ANNA UNIVERSITY, CHENNAI 600 025
NON-AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
B.TECH. COMPUTER SCIENCE AND BUSINESS SYSTEMS
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

PROGRAM EDUCATIONAL OBJECTIVES (PEOs)

I.   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.
II.   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
III.   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
IV.   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 (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 SPECIFICOUTCOMES (PSOs)

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 evolve computer science domain specific methodologies for effective decision making in several critical problem domains of the real world.

PSO3: To be able to apply entrepreneurial skills and management tools for identifying, analyzing and creating business opportunities with smart business ideas.

PSO4: 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

ANNA UNIVERSITY, CHENNAI 600 025
NON - AUTONOMOUS COLLEGES AFFILIATED TO ANNA UNIVERSITY
B.TECH. COMPUTER SCIENCE AND BUSINESS SYSTEMS
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM
I - VIII SEMESTERS CURRICULUM

SEMESTER I

SI. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	MA8151	Engineering Mathematics – I	BS	4	4	0	0	4
3.	PH8151	Engineering Physics	BS	3	3	0	0	3
4.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
5.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
6.	GE8152	Engineering Graphics	ES	6	2	0	4	4
PRACTICALS								
7.	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
8.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
			TOTAL	**31**	**19**	**0**	**12**	**25**

SEMESTER II

SI. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	HS8251	Technical English	HS	4	4	0	0	4
2.	MA8252	Linear Algebra	BS	4	4	0	0	4
3.	AD8251	Data Structures Design	PC	3	3	0	0	3
4.	GE8291	Environmental Science and Engineering	ES	3	3	0	0	3
5.	BE8255	Basic Electrical, Electronics, and Measurement Engineering	HS	3	3	0	0	3
6.	AD8252	Digital Principles and Computer Organization	PC	5	3	0	2	4
PRACTICALS								
7.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
8.	AD8261	Data Structures Design Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**20**	**0**	**10**	**25**

SEMESTER III

SI. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8351	Discrete Mathematics	BS	4	4	0	0	4
2.	CW8301	Fundamentals of Economics	BS	3	3	0	0	3
3.	CS8392	Object Oriented Programming	PC	3	3	0	0	3
4.	AD8351	Design and Analysis of Algorithms	PC	5	3	0	2	4
5.	CS8492	Database Management Systems	PC	3	3	0	0	3
PRACTICALS								
6.	CW8311	Business Communication and Value Science Laboratory I	PC	4	0	0	4	2
7.	CS8383	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8.	CS8481	Database Management Systems Laboratory	PC	4	0	0	4	2
			TOTAL	**30**	**16**	**0**	**14**	**23**

SEMESTER IV

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8391	Probability and Statistics	BS	4	4	0	0	4
2.	CS8493	Operating Systems	PC	3	3	0	0	3
3.	CW8401	Introduction to Business Systems	PC	3	3	0	0	3
4.	CW8402	Computational Statistics	PC	3	3	0	0	3
5.	CS8494	Software Engineering	PC	3	3	0	0	3
PRACTICALS								
6.	CS8461	Operating Systems Laboratory	PC	4	0	0	4	2
7.	CW8411	Computational Statistics Laboratory	PC	4	0	0	4	2
8.	CW8412	Business Communication and Value Science Laboratory II	PC	4	0	0	4	2
			TOTAL	**28**	**16**	**0**	**12**	**22**

SEMESTER V

Sl. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CW8591	Software Architecture	PC	3	3	0	0	3
2.	CW8501	Software Design using UML	PC	5	3	0	2	4
3.	CW8502	Operations Research	BS	5	3	0	2	4
4.	CW8503	Design Thinking	PC	5	3	0	2	4
5.	CS8501	Theory of Computation	PC	3	3	0	0	3
6.		Open Elective I	OE	3	3	0	0	3
PRACTICALS								
7.	CW8511	Mini Project(Software / System Design/Architecture) end to end	EEC	4	0	0	4	2
8.	CW8512	Soft Skills Laboratory	EEC	2	0	0	2	1
			TOTAL	30	18	0	12	24

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CW8691	Computer Networks	PC	5	3	0	2	4
2.	CS8691	Artificial Intelligence	PC	3	3	0	0	3
3.	CS8602	Compiler Design	PC	5	3	0	2	4
4.	CW8601	Fundamentals of Management	PC	3	3	0	0	3
5.	AD8551	Business Analytics	PC	3	3	0	0	3
6.		Professional Elective-1	PE	3	3	0	0	3
PRACTICALS								
7.	CW8611	Business Analytics Laboratory	PC	4	0	0	4	2
8.	CW8612	Artificial intelligence Laboratory	PC	4	0	0	4	2
			TOTAL	30	18	0	12	24

SEMESTER VII

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	CW8701	Financial Management	PC	3	3	0	0	3
2.	IT8501	Web Technology	PC	3	3	0	0	3
3.	IT8073	Information Security	PC	3	3	0	0	3
4.		Professional Elective-II	PE	3	3	0	0	3
5.		Professional Elective-III	PE	3	3	0	0	3
6.		Open Elective II	OE	3	3	0	0	3
PRACTICALS								
7.	CW8711	Information Security Laboratory	PC	4	0	0	4	2
8.	IT8511	Web Technology Laboratory	PC	4	0	0	4	2
9.	CW8712	Mini Project (Based on concepts of Electives)	EEC	4	0	0	4	2
			TOTAL	**30**	**18**	**0**	**12**	**24**

SEMESTER VIII

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.		Professional Elective-IV	PE	3	3	0	0	3
2.		Professional Elective-V	PE	3	3	0	0	3
PRACTICALS								
3.	CW8811	Project Work	EEC	20	0	0	20	10
			TOTAL	**26**	**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 183

PROFESSIONAL ELECTIVES (PE)

SEMESTER VI, ELECTIVE – I

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	CW8001	Data Mining and Analytics	PE	3	3	0	0	3
2.	CS8601	Mobile Computing	PE	3	3	0	0	3
3.	CW8002	Cryptology	PE	3	3	0	0	3
4.	CS8791	Cloud Computing	PE	3	3	0	0	3
5.	CW8003	Modern Web Applications Development	PE	3	3	0	0	3

SEMESTER VII, ELECTIVE – II

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	CW8004	Blockchain Technologies	PE	3	3	0	0	3
2.	AD8552	Machine Learning	PE	3	3	0	0	3
3.	AD8081	Cognitive Science and Analytics	PE	3	3	0	0	3
4.	CS8081	Internet of Things	PE	3	3	0	0	3
5.	CW8005	Social, Text and Media Analytics	PE	3	3	0	0	3

SEMESTER VII, ELECTIVE – III

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	CW8006	Behavioral Economics	PE	3	3	0	0	3
2.	CW8007	Computational Finance and Modeling	PE	3	3	0	0	3
3.	CW8008	Marketing Research and Marketing Management	PE	3	3	0	0	3
4.	CW8009	HR Management	PE	3	3	0	0	3
5.	CW8010	Supply Chain Management	PE	3	3	0	0	3
6.	CW8011	Psychology	PE	3	3	0	0	3
7.	CW8012	Business Research Method	PE	3	3	0	0	3

SEMESTER VIII, ELECTIVE – IV

SI. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	CW8013	Introduction to Innovation, IP Management and Entrepreneurship	PE	3	3	0	0	3
2.	CW8014	Digital Marketing	PE	3	3	0	0	3
3.	CW8015	Risk Analytics	PE	3	3	0	0	3
4.	CW8016	Customer Relation Management and Customer Experience Management	PE	3	3	0	0	3
5.	CW8017	IT Project Management	PE	3	3	0	0	3
6.	CW8018	Enterprise Security	PE	3	3	0	0	3

SEMESTER VIII, ELECTIVE – V

SI. No	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	CW8019	Quantum Computation and Quantum Information	PE	3	3	0	0	3
2.	CW8020	Embedded Systems and Robotics	PE	3	3	0	0	3
3.	CW8021	Cloud, Micro services and Application	PE	3	3	0	0	3

SUMMARY

S. NO.	SUBJECT AREA	CREDITS AS PER SEMESTER								CREDITS TOTAL	Percentage
		I	II	III	IV	V	VI	VII	VIII		
1.	HS	4	7							11	6.01%
2.	BS	12	4	7	4	4				31	16.94%
3.	ES	9	5							14	7.65%
4.	PC		9	16	18	14	21	13		91	49.73%
5.	PE						3	6	6	15	8.2%
6.	OE					3		3		6	3.28%
7.	EEC					3		2	10	15	8.2%
	Total	25	25	23	22	24	24	24	16	183	100%
8.	Non Credit / Mandatory										

HS8151   **COMMUNICATIVE ENGLISH** | **L** | **T** | **P** | **C** |
                                                                        | **4** | **0** | **0** | **4** |

OBJECTIVES:
- To develop the basic reading and writing skills of first year engineering and technology students.
- To help learners develop their listening skills, which will, enable them listen to lectures and comprehend them by asking questions; seeking clarifications.
- To help learners develop their speaking skills and speak fluently in real contexts.
- To help learners develop vocabulary of a general kind by developing their reading skills

UNIT I   SHARING INFORMATION RELATED TO ONESELF/FAMILY& FRIENDS   12

Reading- short comprehension passages, practice in skimming-scanning and predicting- **Writing**- completing sentences- - developing hints. **Listening**- short texts- short formal and informal conversations.   **Speaking-** introducing oneself - exchanging personal information- **Language development**- Wh- Questions- asking and answering-yes or no questions- parts of speech. **Vocabulary development-**- prefixes- suffixes- articles.- count/ uncount nouns.

UNIT II   GENERAL READING AND FREE WRITING   12

Reading - comprehension-pre-reading-post reading- comprehension questions (multiple choice questions and /or short questions/ open-ended questions)-inductive reading- short narratives and descriptions from newspapers including dialogues and conversations (also used as short Listening texts)- register- **Writing** – paragraph writing- topic sentence- main ideas- free writing, short narrative descriptions using some suggested vocabulary and structures –**Listening**- telephonic conversations. **Speaking –** sharing information of a personal kind—greeting – taking leave- **Language development** – prepositions, conjunctions **Vocabulary development-** guessing meanings of words in context.

UNIT III   GRAMMAR AND LANGUAGE DEVELOPMENT   12

Reading- short texts and longer passages (close reading) **Writing-** understanding text structure- use of reference words and discourse markers-coherence-jumbled sentences **Listening** – listening to longer texts and filling up the table- product description- narratives from different sources. **Speaking**- asking about routine actions and expressing opinions. **Language development**- degrees of comparison- pronouns- direct vs indirect questions- **Vocabulary development –** single word substitutes- adverbs.

UNIT IV   READING AND LANGUAGE DEVELOPMENT   12

Reading- comprehension-reading longer texts- reading different types of texts- magazines **Writing**- letter writing, informal or personal letters-e-mails-conventions of personal email- **Listening**- listening to dialogues or conversations and completing exercises based on them. **Speaking-** speaking about oneself- speaking about one's friend- **Language development-** Tenses- simple present-simple past- present continuous and past continuous- **Vocabulary development**- synonyms-antonyms- phrasal verbs

UNIT V   EXTENDED WRITING   12

Reading- longer texts- close reading –**Writing**- brainstorming -writing short essays **–** developing an outline- identifying main and subordinate ideas- dialogue writing-**Listening** – listening to talks- conversations- **Speaking –** participating in conversations- short group conversations-**Language development**-modal verbs- present/ past perfect tense - **Vocabulary development**-collocations-fixed and semi-fixed expressions.

TOTAL: 60 PERIODS

OUTCOMES:
AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:
- Read articles of a general kind in magazines and newspapers.
- Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.
- Comprehend conversations and short talks delivered in English
- Write short essays of a general kind and personal letters and emails in English.

TEXT BOOKS:
1.   Board of Editors. **Using English** A Coursebook for Undergarduate Engineers and Technologists**.** Orient BlackSwan Limited, Hyderabad: 2015
2.   Richards, C. Jack. **Interchange Students' Book-2** New Delhi: CUP, 2015.

REFERENCES:
1.   Bailey, Stephen. Academic Writing: A practical guide for students. New York: Rutledge,2011.
2.   Means,L. Thomas and Elaine Langlois.   English & Communication For Colleges. CengageLearning ,USA: 2007
3.   Redston, Chris &Gillies Cunningham Face2Face (Pre-intermediate Student's Book& Workbook) Cambridge University Press, New Delhi: 2005
4.   Comfort, Jeremy, et al. Speaking Effectively: Developing Speaking Skills for Business English. Cambridge University Press, Cambridge: Reprint 2011
5.   Dutt P. Kiranmai and Rajeevan Geeta. Basic Communication Skills, Foundation Books: 2013.

MA8151	ENGINEERING MATHEMATICS – I	L	T	P	C
		4	0	0	4

OBJECTIVES:

- The goal of this course is to achieve conceptual understanding and to retain the best traditions of traditional calculus. The syllabus is designed to provide the basic tools of calculus mainly for the purpose of modelling the engineering problems mathematically and obtaining solutions. This is a foundation course which mainly deals with topics such as single variable and multivariable calculus and plays an important role in the understanding of science, engineering, economics and computer science, among other disciplines.

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   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 III   INTEGRAL CALCULUS   12

Definite and Indefinite integrals - Substitution rule - Techniques of Integration - Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions - Improper integrals.

UNIT IV   MULTIPLE INTEGRALS   12

Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.

UNIT V   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.

TOTAL: 60 PERIODS

OUTCOMES:
After completing this course, students should demonstrate competency in the following skills:
- Use both the limit definition and rules of differentiation to differentiate functions.
- Apply differentiation to solve maxima and minima problems.
- Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.
- Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.
- Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.
- Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.
- Apply various techniques in solving differential equations.

TEXT BOOKS :
1. Grewal B.S., "Higher Engineering Mathematics", Khanna Publishers, New Delhi, 43rd Edition, 2014.
2. James Stewart, "Calculus: Early Transcendentals", Cengage Learning, 7th Edition, New Delhi, 2015. [For Units I & III - Sections 1.1, 2.2, 2.3, 2.5, 2.7(Tangents problems only), 2.8, 3.1 to 3.6, 3.11, 4.1, 4.3, 5.1(Area problems only), 5.2, 5.3, 5.4 (excluding net change theorem), 5.5, 7.1 - 7.4 and 7.8].

REFERENCES:
1. Anton, H, Bivens, I and Davis, S, "Calculus", Wiley, 10th Edition, 2016.
2. Jain R.K. and Iyengar S.R.K., "Advanced Engineering Mathematics", Narosa Publications, New Delhi, 3rd Edition, 2007.
3. Narayanan, S. and Manicavachagom Pillai, T. K., "Calculus" Volume I and II, S. Viswanathan Publishers Pvt. Ltd., Chennai, 2007.
4. Srimantha Pal and Bhunia, S.C, "Engineering Mathematics" Oxford University Press, 2015.
5. Weir, M.D and Joel Hass, "Thomas Calculus", 12th Edition, Pearson India, 2016.

		L	T	P	C
PH8151	**ENGINEERING PHYSICS**	3	0	0	3

OBJECTIVES:
- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.

UNIT I   PROPERTIES OF MATTER   9

Elasticity – Stress-strain diagram and its uses - factors affecting elastic modulus and tensile strength – torsional stress and deformations – twisting couple - torsion pendulum: theory and experiment - bending of beams - bending moment – cantilever: theory and experiment – uniform and non-uniform bending: theory and experiment - I-shaped girders - stress due to bending in beams.

UNIT II   WAVES AND FIBER OPTICS   9

Oscillatory motion – forced and damped oscillations: differential equation and its solution – plane progressive waves – wave equation. Lasers : population of energy levels, Einstein's A and B coefficients derivation – resonant cavity, optical amplification (qualitative) – Semiconductor lasers: homojunction and heterojunction – Fiber optics: principle, numerical aperture and acceptance angle - types of optical fibres (material, refractive index, mode) – losses associated with optical fibers - fibre optic sensors: pressure and displacement.

UNIT III   THERMAL PHYSICS   9

Transfer of heat energy – thermal expansion of solids and liquids – expansion joints - bimetallic strips - thermal conduction, convection and radiation – heat conductions in solids – thermal conductivity - Forbe's and Lee's disc method: theory and experiment - conduction through compound media (series and parallel) – thermal insulation – applications: heat exchangers, refrigerators, ovens and solar water heaters.

UNIT IV   QUANTUM PHYSICS   9

Black body radiation – Planck's theory (derivation) – Compton effect: theory and experimental verification – wave particle duality – electron diffraction – concept of wave function and its physical significance – Schrödinger's wave equation – time independent and time dependent equations – particle in a one-dimensional rigid box – tunnelling (qualitative) - scanning tunnelling microscope.

UNIT V   CRYSTAL PHYSICS   9

Single crystalline, polycrystalline and amorphous materials – single crystals: unit cell, crystal systems, Bravais lattices, directions and planes in a crystal, Miller indices – inter-planar distances - coordination number and packing factor for SC, BCC, FCC, HCP and diamond structures - crystal imperfections: point defects, line defects – Burger vectors, stacking faults – role of imperfections in plastic deformation - growth of single crystals: solution and melt growth techniques.

TOTAL :45 PERIODS

OUTCOMES:

Upon completion of this course,
- The students will gain knowledge on the basics of properties of matter and its applications,
- The students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,
- The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in expansion joints and heat exchangers,
- The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and
- The students will understand the basics of crystals, their structures and different crystal growth techniques.

TEXT BOOKS:
1. Bhattacharya, D.K. & Poonam, T. "Engineering Physics". Oxford University Press, 2015.
2. Gaur, R.K. & Gupta, S.L. "Engineering Physics". Dhanpat Rai Publishers, 2012.
3. Pandey, B.K. & Chaturvedi, S. "Engineering Physics". Cengage Learning India, 2012.

REFERENCES:
1. Halliday, D., Resnick, R. & Walker, J. "Principles of Physics". Wiley, 2015.
2. Serway, R.A. & Jewett, J.W. "Physics for Scientists and Engineers". Cengage Learning, 2010.
3. Tipler, P.A. & Mosca, G. "Physics for Scientists and Engineers with Modern Physics'. W.H.Freeman, 2007.

CY8151	ENGINEERING CHEMISTRY	L T P C
		3 0 0 3

OBJECTIVES:
- 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.
- Preparation, properties and applications of engineering materials.
- Types of fuels, calorific value calculations, manufacture of solid, liquid and gaseous fuels.
- Principles and generation of energy in batteries, nuclear reactors, solar cells, wind mills and fuel cells.

UNIT I WATER AND ITS TREATMENT 9

Hardness of water – types – expression of hardness – units – estimation of hardness of water by EDTA – numerical problems – boiler troubles (scale and sludge) – treatment of boiler feed water – Internal treatment (phosphate, colloidal, sodium aluminate and calgon conditioning) external treatment – Ion exchange process, zeolite process – desalination of brackish water - Reverse Osmosis.

UNIT II SURFACE CHEMISTRY AND CATALYSIS 9

Adsorption: Types of adsorption – adsorption of gases on solids – adsorption of solute from solutions – adsorption isotherms – Freundlich's adsorption isotherm – Langmuir's adsorption isotherm – contact theory – kinetics of surface reactions, unimolecular reactions, Langmuir - applications of adsorption on pollution abatement. Catalysis: Catalyst – types of catalysis – criteria – autocatalysis – catalytic poisoning and catalytic promoters - acid base catalysis – applications (catalytic convertor) – enzyme catalysis– Michaelis – Menten equation.

UNIT III ALLOYS AND PHASE RULE 9

Alloys: Introduction- Definition- properties of alloys- significance of alloying, functions and effect of alloying elements- Nichrome and stainless steel (18/8) – heat treatment of steel. Phase rule: Introduction, definition of terms with examples, one component system -water system - reduced phase rule - thermal analysis and cooling curves - two component systems - lead-silver system - Pattinson process.

UNIT IV FUELS AND COMBUSTION 9

Fuels: Introduction - classification of fuels - 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) - power alcohol and biodiesel. Combustion of fuels: Introduction - calorific value - higher and lower calorific values- theoretical calculation of calorific value - ignition temperature - spontaneous ignition temperature - explosive range - flue gas analysis (ORSAT Method).

UNIT V ENERGY SOURCES AND STORAGE DEVICES 9

Nuclear fission - controlled nuclear fission - nuclear fusion - differences between nuclear fission and fusion - nuclear chain reactions - nuclear energy - light water nuclear power plant - breeder reactor - solar energy conversion - solar cells - wind energy. Batteries, fuel cells and supercapacitors: Types of batteries – primary battery (dry cell) secondary battery (lead acid battery, lithium-ion-battery) fuel cells – H_2-O_2 fuel cell.

TOTAL: 45 PERIODS

OUTCOMES:
- The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.

TEXT BOOKS:
1. S. S. Dara and S. S. Umare, "A Textbook of Engineering Chemistry", S. Chand & Company LTD, New Delhi, 2015
2. P. C. Jain and Monika Jain, "Engineering Chemistry" Dhanpat Rai Publishing Company (P) LTD, New Delhi, 2015

3. S. Vairam, P. Kalyani and Suba Ramesh, "Engineering Chemistry", Wiley India PVT, LTD, New Delhi, 2013.

REFERENCES:
1. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
2. Prasanta Rath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
3. Shikha Agarwal, "Engineering Chemistry-Fundamentals and Applications", Cambridge University Press, Delhi, 2015.

GE8151   **PROBLEM SOLVING AND PYTHON PROGRAMMING**   **L T P C**
3 0 0 3

OBJECTIVES:
- To know the basics of algorithmic problem solving
- To read and write simple Python programs.
- To develop Python programs with conditionals and loops.
- To define Python functions and call them.
- To use Python data structures –- lists, tuples, dictionaries.
- To do input/output with files in Python.

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, 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, mergesort, histogram.

UNIT V FILES, MODULES, PACKAGES 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.

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of the course, students will be able to
- Develop algorithmic solutions to simple computational problems
- Read, write, execute by hand simple Python programs.
- Structure simple Python programs for solving problems.
- Decompose a Python program into functions.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python Programs.

