysis of Algorithms, Oxford university press, 2014.
4.	Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, Data Structures and Algorithms, Pearson Education, Reprint 2006.

EBOOKS

1.	courses.cs.duke.edu/fall08/cps230/Book.pdf
2.	**Introduction to Design Analysis of Algorithms** by K. Raghava Rao

MOOC

1.	Best Algorithm Design Courses & Certificates Online [2023] | Coursera
2.	Free Algorithms Course with Online Certificate - Enrol Now (mygreatlearning.com)
3.	Free Course: Algorithm Design and Analysis from University of Pennsylvania | Class Central

COURSE TITLE	FUNDAMENTALS OF DATA SCIENCE			CREDITS	3
COURSE CODE	CW1401A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)

Course Description	
Course Objective	• Understand the basics of data science • Summarize testable predictions for real-time data • Understand Data Scientist's Role in the analysis Process • Understand the concepts of Data collection and management • Establish sources of data • Explain various mathematical concepts for Data Science and Use the concepts of statistics. • Identify distribution properties of data using statistical concepts and Understand types of data Visualization techniques • Use the measures for model evaluation and Evaluate models for multiple environments. • Understand types of data Visualization techniques and Use the measures for model evaluation • Evaluate models for multiple environments. • Understand regression techniques and Compare multiple classification techniques . • Interpret multiple techniques for solving Data science application
Course Outcome	At the end of the course, a student will be able to • Describe the significance of data science and understand the Data Science process. • Explain how data is collected, managed and stored for data science. • Build, and prepare data for use with a variety of statistical methods and models • Analyze Data using various Visualization techniques. • Choose contemporary models, such as machine learning, AI, techniques to solve practical problems

UNIT I: INTRODUCTION TO DATA SCIENCE **(9L)**

Definition, Big Data and Data Science Hype, Datafication , Data Science Profile, Meta-Definition, Data Scientist, Statistical Inference, Populations and Samples, Populations and Samples of Big Data, Big Data Can Mean Big Assumptions, Modeling, Philosophy of Exploratory Data Analysis, The Data Science Process , A Data Scientist's Role in this Process Case Study: Real Direct.(Text Book 2)

UNIT II: MATHEMATICAL PRELIMINARIES **(9L)**

Probability, Descriptive Statistics, Correlation Analysis.(Textbook 1) Data Munging: Properties of Data, Languages for Data Science, Collecting Data, Cleaning Data, Crowdsourcing. (Text Book 1)

UNIT III : SCORES AND RANKINGS **(9L)**

Scores and Rankings: Developing Scoring Systems, Z-scores and Normalization, Advanced Ranking Techniques Statistical Analysis: Sampling from Distributions, Statistical Distributions, Statistical Significance, Permutation Tests and P-values(Text Book 1)

UNIT IV: DATA HANDLING AND MODEL EVALUATION **(9L)**

Visualizing Data: Exploratory Data Analysis, Developing a Visualization Aesthetic, Chart Types, Great Visualization Mathematical Models: Philosophies of Modeling, A Taxonomy of Models, Baseline Models, Evaluating Models, Evaluatio Environment. (Text Book 1)

UNIT V: SUPERVISED LEARNING **(9L)**

Supervised Learning: Linear Regression, Better Regression Models, Regression as Parameter Fitting, Simplifying Models through Regularization Classification and Logistic Regression, Issues in Logistic Classification, Naive Bayes, Decision Trees Classifiers (Text Book 1)	
TEXT BOOKS	
1.	Steven S. Skiena, "The Data Science Design Manual", Springer 2017.
2	Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Frontline O'REILLY, ISBN:978-1-449-35865-5, 1st edition, October 2013.
REFERENCE BOOKS	
1.	Joel Grus," Data Science from Scratch" First Edition, April 2015
2.	Gareth James, Daniela Witten, Trevor Hatie, Roberst Tibhirani , "An Introduction to Statistical Learning-with Applications in R", 2013
3.	Jure Leskovek, Anand Raja Raman and Jeffrey Ullman. Mining of Massive Datasets. v2.1, Cambridge University Press. 2 edition (30 September 2014)
4.	R Programming for Data Science, Roger D. Peng, Lean Pub, 2015.
EBOOKS	
1.	Steven S. Skiena, "The Data Science Design Manual", Springer 2017.
2.	Rachel Schutt & O'neil, "Doing Data Science", Straight Talk from The Frontline O'REILLY, ISBN: 978-1-449-35865-5, 1st edition, October 2013.
MOOC	
1.	https://nptel.ac.in/noc/courses/noc20/SEM1/noc20-cs28
2.	Free Data Science Foundations Course Online with Certificate - Great Learning (mygreatlearning.com)

COURSE TITLE	**OPTIMIZATION TECHNIQUES**			**CREDITS**	**4**
COURSE CODE	MA1406A	**COURSE CATEGORY**	**HS**	**L-T-P-C**	**3-1-0-4**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• Formulate and solve linear programming problems (LPP) • Integer Programming Problems, Transportation and Assignment Problems. • Obtain a solution to network problems using CPM and PERT techniques. • Able to optimize the function subject to the constraints • Identify and solve problems under Markovian queuing models
Course Outcome	Upon completion of this course, the students will be able to • Formulate and solve linear programming problems (LPP) • Evaluate Integer Programming Problems, Transportation and Assignment Problems. • Obtain solution to network problems using CPM and PERT techniques. • Able to optimize the function subject to the constraints.

	• Identify the best strategy using decision making methods under game theory. • Understand the various techniques applied on linear and non-linear programming
UNIT I: LINEAR MODELS **(12L)**	
Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Big M method, Two-Phase method	
UNIT II: INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS **(12L)**	
Integer programming: Branch and bound method- Transportation and Assignment problems - Travelling salesman problem	
UNIT III : PROJECT SCHEDULING **(12L)**	
Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM	
UNIT IV : CLASSICAL OPTIMIZATION THEORY **(12L)**	
Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equalit constraints – inequality constraints - Kuhn-Tucker conditions	
UNIT V: GAME THEORY **(12L)**	
Competitive game, rectangular game, saddle point, minima (maxim in) method of optimal strategies- value of the game. Solution of games with saddle points, dominance principle. Rectangular games without saddle point – mixed strategy for 2 X 2 games.	
TEXT BOOKS	
1.	Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.
REFERENCE BOOKS	
1.	ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011
2.	J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.
3.	Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.
4.	Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas
E-BOOKS	
1.	Optimization Techniques – Techknowledge Publications (techknowledgebooks.com)
MOOC	
1.	Optimization from fundamentals - Course (nptel.ac.in)
2.	Best Optimization Courses & Certificates Online [2023] | Coursera

COURSE TITLE	**INTRODUCTION TO FINTECH**			**CREDITS**	**3**
COURSE CODE	**CW1402A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**0-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To learn about history, importance and evolution of Fintech. • To acquire the knowledge of Fintech in payment industry • To acquire the knowledge of Fintech in insurance industry • To learn the Fintech developments around the world • To know about the future of Fintech .
Course Outcome	At the end of the course, the student should be able to

Prerequisites:

UNIT I: INTRODUCTION **(9L)**

Fintech - Definition, History, concept, meaning, architecture, significance, Goals, key areas in Fintech, Importance of Fintech, role of Fintech in economic development, opportunities and challenges in Fintech, Evolution of Fintech in different sectors of the industry - Infrastructure, Banking Industry, Startups and Emerging Markets, recent developments in FinTech, future prospects and potential issues with Fintech.

UNIT II: PAYMENT INDUSTRY **(9L)**

FinTech in Payment Industry-Multichannel digital wallets, applications supporting wallets, onboarding and KYC application, FinTech in Lending Industry- Formal lending, Informal lending, P2P lending, POS lending, Online lending, Payday lending, Microfinance, Crowdfunding

UNIT III : INSURANCE INDUSTRY **(9L)**

FinTech in Wealth Management Industry-Financial Advice, Automated investing, Socially responsible investing, Fractional Investing, Social Investing. FinTech in Insurance Industry- P2P insurance, On-Demand Insurance, On-Demand Consultation, Customer engagement through Quote to sell, policy servicing, Claims Management, Investment linked health insurance.

UNIT IV: FINTECH AROUND THE GLOBE **(9L)**

FinTech developments - US, Europe and UK, Germany, Sweden, France, China, India, Africa, Australia, New Zealand, Brazi and Middle East, Regulatory and Policy Assessment for Growth of FinTech. FinTech as disruptors, Financial institution collaborating with FinTech companies, The new financial world.

UNIT V: FUTURE OF FINTECH **(9L)**

How emerging technologies will change financial services, the future of financial services, banking on innovation through data, why FinTech banks will rule the world, The FinTech Supermarket, Banks partnering with FinTech start-ups, The rise of BankTech, Fintech impact on Retail Banking, A future without money, Ethics in Fintech.

TEXT BOOKS

1.	Arner D., Barbers J., Buckley R, The evolution of FinTech: a new post crisis paradigm, University of New South Wales Research Series, 2015
2	Susanne Chishti, Janos Barberis, The FINTECH Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries, Wiley Publications, 2016

REFERENCE BOOKS

1.	Richard Hayen, FinTech: The Impact and Influence of Financial Technology on Banking and the Finance Industry, 2016
2.	Parag Y Arjunwadkar, FinTech: The Technology Driving Disruption in the financial service industry CRC Press, 2018
3.	Sanjay Phadke, Fintech Future : The Digital DNA of Finance Paperback .Sage Publications, 2020
4.	Pranay Gupta, T. Mandy Tham, Fintech: The New DNA of Financial Services Paperback, 2018

COURSE TITLE	**EMPLOYABILITY AND SOFT SKILLS LAB**	**CREDITS**	**2**

COURSE CODE	HS1401A	COURSE CATEGORY	PC	L-T-P-C	0-0-2-1
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• Strengthen the Employability skills of students and develop their personality towards placement and career advancement. • Improve the listening, speaking, reading and writing skills for comprehending and responding in academic, general and professional contexts. • Develop students' critical thinking skills. • Provide more opportunities to develop their project and proposal writing skills. • Enrich the Soft Skills of the students to interact with others harmoniously.
Course Outcome	At the end of the course, the student should be able to • Write for different purposes in general and technical context. • Write formal job applications. • Excel in Verbal aptitude, read and evaluate texts logically to solve the puzzles. • Develop and demonstrate the employability and soft skills. • Display critical thinking in various professional contexts

Prerequisites:

UNIT I: SOFT SKILLS **(6L)**

Soft Skills- Interpersonal Skills - Professionalism- Courtesy-Manners - Workplace Etiquette- Business Etiquette-Flexibility- Positive Attitude- Responsibility-Teamwork- Time Management.

UNIT II: EMPLOYABILITY SKILLS **(6L)**

Communication- Oral Presentation Practice. - Writing Skill Development- Presentation Skills -Listening Practice– Listening To Longer Technical Talks And Completing Exercises Based On Them- Enhancing Elements of Effective Communication- Motivation and Initiative- Leadership- Reliability/DependabilityAdaptability- Patience- Problem Solving- Negotiation and Persuasion

UNIT III : WRITING **(6L)**

Writing-Plan before writing-Develop a paragraph: Topic sentence, Supporting Sentences, Concluding sentence- Coherence Markers-Writing Narrative, Descriptive, Expository, and Persuasive Paragraphs

UNIT IV:READING **(6L)**

Reading- Reading different Genres -Collection and Organization of Ideas- Review of Books/ Newspaper Articles, Readin General and Technical Passages Writing: Email, Resume, Job Application, Technical Articles, Projects and Proposals.

UNIT V: VERBAL APTITUDE & LOGICAL REASONING **(6L)**

Aptitude- Verbal Analogy- Error Spotting, Sentence Completion for Preparation for Higher Studies and Placement- Logical Reasoning- Critical Reading and Thinking- Understanding How The Text Positions The Reader- Writing- Statement of Purpose- Letter of Recommendation- Vision Statement.

TEXT BOOKS

1.	Gramer F. Margot and Colin S. Ward Reading and Writing (Level 3) Oxford University Press: Oxford, 2011
2	Debra Daise, CharlNorloff, and Paul Carne Reading and Writing (Level 4) Oxford University Press: Oxford, 2011

REFERENCE BOOKS

1.	Davis, Jason and Rhonda LIss.Effective Academic Writing (Level 3) Oxford University Press: Oxford, 2006
2.	E. Suresh Kumar and et al. Enriching Speaking and Writing Skills. Second Edition. Orient Black swan: Hyderabad, 2012
3.	Withrow, Jeans and et al. Inspired to Write. Readings and Tasks to develop writing skills. Cambridge University Press: Cambridge, 2004
4.	Goatly, Andrew. Critical Reading and Writing. Routledge: United States of America, 2000
SOFTWARES	
1.	SOFTWARE: Globearena (English Language Lab & Career Lab Software)
WEBSITES	
1.	https://placement.freshersworld.com/
2.	https://www.examenglish.com/
3.	https://www.faceprep.in/
4.	https://www.fresherslive.com/online-test

COURSE TITLE	**DESIGN AND ANALYSIS OF ALGORITHMS LABORATORY**			**CREDITS**	**2**
COURSE CODE	**CS1404A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**0-0-4-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To understand and apply algorithm analysis technique • To acquire and analyze knowledge to solve problems. • To Design and implement efficient algorithms for a specified application. • Strengthen the ability to identify and apply the suitable algorithm for the real world problem. • To understand and analyze the Approximation algorithms
Course Outcome	At the end of the course, the students should be able to: • Design algorithms for various computing problems • Understand different algorithm to solve problems • Implement efficient algorithms for a specified application • Identify and apply the suitable algorithm for the given real-world problem. • Understand the approximation algorithms.

LIST OF EXPERIMENTS:

1.	To find the factorial of a given number using recursive algorithm
2.	To find the number of bits in integer

3.	Create Diamond Pattern Printing
4.	Sort a given set of elements using the quick sort method and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the 1st to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
5.	Implement merge sort algorithm to sort a given set of elements and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.
6.	Implement 0/1 Knapsack problem using Dynamic Programming.
7.	Compute the transitive closure of a given graph using Warshall's algorithm
8.	Implement All-Pairs Shortest Paths Problem using Floyd's algorithm. Parallelize this algorithm, implement it using OpenMP and determine the speed-up achieved
9.	Find Minimum Cost Spanning Tree of a given graph using Prim's andKruskal's algorithm
10.	Implementthe Single source Shortest path algorithm
	Implement any scheme to find the optimal solution for the Traveling Sales Person problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
11.	Implement N Queen's problem using Back Tracking.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE: 30 Terminals
SOFTWARE:
JAVA

REFERENCES:

1.	Levitin A, "Introduction to the Design And Analysis of Algorithms", Pearson Education, 2008.
2.	Goodrich M.T.,RTomassia, "Algorithm Design foundations Analysis and Internet Examples", John Wileyn and Sons, 2006.
3.	Base Sara, Allen Van Gelder ," Computer Algorithms Introduction to Design and Analysis", Pearson, 3 rd Edition, 1999

COURSE TITLE	**DATABASE MANAGEMENT SYSTEMS LABORATORY**			**CREDITS**	**2**
COURSE CODE	**IT1402A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**0-0-4-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME					
First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To learn and implement important commands in SQL. • To learn the usage of nested and joint queries. • To understand functions, procedures and procedural extensions of databases. • To understand design and implementation of typical database applications. • To be familiar with the use of a front end tool for GUI based application development
Course Outcome	• Use typical data definitions and manipulation commands. • Design applications to test Nested and Join Queries • Implement simple applications that use Views • Critically analyze the use of Tables, Views, Functions and Procedures • Implement a GUI application that require a Front-end and Back end Tool • Create and manipulate data using NOSQL database.

LIST OF EXPERIMENTS:	
1.	Data Definition Commands, Data Manipulation Commands for inserting, deleting, updating and retrieving Tables and Transaction Control statements
2.	Database Querying – Simple queries, Nested queries, Sub queries and Joins
3.	Views, Sequences, Synonyms
4.	Database Programming: Implicit and Explicit Cursors
5.	Procedures and Functions
6.	Triggers
7.	Exception Handling
8.	Database Design using ER modeling, normalization and Implementation for any application
9.	Create Document, column and graph based data using NOSQL database tools.
10.	Develop a simple GUI based database application

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE: 30 Terminals
SOFTWARE:
Front end: VB/VC ++/JAVA or Equivalent Back end: Oracle / SQL / MySQL/ PostGress / DB2 or Equivalent

SEMESTER V

COURSE TITLE	FUNDAMENTALS OF MANAGEMENT			CREDITS	3
COURSE CODE	CW1501A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	This course explores the basic concepts and processes of management. Students will examine the fundamental roles and processes of planning, leading, organizing and controlling that comprise the managers' role
Course Objective	• Managers manage business organizations in the dynamic global environment • Organizations develop and maintain competitive advantage • Business decisions are made using various tools and techniques to remain competitive • Managers use problem-solving strategies and critical thinking skills in real-life situations • Different areas of the business (i.e., Manufacturing/Service, Marketing, Finance and Human Resource Management) support the vision and mission • Managers implement successful planning
Course Outcome	Upon completion of this course, the students will be able to • Analyze and evaluate the influence of historical forces on the current practice of management. • Identify and evaluate social responsibility and ethical issues involved in business situations and logically articulate own position on such issues. • Explain how organizations adapt to an uncertain environment and identify techniques managers use to influence and control the internal environment. • Develop the process of management's four functions: planning, organizing, leading, and controlling. • Interpret and properly use vocabularies within the field of management to articulate one's own position on a specific management issue and communicate effectively with varied audiences. Evaluate leadership styles to anticipate the consequences of each leadership style. • Identify the areas to control and Selecting the Appropriate controlling methods/Technique

UNIT I: INTRODUCTION **(9L)**

Definition, Nature and Scope, Functions, Managerial Roles, Levels of Management, Managerial Skills, Challenges of Management; Evolution of Management- Classical Approach- Scientific and Administrative Management; The Behavioral approach; The Quantitative approach; The Systems Approach; Contingency Approach, IT Approach

UNIT II: Planning and Decision Making **(9L)**

General Framework for Planning - Planning Process, Types of Plans, Management by Objectives; Development of Business Strategy. Decision making and Problem Solving - Programmed and Non Programmed Decisions, Steps in Problem Solving and Decision Making; Bounded Rationality and Influences on Decision Making; Group Problem Solving and Decision Making, Creativity and Innovation in Managerial Work.