TEXT BOOKS:
1. Allen B. Downey, ``Think Python: How to Think Like a Computer Scientist'', 2nd edition, Updated for Python 3, Shroff/O'Reilly Publishers, 2016 (http://greenteapress.com/wp/think-python/)
2. Guido van Rossum and Fred L. Drake Jr, "An Introduction to Python – Revised and updated for Python 3.2, Network Theory Ltd., 2011.

REFERENCES:
1. John V Guttag, "Introduction to Computation and Programming Using Python'', Revised and expanded Edition, MIT Press , 2013
2. Robert Sedgewick, Kevin Wayne, Robert Dondero, "Introduction to Programming in Python: An Inter-disciplinary Approach, Pearson India Education Services Pvt. Ltd., 2016.
3. Timothy A. Budd, "Exploring Python", Mc-Graw Hill Education (India) Private Ltd.,, 2015.
4. Kenneth A. Lambert, "Fundamentals of Python: First Programs", CENGAGE Learning, 2012.
5. Charles Dierbach, "Introduction to Computer Science using Python: A Computational Problem-Solving Focus, Wiley India Edition, 2013.
6. Paul Gries, Jennifer Campbell and Jason Montojo, "Practical Programming: An Introduction to Computer Science using Python 3", Second edition, Pragmatic Programmers, LLC, 2013.

GE8152 **ENGINEERING GRAPHICS** **L T P C**
2 0 4 4

OBJECTIVES:
- To develop in students, graphic skills for communication of concepts, ideas and design of Engineering products.
- To expose them to existing national standards related to technical drawings.

CONCEPTS AND CONVENTIONS (Not for Examination) 1

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

UNIT I PLANE CURVES AND FREEHAND SKETCHING 7+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 concepts and Free Hand sketching: Visualization principles –Representation of Three Dimensional objects – Layout of views- Freehand sketching of multiple views from pictorial views of objects

UNIT II   PROJECTION OF POINTS, LINES AND PLANE SURFACE   6+12
Orthographic projection- principles-Principal planes-First angle projection-projection of points. Projection of straight lines (only First angle projections) inclined to both the principal planes - Determination of true lengths and true inclinations by rotating line method and traces Projection of planes (polygonal and circular surfaces) inclined to both the principal planes by rotating object method.

UNIT III   PROJECTION OF SOLIDS   5+12
Projection of simple solids like prisms, pyramids, cylinder, cone and truncated solids when the axis is inclined to one of the principal planes by rotating object method.

UNIT IV   PROJECTION OF SECTIONED SOLIDS AND DEVELOPMENT OF
**   SURFACES   5+12**
Sectioning of above solids in simple vertical position when 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.

UNIT V   ISOMETRIC AND PERSPECTIVE PROJECTIONS   6+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 .

                                                                TOTAL: 90 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to:
- Familiarize with the fundamentals and standards of Engineering graphics
- Perform freehand sketching of basic geometrical constructions and multiple views of objects.
- Project orthographic projections of lines and plane surfaces.
- Draw projections and solids and development of surfaces.
- Visualize and to project isometric and perspective sections of simple solids.

TEXT BOOKS:
1. Natrajan K.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.

REFERENCES:
1. Bhatt N.D. and Panchal V.M., "Engineering Drawing", Charotar Publishing House, 50th Edition, 2010.
2. Basant Agarwal and Agarwal C.M., "Engineering Drawing", Tata McGraw Hill Publishing Company Limited, New Delhi, 2008.

3. Gopalakrishna K.R., "Engineering Drawing" (Vol. I&II combined), Subhas Stores, Bangalore, 2007.
4. 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.
5. N. S. Parthasarathy and Vela Murali, "Engineering Graphics", Oxford University, Press, New Delhi, 2015.
6. Shah M.B., and Rana B.C., "Engineering Drawing", Pearson, 2nd Edition, 2009.

Publication of Bureau of Indian Standards:
1. IS 10711 – 2001: Technical products Documentation – Size and lay out of drawing
2. sheets.
3. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
4. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
5. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.
6. IS 15021 (Parts 1 to 4) – 2001: Technical drawings – Projection Methods.

Special points applicable to University Examinations on Engineering Graphics:
1. There will be five questions, each of either or type covering all units of the syllabus.
2. All questions will carry equal marks of 20 each making a total of 100.
3. The answer paper shall consist of drawing sheets of A3 size only. The students will be permitted to use appropriate scale to fit solution within A3 size.
4. The examination will be conducted in appropriate sessions on the same day

GE8161   PROBLEM SOLVING AND PYTHON PROGRAMMING LABORATORY   L T P C
                                                                   0 0 4 2
OBJECTIVES:
- To write, test, and debug simple Python programs.
- To implement Python programs with conditionals and loops.
- Use functions for structuring Python programs.
- Represent compound data using Python lists, tuples, dictionaries.
- Read and write data from/to files in Python.

LIST OF PROGRAMS:
1. Compute the GCD of two numbers.
2. Find the square root of a number (Newton's method)
3. Exponentiation (power of a number)
4. Find the maximum of a list of numbers
5. Linear search and Binary search
6. Selection sort, Insertion sort
7. Merge sort
8. First n prime numbers
9. Multiply matrices
10. Programs that take command line arguments (word count)
11. Find the most frequent words in a text read from a file
12. Simulate elliptical orbits in Pygame

13. Simulate bouncing ball using Pygame

PLATFORM NEEDED
Python 3 interpreter for Windows/Linux

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Write, test, and debug simple Python programs.
- Implement Python programs with conditionals and loops.
- Develop Python programs step-wise by defining functions and calling them.
- Use Python lists, tuples, dictionaries for representing compound data.
- Read and write data from/to files in Python.

BS8161	PHYSICS AND CHEMISTRY LABORATORY (Common to all branches of B.E. / B.Tech Programmes)	L	T	P	C
		0	0	4	2

OBJECTIVES:

● To introduce different experiments to test basic understanding of physics concepts applied in optics, thermal physics, properties of matter and liquids.

LIST OF EXPERIMENTS: PHYSICS LABORATORY (Any 5 Experiments)

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

TOTAL: 30 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to
- Apply principles of elasticity, optics and thermal properties for engineering applications.

CHEMISTRY LABORATORY: (Any seven experiments to be conducted)

OBJECTIVES:
- To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis.
- To acquaint the students with the determination of molecular weight of a polymer by viscometery.

1. Estimation of HCl using Na_2CO_3 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 chloride content of water sample by argentometric method.
5. Estimation of copper content of the given solution by Iodometry.
6. Determination of strength of given hydrochloric acid using pH meter.
7. Determination of strength of acids in a mixture of acids using conductivity meter.
8. Estimation of iron content of the given solution using potentiometer.
9. Estimation of iron content of the water sample using spectrophotometer (1, 10-Phenanthroline / thiocyanate method).
10. Estimation of sodium and potassium present in water using flame photometer.
11. Determination of molecular weight of polyvinyl alcohol using Ostwald viscometer.
12. Pseudo first order kinetics-ester hydrolysis.
13. Corrosion experiment-weight loss method.
14. Determination of CMC.
15. Phase change in a solid.
16. Conductometric titration of strong acid vs strong base.

OUTCOMES:
- The students will be outfitted with hands-on knowledge in the quantitative chemical analysis of water quality related parameters.

TOTAL: 30 PERIODS

TEXTBOOK:
1. Vogel's Textbook of Quantitative Chemical Analysis (8TH edition, 2014).

	L	**T**	**P**	**C**
HS8251 **TECHNICAL ENGLISH**	**4**	**0**	**0**	**4**

OBJECTIVES:
The Course prepares second semester engineering and Technology students to:

- Develop strategies and skills to enhance their ability to read and comprehend engineering and technology texts.
- Foster their ability to write convincing job applications and effective reports.
- Develop their speaking skills to make technical presentations, participate in group discussions.
- Strengthen their listening skill which will help them comprehend lectures and talks in their areas of specialization.

UNIT I   INTRODUCTION TECHNICAL ENGLISH   12

Listening- Listening to talks mostly of a scientific/technical nature and completing information-gap exercises- **Speaking** –Asking for and giving directions- **Reading** – reading short technical texts from journals- newsapapers- **Writing**- purpose statements – extended definitions – issue- writing instructions – checklists-recommendations-**Vocabulary Development**- technical vocabulary **Language Development** –subject verb agreement - compound words.

UNIT II   READING AND STUDY SKILLS   **12**

Listening- Listening to longer technical talks and completing exercises based on them-**Speaking** – describing a process-**Reading** – reading longer technical texts- identifying the various transitions in a text- paragraphing- **Writing**- interpreting cgarts, graphs- **Vocabulary Development**- vocabulary used in formal letters/emails and reports **Language Development-** impersonal passive voice, numerical adjectives.

UNIT III   TECHNICAL WRITING AND GRAMMAR   **12**

Listening- Listening to classroom lectures/ talkls on engineering/technology -**Speaking** – introduction to technical presentations-   **Reading** – longer texts both general and technical, practice in speed reading; **Writing**-Describing a process, use of sequence words- **Vocabulary Development-** sequence words- Misspelled words. **Language Development-** embedded sentences

UNIT IV   REPORT WRITING   **12**

Listening- Listening to documentaries and making notes. **Speaking** – mechanics of presentations- **Reading** – reading for detailed comprehension- **Writing**- email etiquette- job application – cover letter –Résumé preparation(via email and hard copy)- analytical essays and issue based essays--**Vocabulary Development**- finding suitable synonyms-paraphrasing-. **Language Development-** clauses- if conditionals.

UNIT V   GROUP DISCUSSION AND JOB APPLICATIONS   **12**

Listening- TED/Ink talks; **Speaking** –participating in a group discussion -**Reading**– reading and understanding technical articles **Writing**– Writing reports- minutes of a meeting- accident and survey-**Vocabulary Development- verbal analogies Language Development-** reported speech.

TOTAL :60 PERIODS

OUTCOMES:
At the end of the course learners will be able to:
- Read technical texts and write area- specific texts effortlessly.
- Listen and comprehend lectures and talks in their area of specialisation successfully.
- Speak appropriately and effectively in varied formal and informal contexts.
- Write reports and winning job applications.

TEXT BOOKS:

1.   Board of editors. **Fluency in English A Course book for Engineering and Technology.** Orient Blackswan, Hyderabad: 2016
2.   Sudharshana.N.P and Saveetha. C. **English for Technical Communication**. Cambridge University Press: New Delhi, 2016.

REFERENCES:
1.   Raman, Meenakshi and Sharma, Sangeetha- **Technical Communication Principles and Practice.**Oxford University Press: New Delhi,2014.
2.   Kumar, Suresh. E. **Engineering English**. Orient Blackswan: Hyderabad,2015
3.   Booth-L. Diana**, Project Work,** Oxford University Press**,** Oxford: 2014.
4.   Grussendorf, Marion, **English for Presentations,** Oxford University Press, Oxford: 2007

5. Means, L. Thomas and Elaine Langlois, **English & Communication For Colleges.**
   Cengage Learning, USA: 2007
Students can be asked to read Tagore, Chetan Bhagat and for supplementary reading.

MA8252	LINEAR ALGEBRA	L T P C
		4 0 0 4

COURSE OBJECTIVES :
- To test the consistency and solve system of linear equations
- To find the basis and dimension of vector space
- To obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- To find orthonormal basis of inner product space and find least square approximation
- To find eigenvalues of a matrix using numerical techniques and perform matrix decomposition.

UNIT - I   MATRICES AND SYSTEM OF LINEAR EQUATIONS   12

Matrices - Row echelon form - Rank - System of linear equations - Consistency - Gauss elimination method - Gauss Jordon method.

UNIT - II   VECTOR SPACES   12

Real and Complex fields - Vector spaces over Real and Complex fields - Subspace - Linear space - Linear independence and dependence - Basis and dimension.

UNIT - III   LINEAR TRANSFORMATION   12

Linear transformation - Rank space and null space - Rank and nullity - Dimension theorem - Matrix representation of linear transformation - Eigenvalues and eigenvectors of linear transformation.

UNIT - IV   INNER PRODUCT SPACES   12

Inner product and norms - Properties - Orthogonal, Orthonormal vectors - Gram Schmidt orthonormalization process - Least square approximation.

UNIT - V   EIGEN VALUE PROBLEMS AND MATRIX DECOMPOSITION   12

Eigen value Problems : Power method, Jacobi rotation method - Singular value decomposition - QR decomposition.

                                                        TOTAL : 60 PERIODS

COURSE OUTCOMES :
After the completion of the course the student will be able to
- Test the consistency and solve system of linear equations
- Find the basis and dimension of vector space
- Obtain the matrix of linear transformation and its eigenvalues and eigenvectors
- Find orthonormal basis of inner product space and find least square approximation
- Find eigenvalues of a matrix using numerical techniques and perform matrix decomposition

TEXT BOOKS :

1. Friedberg A.H, Insel A.J. and Spence L, Linear Algebra, Prentice Hall of India, New Delhi, 2004.
2. Faires J.D. and Burden R., Numerical Methods, Brooks/Cole (Thomson Publications), New Delhi, 2002.

REFERENCE BOOKS

1. Kumaresan S, Linear Algebra - A geometric approach, Prentice Hall of India, New Delhi, Reprint, 2010.
2. Strang G, Linear Algebra and its applications, Thomson (Brooks / Cole) New Delhi, 2005.
3. Gerald C.F. and Wheatley P.O, Applied Numerical Analysis, Pearson Educations, New Delhi, 2002.
4. Sundarapandian V, Numerical Linear Algebra, Prentice Hall of India, New Delhi, 2008.
5. Richard Branson, Matrix Operations, Schaum's outline series, 1989.
6. Bernard Kolman, David R. Hill, Introductory Linear Algebra, Pearson Educations, New Delhi, First Reprint, 2009.

AD8251	DATA STRUCTURES DESIGN	L T P C
		3 0 0 3

OBJECTIVES:
- To understand the concepts of ADTs
- To design linear data structures – lists, stacks, and queues
- To understand sorting, searching and hashing algorithms
- To apply Tree and Graph structures

UNIT I   ABSTRACT DATA TYPES   9

Abstract Data Types (ADTs) – ADTs and classes – introduction to OOP – classes in Python – inheritance – namespaces – shallow and deep copying

Introduction to analysis of algorithms – asymptotic notations – recursion – analyzing recursive algorithms

UNIT II   LINEAR STRUCTURES   9

List ADT – array-based implementations – linked list implementations – singly linked lists – circularly linked lists – doubly linked lists – applications of lists – Stack ADT – Queue ADT – double ended queues

UNIT III   SORTING AND SEARCHING   9

Bubble sort – selection sort – insertion sort – merge sort – quick sort – linear search – binary search – hashing – hash functions – collision handling – load factors, rehashing, and efficiency

UNIT IV   TREE STRUCTURES   9

Tree ADT – Binary Tree ADT – tree traversals – binary search trees – AVL trees – heaps – multi-way search trees

UNIT V   GRAPH STRUCTURES   9

Graph ADT – representations of graph – graph traversals – DAG – topological ordering – shortest paths – minimum spanning trees

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:

- explain abstract data types
- design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOK:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", John Wiley & Sons Inc., 2013
2. **Lee**, Kent D., **Hubbard**, Steve, "Data Structures and Algorithms with Python" Springer Edition 2015

REFERENCES:

1. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011
2. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014

GE8291	ENVIRONMENTAL SCIENCE AND ENGINEERING	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To study the nature and facts about environment.
- To finding and implementing 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.

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 the (a) forest ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity. Field study of common plants, insects, birds; Field study of simple ecosystems – pond, river, hill slopes, etc.

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. Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III   NATURAL RESOURCES   10
Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over- utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, 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 – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles. Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

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, case studies – role of non-governmental organization- environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

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 – Case studies.

OUTCOMES:
- Environmental Pollution or problems cannot be solved by mere laws. Public participation is an important aspect which serves the environmental Protection. One will obtain knowledge on the following after completing the course.
- Public awareness of environmental is at infant stage.
- Ignorance and incomplete knowledge has lead to misconceptions
- Development and improvement in std. of living has lead to serious environmental disasters

TEXTBOOKS:
1. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, 2006.
2. Gilbert M.Masters, 'Introduction to Environmental Engineering and Science', 2nd edition, Pearson Education, 2004.

REFERENCES :
1. Dharmendra S. Sengar, 'Environmental law', Prentice hall of India PVT LTD,New Delhi, 2007.
2. Erach Bharucha, "Textbook of Environmental Studies", Universities Press(I) PVT, LTD, Hydrabad, 2015.
3. Rajagopalan, R, 'Environmental Studies-From Crisis to Cure', Oxford University Press, 2005.
4. G. Tyler Miller and Scott E. Spoolman, "Environmental Science", Cengage Learning India PVT, LTD, Delhi, 2014.

BE8255   BASIC ELECTRICAL, ELECTRONICS AND MEASUREMENT   L T P C
ENGINEERING   3 0 0 3

OBJECTIVES:
- To understand the fundamentals of electronic circuit constructions.
- To learn the fundamental laws, theorems of electrical circuits and also to analyze them
- To study the basic principles of electrical machines and their performance
- To study the different energy sources, protective devices and their field applications
- To understand the principles and operation of measuring instruments and transducers

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 - Thevenins theorem, Norton theorem, maximum power transfer 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- All day efficiency calculation.

UNIT III   UTILIZATION OF ELECTRICAL POWER   9
Renewable energy sources-wind and solar panels. Illumination by lamps- Sodium Vapour, Mercury vapour, Fluorescent tube. Domestic refrigerator and air conditioner-Electric circuit,

construction and working principle. Batteries-NiCd, Pb Acid and Li ion–Charge and Discharge Characteristics. Protection-need for earthing, fuses and circuit breakers.Energy Tariff calculation for domestic loads.

UNIT IV   ELECTRONIC CIRCUITS   9
PN Junction-VI Characteristics of Diode, zener diode, Transistors configurations - amplifiers. Op amps- Amplifiers, oscillator,rectifiers, differentiator, integrator, ADC, DAC. Multi vibrator using 555 Timer IC . Voltage regulator IC using LM 723,LM 317.

UNIT V   ELECTRICAL MEASUREMENT   9
Characteristic of measurement-errors in measurement, torque in indicating instruments- moving coil and moving iron meters, Energy meter and watt meter. Transducers- classification-thermo electric, RTD, Strain gauge, LVDT, LDR and piezoelectric. Oscilloscope-CRO.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Discuss the essentials of electric circuits and analysis.
- Discuss the basic operation of electric machines and transformers
- Introduction of renewable sources and common domestic loads.
- Introduction to measurement and metering for electric circuits.

TEXT BOOKS:
1. D.P. Kotharti and I.J Nagarath, Basic Electrical and Electronics Engineering, Mc Graw Hill, 2016,Third Edition.
2. M.S. Sukhija and T.K. Nagsarkar, Basic Electrical and Electronic Engineering, Oxford, 2016.

REFERENCES:
1. S.B. Lal Seksena 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 Utilisation of Electrical Energy", New Age international pvt.ltd.,2003.

AD8252   DIGITAL PRINCIPLES AND COMPUTER ORGANIZATION   L T P C
                                                                        3 0 2 4

UNIT I   DIGITAL FUNDAMENTALS   9
Digital Systems – Binary Numbers – Octal – Hexadecimal Conversions – Signed Binary Numbers – Complements – Logic Gates – Boolean Algebra – K-Maps – Standard Forms – NAND – NOR Implementation.

UNIT II COMBINATIONAL AND SEQUENTIAL CIRCUITS 9

Combinational circuits – Adder – Subtractor – ALU Design – Decoder – Encoder – Multiplexers – Introduction to Sequential Circuits – Flip-Flops – Registers – Counters.

UNIT III COMPUTER FUNDAMENTALS 9

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 – Interaction between Assembly and High Level Language.

UNIT IV PROCESSOR 9

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 9

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.

PRACTICAL EXERCISES (30 hrs)

1. Verification of Boolean theorems using logic gates.
2. Design and implementation of combinational circuits using gates for arbitrary functions.
3. Implementation of 4-bit binary adder/subtractor circuits.
4. Implementation of code converters.
5. Implementation of BCD adder, encoder and decoder circuits.
6. Implementation of functions using Multiplexers.
7. Implementation of any one of the synchronous counters.
8. Implementation of a Universal Shift register.
9. Simulator based study of Computer architecture.

TOTAL : 75 PERIODS

TEXT BOOK:

1. M. Morris Mano, Michael D. Ciletti, "Digital Design", Fifth Edition, Pearson Education, 2013.
2. David A. Patterson, John L. Hennessy, "Computer Organization and Design, The Hardware/Software Interface", Fifth Edition, Morgan Kaufmann/Elsevier, 2013.

REFERENCES:

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, 2008.

| GE8261 | ENGINEERING PRACTICES LABORATORY | L T P C |
| | | 0 0 4 2 |

OBJECTIVES:

● To provide exposure to the students with hands on experience on various basic engineering practices in Civil, Mechanical, Electrical and Electronics Engineering.

GROUP A (CIVIL & MECHANICAL)

I   CIVIL ENGINEERING PRACTICE   **13**

BUILDINGS:
 (a)   Study of plumbing and carpentry components of residential and industrial buildings. Safety
       aspects.

PLUMBING WORKS:
(a) Study of pipeline joints, its location and functions: valves, taps, couplings, unions, reducers,
    elbows in household fittings.
(b) Study of pipe connections requirements for pumps and turbines.
(c) Preparation of plumbing line sketches for water supply and sewage works.
(d) Hands-on-exercise:

Basic pipe connections – Mixed pipe material connection – Pipe connections with different joining
components.

  (e) Demonstration of plumbing requirements of high-rise buildings.

CARPENTRY USING POWER TOOLS ONLY:
(a) Study of the joints in roofs, doors, windows and furniture.
(b) Hands-on-exercise:
    Wood work, joints by sawing, planing and cutting.