UNIT III : Organization and HRM **(9L)**

Principles of Organization: Organizational Design & Organizational Structures; Departmentalization, Delegation; Empowerment, Centralization, Decentralization, Recentralization; Organizational Culture; Organizational Climate and Organizational Change.Human Resource Management & Business Strategy: Talent Management, Talent Management Models and Strategic Human Resource Planning; Recruitment and Selection; Training and Development; Performance Appraisal

UNIT IV : Leading and Motivation **(9L)**

Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leade as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Motivatio

- Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Need Hierarchy Theory, Two Factor Theory, Theory X and Theory Y
UNIT V: Controlling: **(9L)**
Control, Types and Strategies for Control, Steps in Control Process, Budgetary and Non- Budgetary Controls. Characteristics of Effective Controls, Establishing control systems, Control frequency, and Methods

TEXT BOOKS	
1.	Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2.	Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009
REFERENCE BOOKS	
1.	Essentials of Management, Koontz Kleihrich, Tata McGraw Hill
2.	Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012
MOOC	
1.	https://onlinecourses.nptel.ac.in/

COURSE TITLE	**OPERATING SYSTEMS**			**CREDITS**	**3**
COURSE CODE	**CS1501A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To understand the basics and functions of operating systems. • To understand Processes and Threads • To analyze Scheduling algorithms and process synchronization • To understand the concept of Deadlocks. • To analyze various memory management schemes. • To be familiar with I/O management and File systems. • To be familiar with the basics of virtual machines and Mobile OS like iOS and Android
Course Outcome	• Upon completion of this course, the students will be able to • Analyze various scheduling algorithms and process synchronization. • Explain deadlock, prevention and avoidance algorithms. • Compare and contrast various memory management schemes. • Explain the functionality of file systems I/O systems, and Virtualization • Compare iOS and Android Operating Systems.
UNIT I: INTRODUCTION **(9L)**	

Computer System - Elements and organization; Operating System Overview - Objectives and Functions - Evolution of Operating System; Operating System Structures – Operating System Services - User Operating System Interface - System Calls – System Programs - Design and Implementation - Structuring methods
UNIT II: PROCESS MANAGEMENT **(9L)**
Processes - Process Concept - Process Scheduling - Operations on Processes - Inter-process Communication; CPU Scheduling - Scheduling criteria - Scheduling algorithms: Threads - Multithread Models – Threading issues; Process Synchronization - The critical-section problem - Synchronization hardware – Semaphores – Mutex - Classical problems of synchronization - Monitors; Deadlock - Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.
UNIT III : MEMORY MANAGEMENT **(9L)**
Main Memory - Swapping - Contiguous Memory Allocation – Paging - Structure of the Page Table - Segmentation, Segmentation with paging; Virtual Memory - Demand Paging – Copy on Write - Page Replacement - Allocation of Frames – Thrashing.
UNIT IV : STORAGE MANAGEMENT **(9L)**
Mass Storage system – Disk Structure - Disk Scheduling and Management; File-System Interface - File concept - Access method - Directory Structure - Directory organization - File system mounting - File Sharing and Protection; File System Implementation - File System Structure - Directory implementation - Allocation Methods - Free Space Management; I/O Systems – I/O Hardware Application I/O interface, Kernel I/O subsystem.
UNIT V: VIRTUAL MACHINES AND MOBILE OS WEB SECURITY **(9L)**
Virtual Machines – History, Benefits and Features, Building Blocks, Types of Virtual Machines and their Implementations, Virtualization and Operating-System Components; Mobile OS - iOS and Android

TEXT BOOKS	
1.	Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, “Operating System Concepts”, 9th Edition, John Wiley and Sons Inc., 2018. 2. Andrew S Tanenbaum, "Modern Operating Systems", Pearson, 4th Edition, New Delhi, 2016.
REFERENCE BOOKS	
1.	Ramaz Elmasri, A. Gil Carrick, David Levine, “Operating Systems – A Spiral Approach”, Tata McGraw Hill Edition, 2010
2.	William Stallings, "Operating Systems: Internals and Design Principles", 7th Edition, Prentice Hall, 2018
3.	Achyut Godbole, Atul Kahate, “Operating Systems”, McGraw Hill Education, 2016
EBOOKS	
1.	https://www.e-booksdirectory.com/ operating-systems
2.	https://csc-knu.github.io/Modern operating-systems
MOOC	
1.	https://onlinecourses.nptel.ac.in/
2.	https://www.udemy.com/courses/it-and-software/operating-systems
3.	https://www.coursera.org/

COURSE TITLE	DESIGN THINKING			CREDITS	3
COURSE CODE	CW1502A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Design Thinking is a human-centered approach to innovation that draws upon the designer's toolkit to integrate the needs of people, the possibilities of technology, and the requirements for business success.
Course Objective	• To familiarize design thinking and its phases. • To perform immersion activity in empathize phase of design thinking. • To create problem statements in the define phase of design thinking. • To ideate and find solutions to the problem defined. • To develop a prototype and perform testing
Course Outcome	Upon completion of this course, the students will be able to 1. Understand the phases of design thinking process 2. Conduct an immersion activity to create an empathy map. 3. Define the key problems of the personas created. 4. Apply the ideation phase steps to present the prototype ideas. 5. Demonstrate the prototype with value propositions and test the prototype.

UNIT I: INTRODUCTION TO DESIGN THINKING	**(9L)**
Introduction to design thinking - Importance of design thinking for business – Phases of design thinking – Experiential activity – Case study.	
UNIT II: EMPATHIZE PHASE	**(9L)**
Empathize phase - Steps involved - Immersion activity- Questionnaire – Empathy map for case study	
UNIT III : DEFINE PHASE	**(9L)**
Creation of personas in define phase – steps in problem statement creation - problem statement definition – Examples – Key problem statements	
UNIT IV: IDEATION PHASE	**(9L)**
Ideation phase steps – Ideation games – Ideate to find solutions – Doodling – Storytelling in presenting ideas and prototypes.	
UNIT V: PROTOTYPE AND TESTING	**(9L)**
Importance of prototype in design thinking –Guidelines - Prototyping the idea – Value proposition statement – Testing in design thinking – Prototype testing – Documentation – Design thinking in functional work – Mapping design thinking to agile methodologies.	

TEXT BOOKS

1.	Christian Müller-Roterberg, "Handbook of Design Thinking", Kindle Direct Publishing, November 2018. https://www.researchgate.net/publication/329310644_Handbook of Design Thinking
2	Dan Senor and Saul Singer, "Start-Up Nation", Grand Central Publishing, Twelfth Edition, 2009.
3	Nir Eyal and Ryan Hoover, "Hooked: How to Build Habit-Forming Products", Library of Congress, 2014

REFERENCE BOOKS

1.	Corral, Luis & Fronza, Ilenia, "Design Thinking and Agile Practices for Software Engineering: An Opportunity for Innovation", 2018. 26-31. 10.1145/3241815.3241864.

2.	Design thinking 101: Principles, Tools & Examples to transform your creative process. https://justcreative.com/design-thinking-101/
EBOOKS	
1.	https://www.interaction-design.org/courses/design-thinking-the-ultimate-guide
2.	https://justcreative.com/design-thinking-101/
3.	Download: Design Thinking - Free Ebook - FocusU
MOOC	
1.	Stanford Webinar- Design Thinking = Method, Not Magi
2.	Design Thinking Online Courses – IDEO U

COURSE TITLE	**COMPUTER NETWORKS**			**CREDITS**	**3**
COURSE CODE	IT1501A	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To understand the protocol layering and physical level communication. • To analyze the performance of a network. • To understand the various components required to build different networks. • To learn the functions of network layer and the various routing protocols. • To familiarize the functions and protocols of the Transport Layer
Course Outcome	Upon completion of this course, the students will be able to • Understand the basic layers and its functions in computer networks. • Evaluate the performance of a network. • Understand the basics of how data flows from one node to another. • Analyze and design routing algorithms. • Design protocols for various functions in the network. • Understand the working of various application layer protocols

UNIT I: INTRODUCTION AND PHYSICAL LAYER	**(9L)**
Motivation-Goals of networking-Need for a layered architecture, Network hardware-Network software -Reference models - Network standardization, RS-232 over serial line - Guided Transmission media - Wireless transmission media	
UNIT II: THE DATA LINK LAYER	**(9L)**

The Data Link Layer: Data link layer design issues – services provided to the network layer, Framing –Flow and error control :Error detection and correction - Elementary data link protocols – A simplex stop and wait protocol –stop and wait ARQ- Sliding window protocols, piggy backing - Wired LANs: Ethernet - Wireless LANs – IEEE 802.11, Bluetooth – Connecting Devices
UNIT III : THE NETWORK LAYER **(9L)**
Network layer design issues –Switching techniques, IP addressing modes- IPV4, IPV6 subnetting, Routing algorithms: Flooding, Distance vector and Link state routing, Hierarchical routing, Multicasting and broadcasting - Congestion control algorithms –Internetworking
UNIT IV: THE TRANSPORT LAYER **(9L)**
Duties of Transport layer– Services – Port Numbers -Multiplexing -Demultiplexing-Congestion control, Internet transport protocols UDP, TCP, SCTP, Case Study: ATM protocols
UNIT V: THE APPLICATION LAYER **(9L)**
WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP

TEXT BOOKS	
1.	Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
REFERENCE BOOKS	
1.	Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012
2.	William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3.	Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4.	Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open S source Approach, McGraw Hill Publisher, 2011
5.	James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
EBOOKS	
1.	An Introduction to Computer Networks (luc.edu),http://intronetworks.cs.luc.edu
2.	An Introduction to Computer Networks - Second Edition - Open Textbook Library (umn.edu)
MOOC	
1.	https://ncert.nic.in
2.	Best Computer Network Courses & Certificates Online [2023] | Coursera

COURSE TITLE	**DATA AND INFORMATION SECURITY**			**CREDITS**	**3**
COURSE CODE	**CW1503A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To understand the basics of Information Security • To know the legal, ethical and professional issues in Information Security • To equip the students' knowledge on digital signature, email security and web security
Course Outcome	Upon completion of this course, the students will be able to • Understand the basics of data and information security • Understand the legal, ethical and professional issues in information security • Understand the various authentication schemes to simulate different applications. • Understand various security practices and system security standards • Understand the Web security protocols for E-Commerce applications

UNIT I: INFORMTION SECURITY **(9L)**

History, what is Information Security? Critical Characteristics of Information, NSTISSC Security Model, Components of an Information System, Securing the Components, Balancing Security and Access, The SDLC, The Security SDLC

UNIT II: **(9L)**

Need for Security, Business Needs, Threats, Attacks, Legal, Ethical and Professional Issues - An Overview of Computer Security - Access Control Matrix, Policy-Security policies, Confidentiality policies, Integrity policies and Hybrid policies

UNIT III : DATA SECURITY **(9L)**

Introduction:History of Cryptography. Mathematical background: Probability theory -Information theory – Complexity theory, Number theory. Symmetric (Private) Key Cryptographic Systems: Caesar – Affine – Monoalphabetic Substitution – Transposition – Homophonic substitution – Vigenère – Beauford and DES Family – Product ciphers – Lucifer and DES.

UNIT IV: **(9L)**

Asymmetric (Public) Key Cryptographic Systems: Concept of PKCS, RSA Cryptosystem- Variants of RSA – Primality testin – Security of RSA – Merkle – Helaman – Security of Merkle – Helaman, ElGamal. Elliptical Curve Cryptography. Stream cipher and block ciphers: The one-time pad – Synchronous stream ciphers – Self-synchronizing stream ciphers – Feedback shift register – Linear Complexity – Non-linear feedback shift registers – Stream ciphers based LFSRs. Non-linear Combination generators Nonlinear filter generators – Clock controlled generators – The alternating step generators – The shrinking generators.

UNIT V: **(9L)**

Digital Signatures: Properties, Generic signature schemes – Rabin Lamport – Matyas Meyer, RSA – Multiple RSA and ElGamal Signatures – Digital signature standard – Blind Signatures- RSA Blind. Secret Sharing Algorithms: Threshold secret sharing – Shamir scheme, Blakley scheme and modular Scheme. Pseudo random number generators: Definition of randomness and pseudo-randomness – Statistical tests of randomness – Linear congruential generator – Modern PRNGs (a brief description).

TEXT BOOKS

1.	Michael E Whitman and Herbert J Mattord, "Principles of Information Security, Course Technology, 6th Edition, 2017. 2. Stallings William. Cryptography and Network Security: Principles and Practice, Seventh Edition, Pearson Education, 2017.
2	Padmanabhan T R, Shyamala C and Harini N, "Cryptography and Security", Wiley Publications 2011.
3.	Josef Pieprzyk, Thomas Hardjono and Jenifer Seberry, "Fundamentals of Computer Security", Springer 2010.

REFERENCE BOOKS

1.	Harold F. Tipton, Micki Krause Nozaki, "Information Security Management Handbook, Volume 6, 6th Edition, 2016.
2.	Stuart McClure, Joel Scram bray, George Kurtz, "Hacking Exposed", McGraw- Hill, Seventh Edition, 2012.
3.	Matt Bishop, "Computer Security Art and Science, Addison Wesley Reprint Edition, 2015

4.	Behrouz A Forouzan, Deb deep Mukhopadhyay, Cryptography And network security, 3rd Edition, McGraw-Hill Education, 2015.
5.	Douglas R Stinson, “Cryptography: Theory and Practice”, CRC Press 2005.
6.	Alfred J Menezes, Paul C Van Oorschot and Scott A. Vanstone, “Handbook of Applied Cryptography”, CRC press 1996.
EBOOKS	
1.	lecture1423183198.pdf (vssut.ac.in)
2.	Wiley Data and Cybersecurity eBooks Library | Innovate (ieee.org)
MOOC	
1.	Data Security | Udemy
2.	Best Data Security Courses & Certificates Online [2023] | Coursera
3.	Information Security (InfoSec) Courses and Certifications for 2023 | Class Central

COURSE TITLE	**NETWORKS LABORATORY**			**CREDITS**	**2**
COURSE CODE	**IT1503A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**0-0-4-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To learn and use network commands. • To learn socket programming. • To implement and analyze various network protocols • To learn and use simulation tools. • To use simulation tools to analyze the performance of various network protocols. • To learn error detection and correction techniques
Course Outcome	• Implement various protocols using TCP and UDP. • Compare the performance of different transport layer protocols. • Use simulation tools to analyze the performance of various network protocols. • Analyze various routing algorithms. • Implement simulation tools. • Implement error correction cod

LIST OF EXPERIMENTS:

1.	Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and traceroute PDUs using a network protocol analyzer and examine.
2.	Write a HTTP web client program to download a web page using TCP sockets.
3.	Applications using TCP sockets like: Echo client and echo server, Chat , File Transfer
4.	Simulation of DNS using UDP sockets
5.	Write a code simulating ARP /RARP protocols
6.	Study of Network simulator (NS) and Simulation of Congestion Control Algorithms

7.	Study of TCP/UDP performance using Simulation tool
8.	Simulation of Distance Vector/ Link State Routing algorithm
9.	. Performance evaluation of Routing protocols using Simulation tool.
10.	Simulation of error correction code (like CRC).
11.	Configuring Network Operating Systems and network devices

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE: 30 Terminals

SOFTWARE:

1. C / C++ / Java / Python / Equivalent Compiler 30.2. Network simulator like NS2/Glomosim/OPNET/ Packet Tracer / Equivalent

COURSE TITLE	**OPERATING SYSTEMS LABORATORY**			**CREDITS**	**2**
COURSE CODE	**CS1503A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**0-0-4-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To learn UNIX commands and shell programming. • To implement Process Creation, Inter Process Communication and various CPU Scheduling Algorithms. • To implement Deadlock Avoidance and Deadlock Detection Algorithms. • To implement Page Replacement Algorithms. • To implement File Allocation Strategies.
Course Outcome	• Learn various UNIX commands, shell programming • Create processes, implement IPC and Semaphores and to compare the performance of various CPU scheduling algorithms. • Implement Deadlock avoidance and Detection Algorithms . • Analyze the performance of the various Page Replacement Algorithms • Implement File Organization and File Allocation Strategies • Implement Disk Scheduling Algorithms

LIST OF EXPERIMENTS:

1.	Installation of LINUX using Virtual Machine
2.	Basics of UNIX and LINUX commands
3.	Write programs using the following system calls of UNIX operating system fork, exec, getpid, exit, wait, close, stat, opendir, readdir
4.	Write C programs to simulate UNIX commands like cp, ls, grep, etc
5.	Shell Programming
6.	Write C programs to implement the various CPU Scheduling Algorithms

7.	Implementation of Semaphores
8.	Implementation of Shared memory and IPC
9	Bankers Algorithm for Deadlock Avoidance
10	Implementation of Deadlock Detection Algorithm
11	Write C program to implement Threading & Synchronization Applications
12	Implementation of the following Memory Allocation Methods for fixed partition a) First Fit b) Worst Fit c) Best Fit
13	Implementation of Paging Technique of Memory Management
14	Implementation of the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
15	Implementation of the various file organization techniques and the following File Allocation Strategies a) Sequential b) Indexed c) Linked
LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:	
LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS: HARDWARE: 30 Terminals	
SOFTWARE:	
1. C / C++ / Java	

SEMESTER VI

COURSE TITLE	ARTIFICIAL INTELLIGENCE			CREDITS	3
COURSE CODE	CS1603A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. To understand the various characteristics of Intelligent agents 2. To learn the different search strategies in 3. To apply logical and probabilistic reasoning in solving AI problems 4. To know about the various applications of AI
Course Outcome	Upon completion of the course, the students will be able to: 1. Understand the intelligent agent frameworks 2. Apply problem solving techniques 3. Understand knowledge representation with logical reasoning 4. Perform probabilistic reasoning under uncertainty 5. Learn the various applications and types of Learning.

1: INTRODUCTION

UNIT I: INTRODUCTION **6L**

Introduction–Definition – Future of Artificial Intelligence- Production systems, Types of Production systems –Typical Intelligent Agents – Agents and Environments – concept of rationality – nature of environments – Structure of agents

UNIT II: PROBLEM SOLVING METHODS **6L**

Search Strategies - Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games

UNIT III: LOGICAL REASONING **6L**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic. First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution

UNIT IV: PROBABILISTIC REASONING **6L**

Acting under uncertainty – Bayesian inference – naïve Bayes models. Probabilistic reasoning – Bayesian networks – exact inference in BN – approximate inference in BN – causal networks.

UNIT V: APPLICATIONS AND LEARNING **6L**

Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Introduction to Machine Learning-Types of Machine Learning

TEXT BOOKS

1.	S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach‖, Prentice Hall, Third Edition, 2009
2.	I. Bratko, ―Prolog: Programming for Artificial Intelligence‖, Fourth edition, Addison-Wesley Educational Publishers Inc., 2011
REFERENCE BOOKS	
1.	M. Tim Jones, ―Artificial Intelligence: A Systems Approach(Computer Science)‖, Jones and Bartlett Publishers, Inc.; First Edition, 2008
2.	Nils J. Nilsson, ―The Quest for Artificial Intelligence‖, Cambridge University Press, 2009
3.	Stephen Marsland, ―Machine Learning – An Algorithmic Perspective‖, Second Edition, Chapman and Hall/CRC Machine Learning and Pattern Recognition Series, 2014
4.	William F. Clocksin and Christopher S. Mellish,‖ Programming in Prolog: Using the ISO Standard‖, Fifth Edition, Springer, 2003
5.	Gerhard Weiss, ―Multi Agent Systems‖, Second Edition, MIT Press, 2013
EBOOKS	
1.	https://www.amazon.in/Artificial-Intelligence-Anna-University-CS8691-ebook/dp/B0885YPJ7T

COURSE TITLE	**CRYPTOGRAPHY AND NETWORK SECURITY**			**CREDITS**	**3**
COURSE CODE	CS1604A	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. To understand Cryptography Theories, Algorithms and Systems. 2. To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
Course Outcome	The students will be able to • Understand the fundamentals of networks security, security architecture, threats and vulnerabilities • Apply the different cryptographic operations of symmetric cryptographic algorithms • Apply the different cryptographic operations of public key cryptography • Apply the various Authentication schemes to simulate different applications. • Understand various Security practices and System security standards

1: INTRODUCTION

UNIT I: INTRODUCTION **6L**

Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Cyber threats and their defense (Phishing Defensive measures, web-based attacks, SQL injection & Defense techniques

UNIT II: BLOCK CIPHER AND SYMMETRIC KEY CRYPTOGRAPHY **6L**

Algebraic structures, Modular arithmetic-Euclid‟s algorithm- Congruence and matrices SYMMETRIC KEY CIPHERS: SDES – Block cipher Principles of DES – Strength of DES – Differential and linear cryptanalysis - Block cipher design principles – Block cipher mode of operation – Evaluation criteria for AES – Advanced Encryption Standard - RC4 – Key distribution

UNIT III: NUMBER THEORY & ASYMETRIC KEY CRYPTOGRAPHY **6L**

Primes – Primality Testing – Factorization – Euler's totient function, Fermat's and Euler's Theorem - Chinese Remainder Theorem – Exponentiation and logarithm - ASYMMETRIC KEY CIPHERS: RSA cryptosystem – Key distribution – Key management – Diffie Hellman key exchange -Elliptic curve cryptography
UNIT IV: MESSAGE AUTHENTICATION AND INTEGRITY 6L
Authentication requirement – Authentication function – MAC – Hash function – Security of hash function and MAC – SHA – Digital signatures – DSS- Entity Authentication applications - Kerberos, X.509
UNIT V: WEB, EMAIL SECURITY AND ADVANCED ENCRYPTION 6L
Web Security: SSL, TLS – EMAIL Security: PGP - Advanced Encryption: Shamir's secret sharing and BE, Identity-based Encrypti (IBE), Attribute-based Encryption (ABE) – Functional Encryption - Introduction to Quantum Cryptography.

TEXT BOOKS	
1.	William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006.
2.	Douglas R Stinson "Cryptography – Theory and practice", First Edition, CRC Press, 1995.
REFERENCE BOOKS	
1.	Charlie Kaufman, Radia Perlman and Mike Speciner, "Network Security", Prentice Hall of India, 2002
2.	Behrouz A. Ferouzan, "Cryptography & Network Security", Tata McGraw Hill, 2007
3.	Man Young Rhee, "Internet Security: Cryptographic Principles", "Algorithms and Protocols", Wiley Publications, 2003.
4.	Charles Pfleeger, "Security in Computing", 4th Edition, Prentice Hall of India, 2006
5.	Ulysess Black, "Internet Security Protocols", Pearson Education Asia, 2000
6.	Nptel.ac.in
7.	"Cryptography Theory and Practice" by Douglas.R. Stinson and Maura.B. Paterson, CRC Press, Fourth Edition
8.	"Attribute based Encryption and Access Control" by Dijiang Huang and Qiuxiang Dong, CRC Press
9.	Functional Encryption, by Khairol Amali Bin Ahmad, Khaleel Ahmad, Uma N. Dulhare, Springer Publication
10.	"Quantum Cryptography" by YoannPeitri, Imperial College, London (Research Paper)
EBOOKS	
1.	https://studymind.app/anna-univ/cs8792

COURSE TITLE	**BUSINESS ANALYTICS**			**CREDITS**	**3**
COURSE CODE	**CW1601A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	➢ To understand the Analytics Life Cycle. ➢ To comprehend the process of acquiring Business Intelligence ➢ To understand various types of analytics for Business Forecasting

	➢ To model the supply chain management for Analytics. ➢ To apply analytics for different functions of a business
Course Outcome	**The students will be able to** • Explain the real-world business problems and model with analytical solutions. • Identify the business processes for extracting Business Intelligence • Apply predictive analytics for business fore-casting • Apply analytics for supply chain and logistics • Use analytics for marketing and sales.

1: INTRODUCTION

UNIT I: INTRODUCTION TO BUSINESS ANALYTICS **6L**

Analytics and Data Science – Analytics Life Cycle – Types of Analytics – Business Problem Definition – Data Collection – Data Preparation – Hypothesis Generation – Modeling – Validation and Evaluation – Interpretation – Deployment and Iteration

UNIT II: BUSINESS INTELLIGENCE **6L**

Data Warehouses and Data Mart - Knowledge Management –Types of Decisions - Decision Making Process - Decision Support Systems – Business Intelligence –OLAP – Analytic functions

UNIT III: BUSINESS FORECASTING **6L**

Introduction to Business Forecasting and Predictive analytics - Logic and Data Driven Models – Data Mining and Predictive Analysis Modeling –Machine Learning for Predictive analytics.

UNIT IV: HR & SUPPLY CHAIN ANALYTICS **6L**

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain. Apply HR Analytics to make a prediction of the demand for hourly employees for a year

UNIT V: MARKETING & SALES ANALYTICS **6L**

Marketing Strategy, Marketing Mix, Customer Behavior –selling Process – Sales Planning – Analytics applications in Marketing and Sales. Do predictive analytics for customers' behavior in marketing and sales.

TEXT BOOKS

1.	R. Evans James, Business Analytics, 2017
2.	R N Prasad, Seema Acharya, Fundamentals of Business Analytics, 2016
3.	Philip Kotler and Kevin Keller, Marketing Management, 15th edition, PHI, 2016
4.	VSP RAO, Human Resource Management, 3rd Edition, Excel Books, 2010
5.	Mahadevan B, “Operations Management -Theory and Practice”,3rd Edition, Pearson Education,2018

REFERENCE BOOKS

1.	Marc J. Schniederjans, Dara G. Schniederjans and Christopher M. Starkey, " Business Analytics Principles, Concepts, and Applications - What, Why, and How", Pearson Ed, 2014
2.	Christian Albright S and Wayne L. Winston, "Business Analytics - Data Analysis and Decision Making", Fifth edition, Cengage Learning, 2015.

COURSE TITLE	MACHINE LEARNING FOR PREDICTIVE ANALYTICS			CREDITS	4
COURSE CODE	CW1602A	COURSE CATEGORY	PC	L-T-P-C	3-0-2-4

Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Machine learning for Predictive analytics involves certain manipulations on data from existing data sets with the goal of identifying some new trends and patterns. These trends and patterns are then used to predict future outcomes and trends. Learning how predictive analytics extensively uses machine learning for data modeling due to its ability to accurately process vast amounts of data and recognize patterns.
Course Objective	• Students will learn how to explore and visualize the data, • To understand the basic theory underlying machine learning. • To understand a range of machine learning algorithms along with their strengths and weaknesses. • To get a preliminary idea of what variables are important, and how they relate to one another.
Course Outcome	By learning the course, the students will be able to • Illustrate the steps involved in predictive analytics and modeling. • Utilize Machine learning in predictive analytic • Apply predictive modeling for solving real world problems. • Appreciate the importance of visualization in the data analytics solution • Apply structured thinking to unstructured problems

Prerequisites: NIL

UNIT I:INTRODUCTION TO MACHINE LEARNING AND DATA ANALYTICS (9)

Machine Learning for Predictive Data Analytics, What Is Predictive Data Analytics? What Is Machine Learning? How Does Machine Learning Work? Inductive Bias Versus Sample Bias, What Can Go Wrong with Machine Learning. The Predictive Data Analytics ,Project Lifecycle: CRISP-DM ,Predictive Data Analytics Tools, The Road Ahead, Exercises.

UNIT II: DATA TO INSIGHTS (9)

Data to Insights to Decisions, Converting Business Problems into Analytics Solutions, Case Study: Motor Insurance Fraud, Assessing Feasibility, Case Study: Motor Insurance Fraud , Designing the Analytics Base Table , Case Study: Motor Insurance Fraud ,Designing and Implementing Features , Different Types of Data. Different Types of Features , Handling Time Legal Issues , Implementing Features ,Case Study: Motor Insurance Fraud

UNIT III: DATA EXPLORATION (9)

Data Exploration , The Data Quality Report , Case Study: Motor Insurance Fraud ,Getting to Know the Data , The Normal Distribution, Case Study: Motor Insurance Fraud , Identifying Data Quality Issues , Missing Values , Irregular Cardinality , Outliers ,Case Study: Motor Insurance Fraud , Handling Data Quality Issues , Handling Missing Values , Handling Outliers , Case Study: Motor Insurance Fraud , Advanced Data Exploration , Visualizing Relationships between Features , Measuring Covariance and Correlation , Data Preparation , Normalization , Binning , Sampling

UNIT IV: PREDICTIVE DATA ANALYTICS (9)

Information-Based Learning , Big Idea , Fundamentals Decision Trees , Shannon's Entropy Model , Information Gain Standard Approach: The ID3 Algorithm ,A Worked Example: Predicting Vegetation Distributions Extensions and Variations , Alternative Feature Selection and Impurity Metrics , Handling Continuous Descriptive Features ,Predicting Continuous Targets , Tree Pruning , Model Ensembles.

UNIT V: SIMILARITY-BASED LEARNING AND PROBABILITY –BASED LEARNING AND ERROR-BASED (9)

Similarity-Based Learning , Big Idea , Fundamentals , Feature Space ,Measuring Similarity Using Distance Metrics , Standard Approach: The Nearest Neighbor Algorithm , A Worked Example , Extensions and Variations , Handling Noisy Data , Efficient Memory Search ,Data Normalization , Predicting Continuous Targets , Other Measures of Similarity ,Feature Selection Probability-Based Learning , Big Idea , Fundamentals , Bayes' Theorem, Bayesian Prediction , Conditional Independence and Factorization Error-Based Learning , Big Idea , Fundamentals , Simple Linear Regression , Measuring Error , Error Surfaces , Standard Approach: Multivariable Linear Regression with Gradient Descent , Multivariable Linear Regression , Gradient Descent , Choosing Learning Rates and Initial Weights , A Worked Example , Extensions and Variations , Interpreting Multivariable Linear Regression Models

TEXT BOOKS

1.	Fundamentals of Machine Learning for Predictive Data Analytics Algorithms, Worked Examples, and Case Studies Second Edition., John D. Kelleher, Brian Mac Name, and Aoife D'Arcy.
REFERENCE BOOKS	
1.	Big data Analytics,Peter Ghavami
EBOOKS	
1.	**Fundamentals of Machine Learning for Predictive Data Analytics.**
MOOC	www.machinelearningbook.com

COURSE TITLE	BUSINESS ANALYTICS LABORATORY			CREDITS	2
COURSE CODE	CW1603A	COURSE CATEGORY	PC	L-T-P-C	0-0-4-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• Implement various machine learning techniques for predictive analysis • Learn the various software development methodologies • Learn predictive analysis in HR, supply chain • Learn predictive analysis in marketing and sales
Course Outcome	• Implement Machine learning techniques for Predictive analytics. • Analyse prediction using Linear Regression • Perform analytics for forecasting and inventory planning for a large retailer. • Apply predictive analysis in HR, supply chain • Apply predictive analysis in marketing and sales

LIST OF EXPERIMENTS: **60L**

1. Implement Machine learning techniques for Predictive analytics.
2. Predict the Customer Credit Risk for Credit card data-set using Linear Regression
3. Apply HR Analytics to make a prediction of the demand for hourly-employees for the following month or for the next few years
4. Apply analytics for forecasting and inventory planning for a large retailer.
5. Perform predictive analytics for customers' behaviour in marketing and sales

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

SOFTWARE:

Systems with R, R Studio (Additional libraries required)

COURSE TITLE	SECURITY LABORATORY			CREDITS	2
COURSE CODE	CS1606A	COURSE CATEGORY	PC	L-T-P-C	0-0-4
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)

Course Description	
Course Objective	• To learn different cipher techniques • To implement the algorithms DES, RSA, MD5, SHA-1 • To use network security tools and vulnerability assessment tools
Course Outcome	**The students will be able to** • To implement the classical cipher techniques. • To implement the classical modern techniques. • To implement the various hash algorithms. • To implement the digital signature algorithm. • To use different open source tools for implementing different security. • To use different open source tools for network intrusion detection.

Prerequisites: C Programming Language, C++, JAVA

LIST OF EXPERIMENTS: **60L**

1. Perform encryption, decryption using the following substitution techniques.
   (i) Ceaser cipher,
   (ii) playfair cipher
   (iii) Hill Cipher
   (iv) Vigenere cipher
2. Perform encryption and decryption using following transposition techniques.
   (i) Rail fence
   (ii) row & Column Transformation
3. Apply DES algorithm for practical applications.
4. Apply AES algorithm for practical applications.
5. Implement RSA Algorithm using HTML and JavaScript.
6. Implement the Diffie-Hellman Key Exchange algorithm for a given problem.
7. Calculate the message digest of a text using the SHA-1 algorithm.
8. Implement the SIGNATURE SCHEME - Digital Signature Standard.
9. Demonstrate intrusion detection system (ids) using any tool eg. Snort or any other s/w.
10. Automated Attack and Penetration Tools Exploring N-Stalker, a Vulnerability Assessment Tool.
11. Defeating Malware i) Building Trojans ii) Rootkit Hunter.

REFERENCES:

1. Build Your Own Security Lab, Michael Gregg, Wiley India

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:

LABORATORY REQUIREMENT FOR BATCH OF 30 STUDENTS:
HARDWARE: 30 Terminals.

SOFTWARE:

C / C++ / Java or equivalent compiler GnuPG, Snort, N-Stalker or Equivalent

SEMESTER VII

COURSE TITLE	SERVICES OPERATIONS AND MANAGEMENT			CREDITS	3
COURSE CODE	CW1701A	COURSE CATEGORY	ES	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. Understand the services and service operations management concepts. 2. Comprehend the techniques of service operations. 3. Understand the service quality and service design aspects. 4. Understand the service innovation aspects. 5. To analyze how services are different from products by its characteristics
Course Outcome	On completion of the course, the students will be able to: • Understand concepts about services and distinguish it from goods. • Able to identify characteristics and nature of services. • Comprehend ways to design services and evaluate them using service qualities. • Understand how various methods can be used to operate and manage service businesses. • Understand how innovation can be approached from services point of view.

1: INTRODUCTION

UNIT I: INTRODUCTION **9L**

Introduction to the course, Introduction to service operations, Role of service in economy and society, Introduction to Indian service sector. Nature of Services and Service Encounters: Differences between services and operations, Service package, characteristics, various frameworks to design service operation system, Kind of service encounter, importance of encounters. Service-Dominant Logic: From Goods-Dominant logic to Service-Dominant logic, Value co-creation

UNIT II: SERVICE STRATEGY AND COMPETITIVENESS **10L**

Development of Strategic Service Vision (SSV), Data Envelopment Analysis-New Service Development: NSD cycle, Service Blueprinting, Elements of service delivery system - Service Design: Customer Journey and Service Design, Design Thinking methods to aid Service Design Locating facilities and designing their layout: models of facility locations (Huff's retail model), Role of service-scape in layout design - Service Quality: SERVQUAL, Walk through Audit, Dimensions of Service quality & other quality tools

UNIT III: SERVICE GUARANTEE & SERVICE RECOVERY **8L**

Service quality GAP analysis, Service guarantee-Service encounter-service profit chain.

UNIT IV: FORECASTING DEMAND FOR SERVICES **9L**

Types of demand forecasting methods for Managing Capacity and Demand: Strategies for matching capacity and demand, managing waiting line in services. Managing Facilitating Goods: inventory models, Role of inventory in services - Managing service supply relationship: Understanding the supply chain, Strategies for managing suppliers of service - Vehicle Routing Problem: understanding services that involve transportation of people and vehicle

UNIT V: SERVICE INNOVATION **9L**

Services Productivity, Need for Services Innovation, service innovation in different service sector – educational, health and hospitality sectors.

TEXT BOOKS

1.	1. Fitzsimmons & Fitzsimmons, "Service Management: Operations, Strategy, Information Technology", McGraw Hill publications, 7th Edition, 2017.
2.	Christopher H.Lovelock and JochenWirtz, "Services Marketing", Pearson Education, New Delhi, 7th Edition, 2011
3.	Metters, Karthryn King-Metters, Madeleine pullman, Steve Walton, "Successful Service Operations Management", South-Western, Cengage Learning, 2nd Edition, 2008
4.	Cengiz Haksever, Barry Render, Roberta S Russell, Pobert G Mirdick, "Service Management and Operations", Pearson Education, 2nd Edition, 2000
REFERENCE BOOKS	
1.	Wilson, A., Zeithaml, V. A., Bitner, M. J., & Gremler, D. D., " Services marketing: Integrating customer focus across the firm", McGraw Hill, 2012.
2.	Lovelock, C,Services, " Marketing", Pearson Education India, 7 th Edition ,2011.
3.	Robert Johnson, Graham clark, "Service Operations Management", Pearson Education, 2nd Edition, 2005
4.	Reason, Ben, and Lovlie, Lavrans, "Service Design for Business: A Practical Guide to Optimizing the Customer Experience", Pan Macmillan India, 2016.
5.	Chesbrough, H, "Open Services Innovation: Rethinking Your Business To Grow and Compete in a New Era". John Wiley & Sons, 2010
EBOOKS	
1.	https://www.researchgate.net/publication/229667633_Service_Operations_and_Management

COURSE TITLE	**DATA VISUALIZATION AND ANALYTICS**			**CREDITS**	**4**
COURSE CODE	**CW1702A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-1-4**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 4**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To understand the need of data analytics • To understand the different methods of analytics • To learn the applications of predictive analytics • To understand the impact of data visualization in data analytics • To provide hands on experience in Data Analytics

1: INTRODUCTION

UNIT I: INTRODUCTION TO DATA ANALYTICS **9L**

Data Analytics – Steps in Data Analytics – Data Gathering – Data Scrubbing – Data Analysis – Descriptive Analytics – What – Use – Measures – Inferential Statistic

UNIT II: PREDICTIVE ANALYTICS **9L**

Definition – Different Kinds – Predictive Models – Descriptive Modeling – Decision Modeling – Machine Learning Techniques – Regression – Linear Regression – Logistic Regression – Neural Network – Support Vector Machines – Naïve Bayes - The

players - Privacy and disclosure – Terminology – Respondent and Holder privacy – Data driven methods – Computation driven methods – Result driven methods
UNIT III: APPLICATION OF PREDICTIVE ANALYTICS **9L**
Analytical Customer Relationship Management – Use of Predictive Analytics in Healthcare - Financial Sector – Predictive Analytics & Business – Marketing Strategies – Fraud Detection
UNIT IV: DATA VISUALIZATION **9L**
Stacked Bar Chart – Histogram – Butterfly Chart – Donut Chart – Scatter Plot – Bubble Chart – Box Plot – Pareto Chart – Bump Chart – Maps – Gantt Chart
UNIT V: DASHBOARD **9L**
Dashboard – What, Types – Dashboard Design Approach – Healthcare Quality Dashboard – Airline Quality Dashboard – Manufacturing Quality Dashboard – Warehouse Quality Dashboard.