II   MECHANICAL ENGINEERING PRACTICE   **18**

WELDING:
(a) Preparation of butt joints, lap joints and T- joints by Shielded metal arc welding.
(b) Gas welding practice

BASIC MACHINING:
(a) Simple Turning and Taper turning
(b) Drilling Practice

SHEET METAL WORK:
        (a) Forming & Bending:
        (b) Model making – Trays and funnels.
        (c) Different type of joints.

MACHINE ASSEMBLY PRACTICE:
(a) Study of centrifugal pump
(b) Study of air conditioner

DEMONSTRATION ON:
(a) Smithy operations, upsetting, swaging, setting down and bending. Example –
     Exercise – Production of hexagonal headed bolt.

(b) Foundry operations like mould preparation for gear and step cone pulley.

(c) Fitting – Exercises – Preparation of square fitting and V – fitting models.

GROUP B (ELECTRICAL & ELECTRONICS)

III   ELECTRICAL ENGINEERING PRACTICE   13

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

IV   ELECTRONICS ENGINEERING PRACTICE   16

1. Study of Electronic components and equipments – Resistor, colour coding measurement of   AC signal parameter (peak-peak, rms period, frequency) using CR.
2. Study of logic gates AND, OR, EX-OR and NOT.
3. Generation of Clock Signal.
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB.
5. Measurement of ripple factor of HWR and FWR.

TOTAL: 60 PERIODS

OUTCOMES:
On successful completion of this course, the student will be able to

- Fabricate carpentry components and pipe connections including plumbing works.
- Use welding equipments to join the structures.
- Carry out the basic machining operations
- Make the models using sheet metal works
- Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and
- fittings
- Carry out basic home electrical works and appliances
- Measure the electrical quantities
- Elaborate on the components, gates, soldering practices.

LIST OF EQUIPMENT FOR A BATCH OF 30 STUDENTS:
CIVIL

1. Assorted components for plumbing consisting of metallic pipes, plastic pipes, flexible pipes, couplings, unions, elbows, plugs and other fittings.	15 Sets.
2. Carpentry vice (fitted to work bench)	15 Nos.
3. Standard woodworking tools	15 Sets.
4. Models of industrial trusses, door joints, furniture joints	5 each
5. Power Tools: (a) Rotary Hammer	2 Nos
(b) Demolition Hammer	2 Nos
(c) Circular Saw	2 Nos
(d) Planer	2 Nos
(e) Hand Drilling Machine	2 Nos

(f) Jigsaw	2 Nos

MECHANICAL

1. Arc welding transformer with cables and holders	5 Nos.
2. Welding booth with exhaust facility	5 Nos.
3. Welding accessories like welding shield, chipping hammer, wire brush, etc.	5 Sets.
4. Oxygen and acetylene gas cylinders, blow pipe and other welding outfit.	2 Nos.
5. Centre lathe	2 Nos.
6. Hearth furnace, anvil and smithy tools	2 Sets.
7. Moulding table, foundry tools	2 Sets.
8. Power Tool: Angle Grinder	2 Nos
9. Study-purpose items: centrifugal pump, air-conditioner	One each.

ELECTRICAL

1. Assorted electrical components for house wiring	15 Sets
2. Electrical measuring instruments	10 Sets
3. Study purpose items: Iron box, fan and regulator, emergency lamp	1 each
4. Megger (250V/500V)	1 No.
5. Power Tools: (a) Range Finder	2 Nos
(b) Digital Live-wire detector	2 Nos

ELECTRONICS

1. Soldering guns	10 Nos.
2. Assorted electronic components for making circuits	50 Nos.
3. Small PCBs	10 Nos.
4. Multimeters	10 Nos.
5. Study purpose items: Telephone, FM radio, low-voltage power supply	

AD8261 **DATA STRUCTURES DESIGN LABORATORY** **L T P C**
                                                                       0 0 4 2

OBJECTIVES:
- To implement ADTs in Python
- To design and implement linear data structures – lists, stacks, and queues
- To implement sorting, searching and hashing algorithms
- To solve problems using tree and graph structures

1. Implement simple ADTs as Python classes
2. Implement recursive algorithms in Python
3. Implement List ADT using Python arrays
4. Linked list implementations of List
5. Implementation of Stack and Queue ADTs
6. Applications of List, Stack and Queue ADTs

7. Implementation of sorting and searching algorithms
8. Implementation of Hash tables
9. Tree representation and traversal algorithms
10. Implementation of Binary Search Trees
11. Implementation of Heaps
12. Graph representation and Traversal algorithms
13. Implementation of single source shortest path algorithm
14. Implementation of minimum spanning tree algorithms

TOTAL: 60 PERIODS

OUTCOMES:

At the end of the course, the student should be able to:
- implement ADTs as Python classes
- design, implement, and analyse linear data structures, such as lists, queues, and stacks, according to the needs of different applications
- design, implement, and analyse efficient tree structures to meet requirements such as searching, indexing, and sorting
- model problems as graph problems and implement efficient graph algorithms to solve them

TEXT BOOK:

1. Michael T. Goodrich, Roberto Tamassia, and Michael H. Goldwasser, "Data Structures & Algorithms in Python", John Wiley & Sons Inc., 2013

REFERENCES:

1. Rance D. Necaise, "Data Structures and Algorithms Using Python", John Wiley & Sons, 2011
2. Aho, Hopcroft, and Ullman, "Data Structures and Algorithms", Pearson Education, 1983.
3. Thomas H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, "Introduction to Algorithms", Second Edition, McGraw Hill, 2002.
4. Mark Allen Weiss, "Data Structures and Algorithm Analysis in C++", Fourth Edition, Pearson Education, 2014

MA8351	DISCRETE MATHEMATICS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- 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 combinatorics and graph theory.
- To familiarize the applications of algebraic structures.
- To understand the concepts and significance of lattices and boolean algebra which are widely used in computer science and engineering.

UNIT I   LOGIC AND PROOFS   12

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

UNIT II   COMBINATORICS   12

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 III   GRAPHS   12

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

UNIT IV   ALGEBRAIC STRUCTURES   12

Algebraic systems – Semi groups and monoids - Groups – Subgroups – Homomorphism's – Normal subgroup and cosets – Lagrange's theorem – Definitions and examples of Rings and Fields.

UNIT V   LATTICES AND BOOLEAN ALGEBRA   12

Partial ordering – Posets – Lattices as posets – Properties of lattices - Lattices as algebraic systems – Sub lattices – Direct product and homomorphism – Some special lattices – Boolean algebra.

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, students would:
- Have knowledge of the concepts needed to test the logic of a program.
- Have an understanding in identifying structures on many levels.
- 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.
- Be exposed to concepts and properties of algebraic structures such as groups, rings and fields.

TEXTBOOKS:
1. Rosen, K.H., "Discrete Mathematics and its Applications", 7th Edition, Tata McGraw Hill Pub. Co. Ltd., New Delhi, Special Indian Edition, 2011.
2. 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.

REFERENCES:
1. Grimaldi, R.P. "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, 2007.
2. Lipschutz, S. and Mark Lipson., "Discrete Mathematics", Schaum's Outlines, Tata McGraw Hill Pub. Co. Ltd., New Delhi, 3rd Edition, 2010.
3. Koshy, T. "Discrete Mathematics with Applications", Elsevier Publications, 2006.

CW8301   FUNDAMENTALS OF ECONOMICS   L T P C
                                                                  3 0 0 3

OBJECTIVES:
- To exemplify the demand curves of households and supply curves of firms with the principles.

- To differentiate Price ceilings , Price floors and compare income effects ,substitute effects
- To Analyze the Keynesian's process of multiplier theory in macro economics

UNIT I INTRODUCTION TO MICRO ECONOMICS 9
Introduction to Economics – Themes of Economics – Micro Vs Macro Economics- Demand curves and supply curves- Elasticity of Demand - Elasticity of Supply- Demand Curves of Households and firms

UNIT II WELFARE ANALYSIS 9
Consumers and Producers Surplus- Price Ceilings and Price Floors; Consumer Behavior - Axioms of Choice-Budget Constraints and Indifference Curves; Consumers Equilibrium Effects of a Price Change, Income and Substitution Effects Derivation of a Demand Curve

UNIT III PRODUCTION AD COST FUNCTION 9
Theory of Production - Production Function and Isoquants - Cost Minimization; Cost Curves - Total, Average and Marginal Costs - Long Run and Short Run Costs; Equilibrium of a Firm under Perfect Competition; Monopoly and Monopolistic Competition

UNIT IV MACRO ECONOMICS 9
National Income and its Components - GNP, NNP, GDP, NDP Consumption Function; Investment; Simple Keynesian Model of Income Determination and the Keynesian Multiplier; Government Sector -Taxes and Subsidies; External Sector - Exports and Imports; Money -Definitions; Demand for Money Transaction and Speculative Demand; Supply of Money - Banks Credit Creation Multiplier; Integrating Money and Commodity Markets - IS, LM Model

UNIT V BUSINESS CYCLES AND STABILIZATION 9
Monetary and Fiscal Policy - Central Bank and the Government; the Classical Paradigm - Price and Wage Rigidities - Voluntary and Involuntary Unemployment.

TOTAL : 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- To analyze the supporting of price, income and substitution effects in the consumers and producers surplus.
- To compare the equilibrium of a firm under perfect competition, monopoly and monopolistic competition.
- To study the concepts of demand for money and supply of money with appropriate model in macro economic analysis.
- To examine and evaluate the problems of voluntary and involuntary unemployment

TEXT BOOKS :
1. Paul Anthony Samuelson, William D. Nordhaus, Economics, Nineteenth Edition, McGraw-Hill Education, 2010.
2. N. Gregory Mankiw, Principles of Macroeconomics, Seventh Edition, Cengage Learning, 2018.
3. Pindyck, Robert S and Daniel L. Rubinfeld , Micro Economics, Eighth Edition, 2013 .

REFERENCES
1. Dornbusch, Fischer and Startz, Macroeconomics, Tenth Edition, Tata Mcgraw Hill, 2012.
2. Hal R, Varia, Intermediate Microeconomics: A Modern Approach, Eighth Edition Affiliated East-West Press, 2006

CS8392	OBJECT ORIENTED PROGRAMMING	L T P C
		3 0 0 3

OBJECTIVES:

- 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

UNIT I   INTRODUCTION TO OOP AND JAVA FUNDAMENTALS   10
Object Oriented Programming - Abstraction – objects and classes - Encapsulation- Inheritance - Polymorphism- OOP in Java – Characteristics of Java – The Java Environment **-** Java Source File -Structure – Compilation. Fundamental Programming Structures in Java – Defining classes in Java – constructors, methods -access specifiers - static members -Comments, Data Types, Variables, Operators, Control Flow, Arrays , Packages - JavaDoc comments.

UNIT II   INHERITANCE AND INTERFACES   9
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, Array Lists - Strings

UNIT III   EXCEPTION HANDLING AND I/O   9
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   8
Differences between multi-threading and multitasking, thread life cycle, creating threads, synchronizing threads, Inter-thread communication, daemon threads, thread groups. Generic Programming – Generic classes – generic methods – Bounded Types – Restrictions and Limitations.

UNIT V   EVENT DRIVEN PROGRAMMING   9
Graphics programming - Frame – Components - working with 2D shapes - Using color, fonts, and images - Basics of event handling - event handlers - adapter classes - actions - mouse events - AWT event hierarchy - Introduction to Swing – layout management - Swing Components – Text Fields , Text Areas – Buttons- Check Boxes – Radio Buttons – Lists- choices- Scrollbars – Windows –Menus – Dialog Boxes.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, students will be able to:
- Develop Java programs using OOP principles
- Develop Java programs with the concepts inheritance and interfaces
- Build Java applications using exceptions and I/O streams
- Develop Java applications with threads and generics classes
- Develop interactive Java programs using swings

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.

REFERENCES:
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.

AD8351	DESIGN AND ANALYSIS OF ALGORITHMS	L T P C
		3 0 2 4

UNIT I   INTRODUCTION AND ANALYSIS   9

Introduction: Fundamentals of algorithmic Problem solving – Important problem types; Recursive algorithms, -- Fundamentals of the Analysis of Algorithm Efficiency: Analysis framework -- Asymptotic notations and basic complexity classes – recurrences – case studies

UNIT II   DIVIDE-AND-CONQUER AND GREEDY STRATEGIES   9

Divide and Conquer strategy -- Mergesort -- Quicksort -- Multiplication of large integers and Strassen's matrix multiplication – closest pairs Greedy strategy – Huffman coding – shortest paths algorithms – minimum-cost spanning tree algorithms –disjoint sets

UNIT III   DYNAMIC PROGRAMMING AND STATE-SPACE APPROACH   9

Dynamic Programming: Computing binomial coefficient – Knapsack problem and memory functions – ordering of matrix multiplications -- Warshall's and Floyd's algorithm State-space approach – exhaustive search: DFS, BFS, Iterative deepening

UNIT IV   BACKTRACKING , ITERATIVE IMPROVEMENT, AND BRANCH & BOUND   10

Backtracking and permutations – N-queens problem – Hamilton circuits – best-first search -- Iterative Improvement: Stable marriage -- Maximum matching in bipartite graphs – maximum flow --- Branch and Bound: Knapsack problem -- Traveling salesman problem

UNIT V INTRACTABILITY 8

Introduction to intractability -- Polynomial reductions – SAT and 3-SAT – NP-complete and NP-Hard problems -- Approximation algorithms: Traveling salesman problem -- Knapsack problem – Introduction to randomized and parallel algorithms

THEORY PERIODS: 45

SUGGESTIVE EXERCISES

1. Implementation of iterative and recursive algorithms for the given problem
2. Empirical analysis of algorithms
3. Implementation of divide-and-conquer sorting algorithms
4. Implementation of closest-pairs algorithm
5. Implementation of Huffman coding
6. Implementation of Dijkstra's and Prim's algorithms
7. Implementation of disjoint sets and Kruskal's algorithm
8. Implementation of dynamic programming algorithm for knapsack problem
9. Implementation of backtracking to solve n-Queens and Hamilton circuits problems
10. Implementation of iterative improvement strategy for stable marriage and maxflow problems
11. Implementation of Branch and Bound technique to solve knapsack and TSP problems
12. Implementation of approximation algorithms for knapsack and TSP problems

PRACTICAL PERIODS: 30

TOTAL PERIODS: 75

TEXT BOOKS:

1. Anany Levitin, ``Introduction to the Design and Analysis of Algorithms'', 3rd Edition, Pearson Education, 2012.
2. Jon Kleinberg and Eva Tardos, ``Algorithm Design'', Pearson Education, 2006.

REFERENCES

1. Thomas H Cormen, Charles E Leiserson, Ronald L Rivest, Clifford Stein, ``Introduction to Algorithms'', 3rd Edition, PHI Learning Private Limited, 2012.
2. Steven S Skiena, ``The Algorithm Design Manual'', 2nd Edition, Springer, 2008.
3. S Dasgupta, C H Papadimitriou, U V Vazirani,``Algorithms'',1st Edition, McGraw Hill Education, 2017.
4. S. Sridhar, "Design and Analysis of Algorithms", Oxford University Press, 2015.
5. Sara Baase and Allen Van Gelder, Computer Algorithms, Third Edition, Pearson Education, 2000.
6. Dexter C. Kozen, The Design and Analysis of Algorithms, Springer-Verlag, 1992.

CS8492	DATABASE MANAGEMENT SYSTEMS	L	T	P	C
		3	0	0	3

OBJECTIVES

- To learn the fundamentals of data models and to represent a database system using ER diagrams.
- To study SQL and relational database design.

- To understand the internal storage structures using different file and indexing techniques which will help in physical DB design.
- To understand the fundamental concepts of transaction processing- concurrency control techniques and recovery procedures.
- To have an introductory knowledge about the Storage and Query processing Techniques

UNIT I   RELATIONAL DATABASES   10
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   8
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   9
Transaction Concepts – ACID Properties – Schedules – Serializability – Concurrency Control – Need for Concurrency – Locking Protocols – Two Phase Locking – Deadlock – Transaction Recovery - Save Points – Isolation Levels – SQL Facilities for Concurrency and Recovery.

UNIT IV   IMPLEMENTATION TECHNIQUES   9
RAID – File Organization – Organization of Records in Files – Indexing and Hashing –Ordered Indices – B+ tree Index Files – B tree Index Files – Static Hashing – Dynamic Hashing – Query Processing Overview – Algorithms for SELECT and JOIN operations – Query optimization using Heuristics and Cost Estimation.

UNIT V   ADVANCED TOPICS   9
Distributed Databases: Architecture, Data Storage, Transaction Processing – Object-based Databases: Object Database Concepts, Object-Relational features, ODMG Object Model, ODL, OQL - XML Databases: XML Hierarchical Model, DTD, XML Schema, XQuery – Information Retrieval: IR Concepts, Retrieval Models, Queries in IR systems.

TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Classify the modern and futuristic database applications based on size and complexity
- Map ER model to Relational model to perform database design effectively
- Write queries using normalization criteria and optimize queries
- Compare and contrast various indexing strategies in different database systems
- Appraise how advanced databases differ from traditional databases.

TEXT BOOKS:
1. Abraham Silberschatz, Henry F. Korth, S. Sudharshan, "Database System Concepts", Sixth Edition, Tata McGraw Hill, 2011.
2. Ramez Elmasri, Shamkant B. Navathe, "Fundamentals of Database Systems", Sixth Edition, Pearson Education, 2011.

REFERENCES:
1. C.J.Date, A.Kannan, S.Swamynathan, "An Introduction to Database Systems", Eighth Edition, Pearson Education, 2006.
2. Raghu Ramakrishnan, "Database Management Systems", Fourth Edition, McGraw-Hill College Publications, 2015.
3. G.K.Gupta,"Database Management Systems", Tata McGraw Hill, 2011.

CW8311   **BUSINESS COMMUNICATION AND VALUE SCIENCE**   **L T P C**
LABORATORY - I   **0 0 4 2**

OBJECTIVES

- Augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals.

- Focus on the development of basic fluency in English, usage of words and also introduce them to the concept and importance of interpersonal skills so as to effectively present their personalities.

LIST OF EXPERIMENTS :
1. Different forms of words
2. Technical terminology
3. Interpersonal Skills: Dialogue & Conversation
4. Job Application
5. Letters & Reports
6. SWOT analysis
7. Socio cultural & Cross-cultural understanding
8. Women in all spheres
9. Team vs Group
10. Conflict management
11. Acquiring Leadership traits
12. Human values and Corporate culture

TOTAL : 60 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:

- Speak fluently in English without errors in tenses and hence present themselves as effective English communicators. They will be able to learn the 12 tenses and use them appropriately.

- Differentiate between active and passive vocabulary and be able to use the 60 words discussed in class for their daily conversation and 40 words also given as assignments

- The ability to process their ideas and thoughts (verbal communication) into written communication in an effective, coherent and logical manner within a stipulated time and specific word limit of 100-150 words for paragraph writing

- Present them in a certain manner by using the 50-55 phrases discussed in class appropriately for group discussions, personal interviews during the campus recruitment process/competitive exams.

- Enhance their communication skills by acquainting with the 2 important aspects of communication and helping them to overcome the 10 most common barriers of communication.

REFERENCES:

1. Business Communication, Dr. Saroj Hire math
2. English vocabulary in use , Alan McCarthy and O'Dell
3. Strategic Writing by Charles Marsh
4. he Seven Basic Plots by Christopher Booker

CS8383   **OBJECT ORIENTED PROGRAMMING LABORATORY**   **L T P C**
          0 0 4 2

OBJECTIVES
- To build software development skills using java programming for real-world applications.
- To understand and apply the concepts of classes, packages, interfaces, arraylist, exception handling and file processing.
- To develop applications using generic programming and event handling.

LIST OF EXPERIMENTS

1. Develop a Java application to generate Electricity bill. Create a class with the following members: Consumer no., consumer name, previous month reading, current month reading, type of EB connection (i.e domestic or commercial). Compute the bill amount using the following tariff.
   If the type of the EB connection is domestic, calculate the amount to be paid as follows:
   - First 100 units   - Rs. 1 per unit
   - 101-200 units   - Rs. 2.50 per unit
   - 201 -500 units - Rs. 4 per unit
   - > 501 units   - Rs. 6 per unit

If the type of the EB connection is commercial, calculate the amount to be paid as follows:
   - First 100 units   - Rs. 2 per unit
   - 101-200 units   - Rs. 4.50 per unit
   - 201 -500 units - Rs. 6 per unit
   - > 501 units   - Rs. 7 per unit

2. Develop a java application to implement currency converter (Dollar to INR, EURO to INR, Yen to INR and vice versa), distance converter (meter to KM, miles to KM and vice versa) , time converter (hours to minutes, seconds and vice versa) using packages.

3. Develop a java application with Employee class with Emp_name, Emp_id, Address, Mail_id, Mobile_no as members. Inherit the classes, Programmer, Assistant Professor, Associate Professor and Professor from employee class. Add Basic Pay (BP) as the member of all the inherited classes with 97% of BP as DA, 10 % of BP as HRA, 12% of BP as PF, 0.1% of BP for staff club fund. Generate pay slips for the employees with their gross and net salary.

4. Design a Java interface for ADT Stack. Implement this interface using array. Provide

necessary exception handling in both the implementations.

5. Write a program to perform string operations using ArrayList. 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 Shape that contains two integers and an empty method named print Area(). Provide three classes named Rectangle, Triangle and Circle such that each one of the classes extends the class Shape. Each one of the classes contains only the method print Area () that prints the area of the given shape.

7. Write a Java program to implement user defined exception handling.

8. Write a Java program that reads a file name 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 implements a multi-threaded application that has three threads. First thread generates a random integer every 1 second and if the value is even, second thread computes the square of the number and prints. If the value is odd, the third thread will print the value of cube of the number.

10. Write a java program to find the maximum value from the given type of elements using a 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 mini project for any application using Java concepts.

TOTAL : 60 PERIODS

OUTCOMES
Upon completion of the course, the students will be able to
- Develop and implement Java programs for simple applications that make use of classes, packages and interfaces.
- Develop and implement Java programs with arraylist, exception handling and multithreading .
- Design applications using file processing, generic programming and event handling.