LIST OF EXPERIMENTS	**30P**
1.	Working with Python Pandas Data Science Library
2.	Working with Python Numpy and Lambdas Library
3.	Data cleaning and manipulation
4.	Data Wrangling
5.	Plots in Python
6.	Creation, manipulation of list, dictionaries, Tuples, Series, DataFrames
7.	Linear Regression with Python
8.	Logistic Regression with Python
9.	Clustering with Python

TEXT BOOKS	
1.	Arshdeep Bahga, Vijay Madisetti , “Big Data Science and Analytics A Hands-OnApproach”, Arshdeep Bahga, Vijay Madisetti, 2016
2.	Jaejin Hwang Youngjin Yoon, “Data Analytics and Visualization in Quality Analysis using Tableau”, CRC, 2022
REFERENCE BOOKS	
1.	Bart Baesens,”Analytics in a Big Data World, The essential guide to data science and it applications”, Wiley, 2014.
2.	S Christian Albright, Wayne L Winston, “Business Analytics, Data analysis and Decision Making”, Cengage Learning, 2014 ,Sixth edition .
3.	Phuong Vo.T.H, Martin Czygan, Ashish Kumar, “Python: Data Analytics and Visualization”,Packt Publishing Ltd. 2017.
4.	Purna Chander Rao. Kathula”, “Hands-on Data Analysis and Visualization with Pandas”,Published by BPB Publications, 2020.
5.	Christian Tominski, Heidrun Schumann,” Interactive Visual Data Analysis”, CRC Press.2020.

COURSE TITLE	**IT PROJECT MANAGEMENT**	**CREDITS**	**3**

COURSE CODE	CW1703A	COURSE CATEGORY	PC	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To learn the concepts of managing IT projects. • To learn more about planning • To understand resource allocation, control, and completion • To learn software quality management • To understand budgeting and scheduling
Course Outcome	The students will be able to 1. Apply project management principles in business situations 2. Learn more about planning, budgeting and 3. Optimize resource utilization and time optimization 4. Understand resource allocation, control, and completion 5. Learn software quality management

1: INTRODUCTION

UNIT I: INTRODUCTION TO PROJECT MANAGEMENT **9L**

Project Management – Definition –Goal - Lifecycles. Project Selection Methods. Project Portfolio Process – Project Formulation. Project Manager – Roles- Responsibilities and Selection – Project Teams, Project support activities, Types of project organizations

UNIT II: PLANNING AND BUDGETING **9L**

The Planning Process – Work Break down Structure – Role of Multidisciplinary teams, Critical path analysis. Budget the Project – Methods. Cost Estimating and Improvement. Budget uncertainty and risk management

UNIT III: SCHEDULING & RESOURCE ALLOCATION **9L**

PERT & CPM Networks - Crashing – Project Uncertainty and Risk Management – Simulation – Gantt Charts – Expediting a project – Resource loading and leveling. Allocating scarce resources – Goldratt‟s Critical Chain

UNIT IV: CONTROL AND COMPLETION **9L**

The Plan-Monitor-Control cycle – Data Collecting and reporting – Project Control – Designing the control system. Project Evaluation, Earned Value Analysis, Auditing and Termination, Risk Management, – Conflict – Origin & Consequences. Managing conflict – Team methods for resolving conflict

UNIT V: SOFTWARE QUALITY MANAGEMENT **9L**

Product quality and software quality, quality management systems, principles and features, System quality specification and measurement, Process and product quality approaches, Quality assurance and quality control, project audit and quality audit, Methods of enhancing quality: the different types of testing, inspections, reviews, standards, Management and control of testing

TEXT BOOKS

1.	Clifford Gray and Erik Larson, Project Management, Tata McGraw Hill Edition, 2005
2.	John M. Nicholas, Project Management for Business and Technology - Principles and Practice, Second Edition, Pearson Education, 2006
3.	Hughes B, Project Management for IT-related Projects. BCS Publications, 2012

REFERENCE BOOKS

1.	Gido and Clements, Successful Project Management, Second Edition, Thomson Learning, 2003
2.	Harvey Maylor, Project Management, Third Edition, Pearson Education, 2006

EBOOKS

1.	https://easyengineering.net/project-management-with-cpm-pert-and-nw/

COURSE TITLE	MATLAB FOR BUSINESS ANALYTICS LAB			CREDITS	2
COURSE CODE	CW1705A	COURSE CATEGORY	PC	L-T-P-C	1-0-2-2
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. To introduce the students about the Mathematical functions like matrix generation and Plotting with multiple data sets, line styles and colors. 2. To introduce the students about the Array operations and solving Linear equations in MATLAB. 3. To introduce the students about the control flow and operators using if-end structures and loo
Course Outcome	**The students will be able to** **1.** Write fundamental programs in MATLAB, creating variables and mathematical functions **2.** How to program matrix operations, array operations and how to solve the system of linear equations. **3.** Program the fundamentals concepts of basic Plotting consisting of simple and multiple data sets in one plot. **4.** Understand how to program M-file scripts, M- file functions, Input –output Arguments and program control flow operators, loops, flow structures. 5. Use the debugging process and debugging M-files.

LIST OF EXPERIMENTS		**30P**
1.	Programs using mathematical, relational expressions and the operators	
2.	Vectors and Matrices: Programs using array operations and matrix operations (such as matrix multiplication).	
3.	Programs on input and output of values.	
4.	Selection Statements: Experiments on if statements, with else and elseif clauses and switch statements	
5.	Loop Statements and Vectorizing Code: Programs based on the concepts of counted (for) and conditional (while) loops.	
6.	Programs based on scripts and user-defined functions	
7.	Programs on Built-in text manipulation functions and conversion between string and number types	
8.	Programs based on two main data structures: cell arrays and structures.	
9.	Programs based on Data Transfer	
10.	Programs based on Advanced Functions.	
11.	Introduction to Object-Oriented Programming and Graphics.	
12.	Programs based on Advanced Plotting Techniques.	
13.	Programs based on sound files and image processing.	
14.	Programs based on Advanced Mathematics	

TEXT BOOKS

1.	Rafael C. Gonzalez, Richard E. Woods, Steven Eddins, “Digital Image Processing using MATLAB”, Pearson Education, Inc., 2004
2.	Stormy Attaway, Butterworth-Heinemann, “MATLAB: A Practical Introduction to Programming and Problem Solving”, 5th Edition, 2018
REFERENCE BOOKS	
1.	1. https://www.mathworks.com/content/dam/mathworks/mathworks-dot com/moler/exm/book.pdf
2.	2.://www.mathworks.com/help/releases/R2014b/pdf_doc/matlab/getstart.pdf
EBOOKS	
1.	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://www.mathworks.com/content/dam/mathworks/ebook/predictive-maintenance-ebook-part1.pdf

PROFESSIONAL ELECTIVE LIST

SEMESTER VI

COURSE TITLE	CONVERSATIONAL SYSTEMS			CREDITS	3
COURSE CODE	CW1611A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME					
First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. Enable attendees to acquire knowledge on chatbots and its terminologies 2. Work with ML Concepts and different algorithms to build custom ML 3. Better understand on Conversational experiences and provide better customer experience
Course Outcome	**The students will be able to** • Familiarize in the NLTK tool kit and the pre-processing techniques of natural language processing. • Familiarize with the basic technologies required for building a conversational system. • Build a Chabot for any application and deploy it • Involve AI in building conversational system and build advanced systems that can be cognitively inclined towards human behaviour. • Build a real time working conversational system for social domain that can intelligently process inputs and generate relevant replies.

UNIT I: FUNDAMENTALS OF CONVERSATIONAL SYSTEMS 9L

Introduction: Overview, Case studies, Explanation about different modes of engagement for a human being, History and impact of AI. Underlying technologies: Natural Language Processing, Artificial Intelligence and Machine Learning, NLG, Speech-To-Text, Text-To-Speech, Computer Vision etc. Introduction to Top players in Market – Google, MS, Amazon &Market trends. Messaging Platforms (Facebook, WhatsApp) and Smart speakers – Alexa, Google Home and other new channels. Ethical and Legal Considerations in AI Overview

UNIT II: FOUNDATIONAL BLOCKS FOR PROGRAMMING AND NATURAL LANGUAGE PROCESSING 9L

Introduction: Brief history, Basic Concepts, Phases of NLP, Application of chat bots etc. General chatbot architecture, Basic concepts in chatbots: Intents, Entities, Utterances, Variables and Slots, Fulfillment. Lexical Knowledge Networks (WordNet, Verbnet, PropBank, etc). Lexical Analysis, Part-of-Speech Tagging, Parsing/Syntactic analysis, Semantic Analysis, Word Sense Disambiguation. Information Extraction, Sentiment Analysis.

UNIT III:BUILDING CHAT BOT / CONVERSATIONAL AI SYSTEMS 9L

Fundamentals of Conversational Systems (NLU, DM and NLG) - Chatbot framework & Architecture, Conversational Flow & Design, Intent Classification (ML and DL based techniques), Dialogue Management Strategies, Natural Language Generation. UX design, APIs and SDKs, Usage of Conversational Design Tools. Introduction to popular chatbot frameworks – Google Dialog flow, Microsoft Bot Framework, Amazon Lex, RASA Channels: Facebook Messenger, Google Home,

Alexa, WhatsApp, Custom Apps. Overview of CE Testing techniques, A/B Testing, Introduction to Testing Frameworks - Botium /Mocha ,Chai. Security & Compliance – Data Management, Storage, GDPR, PCI.
UNIT IV: ROLE OF ML/AI IN CONVERSATIONAL TECHNOLOGIES AND CONTACT CENTERS 9L
Brief Understanding on how Conversational Systems uses ML technologies in ASR, NLP, Advanced Dialog management, Language Translation, Emotion/Sentiment Analysis, Information extraction ,etc. to effectively converse, Introduction to Contact centers – Impact & Terminologies. Case studies & Trends, How does a Virtual Agent/Assistant fit in here
UNIT V: CONVERSATIONAL ANALYTICS AND FUTURE 9L
Conversation Analytics : The need of it - Introduction to Conversational Metrics - Summary, Robots and Sensory Applications overview - XR Technologies in Conversational Systems , XR-Commerce - What to expect next? – Future technologies and market innovations overview.
TEXT BOOKS

1.	Michael McTear, "Conversational AI: Dialogue Systems, Conversational Agents, and Chatbots", Second Edition, Moran and Claypool Publishers, 2020
2.	Cathy Pearl, "Designing Voice User Interfaces: Principles of Conversational Experiences", O'REILLY, 2016
REFERENCE BOOKS	
EBOOKS	
1.	https://www.amazon.in/Conversational-Dialogue-Systems-Electrical-Engineering-ebook/dp/B08LT7HZFD

COURSE TITLE	**CLOUD, MICRO SERVICES AND APPLICATION (LAB ORIENTED THEORY COURSE)**			**CREDITS**	**3**
COURSE CODE	**CW1612A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To know basic components and fundamentals of cloud computing. • To develop an application using various services in cloud. • Understand how to design the web application development in cloud. • To learn the basic and important concepts of python to implement in an application. • Understand the issues and solutions for cloud security and cloud monitoring
Course Outcome	**The students will be able to** • Demonstrate the main concepts of cloud, its characteristics, advantages, key technologies and its various delivery and deployment models. • Develop and design an application using various tools in cloud environment. • Acquire the basic and important design concepts and issues of web application development techniques in cloud. • Structure simple python program for developing an application in cloud. • Analyze the issue of cloud such as security, energy efficiency and interoperability, and provide an insight into future prospects of computing in the cloud monitoring

1: INTRODUCTION	
UNIT I: INTRODUCTION	**6L**
Cloud Fundamentals-Cloud Service Components-Cloud Service, Deployment Models-Cloud Components-Guiding principle with respect to utilization, Security, Pricing- Application of Cloud Computing. Case Study: Design and Implementation of Public and Private Cloud Environments – Open Stack and AWS.	
UNIT II: CLOUD BASED APPLICATIONS DEVELOPMENT	**6L**
Application Architectures-Monolithic & Distributed, Microservice Fundamental and Design Approach-Cloud Native Applications-12 Factors App-Application Integration Process and APIfication Process- API Fundamental-Microservice and API Management- Spring Boot Fundamental and Design of Microservice - API Tools - Developer PortalApplications of Microservice and APIfication.	
UNIT III: WEB DEVELOPMENT TECHNIQUES	**6L**
Devops fundamentals - Devops Role and Responsibility-Tools and Applications- Containerization Process and Application-Evolution of APP Deployment- Docker Fundamentals - Docker Architecture- Docker Commands. Case study Orchestration, Kubernetes, Docker Container	
UNIT IV: CLOUD SECURITY AND MONITORING TOOL	**6L**
Cloud Security-Cloud Security Shared Responsibility Architecture-Security By Design Principles-Identity And Access Management-Cloud Security Layers Illustration-Cloud Network, Host And Data Security Concepts-Security Operations and Major Cloud Service Provider Tools-Security Compliance and Regulations-Cloud Monitoring-Benefits of Cloud Monitoring-Overview of Cloud Monitoring Tools	
UNIT V: BUILDING AN APPLICATION USING PYTHON	**6L**
Developing and Deploying an Application in the Cloud- Building a python project based on Design-DevelopmentTesting-Deployment of an application in the cloud using a development framework and deployment platform. Case Study: Python Use case and Python Framework	
LIST OF EXPERIMENTS	**30P**
1.	Find procedure to run the virtual machine of different configuration using virtual-manager.
2.	Virtualize a machine and check how many virtual machines can be utilized at a particular time
3.	Create a VM Clone and attach virtual block to the cloned virtual machine and check whether it holds the data even after the release of the virtual machine
4.	Create a Snapshot of a VM at a given point in time and test the snapshot by restoring the VM to that time. (Note: Testing can be done by installing an application and then restore it.)
5.	Develop a simple application to understand the concept of PAAS using GAE/Amazon Elastic Beanstalk/IBM Blue Mix and launch it.
6.	Test how a SaaS applications scales in response to demand
7.	Find the procedure to launch a Cloud instance using a Public IaaS cloud like AWS/GCP.
8.	Setup a Private Cloud by performing the procedure using a Single node OPENSTACK implementation.
9.	Find the procedure to develop a DevSecOps – Cloud (AWS, GCP, Azure).
10.	Find the procedure to develop a DevSecOps – Cluster (Kubernetes).
11.	Find the procedure to develop a Container (Docker)
12.	To Build and Test Your Docker Images in the Cloud with Docker commands
13.	Perform the installation steps and configure Google App Engine.
14.	Find the Procedure to develop a SalesForce application in cloud.
15.	Create an Application in SalesForce.com using Apex programming Language.
TEXT BOOKS	

1.	Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, "Cloud Computing Concepts, Technology & Architecture", Prentice Hall, 2013.
2.	Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.
3.	Kai Hwang, Geoffery C. Fox and Jack J. Dongarra, "Distributed and Cloud Computing: Clusters, Grids, Clouds and the Future of Internet", First Edition, Morgan Kaufman Publisher, an Imprint of Elsevier, 2012.
4.	Rajkumar Buyya, James Broberg, Andrzej M. Goscinski, "Cloud Computing: Principles and Paradigms", Wiley, 2011.
REFERENCE BOOKS	
1.	Michael J. Kavis "Architecting the Cloud: Design Decisions for Cloud Computing Service Models (SaaS, PaaS, and IaaS)", 1st Edition, Wiley, 2014.
2.	https://www.techrepublic.com/blog/the enterprise cloud/mini glossary cloud computing terms you should know/
3.	Azure Virtual Machines https://docs.microsoft.com/en us/azure/virtual machines/
4.	Google App Engine https://cloud.google.com/appengine#all features
5.	Google Kubernetes Engine https://cloud.google.com/kubernetes engine#all features
6.	Docker Tutorial : https://docker curriculum.com
7.	GoogleCloudInfrastructure security setup overview: https://cloud.google.com/security/infrastructure/design
EBOOKS	
1.	https://www.everand.com/book/575689614/Cloud-Based-Microservices-Techniques-Challenges-and-Solutions

COURSE TITLE	**MODERN WEB APPLICATION**			**CREDITS**	**3**
COURSE CODE	**CW1613A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-2**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	overview of web applications utilizing Next.js and JavaScript, the book reintroduces React to ensure a strong footing in the core concepts. It then delves into the fundamentals of Next.js, providing insights into the latest version's core advancements and optimizations
Course Objective	• To understand different internet technologies. • Know the importance of object oriented aspects of scripting • Understand creating database connectivity using PHP and MySQL.
Course Outcome	**The students will be able to** • On completion of the course, the students will be able to • Construct a basic website using HTML and Cascading Style Sheets. • Build dynamic web page with validation using Java Script objects and by applying different event handling mechanisms. • Construct simple web pages in PHP and to represent data in XML format. • Design and implement server side programs using PHP. • Do database manipulation using MySQL and authenticate data
UNIT I: INTRODUCTION TO INTERNET & WORLD WIDE WEB	**9**

History of the Internet & World- Wide Web, Web Browsers, Web Servers, Uniform Resource Locator, Tools and Web Programming Languages. Web Standards, Categories of Web Applications, Characteristics of Web Applications, Tiered Architecture.
UNIT II: HYPERTEXT MARKUP LANGUAGE (HTML) AND CASCADING STYLE SHEETS (CSS) 9
HTML: Basic HTML page, Text Formatting, Table, Headers, Linking, Images, List, Meta Elements. CSS: Inline, Internal and External Style Sheet, Bootstrap-CSS Text, CSS forms, CSS components drop down.
UNIT III:JAVASCRIPT AND EXTENSIBLE MARKUP LANGUAGE(XML) 9
JavaScript: Introduction to Java Scripts, Objects in Java Script, Dynamic HTML with Java Script, Bootstrap- JS Alert, JS Button, JS popover. XML: Introduction, Structuring Data, Document Type Definition, XML Vocabularies, Document Object Model (DOM) with JavaScript, Extensible Stylesheet Language Transforms (XSL).
UNIT IV: PHP BASICS 9
Writing Basic PHP Programs: Creating PHP Programs, Numbers and Strings, Literals and Variables, Operators and Functions. Forr & PHP: Creating Form Controls, Using Values Returned From, Forms Using PHP
UNIT V: PHP DATABASE CONNECTIVITY 9
PHP Database Connectivity: Connecting to MySQL Server, Selecting Databases, Checking for Errors, Closing the MySQL Server Connection. Manipulating Data in MySQL Using PHP: Inserting, Viewing, Updating and Deleting Records, Manipulating joined tables. User Authentication: Creating Session, Authorization Level

TEXT BOOKS	
1.	Deitel P. J., Deitel H. M. and Deitel A., "Internet and World Wide Web: How to Program", Fifth Edition, Pearson Prentice Hall, 2012
2.	Jon Duckett, "HTML & CSS: Design and Build Websites", First Edition, John Wiley & Sons, 2011.
3	Naramore E., Gerner J., Scouarnec Y.L., et al., "Beginning PHP5, Apache, MySQL Web Development: Programmer to Programmer", John Wiley & Sons Inc., 2005.
REFERENCE BOOKS	
1.	Sebesta R. W.," Programming the World Wide Web", Eight Edition, Pearson, 2014.
2.	Pressman R. and Lowe D.," Web Engineering: a practitioner's approach", First Edition, Mc GrawHill, 2008.
3.	Kappel G., et al.," Web Engineering: The Discipline of systematic Development of Web Applications", First Edition, John Wiley & Sons, 2006.
4	Suh W., "Web Engineering: Principles and Techniques", Idea Group Inc., 2005.
5	Ullman L ," PHP for the Web: Visual Quick Start Guide", Fifth Edition, Peach pit Press, 2016
EBOOKS	
1.	Modern Web Applications with Next.JS by Shubham Jain - Ebook | Everand

COURSE TITLE	**CRYPTOCURRENCY AND BLOCKCHAIN TECHNOLOGIES**			**CREDITS**	**3**
COURSE CODE	**CW1614A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**2-0-2-3**
Version		**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	Learn the technology that underpins blockchain and review its key concepts, such as decentralization and consensus algorithms. You will assess and critique blockchain as an asset, and review the dynamics of the cryptocurrency markets.

Course Objective	To understand the basics of Blockchain • To learn Different protocols and consensus algorithms in Blockchain • To learn the Blockchain implementation frameworks • To understand the Blockchain Applications • To experiment the Hyperledger Fabric, Ethereum networks
Course Outcome	CO1: Understand emerging abstract models for Blockchain Technology CO2: Identify major research challenges and technical gaps existing between theory and practice in the crypto currency domain. CO3: It provides conceptual understanding of the function of Blockchain as a method of securing distributed ledgers, how consensus on their contents is achieved, and the new applications that they enable. CO4: Apply hyperledger Fabric and Ethereum platform to implement the Block chain Application.

UNIT I: INTRODUCTION TO BLOCKCHAIN	**7**
Blockchain- Public Ledgers, Blockchain as Public Ledgers - Block in a Blockchain, TransactionsThe Chain and the Longest Chain - Permissioned Model of Blockchain, Cryptographic -Hash Function, Properties of a hash function-Hash pointer and Merkle tree	
UNIT II: BITCOIN AND CRYPTOCURRENCY	**6**
A basic crypto currency, Creation of coins, Payments and double spending, FORTH – the precursor for Bitcoin scripting, Bitcoin Scripts , Bitcoin P2P Network, Transaction in Bitcoin Network, Block Mining, Block propagation and block relay	
UNIT III:BITCOIN AND CRYPTOCURRENCY	**6**
Bitcoin Consensus, Proof of Work (PoW)- Hashcash PoW , Bitcoin PoW, Attacks on PoW ,monopoly problem- Proof of Stake- Proof of Burn - Proof of Elapsed Time - Bitcoin Miner, Mining Difficulty, Mining Pool-Permissioned model and use cases.	
UNIT IV: HYPERLEDGER FABRIC & ETHEREUM	**5**
Architecture of Hyperledger fabric v1.1- chain code- Ethereum: Ethereum network, EVM, Transaction fee, Mist Browser, Ether, Gas, Solidity.	
UNIT V: BLOCKCHAIN APPLICATIONS	**6**
Smart contracts, Truffle Design and issue- DApps- NFT. Blockchain Applications in Supply Chain Management, Logistics, Smart Cities, Finance and Banking, Insurance,etc- Case Study.	

TEXT BOOKS	
1.	1. Bashir and Imran, Mastering Blockchain: Deeper insights into decentralization, cryptography, Bitcoin, and popular Blockchain frameworks, 2017.
2.	2. 2.Andreas Antonopoulos, “Mastering Bitcoin: Unlocking Digital Cryptocurrencies”, O’Reilly, 2014.
REFERENCE BOOKS	
1.	Daniel Drescher, “Blockchain Basics”, First Edition, Apress, 2017. 4. 5. Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.
2.	Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller, and Steven Goldfeder. Bitcoin and cryptocurrency technologies: a comprehensive introduction. Princeton University Press, 2016.
3.	Melanie Swan, “Blockchain: Blueprint for a New Economy”, O’Reilly, 2015
4	Ritesh Modi, “Solidity Programming Essentials: A Beginner’s Guide to Build Smart Contracts for Ethereum and Blockchain”, Packt Publishing
5	Handbook of Research on Blockchain Technology, published by Elsevier Inc. ISBN: 9780128198162, 2020.
EBOOKS	
1.	Blockchain and Cryptocurrency by Rachael L. Thomas - Ebook | Everand

COURSE TITLE	FINTECH REGULATION			CREDITS	3
COURSE CODE	CW1615A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Machine learning for Predictive analytics involves certain manipulations on data from existing data sets with the goal of identifying some new trends and patterns. These trends and patterns are then used to predict future outcomes and trends. Learning how predictive analytics extensively uses machine learning for data modeling due to its ability to accurately process vast amounts of data and recognize patterns.
Course Objective	• To learn about Laws and Regulation • To acquire the knowledge of Regulations of Fintech firm and their role in Market
Course Outcome	• Design secure and regulatory compliant financial technology (Fintech) mobile • Use data analytics to guide information for strategic decision making and to implement Fintech solutions. • Adhere to ethical and legal guidelines to ensure data security, integrity, and confidentiality in the delivery of Fintech applications. • Analyze organizational structures and management processes to recommend improvements to organizational performance through financial technology solutions • Develop plans using principles of entrepreneurship to start up, manage, and expand a small business. • Apply interpersonal, teambuilding, and leadership skills when participating in diverse organizational environments.

Prerequisites: NIL

UNIT I: INTRODUCTION (9)

The Role of the Regulators, Equal Treatment and Competition, Need for a regulatory assessment of Fintech, India Regulations, The Risks to Consider, Regtech and SupTech, The rise of TechFins, Regulatory sandboxes, compliance and whistleblowing.

UNIT II: INNOVATION AND REGULATION (9)

The technology, market and the law, Regulation and Innovation in Banking and Finance, Regulations of Fintech Firms and their role in Market-Based Chains, Current Regulatory Approach, Fintech Innovations in Banking, Asset Management, Insurance, Pensions and Healthcare Schemes, Patentability of FinTech inventions.

UNIT III: CROWDFUNDING AND DIGITAL ASSETS (9)

Types of crowdfunding, The Jobs Act, Regulation crowdfunding, Regulation A+, Regulation D crowdfunding, Intrastate offerings, Digital Assets – Three uses of Digital Assets, A world of Altcoins, Stablecoins, Digital Asset Forks, Initial Coin Offerings, Regulatory Framework for Digital and Crypto Assets, Central Bank Digital Currencies.

UNIT IV: MARKETPLACE LENDING AND MOBILE PAYMENTS (9)

Online Lending Business Models, Payday Loans, Consumer Protection Laws, Debt Collection, Equal Credit Opportunity Act, Contract Formation and the E-Sign Act, Military Lending Act, Securities Laws Considerations, Mobile Devices, Payment Cards and the Law, Truth in Lending Act and Regulation Z, Card Act, Electronic Fund Transfer Act and Regulation E, Fair Credit Reporting Act, Federal Bank Secrecy Act, State Money Transmitter Laws.

UNIT V: ANTI-MONEY LAUNDERING AND CYBERSECURITY (9)

Reporting requirements under the Bank Secrecy Act, Patriot Act, Panalties for violating the BSA, Virtual currencies and the Bank Secrecy Act, Cybersecurity Frameworks, Cybersecurity Act of 2015, Contractual and Self Regulatory obligations.

TEXT BOOKS

1.	Fundamentals of Machine Learning for Predictive Data Analytics Algorithms, Worked Examples, and Case Studies Second Edition., John D. Kelleher, Brian Mac Name, and Aoife D'Arcy.

REFERENCE BOOKS

1.	JelenaMadir, FinTech – Law and Regulation, Edward Elgar Publishing Limited, 2019
2	Valerio Lemma, Fintech Regulation : Exploring New Challenges of the Capital Markets Union, Palgrave Macmillan, 2020
3	Chris Brummer, Fintech Law in a Nutshell, West Academic Publishing, 2020

4	Bernardo Nicoletti, The Future of Fintech, Integrating Finance and Technology in Financial Services, Springer Nature, 2017
5	Kevin C. Taylor, FinTech Law : A Guide to Technology Law in the Financial Services Industry, BNA Books, 2014
6	Lee Reiners, FinTech Law and Policy, 2018
EBOOKS	
1.	FinTech Regulation by Valerio Lemma - Ebook | Everand

SEMESTER VII

PROFESSIONAL ELECTIVE –II

COURSE TITLE	**COGNITIVE SCIENCE AND ANALYTICS**			**CREDITS**	**3**
COURSE CODE	**CW1711A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• To explain cognitive computing and design principles. • To distinguish between NLP and cognitive computing. • To apply advanced analytics to cognitive computing. • To discuss application of cognitive computing in business. • To illustrate various applications of cognitive computing.
Course Outcome	The students will be able to: **1.** Explain cognitive computing and design principles. **2.** Distinguish between NLP and cognitive computing. **3.** Apply advanced analytics to cognitive computing. **4.** Discuss application of cognitive computing in business. 5. Illustrate various applications of cognitive computing.

1: INTRODUCTION

UNIT I: FOUNDATION & DESIGN PRINCIPLES **9L**

Foundation of Cognitive Computing: cognitive computing as a new generation, the uses of cognitive systems, system cognitive, gaining insights from data, Artificial Intelligence as the foundation of cognitive computing, understanding cognition. Design Principles for Cognitive Systems: Components of a cognitive system, building the corpus, bringing data into cognitive system, machine learning, hypotheses generation and scoring, presentation and visualization services.

UNIT II: NLP IN COGNITIVE SYSTEM **9L**

Natural Language Processing in support of a Cognitive System: Role of NLP in a cognitive system, semantic web, Applying Natural language technologies to Business problems. Representing knowledge in Taxonomies and Ontologies: Representing knowledge, Defining Taxonomies and Ontologies, knowledge representation, models for knowledge representation, implementation considerations.
UNIT III: BIG DATA Vs COGNITIVE COMPUTING 9L
Relationship between Big Data and Cognitive Computing: Dealing with human-generated data defining big data, architectural foundation, analytical data warehouses, Hadoop, data in motion and streaming data, integration of big data with traditional data. Applying Advanced Analytics to cognitive computing: Advanced analytics is on a path to cognitive computing, Key capabilities in advanced analytics, Using advanced analytics to create value, Impact of open source tools on advanced analytics.
UNIT IV: COGNITIVE COMPUTING IN BUSINESS 9L
The Business Implications of Cognitive Computing: Preparing for change, advantages of new disruptive models, knowledge meaning to business, difference with a cognitive systems approach, meshing data together differently, using business knowledge to plan for the future, answering business questions in new ways, building business specific solutions, making cognitive computing a reality, cognitive application changing the market- IBM Watson as a cognitive systems.
UNIT V: APPLICATIONS 9L
The process of building a cognitive application: Emerging cognitive platform, defining the objective, defining the domain, understanding the intended users and their attributes, questions and exploring insights, training and testing- Building a cognitive health care application- Smarter cities-Cognitive Computing in Government.

TEXT BOOKS	
1.	
REFERENCE BOOKS	
1.	Judith H Hurwitz, Marcia Kaufman, Adrian Bowles, "Cognitive computing and Big Data Analytics" , Wiley, 2015.
2.	Vijay Raghvan, Venu Govindaraju, C.R. Rao, Cognitive Computing: Theory and Applications", by Elsevier publications, North Holland Publication, 1st Edition, 2016
3.	Bernadette Sharp (Author), Florence Sedes (Author), Wieslaw Lubaszewski (Author), Cognitive Approach to Natural Language Processing Hardcover, First Edition May 2017
4.	Arun Kumar Sangaiah, Arunkumar Thangavelu, et al., Cognitive Computing for Big Data Systems Over IoT: Frameworks, Tools and Applications: Lecture Notes on Data Engineering and Communications Technologies 1st edition 2018
5.	Min Chen and Kai Hwang, Big-Data Analytics for Cloud, IoT and Cognitive Computing Wiley Publication, 1st Edition, 2017
6.	Mallick, Pradeep Kumar, Borah, Samarjeet," Emerging Trends and Applications in Cognitive Computing", IGI Global Publishers, 2019.
EBOOKS	
1.	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/http://www2.fiit.stuba.sk/~kvasnicka/CognitiveScience/Friedenberg_Cognitive%20science.pdf

COURSE TITLE	**INTRODUCTION TO IOT**			**CREDITS**	**3**
COURSE CODE	**CW1712A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**

Course Description					
Course Objective	• To understand the fundamentals of Internet of Things • To learn about the basics of IOT protocols • To build a small low cost embedded system using Raspberry Pi. • To apply the concept of Internet of Things in the real world scenario				
Course Outcome	The students will be able to • Analyze various protocols for IoT • Develop web services to access/control IoT devices. • Design a portable IoT using Rasperry Pi • Deploy an IoT application and connect to the cloud. • Analyze applications of IoT in real time scenario				
1: INTRODUCTION					
UNIT I: INTRODUCTION TO IoT					**6L**
Internet of Things - Physical Design- Logical Design- IoT Enabling Technologies - IoT Levels & Deployment Templates - Domain Specific IoTs - IoT and M2M - IoT System Management with NETCONF-YANG- IoT Platforms Design Methodology					
UNIT II: IoT ARCHITECTURE					**6L**
M2M high-level ETSI architecture - IETF architecture for IoT - OGC architecture -IoT reference model - Domain model - information model - functional model - communication model - IoT reference architecture					
UNIT III: IoT PROTOCOLS					**6L**
Protocol Standardization for IoT – Efforts – M2M and WSN Protocols – SCADA and RFID Protocols – Unified Data Standards – Protocols – IEEE 802.15.4 – BACNet Protocol – Modbus– Zigbee Architecture – Network layer – 6LowPAN - CoAP – Security					
UNIT IV: BUILDING IoT WITH RASPBERRY PI & ARDUINO					**6L**
Building IOT with RASPERRY PI- IoT Systems - Logical Design using Python – IoT Physical Devices & Endpoints - IoT Device -Building blocks -Raspberry Pi -Board – Linux on Raspberry Pi - Raspberry Pi Interfaces -Programming Raspberry Pi with Python – Other IoT Platforms - Arduino.					
UNIT V: CASE STUDIES AND REAL-WORLD APPLICATIONS					**6L**
Real world design constraints - Applications - Asset management, Industrial automation, smart grid, Commercial building automation, Smart cities – participatory sensing - Data Analytics for IoT – Software & Management Tools for IoT Cloud Storage Models & Communication APIs - Cloud for IoT - Amazon Web Services for IoT.					
TEXT BOOKS					
1.	Thomas Erl, Zaigham Mahmood, and Ricardo Puttini, “Cloud Computing Concepts, Technology & Architecture”, Prentice Hall, 2013.				
2.	Guo Ning Liu, Qiang Guo Tong, Harm Sluiman, Alex Amies, "Developing and Hosting Applications on the Cloud", IBM Press, 2012.				
REFERENCE BOOKS					
1.	Arshdeep Bahga, Vijay Madisetti, “Internet of Things – A hands-on approach”, Universities Press, 2015				
2.	Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), “Architecting the Internet of Things”, Springer, 2011				
3.	Honbo Zhou, “The Internet of Things in the Cloud: A Middleware Perspective”,CRC Press, 2012				
4.	Jan Ho¨ller, Vlasios Tsiatsis , Catherine Mulligan, Stamatis , Karnouskos,Stefan Avesand. David Boyle, "From Machine-to-Machine to the Internet of Things - Introduction to a New Age of Intelligence", Elsevier, 2014				
5.	Olivier Hersent, David Boswarthick, Omar Elloumi , “The Internet of Things –Key applications and Protocols”, Wiley, 2012				

COURSE TITLE	CRYTOLOGY			CREDITS	3
COURSE CODE	CW1713A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To understand the Basics of Number Theory. • To be able to secure a message over an insecure channel by various means. • To use a variety of public key cryptosystems and authentication methods. • To gain a better understanding of the different security applications. • To acquire a deeper insight of quantum computing on cryptography and security
Course Outcome	**The students will be able to** • Understand and apply the various concepts of basics of Number Theory. • Secure a message over an insecure channel by numerous symmetric key cryptosystem. • Apply diverse Public Key Cryptosystem & Authentication. • Implement varied security applications. • **5.** Understand the implications of quantum computing on cryptography and security.