CS8481   **DATABASE MANAGEMENT SYSTEMS LABORATORY**   **L T P C**
                                                                                      0 0 4 2

AIM:
The aim of this laboratory is to inculcate the abilities of applying the principles of the database management systems. This course aims to prepare the students for projects where a proper implementation of databases will be required.

OBJECTIVES:
- To understand data definitions and data manipulation commands
- To learn the use of nested and join queries
- To understand functions, procedures and procedural extensions of data bases
- To be familiar with the use of a front end tool
- To understand design and implementation of typical database applications

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. Database Connectivity with Front End Tools
10. Case Study using real life database applications

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- Use typical data definitions and manipulation commands.
- Design applications to test Nested and Join Queries
- Implement simple applications that use Views
- Implement applications that require a Front-end Tool
- Critically analyze the use of Tables, Views, Functions and Procedures

MA8391	PROBABILITY AND STATISTICS	L	T	P	C
		4	0	0	4

OBJECTIVES:
- This course aims at providing the required skill to apply the statistical tools in engineering problems.
- To introduce the basic concepts of probability and random variables.
- To introduce the basic concepts of two dimensional random variables.
- To acquaint the knowledge of testing of hypothesis for small and large samples which plays an important role in real life problems.
- To introduce the basic concepts of classifications of design of experiments which plays very important roles in the field of agriculture and statistical quality control.

UNIT I   PROBABILITY AND RANDOM VARIABLES   12
Probability – The axioms of probability – Conditional probability – Baye's theorem - Discrete and continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential and Normal distributions.

UNIT II   TWO - DIMENSIONAL   RANDOM   VARIABLES   12

Joint distributions – Marginal and conditional distributions – Covariance – Correlation and linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III   TESTING   OF HYPOTHESIS   12

Sampling distributions - Estimation of parameters - Statistical hypothesis - Large sample tests based on Normal distribution for single mean and difference of means -Tests based on t, Chi-square and F distributions for mean, variance and proportion - Contingency table (test for independent) - Goodness of fit.

UNIT IV   DESIGN   OF EXPERIMENTS   12

One way and Two way classifications - Completely randomized design – Randomized block design – Latin square design - 2^2 factorial design.

UNIT V   STATISTICAL   QUALITY   CONTROL   `   12

Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

                                                                                   TOTAL : 60 PERIODS

OUTCOMES:
Upon successful completion of the course, students will be able to:
- Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.
- Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.
- Apply the concept of testing of hypothesis for small and large samples in real life problems.
- Apply the basic concepts of classifications of design of experiments in the field of agriculture and statistical quality control.
- Have the notion of sampling distributions and statistical techniques used in engineering and management problems.

TEXT BOOKS:
1. Johnson, R.A., Miller, I and Freund J., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 8th Edition, 2015.
2. Milton. J. S. and Arnold. J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th Edition, 2007.

REFERENCES:
1. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
2. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
4. Spiegel. M.R., Schiller. J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of   Probability and Statistics", Tata McGraw Hill Edition, 2004.
5. Walpole. R.E., Myers. R.H., Myers. S.L. and Ye. K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia, 8th Edition, 2007.

CS8493   **OPERATING SYSTEMS**   **L T P C**

                                                                                  3 0 0 3

OBJECTIVES:

- To understand the basic concepts and functions of operating systems.
- To understand Processes and Threads
- To analyze Scheduling algorithms.
- To understand the concept of Deadlocks.
- To analyze various memory management schemes.
- To understand I/O management and File systems.
- To be familiar with the basics of Linux system and Mobile OS like iOS and Android.

UNIT I   OPERATING SYSTEM OVERVIEW   7

Computer System Overview-Basic Elements, Instruction Execution, Interrupts, Memory Hierarchy, Cache Memory, Direct Memory Access, Multiprocessor and Multicore Organization. Operating system overview-objectives and functions, Evolution of Operating System.- Computer System Organization Operating System Structure and Operations- System Calls, System Programs, OS Generation and System Boot.

UNIT II   PROCESS MANAGEMENT   11

Processes - Process Concept, Process Scheduling, Operations on Processes, Inter-process Communication; CPU Scheduling - Scheduling criteria, Scheduling algorithms, Multiple-processor scheduling, Real time scheduling; Threads- Overview, Multithreading models, Threading issues; Process Synchronization - The critical-section problem, Synchronization hardware, Mutex locks, Semaphores, Classic problems of synchronization, Critical regions, Monitors; Deadlock - System model, Deadlock characterization, Methods for handling deadlocks, Deadlock prevention, Deadlock avoidance, Deadlock detection, Recovery from deadlock.

UNIT III   STORAGE MANAGEMENT   9

Main Memory – Background, Swapping, Contiguous Memory Allocation, Paging, Segmentation, Segmentation with paging, 32 and 64 bit architecture Examples; Virtual Memory – Background, Demand Paging, Page Replacement, Allocation, Thrashing; Allocating Kernel Memory, OS Examples.

UNIT IV   FILE SYSTEMS AND I/O SYSTEMS   9

Mass Storage system – Overview of Mass Storage Structure, Disk Structure, Disk Scheduling and Management, swap space management; File-System Interface - File concept, Access methods, Directory Structure, Directory organization, File system mounting, File Sharing and Protection; File System Implementation- File System Structure, Directory implementation, Allocation Methods, Free Space Management, Efficiency and Performance, Recovery; I/O Systems – I/O Hardware, Application I/O interface, Kernel I/O subsystem, Streams, Performance.

UNIT V   CASE STUDY   9

Linux System - Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, Input-Output Management, File System, Inter-process Communication; Mobile OS - iOS and Android - Architecture and SDK Framework, Media Layer, Services Layer, Core OS Layer, File System.

                                                                TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the students should be able to:
- Analyze various scheduling algorithms.
- Understand deadlock, prevention and avoidance algorithms.
- Compare and contrast various memory management schemes.
- Understand the functionality of file systems.
- Perform administrative tasks on Linux Servers.
- Compare iOS and Android Operating Systems.

TEXT BOOK :
1. Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc., 2012.

REFERENCES :
1. Ramaz Elmasri, A. Gil Carrick, David Levine, "Operating Systems – A Spiral Approach", Tata McGraw Hill Edition, 2010.
2. Achyut S.Godbole, Atul Kahate, "Operating Systems", McGraw Hill Education, 2016.
3. Andrew S. Tanenbaum, "Modern Operating Systems", Second Edition, Pearson Education, 2004.
4. Gary Nutt, "Operating Systems", Third Edition, Pearson Education, 2004.
5. Harvey M. Deitel, "Operating Systems", Third Edition, Pearson Education, 2004.
6. Daniel P Bovet and Marco Cesati, "Understanding the Linux kernel", 3rd edition, O'Reilly,2005.
7. Neil Smyth, "iPhone iOS 4 Development Essentials – Xcode", Fourth Edition, Payload media, 2011.

CW8401   **INTRODUCTION TO BUSINESS SYSTEMS**   **L T P C**
                                                                  3 0 0 3
OBJECTIVES:
- To develop and strengthen business quality and motivation in students
- To impart basic business skills
- To understanding to run a business efficiently and effectively.

UNIT I   OVERVIEW OF BUSINESS SYSTEM   9

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, Organising, Staffing, Directing and Controlling.

UNIT II   OUTLINE OF BUSINESS ORGANISATION   9
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   9

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

UNIT IV   MEASURING BUSINESS PERFORMANCE AND CONTROL PROCESS   9

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   9

Introduction to business Software- Enterprise application and Business application. Overview on types of Business software. ERP. Business Intelligence, e-business and e-governance.

TOTAL : 45 PERIODS

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", Pearson Education,8th Edition, 2012.

REFERENCES:

1. James A. O'Brien, "Management Information Systems: Managing Information Technology in the Business Enterprise", Tata McGraw Hill, 2004.
2. Corey Schou and Dan Shoemaker, "Information Assurance for the Enterprise: A Roadmap to Information Security", Tata McGraw Hill, 2007.
3. Bateman Snell, "Management: Competing in the new era", McGraw-Hill Irwin, 5th Edition,2002.

CW8402   **COMPUTATIONAL STATISTICS**   **L T P C**
                                                                                 3 0 0 3

OBJECTIVES:

- To expose the variables, expressions, control stations of R
- To use R Programming for Analysis of data and visualize outcome inform of graphs, charts
- To develop and understand the modern computational statistical approaches and their applications to different datasets.
- To apply principles of data science to analyze various business problems.
- To analysis data using various statistical tools like correlation and regression

UNIT I   INTRODUCTION TO R   9

Introduction, History and overview of R, elements and data structures, Sessions and Functions, Variables, Data Types, Vectors, Scalars, Conclusion, Data Frames, Lists, Matrices, Arrays, Classes, Data input/output, Data storage formats, Subsetting objects, Vectorization

UNIT II   PROGRAMMING IN R   9
R Programming, Arithmetic and Boolean Operators and values, Structures, Control Statements, Loops, Pointers in R, Recursion, Scoping Rules, Loop functions, Array and Matrices

UNIT III   DATA MANIPULATION   9
Math and Simulation in R, Functions, Math Function, Probability Calculation - Cumulative Sums and Products- Minima and Maxima- Data sorting, Linear Algebra Operation on Vectors and Matrices, Set Operation

UNIT IV   DATA VISUALISATION AND PROBABILITY DISTRIBUTION   9
Graphics, Creating Graphs, Customizing Graphs, lattice library- Visualization, Box plot, Histogram, Pareto charts, Pie graph, Line chart, Scatterplot, Developing graphs, Probability Distributions: Normal, Binomial, Poisson and Other Distributions

UNIT V   STATISTICAL DATA ANALYSIS   9
Basic Statistics, Outlier, regression Analysis: Linear, Multiple, Logistic, Poisson, Survival Analysis, Nonlinear Models: Splines, Decision Tree, Random Forests, Support Vector Machine, Clustering, Correlation, Covariance, Statistical simulation, T-Tests

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students will be able to:
- State the capabilities of R and its data, variable
- Describe various operators, control statements and scoping rules in R
- Apply R programming for manipulation of datasets
- Produce various graphs and distribution plots using R
- Analyse dataset using Statistical Tools available in R

TEXT BOOKS :

1. Norman Matloff, The Art of R Programming, Cengage Learning, ISBN: 9781593273842, No Starch Press, US-Publisher,2017
2. Larry Pace, Joshua Wiley, Beginning R -An Introduction to Statistical Programming, 2nd Edition, Apress, ISBN: 9781484203743, 2015

REFERENCES :

1. Mark Gardener, Beginning R -The Statistical Programming Language, John Wiley & Sons, Inc., ISBN: 9781118164303, 2012.
2. Chris Brunsdon, Lex Comber, An Introduction to R for Spatial Analysis and Mapping, 2nd Revised Edition, Sage Publications Ltd (UK), ISBN: 9781446272954, 2019
3. Jared P. Lander, R for Everyone Advanced Analytics and Graphics, 2nd Edition, Addison-Wesley Professional PTG, ISBN: 9780134546926, 2017
4. Hamid Reza Pourghasemi, Spatial Modeling in GIS and R for Earth and Environmental Sciences, Elsevier (S&T), ISBN: 9780128152263, 2019
5. Michael J. Crawley, The R Book, 2nd Edition, Wiley-Blackwell, ISBN: 9780470973929, 2012

CS8494   **SOFTWARE ENGINEERING**   L   T   P   C
                                                               3   0   0   3

OBJECTIVES:
- To understand the phases in a software project
- To understand fundamental concepts of requirements engineering and Analysis Modeling.
- To understand the various software design methodologies
- To learn various testing and maintenance measures

UNIT I   SOFTWARE PROCESS AND AGILE DEVELOPMENT   9
Introduction to Software Engineering, Software Process, Perspective and Specialized Process Models –Introduction to Agility-Agile process-Extreme programming-XP Process.

UNIT II   REQUIREMENTS ANALYSIS AND SPECIFICATION   9
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-Classical analysis: Structured system Analysis, Petri Nets- Data Dictionary.

UNIT III   SOFTWARE DESIGN   9
Design process – Design Concepts-Design Model– Design Heuristic – Architectural Design - Architectural styles, Architectural Design, Architectural Mapping using Data Flow- User Interface Design: Interface analysis, Interface Design –Component level Design: Designing Class based components, traditional Components.

UNIT IV   TESTING AND MAINTENANCE   9
Software testing fundamentals-Internal and external views of Testing-white box testing - basis path testing-control structure testing-black box testing- Regression Testing – Unit Testing – Integration Testing – Validation Testing – System Testing And Debugging –Software Implementation Techniques: Coding practices-Refactoring-Maintenance and Reengineering-BPR model-Reengineering process model-Reverse and Forward Engineering.

                                                                           9
UNIT V   PROJECT MANAGEMENT
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, RFP Risk Management – Identification, Projection - Risk Management-Risk Identification-RMMM Plan-CASE TOOLS

                                                              TOTAL :45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Identify the key activities in managing a software project.
- Compare different process models.
- Concepts of requirements engineering and Analysis Modeling.
- Apply systematic procedure for software design and deployment.
- Compare and contrast the various testing and maintenance.
- Manage project schedule, estimate project cost and effort required.

TEXT BOOKS:
1. Roger S. Pressman, "Software Engineering – A Practitioner"s Approach", Seventh Edition, Mc

Graw-Hill International Edition, 2010.
2. Ian Sommerville, "Software Engineering", 9th Edition, Pearson Education Asia, 2011.

REFERENCES:

1. Rajib Mall, "Fundamentals of Software Engineering", Third Edition, PHI Learning Private Limited, 2009.
2. Pankaj Jalote, "Software Engineering, A Precise Approach", Wiley India, 2010.
3. Kelkar S.A., "Software Engineering", Prentice Hall of India Pvt Ltd, 2007.
4. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited,2007.
5. http://nptel.ac.in/.

			L T P C
CS8461	**OPERATING SYSTEMS LABORATORY**		**0 0 4 2**

OBJECTIVES
- To learn Unix commands and shell programming
- To implement various CPU Scheduling Algorithms
- To implement Process Creation and Inter Process Communication.
- To implement Deadlock Avoidance and Deadlock Detection Algorithms
- To implement Page Replacement Algorithms
- To implement File Organization and File Allocation Strategies

LIST OF EXPERIMENTS
1. Basics of UNIX commands
2. Write programs using the following system calls of UNIX operating system
   fork, exec, getpid, exit, wait, close, stat, opendir, readdir
3. Write C programs to simulate UNIX commands like cp, ls, grep, etc.
4. Shell Programming
5. Write C programs to implement the various CPU Scheduling Algorithms
6. Implementation of Semaphores
7. Implementation of Shared memory and IPC
8. Bankers Algorithm for Deadlock Avoidance
9. Implementation of Deadlock Detection Algorithm
10. Write C program to implement Threading & Synchronization Applications
11. Implementation of the following Memory Allocation Methods for fixed partition
    a) First Fit   b) Worst Fit   c) Best Fit
12. Implementation of Paging Technique of Memory Management
13. Implementation of the following Page Replacement Algorithms
    a) FIFO   b) LRU   c) LFU
14. Implementation of the various File Organization Techniques
15. Implementation of the following File Allocation Strategies
    a) Sequential   b) Indexed   c) Linked

TOTAL: 60 PERIODS

OUTCOMES:
At the end of the course, the student should be able to
- Compare the performance of various CPU Scheduling Algorithms
- Implement Deadlock avoidance and Detection Algorithms
- Implement Semaphores
- Create processes and implement IPC
- Analyze the performance of the various Page Replacement Algorithms
- Implement File Organization and File Allocation Strategies

CW8411   **COMPUTATIONAL STATISTICS LABORATORY**   **L T P C**
                                                                     0 0 4 2

OBJECTIVES:
- To expose the variables, expressions, control stations of R
- To use R Programming for Analysis of data and visualize outcome inform of graphs, charts
- To develop and understand the modern computational statistical approaches and their applications to different datasets.
- To apply principles of data science to analyze various business problems.
- To use R software to carry out statistical computations
- To analysis data using R

LIST OF EXPERIMENTS :

1. Install R and R Studio
2. Creation and manipulation of Vectors, Matrices, Arrays, Lists, Factors and Data Frames
3. Install of Packages and scripts for Importing and Exporting Data
4. Implement Control structures and Functions
5. Visualize Statistical Graphs using Scatter Plots, Box Plots, Whisker Plot, Histograms
6. Perform Data exploration and visualization techniques over a dataset.
7. Perform Data Query using SQL and R.
8. Create a data set and do statistical analysis on the data

PLATFORM NEEDED
   Systems with R, R Studio (Additional libraries required)

                                                                    TOTAL : 60 PERIODS
OUTCOMES:
Upon Completion of the course, the students should be able to:
- Use R software to carry out statistical computations
- State the capabilities of R and its data, variable
- Describe various operators, control statements and scoping rules in R
- Apply R programming for manipulation of datasets
- Produce various graphs and distribution plots using R
- Analyze dataset using Statistical Tools available in R

CW8412   **BUSINESS COMMUNICATION AND VALUE SCIENCE LABORATORY II**

L T P C
0 0 4 2

OBJECTIVES:

- The course aims to augment students overall communication and interpersonal skills by engaging them in group activities and thus aid in helping them to emerge as professionals.

LIST OF EXPERIMENTS :

1. Writing letters and creating mails
2. Construction of paragraphs and essays
3. Speaking skills and methods of speech
4. Leadership, Communication and Interpersonal skills
5. Being a motivator and role model
6. Corporate Etiquettes
7. Professionalism in the work place
8. Engineering ethics, rights and responsibilities
9. Managing cultural diversities and global diversities
10. Right use of social media
11. Maintaining the image and pride of the organization
12. Winning formula for a successful manager/leader

TOTAL : 60 PERIODS

TEXT BOOKS:
1. Business Communication Today by Bovee, Thill, Raina
2. APAART: Speak Well 1 (English Language and Communication)
3. APAART: Speak Well 2 (Soft Skills)

REFERENCES:
1. Strategic Communication by Charles Marsh
2. English vocabulary in use – Alan Mc'carthy and O'dell
3. Business Communication – Dr. Saroj Hiremath

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Speak fluently in English without errors in the sentence construction and hence present themselves as effective English communicators.
- Differentiate between vocabularies used as adjectives, verbs.
- Deliver a public speech according to the need of the audience and also be aware of positive body language to be manifested during a speech.
- Deal with the deeper parameters of working in teams like team motivation, multicultural team activity and team conflict resolution.
- Set realistic goals in terms of personal and professional growth.

CW8591   **SOFTWARE ARCHITECTURE**   **L T P C**
                                                                          3   0 0 3

OBJECTIVES:

* Understand the fundamentals of software architecture.
* Study the various software development methodologies.
* Learn the importance of architectural documentation and evaluation.
* Learn the various software architecture design components.
* Relate software architecture and software quality.

UNIT I   INTRODUCTION   9
Basic concepts of software architecture – Context of Software Architecture – ABC cycle – What software architecture is and what it isn't – Architectural patterns – Good Architecture- Reference models – Architectural structures and views-Introduction to styles – Decentralized Architectures.

UNIT II   DESIGN METHODOLOGIES   9
Structured design- Design practices-Stepwise refinement – Incremental design- Structured system analysis and design –Jackson structured programming – Jackson system Development.

UNIT III   ARCHITECTURAL DESCRIPTION DOCUMENTATION AND EVALUATION   9
Early architecture description languages-Domain and style specific ADL's- Extensible ADL's – Documenting software architecture – Uses and Audiences for Architecture Documentation – Views – Choosing Views – Combining Views –Architecture evaluation – Evaluation Factors –Architecture Tradeoff Analysis Method – Lightweight Architecture Evaluation – ATAM.

UNIT IV   ARCHITECTURE DESIGN   9
Typical architectural design-Dataflow-Independent components-Call and return – Using styles in design – Architectural design space-Design space of architectural elements – Design space of architectural styles.

UNIT V   IMPLEMENTATION AND CONFORMANCE TO ARCHITECTURE   9
Understanding quality attributes- Implementation of Quality attributes in Architecture – Architecture and requirements conformance –Functionality– Quality attribute considerations – System quality attributes-Introduction to tactics – Achieving Quality Attributes through Tactics –Tactics types – Architectural patterns and styles – Architecture and Quality Attributes – Quality attribute scenarios in practice.

                                                            TOTAL : 45 PERIODS
OUTCOMES:
Upon Completion of the course, the students should be able to:

* Develop Software applications starting from software architecture and design.
* Learn and evaluate existing software architectures.
* Realize importance of architectural documentation and document them.
* Employ various software architecture design components.
* Design methods for improving software quality from the perspective of software architecture.

TEXT BOOKS:

1. Len Bass, Paul Clements, Rick Kazman, "Software Architecture in Practice", Third Edition, Addison,Wesley, 2012.
2. David Budgen, "Software Design", Second Edition, Pearson Education, 2004.

REFERENCES:

1. Richard N.Taylor, NenadMedvidovic and Eric M.Dashofy, "Software Architecture, Foundations,Theory and Practice", Wiley 2010.
2. Hong Zhu, "Software Design Methodology from Principles to Architectural Styles", Elsevier, 2005.
3. Mary Shaw and David Garlan, "Software Architecture –Perspectives on an emerging Discipline",Pearson Education, 2008.

CW8501   SOFTWARE DESIGN USING UML   L T P C
3 0 2 4

OBJECTIVES:
- To understand the fundamentals of object modeling
- To understand and differentiate Unified Process from other approaches.
- To design with static UML diagrams.
- To design with the UML dynamic and implementation diagrams.
- To improve the software design with design patterns.
- To test the software against its requirements specification

UNIT I   UNIFIED PROCESS AND USE CASE DIAGRAMS   9
Introduction to OOAD with OO Basics - Unified Process – UML diagrams – Use Case –Case study – the Next Gen POS system, Inception -Use case Modelling – Relating Use cases – include, extend and generalization – When to use Use-cases.

UNIT II   STATIC UML DIAGRAMS   9
Class Diagram–– Elaboration – Domain Model – Finding conceptual classes and description classes – Associations – Attributes – Domain model refinement – Finding conceptual class Hierarchies – Aggregation and Composition - Relationship between sequence diagrams and use cases – When to use Class Diagrams.

UNIT III   DYNAMIC AND ARCHITECTURAL MODELING UML DIAGRAMS   9
Dynamic Diagrams – UML interaction diagrams - System sequence diagram – Collaboration diagram – When to use Communication Diagrams - State machine diagram and Modelling –When to use State Diagrams - Activity diagram – When to use activity diagrams Implementation Diagrams - UML package diagram - When to use package diagrams - Component and Deployment Diagrams – When to use Component and Deployment diagrams.

UNIT IV   DESIGN PATTERNS AND ELEMENTS   9
DESIGN PATTERNS : GRASP-Designing objects with responsibilities –Applying GoF design patterns – Creational Patterns , Structural Patterns , Behavioral Patterns, Design Elements:

Architectural design elements - Interface design elements - Component level diagram elements - Deployment level design elements, Mapping design to code.

UNIT V   AGILE METHODOLOGY   9
Theories for Agile Management – Agile Software Development – Traditional Model vs. Agile Model - Classification of Agile Methods – Agile Manifesto and Principles – Agile Project Management – Agile Team Interactions – Ethics in Agile Teams - Agility in Design, Testing – Agile Documentations – Agile Drivers, Capabilities and Values

LIST OF EXPERIMENTS :
Draw standard UML diagrams using an UML modeling tool for a given case study and map design to code and implement a 3 layered architecture. Test the developed code and validate whether the SRS is satisfied.

1. Identify a software system that needs to be developed.
2. Document the Software Requirements Specification (SRS) for the identified system.
3. Identify use cases and develop the Use Case model.
4. Identify the conceptual classes and develop a Domain Model and also derive a Class Diagram from that.
5. Using the identified scenarios, find the interaction between objects and represent them using UML Sequence and Collaboration Diagrams
6. Draw relevant State Chart and Activity Diagrams for the same system.
7. Implement the system as per the detailed design
8. Test the software system for all the scenarios identified as per the usecase diagram
9. Improve the reusability and maintainability of the software system by applying appropriate design patterns.
10. Implement the modified system and test it for various scenarios

PRACTICALS	**:**	**30 Periods**
THEORY	**:**	**45 Periods**
TOTAL PERIODS	:	**75 Periods**

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Express software design with UML diagrams
- Design software applications using OO concepts.
- Identify various scenarios based on software requirements
- Transform UML based software design into pattern based design using design patterns
- Understand the various testing methodologies for OO software

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

REFERENCES:
1. Erich Gamma, a n d Richard Helm, Ralph Johnson, John Vlissides, "Design patterns: Elements of Reusable Object-Oriented Software", Addison-Wesley, 1995.

2. Martin Fowler, "UML Distilled: A Brief Guide to the Standard Object Modeling Language", Third edition, Addison Wesley, 2003.

CW8502   **OPERATIONS RESEARCH**   **L T P C**
                                                                                     3 0 2 4

OBJECTIVES:
- Solve linear programming problem and solve using graphical method.
- Solve LPP using simplex method
- Solve transportation, assignment problems
- To provide knowledge and training in using optimization techniques under limited resources for the engineering and business problems

UNIT I   LINEAR MODELS   9
The phase of an operation research study – Linear programming – Graphical method– Simplex algorithm – Duality formulation – Sensitivity analysis.

UNIT II   TRANSPORTATION MODELS AND NETWORK MODELS   9
Transportation Assignment Models –Traveling Salesman problem-Networks models – Shortest route – Minimal spanning tree – Maximum flow models –Project network – CPM and PERT networks – Critical path scheduling – Sequencing models.

UNIT III   INVENTORY MODELS   9
Inventory models – Economic order quantity models – Quantity discount models – Stochastic inventory models – Multi product models – Inventory control models in practice.

UNIT IV   QUEUEING MODELS   9
Queueing models - Queueing systems and structures – Notation parameter – Single server and multi server models – Poisson input – Exponential service – Constant rate service – Infinite population – Simulation.

UNIT V   DECISION MODELS   9
Decision models – Game theory – Two person zero sum games – Graphical solution- Algebraic solution– Linear Programming solution – Replacement models – Models based on service life – Economic life– Single / Multi variable search technique – Dynamic Programming – Simple Problem.

LIST OF EXPERIMENTS :

1. Modeling with Graphical solution of Linear Programming problems
2. Solving simplex maximization problems.
3. Solving simplex minimization problems .
4. Sensitivity Analysis and Duality
5. Solving Transportation problems
6. Solving assignment problems
7. Introduction to Network Models
8. Solving Integer Linear Programming

9. Solving Goal Programming models
10. Introduction to Nonlinear Programming

PLATFORM NEEDED
Systems with R, R Studio (Additional libraries required)

PRACTICALS	30	PERIODS
THEORY	45	PERIODS
TOTAL	75	PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- To formulate linear programming problem and solve using graphical method.
- To solve LPP using simplex methods
- To formulate and solve transportation, assignment problems
- To solve project management problems
- To solve scheduling problems

TEXT BOOK:

1. Hillier and Libeberman, "Operations Research", Holden Day, 2005
2. Taha H.A., "Operations Research", Sixth Edition, Prentice Hall of India, 2003.

REFERENCES:

1. Bazara M.J., Jarvis and Sherali H., "Linear Programming and Network Flows", John Wiley, 2009.
2. Budnick F.S., "Principles of Operations Research for Management", Richard D Irwin, 1990.
3. Philip D.T. and Ravindran A., "Operations Research", John Wiley, 1992.
4. Shennoy G.V. and Srivastava U.K., "Operation Research for Management", Wiley Eastern, 1994.
5. Tulsian and Pasdey V., "Quantitative Techniques", Pearson Asia, 2002.

CW8503	DESIGN THINKING	L T P C
		3 0 2 4

OBJECTIVES:
- Learn design thinking concepts and principles
- Use design thinking methods in every stage of the problem
- Learn the different phases of design thinking
- Apply various methods in design thinking to different problems

UNIT I   INTRODUCTION   9
Why Design? - Four Questions, Ten Tools - Principles of Design Thinking - The process of Design Thinking - How to plan a Design Thinking project.

UNIT II   UNDERSTAND, OBSERVE AND DEFINE THE PROBLEM   9
Search field determination - Problem clarification - Understanding of the problem - Problem

analysis - Reformulation of the problem - Observation Phase - Empathetic design - Tips for observing - Methods for Empathetic Design - Point-of-View Phase - Characterization of the target group - Description of customer needs.

UNIT III   IDEATION AND PROTOTYPING   9

Ideate Phase - The creative process and creative principles - Creativity techniques - Evaluation of ideas - Prototype Phase - Lean Startup Method for Prototype Development - Visualization and presentation techniques.

UNIT IV   TESTING AND IMPLEMENTATION   9

Test Phase - Tips for interviews - Tips for surveys - Kano Model - Desirability Testing - How to conduct workshops - Requirements for the space - Material requirements - Agility for Design Thinking.

UNIT V   FUTURE   9

Design Thinking meets the corporation – The New Social Contract – Design Activism – Designing tomorrow.

LIST OF EXPERIMENTS :

(i)   2030 Schools Challenge: Concept: Design thinking is often presented without teaching content. This is very different. Learners get 30 minutes to choose a UN 2030 Goal (there are 17) that is relevant and meaningful to them, then they get into small groups. The group researches the goal quickly, by answering the questions: What does the world need to know about this goal and what can we do about it? The group then creates a short PSA (Public Service Announcement) and shares it widely with an authentic audience. It is fun, fast, and shows the power of design sprints to teach content and skills.

(ii) THE GIFT-GIVING PROJECT VIA STANFORD D-SCHOOL Concept: The Gift-Giving Project is 90-minute (plus debrief) fast-paced project through a full design cycle. Students pair up to interview each other, come to a point-of-view of how they might design for their partner, ideate, and prototype a new solution to "redesign the giftgiving experience" for their partner.

(iii) THE WALLET PROJECT VIA STANFORD D-SCHOOL Concept: Very similar to the Gift-Giving Project, the Wallet Project is 90-minute (plus Tentative 48 debrief) fast-paced project through a full design cycle. Students pair up, show and tell each other about their wallets, ideate, and make a new solution that is "useful and meaningful" to their partner.

(iv) INVENT A SPORT (WITH JUST THESE ITEMS) Concept: We've all played sports at some point in our life. Who came up with the rules? Who created the game? Who made the constraints? And who decided the objects to play with? Now, with limited time and resources, your group will create and invent a new sport, and a set of directions for people to actually play the game.

(v) "BOOK IN AN HOUR" ACTIVITY (VIA ALL WHO WONDER) Concept: Give a group a book (fiction or non-fiction). Then you break them up into smaller groups (or individuals) to read different parts of the book. Each group (or person) has to read and then create an overview/trailer of their part of the book to share chronologically with the rest of the class. Here

the design really starts with the creative process driving how you share the information, plot, characters etc. Perfect use for professional development when you want to introduce a topic in a fun, engaging way.

(vi) CHILDREN'S STORY DESIGN ACTIVITIES Concept: The University of Arkansas created a series of STEM Challenges that work as great design activities with groups old and young! For example after reading "The Three Billy Goat's Gruff" they set up a challenge like this: You decide to help the billy goats reach the opposite side of the creek so they can eat. You must create a model structure to help the billy goats get from one side to the other while using the design loop and only the materials provided. Your teacher will also provide you with model billy goats, with specific weights, that your bridge must be able to withstand.

(vii) New Product Development Activity: Student teams were given products ranging from toys to air fresheners. In 2 days, they had to create pitches on how to improve these products. The idea was to give them a clear sense of the scope of what they would do in a product development.

PRACTICALS	**30**	**PERIODS**
THEORY	**45**	**PERIODS**
TOTAL	**75 PERIODS**	

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Define key concepts of design thinking
- Practice design thinking in all stages of problem solving
- Apply design thinking approach to real world problems

TEXT BOOKS :
1. Christian Mueller-Roterberg, Handbook of Design Thinking - Tips & Tools for how to design thinking. [Unit 1, 2, 3, 4]
2. Designing for Growth: a design thinking tool kit for managers By Jeanne Liedtka and Tim Ogilvie. [Unit 1]
3. Change by Design: How Design Thinking Transforms Organizations and Inspires Innovation by Tim Brown. [Unit 5]

REFERENCES:

1. Johnny Schneider, "Understanding Design Thinking, Lean and Agile", O'Reilly Media, 2017.
2. Roger Martin, "The Design of Business: Why Design Thinking is the Next Competitive Advantage", Harvard Business Press , 2009.
3. Hasso Plattner, Christoph Meinel and Larry Leifer (eds), "Design Thinking: Understand – Improve   – Apply", Springer, 2011
4. http://ajjuliani.com/design-thinking-activities/
5. https://venturewell.org/class-exercises

CS8501   **THEORY OF COMPUTATION**   **L T P C**
                                                                          3 0 0 3

OBJECTIVES:
- To understand the language hierarchy
- To construct automata for any given pattern and find its equivalent regular expressions
- To design a context free grammar for any given language
- To understand Turing machines and their capability
- To understand undecidable problems and NP class problems

UNIT I   AUTOMATA   FUNDAMENTALS   9
Introduction to formal proof – Additional forms of Proof – Inductive Proofs –Finite Automata – Deterministic Finite Automata – Non-deterministic Finite Automata – Finite Automata with Epsilon Transitions

UNIT II   REGULAR EXPRESSIONS AND LANGUAGES   9
Regular Expressions – FA and Regular Expressions – Proving Languages not to be regular – Closure Properties of Regular Languages – Equivalence and Minimization of Automata.

UNIT III   CONTEXT FREE GRAMMAR AND LANGUAGES   9
CFG – Parse Trees – Ambiguity in Grammars and Languages – Definition of the Pushdown Automata – Languages of a Pushdown Automata – Equivalence of Pushdown Automata and CFG, Deterministic Pushdown Automata.

UNIT IV   PROPERTIES OF CONTEXT FREE LANGUAGES   9
Normal Forms for CFG – Pumping Lemma for CFL – Closure Properties of CFL – Turing Machines – Programming Techniques for TM.

UNIT V   UNDECIDABILITY   9
Non Recursive Enumerable (RE) Language – Undecidable Problem with RE – Undecidable Problems about TM – Post's Correspondence Problem, The Class P and NP.

                                                        TOTAL: 45 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to :
- Construct automata, regular expression for any pattern.
- Write Context free grammar for any construct.
- Design Turing machines for any language.
- Propose computation solutions using Turing machines.
- Derive whether a problem is decidable or not.

TEXT BOOKS :

1. J. E.Hopcroft, R.Motwani and J.D Ullman, "Introduction to Automata Theory, Languages and Computations", Second Edition, Pearson Education, 2003.

REFERENCES BOOKS:

1. H.R.Lewis and C.H.Papadimitriou, "Elements of the theory of Computation", Second Edition, PHI, 2003.
2. J.Martin, "Introduction to Languages and the Theory of Computation", Third Edition, TMH,

2003.
3. Micheal Sipser, "Introduction of the Theory and Computation", Thomson Brokecole, 1997.

| CW8512 | SOFT SKILLS LABORATORY | L T P C |
| | | 0 0 2 1 |

OBJECTIVES:
- To enhance the Employability and Career Skills of students
- To orient the students towards grooming as a professional
- To make them Employable Graduates
- To develop their confidence and help them attend interviews successfully
- To make effective presentations.

LIST OF EXPERIMENTS :

1. Soft and Hard skills
2. Being informed on current affairs and technology
3. Self Intro, G&A, Presentations
4. Group discussion
5. Interview etiquettes & mastering FAGs
6. Group vs Team
7. Net working, time management, social protocol, career plan and success

PLATFORM NEEDED
Systems with Rosetta stone and Globarena

TOTAL : 30 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to :
- Make effective presentations
- Participate confidently in Group Discussions.
- Attend job interviews and be successful in them.
- Develop adequate Soft Skills required for the workplace
- Participate confidently and appropriately in conversations both formal and informal

REFERENCES:
1. Butterfield, Jeff Soft Skills for Everyone. Cengage Learning: New Delhi, 2015
2. E. Suresh Kumar et al. Communication for Professional Success. Orient Blackswan: Hyderabad, 2015
3. Interact English Lab Manual for Undergraduate Students,. Orient BalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

CW8691   **COMPUTER NETWORKS**   **L T P C**
                                                               3 0 2 4

OBJECTIVES:

- 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

UNIT I   **INTRODUCTION AND PHYSICAL LAYER**   **9**

Networks – Network Types – Protocol Layering – TCP/IP Protocol suite – OSI Model – Physical Layer: Performance – Transmission media – Switching – Circuit-switched Networks – Packet Switching.

UNIT II   **DATA-LINK LAYER & MEDIA ACCESS**   **9**

Introduction – Link-Layer Addressing – DLC Services – Data-Link Layer Protocols – HDLC – PPP – Media Access Control – Wired LANs: Ethernet – Wireless LANs – Introduction – IEEE 802.11, Bluetooth – Connecting Devices.

UNIT III   **NETWORK LAYER**   **9**

Network Layer Services – Packet switching – Performance – IPV4 Addresses – Forwarding of IP Packets – Network Layer Protocols: IP, ICMP v4 – Unicast Routing Algorithms – Protocols – Multicasting Basics – IPV6 Addressing – IPV6 Protocol.

UNIT IV   **TRANSPORT LAYER**   **9**

Introduction – Transport Layer Protocols – Services – Port Numbers – User Datagram Protocol – Transmission Control Protocol – SCTP.

UNIT V   **APPLICATION LAYER**   **9**

WWW and HTTP – FTP – Email –Telnet –SSH – DNS – SNMP.

LIST OF EXPERIMENTS :

1. Learn to use commands like tcpdump, netstat, ifconfig, nslookup and traceroute. Capture ping and trace route 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:
   a) Echo client and echo server
   b) Chat
   c) 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 using NS.
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 an error correction code (like CRC).

PLATFORM NEEDED :
System with :
- C/C++/JAVA/Equivalent compiler
- Network Simulator like NS2/OPNET/Wireshark

PRACTICALS	30	PERIODS
THEORY	45	PERIODS
TOTAL	75	PERIODS

OUTCOMES:
Upon completion of the course, the students should 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.

TEXT BOOK:

1. Behrouz A. Forouzan, Data Communications and Networking, Fifth Edition TMH, 2013.
2. Larry L. Peterson, Bruce S. Davie, Computer Networks: A Systems Approach, Fifth Edition, Morgan Kaufmann Publishers Inc., 2012.

REFERENCES:

1. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
2. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
3. James F. Kurose, Keith W. Ross, Computer Networking, A Top-Down Approach Featuring the Internet, Sixth Edition, Pearson Education, 2013.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

CS8691   **ARTIFICIAL INTELLIGENCE**   **L T P C**
                                                                  3 0 0 3

OBJECTIVES:
- To understand the various characteristics of Intelligent agents
- To learn the different search strategies in AI
- To learn to represent knowledge in solving AI problems
- To understand the different ways of designing software agents
- To know about the various applications of AI.

UNIT I   INTRODUCTION   9
Introduction–Definition - Future of Artificial Intelligence – Characteristics of Intelligent Agents– Typical Intelligent Agents – Problem Solving Approach to Typical AI problems.

UNIT II PROBLEM SOLVING METHODS 9

Problem solving Methods - 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 KNOWLEDGE REPRESENTATION 9

First Order Predicate Logic – Prolog Programming – Unification – Forward Chaining-Backward Chaining – Resolution – Knowledge Representation - Ontological Engineering-Categories and Objects – Events - Mental Events and Mental Objects - Reasoning Systems for Categories - Reasoning with Default Information

UNIT IV SOFTWARE AGENTS 9

Architecture for Intelligent Agents – Agent communication – Negotiation and Bargaining – Argumentation among Agents – Trust and Reputation in Multi-agent systems.

UNIT V APPLICATIONS 9

AI applications – Language Models – Information Retrieval- Information Extraction – Natural Language Processing - Machine Translation – Speech Recognition – Robot – Hardware – Perception – Planning – Moving.

TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to :

- Use appropriate search algorithms for any AI problem
- Represent a problem using first order and predicate logic
- Provide the apt agent strategy to solve a given problem
- Design software agents to solve a problem
- Design applications for NLP that use Artificial Intelligence.

TEXT BOOK:

1. S. Russell and P. Norvig, "Artificial Intelligence: A Modern Approach", Prentice Hall, Third Edition, 2009.
2. Bratko, "Prolog: Programming for Artificial Intelligence", Fourth edition, Addison-Wesley Educational Publishers Inc., 2011.

REFERENCES:

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. William F. Clocksin and Christopher S. Mellish, Programming in Prolog: Using the ISO Standard", Fifth Edition, Springer, 2003.
4. Gerhard Weiss, "Multi Agent Systems", Second Edition, MIT Press, 2013.
5. David L. Poole and Alan K. Mackworth, "Artificial Intelligence: Foundations of Computational Agents", Cambridge University Press, 2010.

CS8602   **COMPILER DESIGN**   **L T P C**
                                                                     3 0 2 4

OBJECTIVES :

- To learn the various phases of compiler.
- To learn the various parsing techniques.
- To understand intermediate code generation and run-time environment.
- To learn to implement front-end of the compiler.
- To learn to implement code generator.

UNIT I   INTRODUCTION TO COMPILERS   9

Structure of a compiler – Lexical Analysis – Role of Lexical Analyzer – Input Buffering – Specification of Tokens – Recognition of Tokens – Lex – Finite Automata – Regular Expressions to Automata – Minimizing DFA.

UNIT II   SYNTAX ANALYSIS   9

Role of Parser – Grammars – Error Handling – Context-free grammars – Writing a grammar – Top Down Parsing - General Strategies Recursive Descent Parser Predictive Parser-LL(1) Parser-Shift Reduce Parser-LR Parser-LR (0)Item Construction of SLR Parsing Table -Introduction to LALR Parser - Error Handling and Recovery in Syntax Analyzer-YACC.

UNIT III   INTERMEDIATE CODE GENERATION   9

Syntax Directed Definitions, Evaluation Orders for Syntax Directed Definitions, Intermediate Languages: Syntax Tree, Three Address Code, Types and Declarations, Translation of Expressions, Type Checking.

UNIT IV   RUN-TIME ENVIRONMENT AND CODE GENERATION   9

Storage Organization, Stack Allocation Space, Access to Non-local Data on the Stack, Heap Management - Issues in Code Generation - Design of a simple Code Generator.

UNIT V   CODE OPTIMIZATION   9

Principal Sources of Optimization – Peep-hole optimization - DAG- Optimization of Basic Blocks-Global Data Flow Analysis - Efficient Data Flow Algorithm.

LIST OF EXPERIMENTS :

1. Develop a lexical analyzer to recognize a few patterns in C. (Ex. identifiers, constants, comments, operators etc.). Create a symbol table, while recognizing identifiers.
2. Implement a Lexical Analyzer using Lex Tool
3. Implement an Arithmetic Calculator using LEX and YACC
4. Generate three address code for a simple program using LEX and YACC.
5. Implement simple code optimization techniques (Constant folding, Strength reduction and Algebraic transformation)
6. Implement back-end of the compiler for which the three address code is given as input and the 8086 assembly language code is produced as output.

                                        PRACTICALS   30 PERIODS
                                        THEORY   45 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to :

- Understand the different phases of compiler.
- Design a lexical analyzer for a sample language.
- Apply different parsing algorithms to develop the parsers for a given grammar.
- Understand syntax-directed translation and run-time environment.
- Learn to implement code optimization techniques and a simple code generator.
- Design and implement a scanner and a parser using LEX and YACC tools.

TEXT BOOK:

1. Alfred V. Aho, Monica S. Lam, Ravi Sethi, Jeffrey D. Ullman, Compilers: Principles, Techniques and Tools, Second Edition, Pearson Education, 2009.