1: INTRODUCTION

UNIT I: INTRODUCTION **6L**

Introduction to Cryptography: Elementary number theory, Pseudo-random bit generation, Elementary cryptosystems. Basic security services: confidentiality, integrity, availability, non-repudiation, privacy

UNIT II: SYMMETRIC KEY CRYPTOSYSTEMS **6L**

Stream Cipher: Basic Ideas, Hardware and Software Implementations, Examples with some prominent ciphers: A5/1, Grain family, RC4, Salsa and ChaCha, HC128, SNOW family, ZUC; Block Ciphers: DES, AES and Modes of Operation

UNIT III: PUBLIC KEY CRYPTOSYSTEM & AUTHENTICATION **6L**

Public Key Cryptosystems: RSA, ECC; Digital signatures; Hash Functions; Authentication

UNIT IV: SECURITY APPLICATIONS **6L**

Electronic commerce (anonymous cash, micro-payments), Key management, Zero-knowledge protocols, Cryptology in Contact Tracing Applications

UNIT V: QUANTUM CRYPTANALYSIS & POST-QUANTUM CRYPTOGRAPHY **6L**

Quantum cryptography, quantum encryption, Issues related to Quantum Cryptanalysis. Post-Quantum Cryptography: Lattice-based cryptography : NTRU, Hash-based cryptography :SPHINCS, Multivariate cryptography: Rainbow

TEXT BOOKS

1.	Douglas R. Stinson, “Cryptography, Theory and Practice”, CRC Press, 3rd Edition, 2018
2.	2 A. Menezes, P. Van Oorschot and S. Vanstone, “Handbook of Applied Cryptography”, CRC Press, 5th printing, 2001.
3.	3 Stallings William, “Cryptography and Network Security - Principles and Practice”, Pearson, Seventh Edition, 2017
REFERENCE BOOKS	
1.	1. Ross Anderson, “Security Engineering”, Wiley, 3rd Edition, 2020.
2.	2. Neal Koblitz, “A course in number theory and cryptography”, GTM, Springer
EBOOKS	
1.	http://theory.caltech.edu/~preskill/ph229/

COURSE TITLE	**DEEP LEARNING**			**CREDITS**	**3**
COURSE CODE	**CW1714A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	1. Develop and Train Deep Neural Networks. 2. Develop a CNN, R-CNN, Fast R-CNN, Faster-R-CNN, Mask-RCNN for detection and 3. recognition 4. Build and train RNNs, work with NLP and Word Embeddings 5. The internal structure of LSTM and GRU and the differences between them 6. The Auto Encoders for Image Processing
Course Outcome	**The students will be able to** 1. Feature Extraction from Image and Video Data 2. Implement Image Segmentation and Instance Segmentation in Images 3. Implement image recognition and image classification using a pretrained network (Transfer Learning) 4. Traffic Information analysis using Twitter Data 5. Autoencoder for Classification & Feature Extraction

1: INTRODUCTION

UNIT I: DEEP LEARNING CONCEPTS **9L**

Fundamentals about Deep Learning. Perception Learning Algorithms. Probabilistic modelling. Early Neural Networks. How Deep Learning different from Machine Learning. Scalars. Vectors. Matrixes, Higher Dimensional Tensors. Manipulating Tensors. Vector Data. Time Series Data. Image Data. Video Data.

UNIT II: NEURAL NETWORKS **9L**

About Neural Network. Building Blocks of Neural Network. Optimizers. Activation Functions. Loss Functions. Data Pre-processing for neural networks, Feature Engineering. Overfitting and Underfitting. Hyperparameters.

UNIT III: CONVOLUTIONAL NEURAL NETWORK **9L**

About CNN. Linear Time Invariant. Image Processing Filtering. Building a convolutional neural network. Input Layers, Convolution Layers. Pooling Layers. Dense Layers. Backpropagation Through the Convolutional Layer. Filters and Feature Maps. Backpropagation Through the Pooling Layers. Dropout Layers and Regularization. Batch Normalization. Various Activation Functions.Various Optimizers. LeNet, AlexNet, VGG16, ResNet. Transfer Learning with Image Data. Transfer Learning using Inception Oxford VGG Model, Google Inception Model, Microsoft ResNet Model. R-CNN, Fast R-CNN, Faster R-CNN, Mask-RCNN, YOLO
UNIT IV: NATURAL LANGUAGE PROCESSING USING RNN 9L
About NLP & its Toolkits. Language Modeling . Vector Space Model (VSM). Continuous Bag of Words (CBOW). Skip-Gram Model for Word Embedding. Part of Speech (PoS) Global Co-occurrence Statistics–based Word Vectors. Transfer Learning. Word2Vec. Global Vectors for Word Representation GloVe. Backpropagation Through Time. Bidirectional RNNs (BRNN) . Long Short Term Memory (LSTM). Bi-directional LSTM. Sequence-to-Sequence Models (Seq2Seq). Gated recurrent unit GRU.
UNIT V: DEEP REINFORCEMENT & UNSUPERVISED LEARNING 9L
About Deep Reinforcement Learning. Q-Learning. Deep Q-Network (DQN). Policy Gradient Methods. Actor-Critic Algorithm. About Autoencoding. Convolutional Auto Encoding. Variational Auto Encoding. Generative Adversarial Networks. Autoencoders for Feature Extraction. AutoEncoders for Classification. Denoising Autoencoders. Sparse Autoencoders

LIST OF EXPERIMENTS	**30P**
1.	Feature Selection from Video and Image Data
2.	Image and video recognition
3.	Image Colorization
4.	Aspect Oriented Topic Detection & Sentiment Analysis
5.	Object Detection using Autoencoder

TEXT BOOKS	
1.	
2.	
REFERENCE BOOKS	
1.	Deep Learning A Practitioner's Approach Josh Patterson and Adam Gibson O'Reilly Media,Inc.2017
2.	Learn Keras for Deep Neural Networks, Jojo Moolayil, Apress,2018
3.	Deep Learning Projects Using TensorFlow 2, Vinita Silaparasetty, Apress, 2020
4.	Deep Learning with Python, FRANÇOIS CHOLLET, MANNING SHELTER ISLAND,2017
5.	Pro Deep Learning with TensorFlow, Santanu Pattanayak, Apress,2017
EBOOKS	
1.	https://readyforai.com/download/deep-learning-pdf/

COURSE TITLE	**ROBOTICS AND EMBEDDED SYSTEM**			**CREDITS**	**3**
COURSE CODE	**CW1715A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**
ASSESSMENT SCHEME					

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To understand the concept of Industry 4.0 and technologies for cognitive robotics To understand the fundamentals of robotics operating systems • To understand the role of AI in cognitive robotics • To understand and demonstrate the role of Data Science and their working principles in robotics • To demonstrate the concepts of cloud computing with robot on various real time applications
Course Outcome	**The students will be able to** • Develop skills of using advanced software for solving practical problems in robotics pertaining to • various industries • Understand the basics of Robotic operating systems and communication system • Understand basic concepts and technological advancements in AI and robotics • Understand and apply several statistical analysis techniques, business analytics for cognitive robotics and • programming of robots using python and R languages • **5.** Understand and apply the cloud computing concepts in robotics

1: INTRODUCTION

UNIT I: INTRODUCTION TO MODERN DAY ROBOTICS AND THEIR INDUSTRIAL APPLICATIONS9L

Industry 4.0 Concept: Background and Overview-Industry 4.0 technologies: implementation patterns in manufacturing companies-Evolution of Industrial Robots and their Applications-Advancements in Robotics and Its Future Uses-Types of robotics in various fields for applications

Technologies essential for Cognitive Robotics: Computer systems and Technologies relevant to modern day robotics

Robotic Process Automation: Overview of RPA and its applications-RPA, AI, and Cognitive Technologies for LeadersIntroduction to Robotics: Analysis, Control, Applications

UNIT II: BASICS OF ROBOTIC OPERATING SYSTEM 9L

Basics of Robotic operating System: ROS for beginners an overview- Introduction to the Robot Operating System (ROS) Middleware - Secure communication for the Robot Operating System - An Introduction to Robot Operating System: The Ultimate Robot Application Framework by Adnan Quality of Service and Cybersecurity Communication Protocols -Analysis for the Robot Operating System Robotics systems communication- Threat modelling using ROS

Towards cloud robotic system: A case study of online co-localization for fair resource competence-A Case Study on Model-Based Development of Robotic Systems using Monti Arc with Embedded Automata

UNIT III: AI IN THE CONTEXT OF COGNITIVE ROBOTICS AND ROLE OF AI IN ROBOTICS 9L

Foundation for Advanced Robotics and AI- A Concept for a Practical Robot Design Process- Demo to train A Robot Using AI - Deep learning core applications-Deep learning business applications **Introduction to computer vision and application of Vision Systems in Robotics:** Concepts of computer vision and the how vision systems are becoming essential part of Robotics- Computer Vision: Models, Learning, and Inference - Mastering Computer Vision with TensorFlow 2.x: Build advanced computer vision applications using machine learning and deep learning techniques- Machine Vision Applications- Application areas for vision systems-Robot inspection case study-Autonomous driving using 3D imaging case study.

UNIT IV: DATA SCIENCE AND BIG DATA IN THE CONTEXT OF COGNITIVE ROBOTICS 9L

Cognitive Technologies: The Next Step Up for Data and Analytics in robotics-Cognitive Deep Learning Technology for Big Data Cognitive Assistant Robots for Reducing Variability in Industrial Human-Robot Activities

Introduction to Python and R Programming in the context of Robotics: Introduction to Python - Python Functions for Data Science-Basic ROS Learning Python for robotics- An introduction to R -The R in Robotics rosR: A New Language Extension for the Robot Operating System

Artificial Intelligence and Robotics - The Review of Reliability Factors Related to Industrial Robots -Failure analysis of mature robots in automated production- Data Analytics for Predictive Maintenance of Industrial Robots - Failure Is an Option: How the Severity of Robot Errors Affects Human-Robot Interaction

UNIT V: CONCEPTS OF CLOUD COMPUTING, CLOUD PLATFORMS AND IT APPLICATIONS IN ROBOTICS	IN 9L
Learning Cloud Computing: Core Concepts - Cloud Computing: Private Cloud Platforms -Robot as a Service in Cloud Computing -Cloud Computing Technology and Its Application in Robot Control - A Comprehensive Survey of Recent Trends in Cloud **Robotics Architectures and Applications** - Google's cloud robotics and high computing needs of industrial automation and systems-The role of cloud and opensource software in the future of robotics-The Power of Cloud Robotics by Robotics Industry Association	
LIST OF EXPERIMENTS	**30P**
1.	Build a Self-Driving Robot that can automatically follow a line
2.	Build a basic obstacle-avoiding robot and improve the design to help it avoid getting stuck
3.	Build a Humanoid Robot
4.	Autonomous Robot Navigation using Computer Vision for exhaustive path-finding
5.	A Mobile Autonomous Chemical Detecting Robot
6.	Build a voice controlled robot
7.	Web-Controlled Mobile Video-Enabled Robotic Litter Collection Device
8.	Utilizing Artificial Neural Networks to Create a Learning Robot
9.	Hospital Sanitizing Robot
10.	Autonomous Robotic Vehicle: Saving lives, preventing accidents one at a time
11.	Build a robot with Python and 3D Printed Robotic Arm
12.	Build an Intelligent Irrigation Control System
13.	AI-powered Hearing Aid
14.	Fire Extinguishing Robot
15.	Remote Operated Spy Robot Circuit
TEXT BOOKS	
1.	Saeed Benjamin Niku, “Introduction to Robotics: Analysis, Control, Applications”, Wiley Publishers, 2nd edition, 2011
2.	Simon J. D. Prince, “Computer Vision: Models, Learning, and Inference”, Cambridge University Press, 2012.
3.	Francis X. Govers,” Artificial Intelligence for Robotics: Build Intelligent Robots that Perform Human Tasks Using AI Techniques”, Packt publishing, 2018
REFERENCE BOOKS	
1.	Krishnendu Kar, “Mastering Computer Vision with TensorFlow 2.x: Build Advanced Computer Vision Applications Using Machine Learning and Deep Learning Techniques”, Packt publishing, 2020
2.	Armando Vieira, Bernardete Ribeiro,” Introduction to Deep Learning Business Applications for Developers from Conversational Bots in Customer Service to Medical Image processing”,Apress, 2018.

3.	Steve Heath, "Embedded System Design 2nd Edition", EDN Series for Design Engineers, 2003
EBOOKS	
1.	https://www.ebooks.com/en-af/book/1255735/embedded-robotics/thomas-br-unl/

PROFESSIONAL ELECTIVE –III

COURSE TITLE	**TIME SERIES ANALYSIS**			**CREDITS**	**3**
COURSE CODE	**CW1716A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	1. It familiarizes the learners and researchers to the theory and practice of time series analysis.
Course Outcome	The students will be able to: CO1. Learners will be able to understand the techniques of using Time series data for decision making.

1: INTRODUCTION

UNIT I: UNIVARIATE STATIONARY TIME-SERIES MODELS **9L**

Introduction to stochastic process, stationary processes, World representation theorem, and auto covariance functions, autocorrelation and partial autocorrelation, auto regressive and moving average models, conditions for stationary and invertible process, Box-Jenkins approach, forecasting.

UNIT II: UNIVARIATE NONSTATIONARY PROCESSES **9L**

Nonstationary process, deterministic and stochastic trends, Integrated process and
Random walk, random walk with drift, Unit root process-, test for unit root- Dicky Fuller tests, ARIMA process. Fractional integrated process.

UNIT III: MODELING VOLATILITY CLUSTERING **9L**

Volatility-Meaning and measurement, Volatility clustering, Econometric models of volatility, ARCH model, GARCH model and its various extensions, testing for
ARCH/GARCH effects.

UNIT IV: MULTIVARIATE STATIONARY AND NON-STATIONARY PROCESSES **9L**

Vector autoregressive model, Granger causality, impulse response function, variance decomposition.

UNIT V: MULTIVARIATE NON-STATIONARY PROCESSES **9L**

Introduction to cointegration, testing for cointegration: Single-equation Approaches: Engle Granger method, Johansen test for cointegration, Vector error correction model.

REFERENCE BOOKS	
1.	Brooks, C., Introductory Econometrics for Finance, 3rd Edition, Cambridge University Press, 2014
2.	Enders, W., Applied Econometric Time Series, second edition, John Wiley and Sons, 2006
3.	Hamilton, J. D., Time Series Analysis, Princeton University Press, 1994.
4.	Johnston J. and DiNardo, J. Econometric Methods. 4th Ed. McGraw-Hill 1997
5.	Maddala G.S. and In-Moo Kim, Unit Roots, Cointegration, and Structural Change, 1998.
EBOOKS	
1.	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://civil.colorado.edu/~balajir/CVEN6833/lectures/wwts-book.pdf

COURSE TITLE	ADVANCE SOCIAL, TEXT AND MEDIA ANALYTICS			CREDITS	3
COURSE CODE	CW1717A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• To learn the fundamentals of text mining analysis. • To be able to use various tools for text mining and carry out pattern discovery, predictive modeling. • Explore the use of social network analysis to understand the growing connectivity and complexity. • Perform social network analysis to identify important network properties in social media sites. • Analyzing interactions between people, and determine structural patterns in such interactions in real time application
Course Outcome	**The students will be able to** • Perceive the trends in recent years on online social networks. • Draw the graphical relation between the communities. • Know various social network algorithms related to predictive modelling and pattern discovery. • Determine the relation between the participants of various social media • Understand Social Network Mining Tools and apply in real time problems.

1: INTRODUCTION

UNIT I: INTRODUCTION TO TEXT MINING	9L
Introduction- Defining text mining, general architecture of text mining systems. Core text mining operations- Using background knowledge for text mining, Text mining query languages. Pre-processing techniques-Task oriented approaches. Categorization- Applications of text categorizations, Definition of the problem, Document representations, Knowledge engineering approach to TC, Machine learning approach to TC, Using unlabeled evaluation of text classifiers.	
UNIT II: CLUSTERING AND INFORMATION EXTRACTION	**9L**

Information extraction –Introduction, Historical evolution, Examples, Architecture of IE systems, Anaphora Resolution, Inductive algorithms, Structural IE. Probabilistic models for information extraction- Hidden Markov Models, Stochastic Context Free Grammars, Maximal entropy 138odeling, Maximal entropy Markov Models, Conditional Random Fields. Text mining applications
UNIT III: TEXT MINING METHODS & APPROACHES **9L**
Content Analysis; Natural Language Processing; Clustering & Topic Detection; Simple Predictive Modelling; Sentiment Analysis; Sentiment Prediction
UNIT IV: WEB ANALYTICS **9L**
Web analytics tools, Clickstream analysis, A/B testing, online surveys; Web search and retrieval, Search engine optimization, Web crawling and Indexing, Ranking algorithms, Web traffic models.
UNIT V: SOCIAL MEDIA ANALYTICS **9L**
Social network and web data and methods. Graphs and Matrices-Why Graphs? Graphs, Directed Graphs, Signed Graphs, Valued Graphs, Multigraphs, Hypergraphs, Relations, Matrices. Basic measures for individuals and networks. Information visualization: Architectural considerations, common visualization approaches for text mining, visualization technique in link analysis; Making connections: Link analysis. Random graphs and network evolution. Social contexts: Affiliation and identity; Social network analysis

TEXT BOOKS	
1.	Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006
2.	Hansen, Derek, Ben Sheiderman, Marc Smith, "Analyzing Social Media Networks with NodeXL: Insights from a Connected World", Morgan Kaufmann, 2011
3.	Avinash Kaushik, "Web Analytics 2.0: The Art of Online Accountability", 2009
4.	Hanneman, Robert and Mark Riddle, "Introduction to Social Network Method", 2005.
5.	Ronen Feldman and James Sanger, "The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Cambridge University Press, 2006
REFERENCE BOOKS	
1.	Wasserman, S. & Faust, K.. "Social Network Analysis: Methods and Applications", New York: Cambridge University Press, 1994.
2.	2. Monge, P. R. & Contractor, N. S., "Theories of Communication Networks", New York: Oxford University Press, 2003. http://nosh.northwestern.edu/vita.html
EBOOKS	
1.	chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/https://ptgmedia.pearsoncmg.com/images/9780133892567/samplepages/9780133892567.pdf

COURSE TITLE	**MOBILE COMPUTING**			**CREDITS**	**4**
COURSE CODE	**CW1718A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	1. To learn the basic concepts, aware of the GSM, SMS, GPRS Architecture. 2. To have an exposure about wireless protocols -WLN, Bluetooth, WAP, ZigBee issues. 3. To Know the Network, Transport Functionalities of Mobile communication. 4. To impart knowledge about Mobile Application Development Platform 5. To impart the knowledge about basic components needed for Mobile App development
Course Outcome	**The students will be able to** 1. Gain the knowledge about various types of Wireless Data Networks and Voice Networks. 2. Understand the architectures, the challenges and the Solutions of Wireless Communication 3. Realize the role of Wireless Protocols in shaping the future Internet. 4. Able to develop simple Mobile Application Using Android

1: INTRODUCTION

UNIT I: WIRELESS COMMUNICATION FUNDAMENTALS, ARCHITECTURE 9L

Frequency Spectrum- Multiplexing- Spread spectrum-GSM vs CDMA -Comparison of 2G , 3G, 4G - GSM Architecture-Entities-Call Routing- Address and identifiers- GSM Protocol architecture-Mobility Management-Frequency Allocation- Security –GPRS Architecture (entity and Protocol).