REFERENCES:

1. Randy Allen, Ken Kennedy, Optimizing Compilers for Modern Architectures: A Dependence based Approach, Morgan Kaufmann Publishers, 2002.
2. Steven S. Muchnick, Advanced Compiler Design and Implementation, Morgan Kaufmann Publishers Elsevier Science, India, Indian Reprint 2003.
3. Keith D Cooper and Linda Torczon, Engineering a Compiler, Morgan Kaufmann Publishers Elsevier Science, 2004.
4. Raghavan, Principles of Compiler Design, Tata McGraw Hill Education Publishers, 2010.
5. Allen I. Holub, Compiler Design in C, Prentice-Hall Software Series, 1993.

CW8601   **FUNDAMENTALS OF MANAGEMENT**   **L T P C**
                                                                    3 0 0 3
OBJECTIVES:

- To familiarize the students the basic concepts of Management
- To understand the history, evolution and growth of management concepts
- To learn the applications of different functions of Management
- To study the different issues and challenges faced by modern managers

UNIT I   INTRODUCTION TO MANAGEMENT   9
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   9
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   9
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   9
Leadership, Power and Authority, Leadership Styles; Behavioral Leadership, Situational Leadership, Leadership Skills, Leader as Mentor and Coach, Leadership during adversity and Crisis; Handling Employee and Customer Complaints, Team Motivation -Types of Motivation; Relationship between Motivation, Performance and Engagement, Content Motivational Theories - Needs Hierarchy Theory, Two Factor Theory, Theory X and Theory Y.

UNIT V   EMERGING CONCEPTS AND SKILL DEVELOPMEMT   9
Creativity-Innovation-Entrepreneurship, Technology Management- Management Information Systems (MIS), Productivity Problems-TQM, Kaizen, Six Sigma, 5S Concept, Use of computers and IT in Management Control-Work Applications, Ethics and Social Responsibility.

TOTAL 45 PERIODS
OUTCOMES:
Upon completion of the course, the students should be able to :

*   Understand the different elements of effective management
*   Apply the concepts of planning and decision making in organizations
*   Describe the concepts of organization and need for staffing process
*   Adopt the concept of directing through motivation and leadership
*   Demonstrate the use of control methods in changing business environment

TEXT BOOK:
1.   Management Fundamentals, Robert N Lussier, 5e, Cengage Learning, 2013.
2.   Fundamentals of Management, Stephen P. Robbins, Pearson Education, 2009.

REFERENCES:
1.   Essentials of Management, Koontz Kleihrich, Tata McGraw Hill.
2.   Management Essentials, Andrew DuBrin, 9e, Cengage Learning, 2012
3.   Management: Principles, Processes and Practices, Anil Bhat, Arya Kumar –Oxford University Press-, 2008

AD8551 **BUSINESS ANALYTICS** **L T P C**

3 0 0 3

OBJECTIVES:
1. To understand the Analytics Life Cycle.
2. To comprehend the process of acquiring Business Intelligence
3. To understand various types of analytics for Business Forecasting
4. To model the supply chain management for Analytics.
5. To apply analytics for different functions of a business

UNIT I   INTRODUCTION TO BUSINESS ANALYTICS   9

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   9

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   9

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   9

Human Resources – Planning and Recruitment – Training and Development - Supply chain network - Planning Demand, Inventory and Supply – Logistics – Analytics applications in HR & Supply Chain

UNIT VMARKETING & SALES ANALYTICS   9

Marketing Strategy, Marketing Mix, Customer Behavior – selling Process – Sales Planning – Analytics applications in Marketing and Sales

TOTAL: 45 PERIODS

COURSE OUTCOMES:
- 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 management
- Use analytics for marketing and sales.

REFERENCES:
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.

CW8611   **BUSINESS ANALYTICS LABORATORY**   **L T P C**
                                                                         0 0 4 2

OBJECTIVES:
- Implement various machine learning techniques for predictive analysis
- Learn the various software development methodologies
- Apply predictive analytics in marketing and sales
- Learn predictive analysis in HR, supply chain
- Learn predictive analysis in marketing and sales

LIST OF EXPERIMENTS :

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

TOTAL : 60 PERIODS

PLATFORM NEEDED
Systems with R, R Studio (Additional libraries required)
OUTCOMES:
Upon Completion of the course, the students should be able to:

- 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

CW8612   **ARTIFICIAL INTELLIGENCE LABORATORY**   **L T P C**
                                                                      0 0 4 2
OBJECTIVES :

- To formalize design systems capable of automated reasoning.
- To identify and implement appropriate learning strategies
- To implement and apply machine learning techniques in prediction problems.

LIST OF EXPERIMENTS :

1. Study of Prolog.
2. Write simple fact for the statements using PROLOG.
3. Write predicates one converts centigrade temperatures to Fahrenheit, the other checks if a temperature is below freezing.

4. Write a program to solve the Monkey Banana problem.
5. Write a program in turbo prolog for medical diagnosis and show t he advantage and disadvantage of green and red cuts.
6. Write a program to solve 4-Queen problem.
7. Write a program to solve any problem using Breadth First Search.
8. Write a program to solve Missionaries and Cannibal problem.
9. Write a program to solve water jug problem using LISP
10. Case study – expert system

PLATFORM NEEDED

Systems with Prolog, Turbo C, LISP

TOTAL: 60 PERIODS

OUTCOMES:
Upon completion of the course, the students should be able to :

- Program in prolog and its working environment.
- Demonstrate fundamental understanding of artificial intelligence (AI) and expert systems.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning
- Demonstrate proficiency in applying scientific method to models of machine learning.

				L	T	P	C
CW8701		**FINANCIAL MANAGEMENT**		3	0	0	3

OBJECTIVES:

- To understand the operational nuances of a Finance Manager
- Comprehend the technique of making decisions related to finance function

UNIT I FOUNDATIONS OF FINANCE 9
Financial management – An overview- Time value of money- Introduction to the concept of risk and return of a single asset and of a portfolio- Valuation of bonds and shares-Option valuation.

UNIT II INVESTMENT DECISIONS 9
Capital Budgeting: Principles and techniques - Nature of capital budgeting- Identifying relevant cash flows - Evaluation Techniques: Payback, Accounting rate of return, Net Present Value, Internal Rate of Return, Profitability Index - Comparison of DCF techniques - Project selection under capital rationing - Inflation and capital budgeting - Concept and measurement of cost of capital - Specific cost and overall cost of capital.

UNIT III FINANCING AND DIVIDEND DECISION 9
Financial and operating leverage - capital structure - Cost of capital and valuation – designing capital structure. Dividend policy - Aspects of dividend policy - practical consideration - forms of dividend policy - forms of dividends - share splits.

UNIT IV   WORKING CAPITAL MANAGEMENT   9

Principles of working capital: Concepts, Needs, Determinants, issues and estimation of working capital - Accounts Receivables Management and factoring - Inventory management – Cash management - Working capital finance : Trade credit, Bank finance and Commercial paper.

UNIT V   LONG TERM SOURCES OF FINANCE   9

Indian capital and stock market, New issues market Long term finance: Shares, debentures and term loans, lease, hire purchase, venture capital financing, Private Equity.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:
   • Possess the techniques of managing finance in an organization

TEXT BOOKS

   1. M.Y. Khan and P.K.Jain Financial management, Text, Problems and cases Tata McGraw Hill, 6th edition, 2011.
   2. M. Pandey Financial Management, Vikas Publishing House Pvt. Ltd., 10th edition, 2012.

REFERENCES

   1. Aswat Damodaran, Corporate Finance Theory and practice, John Wiley & Sons, 2011.
   2. James C. Vanhorne –Fundamentals of Financial Management– PHI Learning, 11th Edition, 2012.
   3. Brigham, Ehrhardt, Financial Management Theory and Practice, 12th edition, Cengage Learning 2010.
   4. Prasanna Chandra, Financial Management, 9th edition, Tata McGraw Hill, 2012.
   5. Srivatsava, Mishra, Financial Management, Oxford University Press, 2011.

IT8501	WEB TECHNOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:
   • To understand about client-server communication and protocols used during communication.
   • To design interactive web pages using Scripting languages.
   • To learn server side programming using servlets and JSP.
   • To develop web pages using XML/XSLT.

UNIT I   WEB SITE BASICS AND HTML   9

Web Essentials: Clients, Servers, and Communication. The Internet-Basic Internet Protocols –The World Wide Web-HTTP request message-response message-Web Clients Web Servers. Markup Languages: XHTML. An Introduction to HTML History-Versions-Basic XHTML Syntax and Semantics- Some Fundamental HTML Elements-Relative URLs-Lists-tables-Frames-Forms-HTML 5.0.

UNIT II   CSS AND CLIENT SIDE SCRIPTING   9

Style Sheets: CSS-Introduction to Cascading Style Sheets-Features-Core Syntax-Style Sheets and HTML- Style Rule Cascading and Inheritance-Text Properties-Box Model Normal Flow Box Layout-Beyond the Normal Flow-CSS3.0. Client-Side Programming: The JavaScript Language-History and Versions Introduction JavaScript in Perspective-Syntax-Variables and Data Types-Statements-Operators-Literals-Functions-Objects-Arrays-Built-in Objects-JavaScript Debuggers.

UNIT III   SERVER SIDE SCRIPTING   9

Host Objects: Browsers and the DOM-Introduction to the Document Object Model DOM History and Levels-Intrinsic Event Handling-Modifying Element Style-The Document Tree-DOM Event Handling-Accommodating Noncompliant Browsers Properties of window. Server-Side Programming: Java Servlets- Architecture -Overview-A Servlet-Generating Dynamic Content-Life Cycle- Parameter Data- Sessions-Cookies-URL Rewriting-Other Capabilities-Data Storage Servlets and Concurrency- Databases and Java Servlets.

UNIT IV   JSP AND XML   9

Separating Programming and Presentation: JSP Technology Introduction-JSP and Servlets-Running JSP Applications Basic JSP-JavaBeans Classes and JSP-Tag Libraries and Files-Support for the Model-View-Controller Paradigm- Databases and JSP. Representing Web Data: XML-Documents and Vocabularies-Versions and Declaration-Namespaces- DOM based XML processing Event-oriented Parsing: SAX-Transforming XML Documents-Selecting XML Data: XPATH-Template based Transformations: XSLT-Displaying XML Documents in Browsers.

UNIT V   AJAX AND WEB SERVICES   9

AJAX: Ajax Client Server Architecture-XML Http Request Object-Call Back Methods. Web Services: JAX-RPC-Concepts-Writing a Java Web Service-Writing a Java Web Service Client-Describing Web Services: WSDL- Representing Data Types: XML Schema-Communicating Object Data: SOAP Related Technologies-Software Installation-Storing Java Objects as Files.

TOTAL : 45 PERIODS

OUTCOMES:
At the end of the course, the student should be able to:

- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and java script that is easy to navigate and
- use.
- Program server side web pages that have to process request from client side web pages.
- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

TEXT BOOK:
1. Jeffrey C. Jackson, "Web Technologies--A Computer Science Perspective", Pearson Education, 2006.

REFERENCES
1. Robert. W. Sebesta, "Programming the World Wide Web", Fourth Edition, Pearson Education, 2007 .

2. Deitel, Deitel, Goldberg, "Internet & World Wide Web How To Program", Third Edition, Pearson Education, 2006.
3. Marty Hall and Larry Brown," Core Web Programming" Second Edition, Volume I and II, Pearson Education, 2001.
4. Bates, "Developing Web Applications", Wiley, 2006

IT8073	INFORMATION SECURITY	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To understand the basics of Information Security
- To know the legal, ethical and professional issues in Information Security
- To know the aspects of risk management
- To become aware of various standards in this area
- To know the technological aspects of Information Security

UNIT I   INTRODUCTION   9
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   SECURITY INVESTIGATION   9
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   SECURITY ANALYSIS   9
Risk Management: Identifying and Assessing Risk, Assessing and Controlling Risk - Systems: Access Control Mechanisms, Information Flow and Confinement Problem.

UNIT IV   LOGICAL DESIGN   9
Blueprint for Security, Information Security Policy, Standards and Practices, ISO 17799/BS 7799, NIST Models, VISA International Security Model, Design of Security Architecture, Planning for Continuity.

UNIT V   PHYSICAL DESIGN   9
Security Technology, IDS, Scanning and Analysis Tools, Cryptography, Access Control Devices, Physical Security, Security and Personnel.

TOTAL :45 PERIODS

OUTCOMES:
At the end of this course, the students should be able to:
- Discuss the basics of information security
- Illustrate the legal, ethical and professional issues in information security
- Demonstrate the aspects of risk management.
- Become aware of various standards in the Information Security System
- Design and implementation of Security Techniques.

TEXT BOOK:

1. Michael E Whitman and Herbert J Mattord, "Principles of Information Security", Vikas Publishing House, New Delhi, 2003

REFERENCES:

1. Micki Krause, Harold F. Tipton, " Handbook of Information Security Management", Vol 1-3 CRC Press LLC, 2004.
2. Stuart McClure, Joel Scrambray, George Kurtz, "Hacking Exposed", Tata McGraw- Hill, 2003
3. Matt Bishop, "Computer Security Art and Science", Pearson/PHI, 2002.

CW8711	INFORMATION SECURITY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- Explain the legal issues of preparing for and performing information security analysis
- Perform hashing, password cracking .
- Explain penetration testing
- Explain Intrusion Detection Systems
- Demonstrate OS security related issues

LIST OF EXPERIMENTS

1. Introduction to legal issuesDisk Imaging and Cloning: Use VMWare and modify device configuration in a VMWare system - Image a drive to a file - Extract individual partitions from an image file - Mount the image as a loopback device and read only for analysis - Properly sanitize a disk for cloning - Clone a drive versus imaging the drive - Verify disk and file integrity with hashing.
2. Implement SHA-1 algorithm
3. Implement MD5 algorithm for practical appications.
4. Implementing Digital Signal Standard (DSS).
5. Crack passwords using John the Ripper.
6. Demonstrate penetration testing using any tool (Metasploit or wireshark, etc).
7. Demonstrate intrusion detection system (IDS) using Snort.
8. Demonstrate OS fingerprinting using Nmap.
9. Implementing system call filters using Seccomp BPF filter.
10. Implementing Security Access Control using Multi-factor authentication.

TOTAL: 60 PERIODS

OUTCOMES:
Upon Completion of the course, the students will be able to:

- Explain the legal issues of preparing for and performing information security analysis
- Perform hashing, password cracking
- Create penetration testing
- Represent Intrusion Detection Systems
- Understand OS security related issues

PLATFORM NEEDED:

System with :
- Linux OS
- Java
- John the Ripper
- Metasploit
- Snort
- Nmap
- Wireshark
- Kali Linux

IT8511	WEB TECHNOLOGY LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:
- To design interactive web pages using Scripting languages.
- To learn server side programming using servlets and JSP.
- To develop web pages using XML/XSLT.

LIST OF EXPERIMENTS

1. Create a web page with the following using HTML.
   i) To embed an image map in a web page.
   ii) To fix the hot spots.
   iii) Show all the related information when the hot spots are clicked
2. Create a web page with all types of Cascading style sheets.
3. Client Side Scripts for Validating Web Form Controls using DHTML.
   78
4. Installation of Apache Tomcat web server.
5. Write programs in Java using Servlets: To invoke servlets from HTML forms.
   Session Tracking.
6. Write programs in Java to create three-tier applications using JSP and Databases
   - For conducting on-line examination.
   - For displaying student mark list. Assume that student information is available in a
     database which has been stored in a database server.
7. Programs using XML – Schema – XSLT/XSL.
8. Programs using DOM and SAX parsers.
9. Programs using AJAX.
10. Consider a case where we have two web Services- an airline service and a travel agent
    and the travel agent is searching for an airline. Implement this scenario using Web
    Services and Data base.

TOTAL: 60 PERIODS

OUTCOMES:

Upon Completion of the course, the students will be able to:
- Design simple web pages using markup languages like HTML and XHTML.
- Create dynamic web pages using DHTML and java script that is easy to navigate and
  use.
- Program server side web pages that have to process request from client side web pages.

- Represent web data using XML and develop web pages using JSP.
- Understand various web services and how these web services interact.

PLATFORM NEEDED:
System with :
Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

CW8001   **DATA MINING AND ANALYTICS**   **L T P C**
                                        3 0 0 3

OBJECTIVES:
- To understand data pre-processing and data visualization techniques
- To study algorithms for finding hidden and interesting patterns in data
- To understand and apply various classification and clustering techniques using tools.
- Learn the different ways of Data Analysis
- To familiar with the visualization

UNIT I   DATA MINING – INTRODUCTION   9
Introduction to Data Mining Systems – Knowledge Discovery Process – Data Mining Techniques – Issues – applications- Data Objects and attribute types, Statistical description of data, Data Preprocessing – Cleaning, Integration, Reduction, Transformation and discretization, Data Visualization, Data similarity and dissimilarity measures.

UNIT II   DATA MINING - FREQUENT PATTERN ANALYSIS   9
Mining Frequent Patterns, Associations and Correlations – Mining Methods- Pattern Evaluation Method – Pattern Mining in Multilevel, Multi Dimensional Space – Constraint Based Frequent Pattern Mining, Classification using Frequent Patterns

UNIT III   CLASSIFICATION AND CLUSTERING   9
Decision Tree Induction - Bayesian Classification – Rule Based Classification – Classification by Back Propagation – Support Vector Machines — Lazy Learners – Model Evaluation and Selection- Techniques to improve Classification Accuracy. Clustering Techniques – Cluster analysis- Partitioning Methods - Hierarchical Methods – Density Based Methods - Grid Based Methods – Evaluation of clustering – Clustering high dimensional data- Clustering with constraints, Outlier analysis-outlier detection methods.

UNIT IV   DATA ANALYSIS   9
Web data – Evolution of Analytic scalability, analytic processes and tools, Analysis vs reporting- Regression modeling, Multivariate analysis, Bayesian modeling, inference and Bayesian networks, Support vector and kernel methods, Analysis of time series: linear systems analysis, nonlinear dynamics - Rule induction - Neural networks: learning and generalization, competitive learning, principal component analysis and neural networks; Fuzzy logic: extracting fuzzy models from data, fuzzy decision trees, Stochastic search methods.

UNIT V   FRAMEWORKS AND VISUALIZATION   9
MapReduce – Hadoop, Hive, MapR – Sharding – NoSQL Databases - S3 - Hadoop Distributed file systems – Visualizations - Visual data analysis techniques, interaction techniques; Systems and applications:

OUTCOMES:
Upon completion of the course, the students should be able to:

- Apply suitable pre-processing and visualization techniques for data analysis
- Apply frequent pattern and association rule mining techniques for data analysis
- Apply appropriate classification and clustering techniques for data analysis
- Compare and contrast various soft computing frameworks
- Use Visualization techniques

TEXT BOOKS:
1. Jiawei Han and Micheline Kamber, "Data Mining Concepts and Techniques", Third Edition, Elsevier, 2012.
1. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007.
2. Anand Rajaraman and Jeffrey David Ullman, Mining of Massive Datasets, Cambridge University Press, 2012.

REFERENCES:
1. K.P. Soman, Shyam Diwakar and V. Ajay, "Insight into Data Mining Theory and Practice", Eastern Economy Edition, Prentice Hall of India, 2006.
2. Ian H.Witten and Eibe Frank, "Data Mining: Practical Machine Learning Tools and Techniques", Elsevier, Second Edition.
3. Bill Franks, Taming the Big Data Tidal Wave: Finding Opportunities in Huge Data Streams with advanced analytics, John Wiley & sons, 2012.
4. Glenn J. Myatt, Making Sense of Data, John Wiley & Sons, 2007 Pete Warden, Big Data Glossary, O"Reilly, 2011.
5. Jiawei Han, Micheline Kamber "Data Mining Concepts and Techniques", Second Edition, Elsevier, Reprinted 2008.

CS8601	MOBILE COMPUTING	L T P C
		3 0 0 3

OBJECTIVES:
- To understand the basic concepts of mobile computing.
- To learn the basics of mobile telecommunication system .
- To be familiar with the network layer protocols and Ad-Hoc networks.
- To know the basis of transport and application layer protocols.
- To gain knowledge about different mobile platforms and application development.

UNIT I   INTRODUCTION   9
Introduction to Mobile Computing – Applications of Mobile Computing- Generations of Mobile Communication Technologies- Multiplexing – Spread spectrum -MAC Protocols – SDMA- TDMA-FDMA- CDMA

UNIT II   MOBILE TELECOMMUNICATION SYSTEM   9
Introduction to Cellular Systems - GSM – Services & Architecture – Protocols – Connection

Establishment – Frequency Allocation – Routing – Mobility Management – Security – GPRSUMTS – Architecture – Handover - Security

UNIT III   MOBILE NETWORK LAYER   9
Mobile IP – DHCP – AdHoc– Proactive protocol-DSDV, Reactive Routing Protocols – DSR, AODV , Hybrid routing –ZRP, Multicast Routing- ODMRP, Vehicular Ad Hoc networks (VANET) –MANET Vs VANET – Security.

UNIT IV   MOBILE TRANSPORT AND APPLICATION LAYER   9
Mobile TCP– WAP – Architecture – WDP – WTLS – WTP –WSP – WAE – WTA Architecture – WML

UNIT V   MOBILE PLATFORMS AND APPLICATIONS   9
Mobile Device Operating Systems – Special Constraints & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – MCommerce – Structure – Pros & Cons – Mobile Payment System – Security Issues

TOTAL :45 PERIODS

OUTCOMES:
At the end of the course, the students should be able to:
- Explain the basics of mobile telecommunication systems
- Illustrate the generations of telecommunication systems in wireless networks
- Determine the functionality of MAC, network layer and Identify a routing protocol for a given Ad hoc network
- Explain the functionality of Transport and Application layers
- Develop a mobile application using android/blackberry/ios/Windows SDK

TEXT BOOKS:
1. Jochen Schiller, "Mobile Communications", PHI, Second Edition, 2003.
2. Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt.Ltd, New Delhi – 2012

REFERENCES :
1. Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems",Thomson Asia Pvt Ltd, 2005.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.
3. William.C.Y.Lee,"Mobile Cellular Telecommunications-Analog and Digital Systems", Second Edition, TataMcGraw Hill Edition ,2006.
4. C.K.Toh, "AdHoc Mobile Wireless Networks", First Edition, Pearson Education, 2002.
5. Android Developers : http://developer.android.com/index.html
6. Apple Developer : https://developer.apple.com/
7. Windows Phone DevCenter : http://developer.windowsphone.com
8. BlackBerry Developer : http://developer.blackberry.com

                                                                          3 0 0 3
OBJECTIVES:
- To understand Cryptography Theories, Algorithms and Systems.
- To understand necessary Approaches and Techniques to build protection mechanisms in order to secure computer networks.
- To understand the cryptanalysis on standard algorithms meant for confidentiality, integrity and authenticity.