UNIT II: MOBILE WIRELESS SHORT RANGE NETWORKS 9L

Introduction-WLAN Equipment-WLAN Topologies-WLAN Technologies-IEEE 802.11 Architecture-WLAN MAC-Security of WLAN, Power Management-Standards- WAP Architecture- Bluetooth enabled Devices Network-Layers in Bluetooth Protocol-Security in Bluetooth- IrDA- ZigBee.

UNIT III: MOBILE IP NETWORK LAYER, TRANSPORT LAYER 9L

IP and Mobile IP Network Layer- Packet delivery and Handover Management-Location Management- Registration- Tunneling and Encapsulation-Route Optimization- Mobile Transport Layer-Conventional TCP/IP Transport Layer Protocol-Indirect, Snooping, Mobile TCP.

UNIT IV: MOBILE APPLICATION DEVELOPMENT USING ANDROID 9L

Mobile Applications Development - Understanding the Android Software Stack – Android Application Architecture –The Android Application Life Cycle – The Activity Life Cycle- Creating Android Activity -Views- Layout -Creating User Interfaces with basic views- linking activities with Intents.

UNIT V: MOBILE APPLICATION DEVELOPMENT USING ANDROID 9L

Services-Broadcast Receivers – Adapters – Data Storage, Retrieval and Sharing.-Location based services- Development of simple mobile applications

REFERENCE BOOKS

1.	Asoke K Talukder, Hasan Ahmed,Roopa R Yavagal “Mobile Computing”, Tata McGraw Hill Pub ,2nd Edition Aug – 2010
2.	Barry A. Burd ,’Android Application Development For Dummies All in One”, Wiley, 2015
3.	Ed Burnette,’Hello, Android: Introducing Google’s Mobile Development Platform’ third edition’ Pragmatic Programmers,2012.3
4.	Jochen Schillar “Mobile Communications” Pearson Education second Edition.
5.	Jerome(J.F) DiMarzio “Android A programmer’s Guide” Tata McGraw-Hill 2010 Edition.
6.	Maritn Sauter, ―From GSM to LTE: An Introduction to Mobile Networks and Mobile Broadband‖, John Wiley and Sons, 2011
7.	Raj Kamal “Mobile Computing” Oxford Higher Education, Second Edition, 2012
8.	Reto Meier,Professional Android 2 Application Development, Wrox’s Programmer to Programmer series.

EBOOKS

1.	https://drive.google.com/file/d/1cp3vTa9F27hwsiodHulQ4rOBGY790nmH/view

SEMESTER VIII

PROFESSIONAL ELECTIVE –IV

COURSE TITLE	BEHAVIORAL ECONOMICS			CREDITS	3
COURSE CODE	CW1811A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Brief idea about how economic considerations, cognitive limitations and psychology jointly shape human decision making and how people are more receptive to psychological biases and social nudges than economic policies assume.
Course Objective	1. To familiarize the students to the basic concepts of management in order to aid in understanding how an organization function 2. To understanding the complexity and wide variety of issues managers face in today's business firms. 3. To acquaint the students with the fundamentals of managing business 4. To understand individual and group behavior at work place so as to improve the effectiveness of an organization.
Course Outcome	Upon completion of this course, the students will be able to 1. Understanding of various management concepts and skills required in the business world. 2. In-depth knowledge of various functions of management in a real time management context. 3. Understanding of the complexities associated with management of individual behavior in the organizations. 4. Develop the skill set to have manage group behavior in Organizations. 5. Insights about the current trends in managing organizational behavior.

Prerequisites: NIL

UNIT I: NATURE AND THEORIES OF MANAGEMENT (9)

Evolution of management Thought-Classical, Behavioral and Management Science Approaches Management- meaning, levels, management as an art or science, Managerial functions and Roles, Evolution of Management Theory- Classical era- Contribution of F.W.Taylor, Henri Fayol, Neoclassical-Mayo & Hawthorne Experiments. • Modern era – system & contingency approach Managerial Skills.

UNIT II: PLANNING AND ORGANISING (9)

Planning - Steps in Planning Process - Scope and Limitations - Forecasting and types of Planning - Characteristics of a sound Plan - Management by Objectives (MBO) - Policies and Strategies - Scope and Formulation - Decision Making - Types, Techniques and Processes. Organisation Structure and Design - Authority and Responsibility Relationships - Delegation of Authority and Decentralisation - Interdepartmental Coordination - - Impact of Technology on Organisational design - Mechanistic vs Adoptive Structures - Formal and Informal Organisation. Control: meaning, function, Process and types of Control.
UNIT III:INDIVIDUAL BEHAVIOUR (9)
Meaning of Organizational behavior, contributing disciplines, importance of organizational behavior, Perception and Learning - Personality and Individual Differences - Motivation theories and Job Performance - Values, Attitudes and Beliefs - Communication Types-Process - Barriers - Making Communication Effective.
UNIT IV: GROUP BEHAVIOUR (9)
Groups and Teams: Definition, Difference between groups and teams, Stages of Group Development, Group Cohesiveness, Types of teams, Group Dynamics - Leadership - Styles - Approaches - Power and Politics - Organisational Structure - Organisational Climate and Culture, Conflict: concept, sources, Types, Stages of conflict, Management of conflict Organisational Change and Development.
UNIT V: EMERGING ASPECTS OF ORGANIZATIONAL BEHAVIOUR (9)
Comparative Management Styles and approaches - Japanese Management Practices Organisational Creativity and Innovation - Organizational behavior across cultures - Conditions affecting cross cultural organizational operations, Managing International Workforce, Productivity and cultural contingencies, Cross cultural communication, Management of Diversity.

TEXT BOOKS	
1.	Andrew J. Dubrin, Essentials of Management, Thomson Southwestern, 10th edition,2016
2.	Samuel C. Certo and S.Trevis Certo, Modern Management: Concepts and Skills, Pearson education, 15th edition, 2018
REFERENCE BOOKS	
1.	Harold Koontz and Heinz Weihrich, Essentials of Management: An International, Innovation, And Leadership Perspective, 10th edition, Tata McGraw-Hill Education, 2015
2.	Charles W.L Hill and Steven L McShane, „Principles of Management, McGraw Hill Education, Special Indian Edition, 2017.
3.	Stephen P. Robbins, Timothy A.Judge, Organisational Behavior, PHI Learning / Pearson Education, 16th edition, 2014.
4.	Fred Luthans, Organisational Behavior, McGraw Hill, 12th Edition, 2013.
5.	Don Hellriegel, Susan E. Jackson and John W,Jr Slocum, Management: A competency Based Approach, Thompson South Western,11th edition.
EBOOKS	
1.	https://bkbcollege.in/upload/dpt_book/1669870509.pdf
MOOC	
1.	https://www.edx.org/learn/behavioral-economics
2.	https://pll.harvard.edu/course/behavioral-economics-virtual

COURSE TITLE	**COMPUTATION FINANCE AND MODELING**			**CREDITS**	**3**
COURSE CODE	**CW1812A**	**COURSE CATEGORY**	**PE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	The use of practical numerical methods and modeling techniques for asset management and the systems designed for algorithmic or high-frequency trading, rather than just using mathematical proofs or theorems.

Course Objective	1. To make the students to understand how the techniques in computational finance applied in risk hedging and pricing of options. 2. To discover how to build key model schedules, such as revenues, costs, fixed assets. 3. To determine the fair prices of stock options based on six variables: volatility, type, underlying stock price. 4. To understand the Overview of Indian Financial System, Investment Banking in India and also Recent Developments and Challenges ahead.
Course Outcome	Upon completion of this course, the students will be able to 1. Understand existing financial models in a quantitative and mathematical way. 2. Apply these quantitative tools to solve complex problems in the areas of portfolio management, risk management and financial engineering. 3. Explain the approaches required to calculate the price of options 4. Identify the methods required to analyse information from financial data and trading systems. 5. Understand the various statistical methods to analyse the financial data.

Prerequisites: NIL

UNIT I: NUMERICAL METHODS AND MODELS (9)

Numerical methods relevant to integration, differentiation and solving the partial differential equations of mathematical finance- examples of exact solutions including Black Scholes and its relatives. Finite difference methods including algorithms and question of stability and convergence. Treatment of near and far boundary conditions-the connection with binomial models- interest rate model- early exercise- the corresponding free boundary problems. Introduction to numerical methods for solving multi-factor models.

UNIT II: BLACK-SCHOLES FRAMEWORK (9)

Black-Scholes PDE: simple European calls and puts; put-call parity. The PDE for pricing commodity and currency options. Discontinuous payoffs - Binary and Digital options. Option Greeks and their role in hedging. The mathematics of early exercise - American options: perpetual calls and puts; optimal exercise strategy and the smooth pasting condition. Volatility considerations - actual, historical, and implied volatility; local volatility surfaces. Simulation including random variable generation, variance reduction methods and statistical analysis of simulation output. Pseudo random numbers, Linear congruential generator, Mersenne twister RNG. The use of Monte Carlo simulation in solving applied problems on derivative pricing discussed in the current finance literature. The technical topics addressed include importance sampling, Monte Carlo integration, Simulation of Random walk and approximations to diffusion processes, martingale control variables, stratification, and the estimation of the "Greeks."

UNIT III:FINANCIAL PRODUCTS AND MARKETS (9)

Introduction to the financial markets and the products which are traded in them: Equities, indices, foreign exchange, and commodities. Options contracts and strategies for speculation and hedging.

UNIT IV: APPLICATION AREAS (9)

The pricing of American options- pricing interest rate dependent claims, and credit risk. The use of importance of sampling for Monte Carlo simulation of VaR for portfolios of options.

UNIT V: STATISTICAL ANALYSIS OF FINANCIAL RETURNS (9)

Fat-tailed and skewed distributions, outliers, stylized facts of volatility, implied volatility surface, and volatility estimation using high frequency data. Copulas, Hedging in incomplete markets, American Options, Exotic options, Electronic trading, Jump Diffusion Processes, High-dimensional covariance matrices, Extreme value theory, Statistical Arbitrage.

TEXT BOOKS

1.	R. Seydel, "Tools for Computational Finance", 2nd edition, Springer-Verlag, New York, 2004
2.	P. Glasserman, "Monte Carlo Methods in Financial Engineering", Springer-Verlag, New York, 2004.

REFERENCE BOOKS

1.	W. Press, S. Teukolsky, W. Vetterling and B. Flannery, "Numerical Recipes in C: The Art of Scientific Computing", 1997. Cambridge University Press, Cambridge, UK. Available on-line at: http://www.nr.com/
2.	A. Lewis, " Option Valuation under Stochastic Volatility", Finance Press, Newport Beach, California, 2000
3.	5. A. Pelsser, "Efficient Methods for Valuing Interest Rate Derivatives", Springer-Verlag, New York, 2000

EBOOKS

1.	https://www.researchgate.net/profile/Lech-Grzelak/publication/334748386_Mathematical_Modeling_and_Computation_in_Finance_With_Exercises_and_Python_and_MATLAB_Computer_Codes/links/5f8f252992851c14bcd84e26/Mathematical-Modeling-and-Computation-in-Finance-With-Exercises-and-Python-and-MATLAB-Computer-Codes.pdf?_tp=eyJjb250ZXh0Ijp7ImZpcnN0UGFnZSI6InB1YmxpY2F0aW9uIiwicGFnZSI6InB1YmxpY2F0aW9uIn19
MOOC	
1.	https://www.coursera.org/courses?query=computational%20finance
2.	https://www.cqf.com/computational-finance-course

COURSE TITLE	PSYCHOLOGY			CREDITS	3
COURSE CODE	CW1813A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL –

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	A survey of basic topics, concepts, and psychological principles, including child development, learning, memory, motivation, physiological influences, stress, coping, personality dynamics, social functioning, abnormal behavior, and psychotherapy.
Course Objective	1. Review critically contemporary organizational psychology topics 2. To imbibe the competency to recruit, select and appraise the performance of employees 3. Describe their motivational theories to improve productivity 4. Achieving the Organizational goals through team building and leadership styles Equip with the stress coping strategies and effective work-life balance
Course Outcome	Upon completion of this course, the students will be able to 1. Learn core psychological competencies in the subspecialties of I/O psychology 2. To support more for the employees are by the HR team, the higher quality of work they'll produce, and the better their performance, which means higher profit and ROI for the organization. 3. A study published in the Journal of Applied Psychology found when people have greater job satisfaction, they have more positive moods. 4. How global leadership skills contribute to leadership effectiveness. Understand the leader's role in team-based organizations. 5. Understand the benefits of achieving a healthy work-life balance. 6. Recognize the signs and symptoms of stress.

Prerequisites: NIL

UNIT I: INDUSTRIAL AND ORGANISATIONAL PSYCHOLOGY (9)

Introduction to Industrial and Organisational Psychology, Research Methods, Evidence-based Practice. Overview of Legal Context of Industrial Psychology, Job Analysis & Competency Modeling, Job Evaluation, Compensation and Benefits, Job Design & Employee Well-Being.

UNIT II: RECRUITMENT, SELECTION AND PERFORMANCE EVALUATION (9)

Human Resource Planning process, Recruitment – Internal and External sources of Recruitment, Recruitment process. Selection – Process of Selection, Identifying talent & Validating Tests, Screening Methods. Performance Evaluation – Process of appraisal, Traditional and Modern methods. Feedback mechanism, Performance management.

UNIT III:MOTIVATION AND JOB SATISFACTION (9)

Concept of Motivation – Types of Motivation, Process of motivation, Motivation theories and work behaviour (Maslow's theory, Theory X and Y, McClelland's, Need Theory, Herzberg's Two Factor Theory), and Cultural differences in motivation. Job Satisfaction and factors that influence job satisfaction.

UNIT IV: LEADERSHIP AND TEAM BEHAVIOUR (9)

Leader and Leadership, Qualities of Effective Leaders, leadership style, types of leaders. Organizational Climate, Culture, and Development. Significance of psychology in Team building, channelizing teams towards goal attainment.

UNIT V: STRESS MANAGEMENT AND WORK-LIFE BALANCE (9)

Stress Management – Types of stress, Identifying stressors, Analysing the current stress management practices in organisations, stress coping strategies. Facing the demands of Life and Work through effective Work-life balance.

TEXT BOOKS

1.	Thomas M. Heffernan,(2015),The Student's Guide to Studying Psychology, Psychology press
2.	Landy, F. J. and Conte, J. M. (2013). Work in the 21st Century (4th Edition). Oxford: Blackwell Publishing
3.	Muchinsky, P. M. and Culbertson, S. S. (2015). Psychology applied to work (11th Edition). Hyper graphic Press.
4.	Robert Baron and Misra(2000)Psychology , Pearson Publications, Fifth edition.
REFERENCE BOOKS	
1.	Luthans, Fred, Organizational Behavior, McGraw Hill 2008.
2.	Udai Pareek, Understanding Organizational Behavior, Oxford University Press.
3.	Robbins, Stephen, Organizational Behavior, Prentice Hall, India
EBOOKS	
1.	https://open.lib.umn.edu/intropsyc/
MOOC	
1.	https://www.coursera.org/browse/health/psychology
2.	https://www.edx.org/learn/psychology

COURSE TITLE	**DATA MINING AND ANALYTICS**			**CREDITS**	**3**
COURSE CODE	**CW1814A**	**COURSE CATEGORY**	**PC**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**

Course Description	This is a course suitable for B. Tech students. It deals with basic C++ programs, classes and objects. This course develops applications using friend function. Also, from this course students are able to understand the concepts of inheritance, polymorphism, exception handling, streaming and file handling mechanisms.
Course Objective	• To introduce the fundamental concepts of data mining and data Representation. • To learn the data preprocessing task and attribute oriented analysis. • To understand the association rules, classification and prediction algorithms. • To learn and apply the linear and non-linear models of data analysis. • To understand the time series analysis and aspects of prescriptive analysis.
Course Outcome	Upon completion of this course, the students will be able to • Understand the fundamentals of data mining and data representation. • Describe preprocessing tasks for the data set. • Apply association rules and predictive methods for data mining. • Build data models using linear and non-linear regression techniques. • Gain knowledge on time series analysis and prescriptive analysis.

UNIT I: INTRODUCTION AND KNOWLEDGE REPRESENTATION (9)

Introduction - Related technologies - Machine Learning, DBMS, OLAP, Statistics, Stages of the Data Mining Process, Data Mining Techniques, Knowledge Representation Methods, Task relevant data, Background knowledge, Representing input data and output knowledge, Visualization techniques, Applications.

UNIT II: DATA PREPROCESSING (9)

Data preprocessing: Data cleaning, Data transformation, Data reduction, Discretization and generating concept hierarchies. Attribute-oriented analysis: Attribute generalization, Attribute relevance, Class comparison,Statistical Measures

UNIT III:ASSOCIATION AND MINING METHODS (9)

Association rules: Motivation and terminology, Basic idea: item sets, Generating item sets and rules efficiently, Correlation analysis. Classification: Basic learning/mining tasks, Inferring rudimentary rules: 1R, algorithm, Decision trees, covering rules. Prediction: The prediction task, Statistical (Bayesian) classification, Bayesian networks, Instance- based methods (nearest neighbor), linear models.

UNIT IV: LINEAR AND NON-LINEAR MODELS **(9)**

Descriptive analytics: Data Modeling, Trend Analysis, Simple Linear Regression Analysis Forecasting models: Heuristic methods, predictive modeling and pattern discovery, Logistic Regression: Logit transform, ML estimation, Tests of hypotheses, Wald test, LR test, score test, test for overall regression, multiple logistic regression, forward, backward method, interpretation of parameters, relation with categorical data analysis. Interpreting Regression Models, Implementing Predictive Models. Generalized Linear model: Link functions such as Poisson, binomial, inverse binomial, inverse Gaussian, Gamma. Non Linear Regression (NLS): Linearization transforms,their uses & limitations, examination of non-linearity, initial estimates, iterative procedures for NLS, grid search, Newton-Raphson, steepest descent, Marquardt's methods. Introduction to semiparametric regression models, additive regression models. Introduction to nonparametric regression methods.

UNIT V: TIME SERIES ANALYSIS **(9)**

Time Series Analysis: Auto - Covariance, Auto-correlation and their properties. Exploratory time series analysis, Test for trend and seasonality, Exponential and moving average smoothing, Holt – Winter smoothing, forecasting based on smoothing. Linear time series models: Autoregressive, Moving Average, Autoregressive Moving Average and Autoregressive Integrated Moving Average models; Estimation of ARIMA models such as Yule-Walker estimation for AR Processes, Maximum likelihood and least squares estimation for ARIMA Processes, Forecasting using ARIMA models.Prescriptive Analytics: Mathematical optimization, Networks modeling-Multi-objective optimization-Stochastic modeling, Decision and Risk analysis,Decision trees.

TEXT BOOKS

1.	Jiawei Han and MichelineKamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
2.	Lior Rokach and OdedMaimon, "Data Mining and Knowledge Discovery Handbook", Springer, 2nd edition, 2010.
3.	Ian H. Witten, Eibe Frank and Mark A. Hall "Data Mining: Practical Machine Learning Tools and Techniques", Fourth Edition, Elsevier, 2017.

REFERENCE BOOKS

1.	Draper, N. R. and Smith, H., "Applied Regression Analysis", Third Edition, John Wiley, 1998.
2.	Hosmer, D. W. and Lemeshow, S., "Applied Logistic Regression", Third Edition, Wiley, 2003.
3.	Daniel T.Larose, "Data Mining Methods and Models", Wiley-Interscience, 2006.
4.	Jason Brownlee "Machine Learning Mastery with Weka", 2020.

EBOOKS

1.	http://garfield.library.upenn.edu/classics1989/A1989AV485000 01.pdf

MOOC

1.	https://www.coursera.org/courses?query=data%20mining
2.	https://www.my-mooc.com/en/categorie/data-mining

COURSE TITLE	IMAGE PROCESSING AND PATTERN RECOGNITION			CREDITS	3
COURSE CODE	CW1815A	COURSE CATEGORY	PE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL –3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	An introduction to image processing and image analysis techniques and concepts. Areas examined include: Imaging sensors and their principles; Image representation and storage, coding and compression techniques, loss versus lossless; Techniques for noise reduction.
Course Objective	• To learn the fundamentals of image formation and formats. • To understand the intensity transformations and filtering techniques. • To acquire knowledge on image segmentation operations. • To learn the feature extraction and image registration process. • To understand the components of color image processing.
Course Outcome	Upon completion of this course, the students will be able to • Be familiar with the fundamentals of image formation and formats. • Understand image transformation functions and filtering operations. • Apply the segmentation techniques on the images. • Describe the features of an image and perform image registration. • Manipulate Color image processing and conversion operations.

UNIT I: INTRODUCTION AND IMAGE FORMATION	**(9)**
Introduction - Image processing systems and its applications - Basic image file formats. Image formation: Geometric and photometric models; Digitization -sampling, quantization; Image definition and its representation, neighborhood metrics.	
UNIT II: INTENSITY TRANSFORMATIONS AND SPATIAL FILTERING	**(9)**
Enhancement, contrast stretching, histogram specification, local contrast enhancement; Smoothing, linear and order statistic filtering, sharpening, spatial convolution, Gaussian smoothing, DoG, LoG- Morphological Filtering Basics -Dilation and Erosion Operators, Top Hat Filters.	
UNIT III:IMAGE SEGMENTATION	**(9)**
Pixel classification; Grey level thresholding, global/local thresholding; Optimum thresholding - Bayes analysis, Otsu method; Derivative based edge detection operators, edge detection/linking, Canny edge detector; Region growing, split/merge techniques, line detection, Hough transform.	
UNIT IV: FEATURE EXTRACTION AND IMAGE REGISTRATION	**(9)**
Textural features - gray level co-occurrence matrix; Moments; Connected component analysis; Convex hull; Distance transform, medial axis transform, skeletonization/thinning, shape properties. Mono-modal/multimodal image registration; Global/local registration; Transform and similarity measures for registration; Intensity/pixel interpolation.	
UNIT V: COLOUR IMAGE PROCESSING	**(9)**
Fundamentals of different Colour models - RGB, CMY, HSI, YCbCr, Lab; False Colour; Pseudo Colour; Enhancement.	

TEXT BOOKS	
1.	R. C. Gonzalez and R. E. Woods, "Digital Image Processing", Pearson, 4th Edition, 2018.
2.	Maria Petrou and PanagiotaBosdogianni, "Image Processing: The Fundamentals", John Wiley & Sons, Ltd, 2nd Edition , 2010.
3.	K. R. Castleman, "Digital Image Processing", Prentice Hall, Englewood Cliffs, 1st Edition, 1995.
REFERENCE BOOKS	
1.	A. Blake and A. Zisserman, "Visual Reconstruction", MIT Press, Cambridge. https://doi.org/10.7551/mitpress/7132.001.0001.
2.	A. N. Netravali and B. G. Haskell, "Digital Pictures", Plenum Press, 2nd Edition, 1995.
3.	A. B. Watson, "Digital Images and Human Vision", MIT Press, Cambridge, 1993.
EBOOKS	
1.	https://farid.berkeley.edu/downloads/tutorials/fip.pdf
MOOC	
1.	https://www.coursera.org/courses?query=image%20processing
2.	https://www.edx.org/learn/image-processing

OPEN ELECTIVE - I

COURSE TITLE	STORAGE TECHNOLOGIES			CREDITS	3
COURSE CODE	OCW1511A	COURSE CATEGORY	OE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	
Course Objective	• Characterize the functionalities of logical and physical components of storage • Describe various storage networking technologies • Identify different storage virtualization technologies • Discuss the different backup and recovery strategies • Understand common storage management activities and solutions
Course Outcome	Upon completion of this course, the students will be able to • Demonstrate the fundamentals of information storage management and various models of Cloud infrastructure services and deployment • Illustrate the usage of advanced intelligent storage systems and RAID • Interpret various storage networking architectures - SAN, including storage subsystems and virtualization • Examine the different role in providing disaster recovery and remote replication technologies • Infer the security needs and security measures to be employed in information storage management.

UNIT I: STORAGE SYSTEMS **(9L)**

Introduction to Information Storage: Digital data and its types, Information storage, Key characteristics of data center and Evolution of computing platforms. Information Lifecycle Management. Third Platform Technologies: Cloud computing and its essential characteristics,Cloud services and cloud deployment models, Big data analytics, Social networking and mobile computing, Characteristics of third platform infrastructure and Imperatives for third platform transformation. Data Center Environment: Building blocks of a data center, Compute systems and compute virtualization and Software-defined data center

UNIT II: INTELLIGENT STORAGE SYSTEMS AND RAID **(9L)**

Components of an intelligent storage system, Components, addressing, and performance of hard disk drives and solid-state drives, RAID, Types of intelligent storage systems, Scale-up and scale-out storage Architecture.

UNIT III : STORAGE NETWORKING TECHNOLOGIES AND VIRTUALIZATION **(9L)**

Block-Based Storage System, File-Based Storage System, Object-Based and Unified Storage. Fibre Channel SAN: Software-defined networking, FC SAN components and architecture, FC SAN topologies, link aggregation, and zoning, Virtualization in FC SAN environment. Internet Protocol SAN: iSCSI protocol, network components, and connectivity, Link aggregation, switch aggregation,and VLAN, FCIP protocol, connectivity, and configuration. Fibre Channel over Ethernet SAN: Components of FCoE SAN, FCoE SAN connectivity, Converged Enhanced Ethernet, FCoE architecture.

UNIT IV : BACKUP, ARCHIVE AND REPLICATION **(9L)**

Introduction to Business Continuity, Backup architecture, Backup targets and methods, Data deduplication, Cloud-based an mobile device backup, Data archive, Uses of replication and its characteristics, Compute based, storage-based, and network-base replication, Data migration,Disaster Recovery as a Service (DRaaS).

UNIT V : SECURING STORAGE INFRASTRUCTURE	**(9L)**
Information security goals, Storage security domains, Threats to a storage infrastructure, Security controls to protect a storage infrastructure, Governance, risk, and compliance, Storageinfrastructure management functions, Storage infrastructure management processes.	
TEXT BOOKS	
1.	EMC Corporation, Information Storage and Management, Wiley, India.
2	Jon Tate, Pall Beck, Hector Hugo Ibarra, Shanmuganathan Kumaravel and Libor Miklas,Introduction to Storage Area Networks, Ninth Edition, IBM - Redbooks, December 2017.
3	Ulf Troppens, Rainer Erkens, Wolfgang Mueller-Friedt, Rainer Wolafka, NilsHaustein, Storage Networks Explained, Second Edition, Wiley, 2009
REFERENCE BOOKS	
1.	G. Somasundaram, Alok Shrivastava, Information Storage and Management, EMC Education Series, Wiley, Publishing Inc., 2011.
2.	Gustavo Santana, Data Center Virtualization Fundamentals: Understanding Techniques and Designs for Highly Efficient Data Centers with Cisco Nexus, UCS, MDS, and Beyond, Cisco Press; 1 edition, 2013.
EBOOKS	
1.	Storage Technologies A Complete Guide - 2019 Edition, Gerardus Blokdyk
2.	https://www.vitalsource.com/nz/products/storage-technologies-simple-steps-to-win-gerard-blokdijk
MOOC	
1.	Introduction to Data Storage and Management Technologies | My Mooc (my-mooc.com)

COURSE TITLE	**RESOURCE MANAGEMENT TECHNIQUES**			**CREDITS**	**3**
COURSE CODE	**OCW1512A**	**COURSE CATEGORY**	**OE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL – 3**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	
Course Objective	• Learn to formulate linear programming problems and solve LPP using simple algorithm • Learn to solve networking problems • Learn to formulate and solve integer programming problems • Learn to solve Non Linear programming problems • Learn to understand and solve project management problems
Course Outcome	Upon completion of this course, the students will be able to 1: Understand to formulate linear programming problems and solve LPP using simple algorithm

	2: Understand to solve networking problems 3: Understand to formulate and solve integer programming problems 4: Understand to solve Non Linear programming problems 5: Understand to understand and solve project management problems
UNIT I: LINEAR PROGRAMMING	**(9L)**
Principal components of decision problem – Modeling phases – LP formulation and graphic solution – Resource allocation problems – simplex method – sensitivity analysis	
UNIT II: DUALITY AND NETWORKS	**(9L)**
Definition of dual problems – primal – Dual relationships – Dual simplex method –post optimality analysis – Transportation and assignment model – Shortest route problem.	
UNIT III : INTEGER PROGRAMMING	**(9L)**
Cutting plan algorithm – Branch and bound methods, Multistage (Dynamic) programming	
UNIT IV : CLASSICAL OPTIMISATION THEROY	**(9L)**
Unconstrained external problems, Newton – Ralphson method – Equality constraints –Jacobean methods – Lagrangian metho – Kuhn – Tucker conditions – Simple problems.	
UNIT V : OBJECT SCHEDULOING	**(9L)**
Network diagram representation – Critical path method – Time charts and resource leveling – PERT.	
TEXT BOOKS	
1.	H.A. Taha, “Operation Research”, Prentice Hall of India, 2002.
REFERENCE BOOKS	
1.	Paneer selvam, ‘Operations Research’ Prentice Hall of India, 2002.
2.	Anderson ‘Quantitative Methods for Business’, 8th Edition, Thomson Learning, 2002.
EBOOKS	
1	https://books.google.co.in/books?id=OtUxEAAAQBAJ&printsec=copyright&redir_esc=y#v=onepage&q&f=false
MOOC	
1.	

OPEN ELECTIVE – II

COURSE TITLE	PROJECT REPORT WRITING			CREDITS	3
COURSE CODE	OCW1711A	COURSE CATEGORY	OE	L-T-P-C	3-0-0-3
Version	1.0	Approval Details		LEARNING LEVEL	BTL – 3

ASSESSMENT SCHEME

First Internal Assessment (Theory)	Second Internal Assessment (Theory)	Third Internal Assessment (Theory)	Practical Assessment /Observation / Lab records/ Attendance	End Semester Examination (Theory)	

Course Description	Project Report Writing is designed to equip students with the essential skills and knowledge necessary to effectively communicate the results of projects and research endeavors.
Course Objective	• Write effective project reports. • Use statistical tools with confidence. • Explain the purpose and intension of the proposed project coherently and with clarity. • Create writing texts to suit achieve the intended purpose. • Master the art of writing winning proposals and projects.
Course Outcome	Upon completion of this course, the students will be able to 1. Students will be able to identify and explain the components of a project report, including abstracts, introductions, methodology, results, conclusions, and recommendations. 2. Develop the ability to write clearly and concisely, ensuring that the language used is appropriate for the audience and purpose of the report. 3. Gain proficiency in gathering relevant information, synthesizing findings from primary and secondary sources, and presenting them coherently in the report. 4. Demonstrate critical thinking skills by analyzing data, interpreting results, and drawing conclusions based on evidence presented in the project report. 5. Understand the importance of project planning and management in the context of report writing, including setting deadlines, managing resources, and coordinating with team members.

Prerequisites: NIL

UNIT I: INTRODUCTION **(9)**

Writing Skills – Essential Grammar and Vocabulary – Passive Voice, Reported Speech, Concord, Signpost words, Cohesive Devices – Paragraph writing – Technical Writing vs. General Writing.

UNIT II: PROJECT REPORT **(9)**

Project Report – Definition, Structure, Types of Reports, Purpose – Intended Audience – Plagiarism – Report Writing in STEM fields – Experiment – Statistical Analysis.

UNIT III: STRUCTURE OF THE PROJECT REPORT **(9)**

Structure of the Project Report: (Part 1) Framing a Title – Content – Acknowledgement – Funding Details -Abstract – Introduction – Aim of the Study – Background – Writing the research question -Need of the Study/Project Significance, Relevance – Determining the feasibility – Theoretical Framework.

UNIT IV: STRUCTURE OF THE PROJECT REPORT **(9)**

Structure of the Project Report: (Part 2) – Literature Review, Research Design, Methods of Data Collection – Tools and Procedures – Data Analysis – Interpretation – Findings -Limitations -Recommendations – Conclusion – Bibliography

UNIT V: PROOF READING A REPORT **(9)**

Proof reading a report – Avoiding Typographical Errors – Bibliography in required Format – Font -Spacing – Checking Tables and Illustrations – Presenting a Report Orally – Techniques.

TEXT BOOKS

1.	Gerson and Gerson – Technical Communication: Process and Product, 7th Edition, Prentice Hall(2012).
2.	Virendra K. Pamecha – Guide to Project Reports, Project Appraisals and Project Finance (2012).
3.	Daniel Riordan – Technical Report Writing Today (1998) Darla-Jean Weatherford – Technical Writing for Engineering Professionals (2016) Penwell Publishers.
EBOOKS	
1.	https://www.goodreads.com/work/editions/3531854-technical-communication-process-and-product-6th-edition-mytechcommla
2.	https://www.goodreads.com/book/show/41504801-guide-to-project-reports-project-appraisals-project-finance
3.	
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc22_hs05/preview

COURSE TITLE	**QUEUEING AND RELIABILITY MODELLING**			**CREDITS**	**3**
COURSE CODE	**OCW1712A**	**COURSE CATEGORY**	**OE**	**L-T-P-C**	**3-0-0-3**
Version	**1.0**	**Approval Details**		**LEARNING LEVEL**	**BTL –**

ASSESSMENT SCHEME

First Internal Assessment (Theory)	**Second Internal Assessment (Theory)**	**Third Internal Assessment (Theory)**	**Practical Assessment /Observation / Lab records/ Attendance**	**End Semester Examination (Theory)**	

Course Description	Queueing and Reliability Modelling is an advanced course that explores mathematical models and analytical techniques used to study the behavior of systems involving queues and reliability.
Course Objective	• Develop a thorough understanding of the basic concepts of queueing theory • Apply mathematical techniques and computational tools to model and simulate queueing systems, enabling the evaluation of system performance under various scenarios. • Gain insight into reliability modelling principles, including reliability . • Learn how to optimize system performance and resource allocation based on queueing and reliability models, aiming to enhance system efficiency and reliability. • Apply queueing and reliability models to analyze real-world applications in telecommunications networks.
Course Outcome	Upon completion of this course, the students will be able to 1. Enable the students to apply the concept of random processes in engineering disciplines. 2. Acquire skills in analyzing various queueing models. 3. Understand and characterize phenomenon which evolve with respect to time in a probabilistic manner. 4. Analyze reliability of the systems for various probability distributions. 5. Able to formulate problems using the maintainability and availability analyses by using theoretical approach.

UNIT I: RANDOM PROCESSES **(9)**

Classification – Stationary process – Markov process – Poisson process – Discrete parameter Markov chain – Chapman Kolmogorov equations – Limiting distributions.

UNIT II: MARKOVIAN QUEUEING MODELS **(9)**

Markovian queues – Birth and death processes – Single and multiple server queueing models -Little's formula – Queues with finite waiting rooms.

UNIT III: ADVANCED QUEUEING MODELS	**(9)**
M/G/1 queue – Pollaczek Khinchin formula – M/D/1 and M/EK/1 as special cases – Series queues – Open Jackson networks.	
UNIT IV: SYSTEM RELIABILITY	**(9)**
Reliability and hazard functions- Exponential, Normal, Weibull and Gamma failure distribution -Time – dependent hazard models – Reliability of Series and Parallel Systems.	
UNIT V: MAINTAINABILITY AND AVAILABILITY	**(9)**
Maintainability and Availability functions – Frequency of failures – Two Unit parallel system with repair – k out of m systems.	
TEXT BOOKS	
1.	Shortle J.F, Gross D, Thompson J.M,Harris C.M., Fundamentals of Queueing Theory, John Wiley and Sons, New York,2018.
2.	Balagurusamy E., Reliability Engineering, Tata McGraw Hill Publishing Company Ltd., New Delhi,2010.
REFERENCE BOOKS	
1.	Medhi J, Stochastic models of Queueing Theory, Academic Press, Elsevier, Amsterdam, 2003.
2.	Taha, H.A., "Operations Research", 9th Edition, Pearson India Education Services, Delhi, 2016.
	Trivedi, K.S., "Probability and Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, John Wiley and Sons, 2002.
3.	Govil A.K., Reliability Engineering, Tata-McGraw Hill Publishing Company Ltd., New Delhi,1983.
EBOOKS	
1.	https://link.springer.com/book/10.1007/978-981-13-0857-4
MOOC	
1.	https://onlinecourses.nptel.ac.in/noc19_ma30/preview