UNIT I   INTRODUCTION   **9**
Security trends - Legal, Ethical and Professional Aspects of Security, Need for Security at Multiple levels, Security Policies - Model of network security – Security attacks, services and mechanisms – OSI security architecture – Classical encryption techniques: substitution techniques, transposition techniques, steganography- Foundations of modern cryptography: perfect security – information theory – product cryptosystem.

UNIT II   SYMMETRIC KEY CRYPTOGRAPHY   **9**
MATHEMATICS OF SYMMETRIC KEY CRYPTOGRAPHY: Algebraic structures - Modular arithmetic-Euclid‟s algorithm- Congruence and matrices - Groups, Rings, Fields- Finite fields- 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   PUBLIC KEY CRYPTOGRAPHY   **9**
MATHEMATICS OF ASYMMETRIC KEY CRYPTOGRAPHY: 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 - ElGamal cryptosystem

UNIT IV   ALGORITHMIC CRYPTANALYSIS   **9**
Linear Algebra – Dense matrix multiplication - Gaussian elimination algorithms - Sieve Algorithms – Sieving for smooth composites - Bruteforce cryptanalysis - Brute force steps in advanced cryptanalysis - Birthday attacks through quadrisection

UNIT V   CRYPTANALYSIS APPLICATIONS   **9**
Attacks on stream ciphers - Correlation attacks - Algebraic attacks - Lattice-based cryptanalysis - Direct attacks using lattice reduction - Coppersmith's small roots attacks - Elliptic curves and pairings - The Weil pairing - The elliptic curve factoring method - Index calculus algorithms - A simple finite field example

                                                          TOTAL :45 PERIODS

OUTCOMES:
At the end of the course, the student should 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

- Evaluate and choose the appropriate technologies, algorithms and approaches for security.

TEXT BOOK:
1. William Stallings, Cryptography and Network Security: Principles and Practice, PHI 3rd Edition, 2006. (Units 1, 2, 3)
2. Antoine Joux, Algorithmic Cryptanalysis, (Chapman & Hall/CRC Cryptography and Network Security Series), 2009. (Units 4, 5)

REFERENCES:
1. C K Shyamala, N Harini and Dr. T R Padmanabhan: Cryptography and Network Security, Wiley India Pvt.Ltd. 2011
2. BehrouzA.Foruzan, Cryptography and Network Security, Tata McGraw Hill 2007.
3. Lawrence C. Washington, Elliptic Curves: Number Theory and Cryptography, Second Edition, CRC Press 2008.

CS8791	CLOUD COMPUTING	L T P C
		3 0 0 3

OBJECTIVES:
- To understand the concept of cloud computing.
- To appreciate the evolution of cloud from the existing technologies.
- To have knowledge on the various issues in cloud computing.
- To be familiar with the lead players in cloud.
- To appreciate the emergence of cloud as the next generation computing paradigm.

UNIT I   INTRODUCTION   9
Introduction to Cloud Computing – Definition of Cloud – Evolution of Cloud Computing – Underlying Principles of Parallel and Distributed Computing – Cloud Characteristics – Elasticity in Cloud – On-demand Provisioning.

UNIT II   CLOUD ENABLING TECHNOLOGIES   10
Service Oriented Architecture – REST and Systems of Systems – Web Services – Publish-Subscribe Model – Basics of Virtualization – Types of Virtualization – Implementation Levels of Virtualization – Virtualization Structures – Tools and Mechanisms – Virtualization of CPU – Memory – I/O Devices –Virtualization Support and Disaster Recovery.

UNIT III   CLOUD ARCHITECTURE, SERVICES AND STORAGE   8
Layered Cloud Architecture Design – NIST Cloud Computing Reference Architecture – Public, Private and Hybrid Clouds - IaaS – PaaS – SaaS – Architectural Design Challenges – Cloud Storage – Storage-as-a-Service – Advantages of Cloud Storage – Cloud Storage Providers – S3.

UNIT IV   RESOURCE MANAGEMENT AND SECURITY IN CLOUD   10
Inter Cloud Resource Management – Resource Provisioning and Resource Provisioning Methods – Global Exchange of Cloud Resources – Security Overview – Cloud Security Challenges – Software-as-a-Service Security – Security Governance – Virtual Machine Security – IAM – Security Standards.

UNIT V   CLOUD TECHNOLOGIES AND ADVANCEMENTS   8

Hadoop – MapReduce – Virtual Box -- Google App Engine – Programming Environment for Google App Engine —– Open Stack – Federation in the Cloud – Four Levels of Federation – Federated Services and Applications – Future of Federation.

TOTAL: 45 PERIODS

OUTCOMES:
On Completion of the course, the students should be able to:
- Articulate the main concepts, key technologies, strengths and limitations of cloud computing.
- Learn the key and enabling technologies that help in the development of cloud.
- Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models.
- Explain the core issues of cloud computing such as resource management and security.
- Be able to install and use current cloud technologies.
- Evaluate and choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.

TEXT BOOKS:
1. Kai Hwang, Geoffrey C. Fox, Jack G. Dongarra, "Distributed and Cloud Computing, From Parallel Processing to the Internet of Things", Morgan Kaufmann Publishers, 2012.
2. Rittinghouse, John W., and James F. Ransome, "Cloud Computing: Implementation, Management and Security", CRC Press, 2017.

REFERENCES:
1. Rajkumar Buyya, Christian Vecchiola, S. ThamaraiSelvi, "Mastering Cloud Computing", Tata Mcgraw Hill, 2013.
2. Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing - A Practical Approach", Tata Mcgraw Hill, 2009.
3. George Reese, "Cloud Application Architectures: Building Applications and Infrastructure in the Cloud: Transactional Systems for EC2 and Beyond (Theory in Practice)", O'Reilly, 2009.

CW8003   MODERN WEB APPLICATIONS DEVELOPMENT   L T P C
3 0 0 3

OBJECTIVES:
- To understand the back end data model and accessing
- To understand Django fundamentals and use its concepts to build and deploy robust web applications and apps.
- Learn about Django URL patterns and views and deploy Django applications

UNIT I   PYTHON: OBJECT ORIENTED PROGRAMMING   9

Class Definitions – Instantiation - Sub Classing – Inner Classes – Regular Expressions – Inheriting from other classes- Class and Static Methods – Private Methods- Polymorphism - Importing python modules and libraries-Creating objects-Manipulating and working with objects.

UNIT II   DJANGO   9

Creating the Project – Running the Development Server – Creating the Application – Designing a Model – Setting up the Database – Setting up the Application – Dynamic Web Sites – Communication – Data Storage – Presentation.

UNIT III   DJANGO ARCHITECTURE   9

Django and Python - DJango stake on MVC: Models - Views and Template – Overall Django Architecture - 3 Core Files: models.py- urls.py- views.py – URL's – Modeling HTTP: Requests ; Responses and Middleware – Views / Logic

UNIT IV   DJANGO FORMS AND APIS   9

Templates – Forms - Validation – Authentication - Advanced Forms processing techniques - Django REST framework – Django piston.

UNIT V   APPLICATION ESSENTIALS   9

Creation of simple interactive applications - Simple database applications - Multimedia applications - Design and development of information systems – Personal Information System – Information retrieval system – Social networking applications

TOTAL : 45 PERIODS

OUTCOMES:

After completing this course- students will have a fundamental understanding of how to Implementing Python based applications

- Safely model and store data in SQL databases
- Use MVC (Models- Views & Templates)
- Build and deploy robust Django web apps
- Integrate with RESTful web services
- Unit Testing and Debugging Django apps

REFERENCES:

1. Python Web Development with Django 1st Edition by Jeff Forcier ; Paul Bissex; Wesley Chun; Pearson Education; 2009
2. Think Python, 2nd Edition - How to Think Like a Computer Scientist - Allen B. Downey – 2nd Edition, Shroff / O'Reilly Publication, 2016.
3. Django for Beginners: Build websites with Python and Django Paperback, William S Vincent, Independently Published, 2018

CW8004	BLOCKCHAIN TECHNOLOGIES	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To decompose a blockchain system's fundamental components, how they fit together and examine a decentralization using blockchain.
- To explain how Cryptocurrency works, from when a transaction is created to when it is considered part of the blockchain.
- To explain the components of Ethereum and Programming Languages for Ethereum.
- To study the basics Hyperledger and Web3.

- To provide a details of alternative blockchain and blockchain projects in different perspective.

UNIT I INTRODUCTION TO BLOCKCHAIN 9

History of Blockchain – Types of Blockchain – Consensus – Decentralization using Blockchain – Blockchain and Full Ecosystem Decentralization – Platforms for Decentralization.

UNIT II INTRODUCTION TO CRYPTOCURRENCY 9

Bitcoin – Digital Keys and Addresses – Transactions – Mining – Bitcoin Networks and Payments – Wallets – Alternative Coins – Theoretical Limitations – Bitcoin Limitations – Name Coin – Prime Coin – Zcash – Smart Contracts – Ricardian Contracts.

UNIT III ETHEREUM 9

The Ethereum Network – Components of Ethereum Ecosystem – Ethereum Programming Languages: Runtime Byte Code, Blocks and Blockchain, Fee Schedule – Supporting Protocols – Solidity Language.

UNIT IV WEB3 AND HYPERLEDGER 9

Introduction to Web3 – Contract Deployment – POST Requests – Development frameworks – Hyperledger as a protocol – The Reference Architecture – Hyperledger Fabric – Distributed Ledger – Corda.

UNIT V ALTERNATIVE BLOCKCHAINS AND NEXT EMERGING TRENDS 9

Kadena – Ripple- Rootstock – Quorum – Tendermint – Scalability – Privacy – Other Challenges – Blockchain Research – Notable Projects – Miscellaneous tools.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:
- Understand the technology components of Blockchain and how it works behind-the scenes.
- Aware of different approaches to developing decentralized applications.
- Understand the Bitcoin and its limitations by comparing with other alternative coins.
- Establish deep understanding of the Ethereum model, its consensus model, code execution.
- Understand the architectural components of a Hyperledger and its development framework.
- Come to know the Alternative blockchains and emerging trends in blockchain.

TEXT BOOK:

1. Imran Bashir, "Mastering Blockchain: Distributed Ledger Technology, Decentralization, and Smart Contracts Explained", Second Edition, Packt Publishing, 2018.

REFERENCES:

1. Arshdeep Bahga, Vijay Madisetti, "Blockchain Applications: A Hands-On Approach", VPT, 2017.
2. Andreas Antonopoulos, Satoshi Nakamoto, "Mastering Bitcoin", O'Reilly Publishing, 2014.
3. Roger Wattenhofer, "The Science of the Blockchain" CreateSpace Independent Publishing Platform, 2016.

4. Narayanan, J. Bonneau, E. Felten, A. Miller, S. Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, 2016.
5. Alex Leverington, "Ethereum Programming", Packt Publishing, 2017.

AD8552	MACHINE LEARNING	L T P C
		3 0 0 3

OBJECTIVES:

- To understand the basics of Machine Learning (ML)
- To understand the methods of Machine Learning
- To know about the implementation aspects of machine learning
- To understand the concepts of Data Analytics and Machine Learning
- To understand and implement usecases of ML

UNIT I   MACHINE LEARNING BASICS   8

Introduction to Machine Learning (ML) - Essential concepts of ML – Types of learning – Machine learning methods based on Time – Dimensionality – Linearity and Non linearity – Early trends in Machine learning – Data Understanding Representation and visualization.

UNIT II   MACHINE LEARNING METHODS   11

Linear methods – Regression -Classification –Perceptron and Neural networks – Decision trees – Support vector machines – Probabilistic models ——Unsupervised learning – Featurization

UNIT III   MACHINE LEARNING IN PRACTICE   9

Ranking – Recommendation System - Designing and Tuning model pipelines- Performance measurement – Azure Machine Learning – Open-source Machine Learning libraries – Amazon's Machine Learning Tool Kit: Sagemaker

UNIT IV   MACHINE LEARNING AND DATA ANALYTICS   9

Machine Learning for Predictive Data Analytics – Data to Insights to Decisions – Data Exploration – Information based Learning – Similarity based learning – Probability based learning – Error based learning – Evaluation – The art of Machine learning to Predictive Data Analytics.

UNIT V   APPLICATIONS OF MACHINE LEARNING   8

Image Recognition – Speech Recognition – Email spam and Malware Filtering – Online fraud detection – Medical Diagnosis.

TOTAL: 45 PERIODS

OUTCOMES:

- Understand the basics of ML
- Explain various ZMachine Learning methods
- Demonstrate various ML techniques using standard packages.
- Explore knowledge on Machine learning and Data Analytics
- Apply ML to various real time examples

TEXT BOOKS:

1. Ameet V Joshi, Machine Learning and Artificial Intelligence, Springer Publications, 2020

2. John D. Kelleher, Brain Mac Namee, Aoife D' Arcy, Fundamentals of Machine learning for Predictive Data Analytics, Algorithms, Worked Examples and case studies, MIT press,2015

REFERENCES:

1. Christopher M. Bishop, Pattern Recognition and Machine Learning, Springer Publications, 2011

2. Stuart Jonathan Russell, Peter Norvig, John Canny, Artificial Intelligence: A Modern Approach, Prentice Hall, 2020

3. Machine Learning Dummies, John Paul Muller, Luca Massaron, Wiley Publications, 2021

AD8081	COGNITIVE SCIENCE AND ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- 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.

UNIT I   FOUNDATION & DESIGN PRINCIPLES   9

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   9

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   9

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   9

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   9

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.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Explain cognitive computing and design principles.
CO2: Distinguish between NLP and cognitive computing.
CO3: Apply advanced analytics to cognitive computing.
CO4: Discuss application of cognitive computing in business.
CO5: Illustrate various applications of cognitive computing.

REFERENCES:

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.

CS8081   **INTERNET OF THINGS**   **L T P C**

                                                                             3 0 0 3

OBJECTIVES:
- To understand Smart Objects and IoT Architectures
- To learn about various IOT-related protocols
- To build simple IoT Systems using Arduino and Raspberry Pi.
- To understand data analytics and cloud in the context of IoT
- To develop IoT infrastructure for popular applications

UNIT I   FUNDAMENTALS OF IoT   9

Evolution of Internet of Things - Enabling Technologies – IoT Architectures: oneM2M, IoT World Forum (IoTWF) and Alternative IoT models – Simplified IoT Architecture and Core IoT Functional Stack -– Fog, Edge and Cloud in IoT – Functional blocks of an IoT ecosystem – Sensors, Actuators, Smart Objects and Connecting Smart Objects

UNIT II   IoT PROTOCOLS   9

IoT Access Technologies: Physical and MAC layers, topology and Security of IEEE 802.15.4, 802.15.4g, 802.15.4e, 1901.2a, 802.11ah and LoRaWAN – Network Layer: IP versions, Constrained Nodes and Constrained Networks – Optimizing IP for IoT: From 6LoWPAN to 6Lo, Routing over Low Power and Lossy Networks – Application Transport Methods: Supervisory Control and Data Acquisition – Application Layer Protocols: CoAP and MQTT

UNIT III   DESIGN AND DEVELOPMENT   9

Design Methodology - Embedded computing logic - Microcontroller, System on Chips - IoT system building blocks - Arduino - Board details, IDE programming - Raspberry Pi - Interfaces and Raspberry Pi with Python Programming.

UNIT IV   DATA ANALYTICS AND SUPPORTING SERVICES   9

Structured Vs Unstructured Data and Data in Motion Vs Data in Rest – Role of Machine Learning – No SQL Databases – Hadoop Ecosystem – Apache Kafka, Apache Spark – Edge Streaming Analytics and Network Analytics – Xively Cloud for IoT, Python Web Application Framework – Django – AWS for IoT – System Management with NETCONF-YANG

UNIT V   CASE STUDIES/INDUSTRIAL APPLICATIONS   9

Cisco IoT system - IBM Watson IoT platform – Manufacturing - Converged Plantwide Ethernet Model (CPwE) – Power Utility Industry – GridBlocks Reference Model - Smart and Connected Cities: Layered architecture, Smart Lighting, Smart Parking Architecture and Smart Traffic Control

                                                                    TOTAL : 45 PERIODS

OUTCOMES:
Upon completion of the course, the student should be able to:
- Explain the concept of IoT.
- Analyze various protocols for IoT.
- Design a PoC of an IoT system using Rasperry Pi/Arduino
- Apply data analytics and use cloud offerings related to IoT.
- Analyze applications of IoT in real time scenario

TEXTBOOK:
1. David Hanes, Gonzalo Salgueiro, Patrick Grossetete, Rob Barton and Jerome Henry, "IoT Fundamentals: Networking Technologies, Protocols and Use Cases for Internet of Things, Cisco Press, 2017

REFERENCES:
1. Arshdeep Bahga, Vijay Madisetti, "Internet of Things – A hands-on approach", Universities
Press, 2015
2. Olivier Hersent, David Boswarthick, Omar Elloumi , "The Internet of Things – Key applications and Protocols", Wiley, 2012 (for Unit 2).
3. 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.
4. Dieter Uckelmann, Mark Harrison, Michahelles, Florian (Eds), "Architecting the Internet of
Things", Springer, 2011.
5. Michael Margolis, Arduino Cookbook, Recipes to Begin, Expand, and Enhance Your Projects, 2nd Edition, O'Reilly Media, 2011.
https://www.arduino.cc/
https://www.ibm.com/smarterplanet/us/en/?ca=v_smarterplanet

CW8005   **SOCIAL, TEXT AND MEDIA ANALYTICS**   **L   T   P   C**

                                                                          3   0   0   3

OBJECTIVES:
- To understand the basic issues and types of social,,text and media mining
- Familiarize the learners with the concept of social, text and media analytics and understand its significance.
- Familiarize the learners with the tools of social, text and media analytics.
- Enable the learners to develop skills required for analyzing the effectiveness of social, text and media for business purposes
- To know the applications in real time systems.

UNIT I   INTRODUCTION TO SOCIAL MEDIA ANALYSIS   9
Social media landscape, Need for SMA; SMA in Small organizations; SMA in large organizations; Application of SMA in different areas. Network fundamentals and models:
The social networks perspective - nodes, ties and influencers, Social network and web data and methods. Graphs and Matrices- Basic measures for individuals and networks. Information visualization.

UNIT II   OVERVIEW OF TEXT MINING   9
Overview of text mining- Definition- General Architecture– Algorithms– Core Operations – Preprocessing–Types of Problems- basics of document classification- information retrieval-

clustering and organizing documents- information extraction- prediction and evaluation-Textual information to numerical vectors -Collecting documents- document standardization- tokenization-lemmatization vector generation for prediction- sentence boundary determination -evaluation performance.

UNIT III   TEXT MINING FOR INFORMATION RETRIEVAL AND INFORMATION   9
EXTRACTION

Information retrieval and text mining- keyword search- nearest-neighbor methods- similarity- web based document search- matching- inverted lists- evaluation. Information extraction- Architecture - Co-reference - Named Entity and Relation Extraction- Template filling and database construction – Applications. Inductive -Unsupervised Algorithms for Information Extraction. Text Summarization Techniques - Topic Representation - Influence of Context - Indicator Representations – Pattern Extraction - Apriori Algorithm – FP Tree algorithm.

UNIT IV   WEB ANALYTICS TOOLS   9
Clickstream analysis, A/B testing, online surveys, Web crawling and Indexing. Natural Language Processing Techniques for Micro-text Analysis.

UNIT V   SOCIAL MEDIA ANALYTICS   9
Introduction, parameters, demographics. Analyzing page audience. Reach and Engagement analysis. Post- performance on FB. Social campaigns. Measuring and Analyzing social campaigns, defining goals and evaluating outcomes, Network Analysis.

OUTCOMES:
Upon Completion of the course, the students should be able to:
* Understand about social, text and media mining
* Understand the significance of social text and media analytics
* Learn tools of social, text and media analytics.
* Develop skills required for analyzing the effectiveness of social text and media for business purposes
* Know the applications in real time systems.

TEXT BOOK:
1. Marshall Sponder, Social Media Analytics, McGraw Hill ,2011.
2. Charu C. Aggarwal ,ChengXiang Zhai**,** Mining Text Data, Springer; 2012

REFERENCES:
1. Matthew Ganis, Avinash Kohirkar , Social Media Analytics: Techniques and Insights for Extracting Business Value Out of Social Media, Pearson, 2016.
2. Jim Sterne, Social Media Metrics: How to Measure and Optimize Your Marketing Investment, Wiley, 2010.
3. Oliver Blanchard ,Social Media ROI: Managing and Measuring Social Media Efforts in Your Organization (Que Biz-Tech), 2019.
4. Sholom Weiss, Nitin Indurkhya, Tong Zhang, Fred Damerau "The Text Mining Handbook.
5. Advanced Approaches in Analyzing Unstructured Data", Springer, paperback 2010
6. Ronen Feldman, James Sanger -" The Text Mining Handbook: Advanced Approaches in Analyzing Unstructured Data", Springer, paperback 2010.
7. Tracy L. Tuten, Michael R. Solomon, Social Media Marketing , Sage, 2016.

CW8006   **BEHAVIORAL ECONOMICS**   **L   T   P   C**

                                                              3   0   0   3

OBJECTIVES:

- To familiarize the students to the basic concepts of management in order to aid in understanding how an organization functions
- To explain economic decision-making process and role of psychology in it
- To elaborate the deviation in reality and standard economic theoretical predictions in the framework of behavioral economics

UNIT I   INTRODUCTION TO BEHAVIORAL ECONOMICS   9
Behavioral Economics and Consumer Behavior – Psychology and Behavioral Economics – Institution in Behavioral Economics – Introspective economics – Integrating emotions into economic theory.

UNIT II   CONTEXT AND MODELLING   9
Introduction to Behavioral Economics, Origins of Behavioral Economics, Decision-making under Neo-classical economic framework- rationality, optimization Role of Intuition, Emotions,Beliefs in decision making Bounded Rationality Judgment under Risk & Uncertainty : Heuristics & Biases Heuristics : Representativeness, Substitution, Availability, Affect, Anchoring, framing Biases: Cognitive and emotional biases.

UNIT III   RISK AND UNCERTAINTY   9
Choice Under Risk & Uncertainty Expected Utility Prospect Theory – Reference Points – Risk Concept and Understanding – Loss Aversion – Shape of Utility Function – Decision Weighting– Probabilistic Judgment. Mental Accounting Framing Mental Accounts Fungibility & Labels Hedonic Editing.

UNIT IV   EVIDENCE ON HUMAN CHOICE   9
Intertemporal Choice, Temporal Choice, Construal Level Theory, Valuation of Delayed Consumption Preferences for Sequences of Outcomes, Hyberbolic Discounting, Preference Reversal

UNIT V   BEHAVIORAL GAME THEORY   9
Behavioral Game Theory Social preferences: Fairness, trust, cooperation, reciprocity, Norms Limited Strategic Thinking Choice architecture: Nudge, Nudge vs. boost, Behavioral public policy.

                                              TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:

- Familiarize the concepts of management in order to aid in understanding how an organization functions
- Explain economic decision-making process and role of psychology in it
- Elaborate the deviation in reality and standard economic theoretical predictions in the framework of behavioral economics

TEXT BOOK:

1. M. Altman, Handbook of Contemporary Behavioural Economics: Foundation and Developments, Prentice Hall India,2007
2. Sanjit Dhami, "The Foundations of Behavioral Economic Analysis", Oxford University Press, 2016.

REFERENCES:

1. Erik Angner, "A Course in Behavioral Economics", Palgrave Macmillan
2. E. Cartwright, Behavioural Economics (2011), Routledge
3. D. Kahneman, Thinking Fast and Slow (2011), Allen Lane, Penguin Books
4. G. Loewenstein, Exotic Preferences: Behavioural Economics and Human Motivation (2007), Oxford University Press
5. Behavioral Economics: Toward a New Economics by Integration with Traditional Economics by Ogaki, Masao, Tanaka, Saori C. Published by Springer, ISBN 978-981-10-6439-5
6. Nick Wilkinson; Matthias Klaes(2012), An Introduction to Behavioral Economics, 2nd Edition, Palgrave Macmillan.
7. World Development Report 2015: Mind, Society, and Behavior

CW8007	COMPUTATIONAL FINANCE AND MODELING	L	T	P	C
		3	0	0	3

OBJECTIVES:

* To build financial models by including various fields of study viz financial management and derivatives.
* To design and construct useful and robust financial modelling applications
* To recognize efficient financial budgeting and forecasting techniques
* To develop various portfolio models

**UNIT I   INTRODUCTION TO FINANCIAL MODELLING & BUILT IN FUNCTIONS
                USING SPREAD SHEETS   9**

Introduction to Financial Modelling- Need for Financial Modelling- Steps for effective financial modelling-Introduction to Time value of money & Lookup array functions :FV,PV,PMT,RATE,NPER, Vlookup, Hlookup ,if, countifetc - Time value of Money Models: EMI with Single & Two Interest rates –Loan amortisation modelling-Debenture redemption modelling

UNIT II   BOND & EQUITY SHARE VALUATION MODELLING   9
Bond valuation – Yield to Maturity(YTM): Rate method Vs IRR method-Flexi Bond and Strip Bond YTM Modelling-Bond redemption modelling -Equity share valuation : Multiple growth rate valuation modelling with and without growth rates.

UNIT III CORPORATE FINANCIAL MODELLING 9

Alt Man Z score Bankruptcy Modelling-Indifference point modelling – Financial Break even modelling -Corporate valuation modelling(Two stage growth)- Business Modelling for capital budgeting evaluation: Payback period ,NPV ,IRR and MIRR.

UNIT IV PORTFOLIO MODELLING 9

Risk ,Beta and Annualised Return –Security Market Line Modelling –Portfolio risk calculation (Equal Proportions)-Portfolio risk optimisation (varying proportions)-Portfolio construction modelling.

UNIT V DERIVATIVE MODELLING 9

Option pay off modelling: Long and Short Call & Put options -Option pricing modelling (B-S Model)-Optimal Hedge Contract modelling.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Develop fast, efficient and accurate excel skills
- Design and construct useful and robust financial modelling applications
- Recognize efficient financial budgeting and forecasting techniques
- Familiarise the students with the valuation modelling of securities
- Develop various portfolio models

TEXT BOOK:

1. John C. Hull, Options, Futures, and Other Derviatives Prentice Hall, Tenth Edition
   Ruey S. Tsay, Analysis of Financial Time Series John Wiley, 2020

REFERENCES:

1. Wayne L Winston," Microsoft Excel 2016-Data Analysis and Business Modelling ",PHI publications, (Microsoft Press),New Delhi,2017.
2. Chandan Sen Gupta, "Financial analysis and Modelling –Using Excel and VBA" , Wiley Publishing House ,2014'
3. Craig W Holden,"Excel Modelling in Investments" Pearson Prentice Hall, Pearson Inc,New Jersey,5th Edition 2015
4. Ruzhbeh J Bodanwala , "Financial management using excel spread sheet",Taxman Allied services Pvt Ltd, New Delhi,3rd Edition 2015.

CW8008	MARKETING RESEARCH AND MARKETING MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the changing business environment and the fundamental premise underlying market driven strategies.
- To identify the indicators of management thoughts and practices.
- to analyze the nature of consumer buying behaviour

- To understanding the marketing research and new trends in the arena of marketing

UNIT I INTRODUCTION 9
Defining Marketing − Core concepts in Marketing – Evolution of Marketing − Marketing Planning Process − Scanning Business environment: Internal and External − Value chain − Core Competencies – PESTEL − SWOT Analysis − Marketing interface with other functional areas – Production, Finance, Human Relations Management, Information System − Marketing in global environment – International Marketing − Rural Marketing − Prospects and Challenges.

UNIT II MARKETING STRATEGY 9
Marketing strategy formulations – Key Drivers of Marketing Strategies - Strategies for Industrial Marketing – Consumer Marketing − Services marketing – Competition Analysis − Analysis of consumer and industrial markets − Influence of Economic and Behavioral Factors − Strategic Marketing Mix components.

UNIT III MARKETING MIX DECISIONS 9
Product planning and development – Product life cycle – New product Development and Management – Defining Market Segmentation – Targeting and Positioning − Brand Positioning and Differentiation – Channel Management – Managing Integrated Marketing Channels − Managing Retailing, Wholesaling and Logistics − Advertising and Sales Promotions – Pricing Objectives, Policies and Methods.

UNIT IV BUYER BEHAVIOUR 9
Understanding Industrial and Consumer Buyer Behaviour − Influencing factors – Buyer Behaviour Models – Online buyer behaviour − Building and measuring customer satisfaction – Customer relationships management – Customer acquisition, Retaining, Defection − Creating Long Term Loyalty Relationships.

UNIT V MARKETING RESEARCH & TRENDS IN MARKETING 9
Marketing Information System – Marketing Research Process – Concepts and applications: Product – Advertising – Promotion – Consumer Behaviour – Retail research – Customer driven organizations - Cause related marketing − Ethics in marketing – Online marketing trends - social media and digital marketing.

TOTAL: 45 PERIODS

OUTCOMES:
Upon Completion of the course, the students should be able to:

- Applied knowledge of contemporary marketing theories to the demands of business and management practice
- Enhanced knowledge of marketing strategies for consumer and industrial marketing
- Deep understanding of choice of marketing mix elements and managing integrated marketing channels
- Ability to analyze the nature of consumer buying behaviour
- Understanding of the marketing research and new trends in the arena of marketing

TEXT BOOK:

1. Philip T. Kotler and Kevin Lane Keller, Marketing Management, Prentice Hall India, 15th Edition, 2017.
2. KS Chandrasekar, "Marketing management-Text and Cases", Tata McGraw Hill Education, 2012

REFERENCES:
1. Philip T. Kotler and Kevin Lane Keller, Marketing Management, Prentice Hall India, 15th Edition, 2017.
2. KS Chandrasekar, "Marketing management-Text and Cases", Tata McGraw Hill Education, 2012
3. Lamb, Hair, Sharma, Mc Daniel– Marketing – An Innovative approach to learning and teaching- A south Asian perspective, Cengage Learning, 2012.
4. Paul Baines, Chris Fill, Kelly Page, Marketing, Asian edition, Oxford University Press,5 th edition, 2019.
5. Ramasamy, V.S, Namakumari, S, Marketing Management: Global Perspective Indian Context, Macmillan Education, New Delhi, 6 th edition, 2018.
6. NAG, Marketing successfully- A Professional Perspective, Macmillan 2008.
7. Micheal R.Czinkota, Masaaki Kotabe, Marketing Management, Vikas Thomson Learning, 2nd edition 2006.
8. Philip Kotler , Gay Armstrong, Prafulla Agnihotri, Principles of marketing, 7 th edition, 2018.

CW8009	HR MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

* To provide knowledge about management issues related to staffing, training, performance, compensation, human factors consideration and compliance with human resource requirements.
* To gain knowledge needed for success as a human resources professional.
* To develop the skills needed for a successful HR manager
* To implement the concepts learned in the workplace.

UNIT I   PERSPECTIVES IN HUMAN RESOURCE MANAGEMENT   9
 Evolution of human resource management – The importance of the human capital – Role of human resource manager –Challenges for human resource managers - trends in Human resource policies – Computer applications in human resource management – Human resource accounting and audit.

UNIT II   HUMAN RESOURCE PLANNING AND RECRUITMENT   9
Importance of Human Resource Planning – Forecasting human resource requirement –matching supply and demand - Internal and External sources- Organizational Attraction-. Recruitment, Selection, Induction and Socialization- Theories, Methods and Process.

UNIT III   TRAINING AND DEVELOPMENT   9

Types of training methods –purpose- benefits- resistance. Executive development programme – Common practices - Benefits – Self development – Knowledge management.

UNIT IV   EMPLOYEE ENGAGEMENT   9

Compensation plan – Reward – Motivation – Application of theories of motivation – Career management – Mentoring - Development of mentor – Protégé relationships- Job Satisfaction, Employee Engagement, Organizational Citizenship Behavior: Theories, Models.

UNIT V   PERFORMANCE EVALUATION AND CONTROL   9

Method of performance evaluation – Feedback – Industry practices. Promotion, Demotion, Transfer and Separation – Implication of job change. The control process – Importance – Methods – Requirement of effective control systems grievances – Causes – Implications – Redressal methods.

TOTAL: 45 PERIODS

OUTCOMES:

Upon Completion of the course, the students should be able to:
- Gain knowledge on the various aspects of HRM
- Gain knowledge needed for success as a human resources professional.
- Develop the skills needed for a successful HR manager
- Prepared to implement the concepts learned in the workplace.
- Aware of the emerging concepts in the field of HRM

TEXT BOOK:

1. Human Resource Management, 8th Edition, K. Aswathappa, Tata McGraw Hill, 2017.

REFERENCES:

1. Dessler Human Resource Management, Pearson Education Limited, 14th Edition, 2015.
2. Decenzo and Robbins, Fundamentals of Human Resource Management, Wiley, 11th Edition, 2013.
3. Luis R.Gomez-Mejia, David B.Balkin, Robert L Cardy. Managing Human Resource. PHI Learning. 2012
4. Bernadin , Human Resource Management ,Tata Mcgraw Hill ,8th edition 2012.
5. Wayne Cascio, Managing Human Resource, McGraw Hill, 2007.
6. Ivancevich, Human Resource Management, McGraw Hill 2012.
7. Uday Kumar Haldar, Juthika Sarkar. Human Resource management. Oxford. 2012

CW8010	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To understand the importance of and major decisions in supply chain management for gaining competitive advantage
- To design supply chain networks to enhance supply chain performance
- To plan demand based on inventory and supply

- To understanding the role of logistics in supply chain performance

UNIT I   INTRODUCTION   9
Supply Chain – Fundamentals, Evolution, Role in Economy, Importance, Decision Phases, Enablers & Drivers of Supply Chain Performance; Supply chain strategy; Supply Chain Performance Measures.

UNIT II   SUPPLY CHAIN NETWORK   9
Distribution Network Design – Role in supply chain, Influencing factors, design options, online sales and distribution network, Distribution Strategies; Network Design in supply chain – Role, influencing factors, framework for network design, Impact of uncertainty on Network Design.

UNIT III   PLANNING DEMAND, INVENTORY AND SUPPLY   9
Managing supply chain cycle inventory and safety inventory - Uncertainty in the supply chain ,Analyzing impact of supplychain redesign on the inventory, Risk Pooling, Managing inventory for short life-cycle products, multiple item -multiple location inventory management; Pricing and Revenue Management.

UNIT IV   LOGISTICS   9
Transportation – Role, Modes and their characteristics, infrastructure and policies, transport documentation, design options, trade-offs in transportation design, intermodal transportation. Logistics outsourcing – catalysts, benefits, value proposition. 3PL, 4PL, 5PL, 6PL; International Logistics -objectives, importance in global economy, Characteristics of global supply chains, Incoterms.

UNIT V   SUPPLY CHAIN INNOVATIONS   9
 Supply Chain Integration, SC process restructuring, IT in Supply Chain; Agile Supply Chains, Legible supply chain, Green Supply Chain, Reverse Supply chain; Supply chain technology trends – AI, Advanced analytics, Internet of Things, Intelligent things, conversational systems, robotic process automation, immersive technologies, Blockchain.

TOTAL: 45 PERIODS
OUTCOME:
Upon Completion of the course, the students should be able to:
- Understanding of supply chain fundamentals
- Ability to design supply chain networks to enhance supply chain performance
- Ability to plan demand based on inventory and supply
- Understanding the role of logistics in supply chain performance
- Awareness of innovations for sustainable supply chains

TEXT BOOK:
1. Chopra, Sunil, Meindl, Peter and Kalra, D. V.; Supply Chain Management: Strategy, Planning and Operation; Pearson Education, 2015.
2. Altekar, Rahul V.; Supply Chain Management: Concepts and Cases; PHI Learning, 2005.

REFERENCES:
1. Sunil Chopra, Peter Meindl and DharamVirKalra, Supply Chain Management-Strategy Planning and Operation, Pearson Education, Sixth Edition, 2016.
2. Janat Shah, Supply Chain Management – Text and Cases, Pearson Education, 2009

3. Ballou Ronald H, Business Logistics and Supply Chain Management, Pearson Education, 5thEdition, 2007.
4. David Simchi-Levi, Philip Kaminsky, Edith Simchi-Levi, Designing and Managing the Supply Chain: Concepts, Strategies, and Cases, Tata McGraw-Hill, 2005.
5. Pierre David, International Logistics, Biztantra, 2011.

CW8011	PSYCHOLOGY	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To develop students' awareness – on psychology, learning behavior and usage of perception effectively.
- To learn to use the various kinds of thinking in a formal context.
- To critically evaluate content and comprehend the message on the bases of perception, personality and intelligence.

UNIT I   INTRODUCTION   9

Psychology as science – Behavior and its role in human communication – socio-cultural bases of behaviour – Biological bases of behavior - Brain and its functions – Principles of Heredity – Cognition and its functions Fields of psychology – Cognitve and Perceptual – Industrial and Organizational.

UNIT II   SENSORY & PERCEPTUAL PROCESSES   9

Some general properties of Senses: Visual system – the eye, colour vision – Auditory system – Hearing, listening, Sounds - Other senses - Selective attention; physiological correlates of attention; Internal influences on perception learning – set - motivation & emotion - cognitive styles; External influences on perception figure and ground separation – movement – organization – illusion; Internal- external interactions: Constancy - Depth Perception- Binocular & Monocular Perception; Perceptual defense & Perceptual vigilance; Sensory deprivation -Sensory bombardment; ESP - Social Perception.

UNIT III   COGNITION & AFFECT   9

Learning and memory – philosophy of mind – concepts - words – images – semantic features – Association of words – Repetition – Retrieval – Chunking - Schemata - Emotion and motivation – nature and types of motivation – Biological & Psychosocial motivation – nature and types of emotions – physiological & cognitive bases of emotions – expressions of emotions – managing negative emotions - enhancing positive emotions.

UNIT IV   THINKING, PROBLEM-SOLVING & DECISION MAKING   9

Thinking skills – Types of thinking skills – Concrete & Abstract thinking – Convergent & Divergent - Analytical & Creative thinking – Problem & Possibility thinking – Vertical & Lateral thinking – Problem solving skills – stages of problem solving skills – Decision making - intuition and reasoning skills - Thinking and language - The thinking process- concepts, problem solving, decision-making, creative thinking; language communication.

UNIT V   PERSONALITY & INTELLGENCE   9

Psychological phenomena & Attributes of humans - cognition, motivation, and behaviour - thoughts, feelings, perceptions, and actions – personality dimensions, traits, patterns - Specialized knowledge, performance accomplishments, automaticity or ease of functioning, skilled performance under challenge - generative flexibility, and speed of learning or behaviour change.

TOTAL: 45 PERIODS

OUTCOME:

Upon Completion of the course, the students should be able to:

- Have got awareness – on psychology, learning behaviour and usage of perception effectively.
- Learn to use the various kinds of thinking in a formal context.
- Evaluate content and comprehend the message on the bases of perception, personality and intelligence.

TEXT BOOK:

1. Michael W.Passer, Ronald E.smith, "Psychology: The science of mind and Behavior", Tata McGraw-Hill, 3rd Edition, 2007.

REFERENCES :

1. Baron, R. &Misra.G. (2013).Psychology. New Delhi: Pearson.
2. Chadha, N.K. & Seth, S. (2014). The Psychological Realm: An Introduction. New Delhi: Pinnacle Learning
3. Morgan, C.T.and King, R.A "Introduction to Psychology", Tata McGraw Hill Co Ltd, New Delhi, 1994.
4. Robert A. Baron, "Psychology", 5th Edition, Prentice Hall, India, 2002.
5. Robert S.Feldman, "Understanding Psychology", Tata McGraw – Hill, 6th Edition, 2004.
6. Endler, N. S., & Summerfeldt, L. J., "Intelligence, personality, psychopathology and Adjustment".
7. D. H. Saklofske & M. Zeidner (Eds.), "International handbook of personality and intelligence", (pp. 249-284). New York: Plenum Press, 1995.
8. Ford, M. E., "A living systems approach to the integration of personality and intelligence". R. J. Sternberg.& P. Ruzgis (Eds.), "Personality and intelligence", (pp. 188-21 7), New York: Cambridge University Press.
9. De Bono E, "Lateral Thinking", Harper Perennial, New York.

CW8012	BUSINESS RESEARCH METHOD	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To make the students of tourism understand the principles of scientific methodology in business enquiry
- To develop analytical skills of business research
- To prepare scientific business reports.

UNIT I INTRODUCTION 9

Business Research – Definition and Significance – the research process – Types of Research – Exploratory and causal Research – Theoretical and empirical Research – Cross –Sectional and time – series Research – Research questions / Problems – Research objectives – Research hypotheses – characteristics – Research in an evolutionary perspective – the role of theory in research.

UNIT II RESEARCH DESIGN AND MEASUREMENT 9

Research design – Definition – types of research design – exploratory and causal research design – Descriptive and experimental design – different types of experimental design – Validity of findings – internal and external validity – Variables in Research – Measurement and scaling – Different scales – Construction of instrument – Validity and Reliability of instrument.

UNIT III DATA COLLECTION 9

Types of data – Primary Vs Secondary data – Methods of primary data collection – Survey Vs Observation – Experiments – Construction of questionnaire and instrument – Types of Validity – Sampling plan – Sample size – determinants optimal sample size – sampling techniques – Sampling methods.

UNIT IV DATA PREPARATION AND ANALYSIS 9

Data Preparation – editing – Coding –Data entry – Validity of data – Qualitative Vs Quantitative data analyses – Applications of Bivariate and Multivariate statistical techniques, Factor analysis, Discriminant analysis, Cluster analysis, Multiple regression and Correlation, Multidimensional scaling – Conjoint Analysis – Application of statistical software for data analysis.

UNIT V REPORT DESIGN, WRITING AND ETHICS IN BUSINESS RESEARCH 9

Research report –Types – Contents of report – need for executive summary – chapterization – contents of chapter – report writing – the role of audience – readability – comprehension – tone – final proof – report format – title of the report – ethics in research – Ethics in research – Subjectivity and Objectivity in research.

TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:
- Understand and appreciate scientific inquiry
- Know to write research proposals
- Undertake a systematic outlook towards business situations for the purpose of objective decision making
- Understand the method of conducting scientific inquiry to solve organizational problems
- Analyze data and find solutions to the problems.
- Prepare research reports

TEXT BOOK:
1. Kothari ,C. R, Research Methodology- Methods & Techniques, New age international publishers, 2016.
2. Gupta, S L & Gupta, H, Business Research Methods, TMHE Pvt. Ltd, 2009.

REFERENCES :
1. Donald R. Cooper, Pamela S. Schindler and J K Sharma, Business Research methods,

11th Edition, Tata Mc Graw Hill, New Delhi, 2012.

2. Alan Bryman and Emma Bell, Business Research methods, 3rd Edition, Oxford University Press, New Delhi, 2011.
3. Uma Sekaran and Roger Bougie, Research methods for Business, 5th Edition, Wiley India, New Delhi, 2012.
4. William G Zikmund, Barry J Babin, Jon C.Carr, AtanuAdhikari,Mitch Griffin, Business Research methods, A South Asian Perspective, 8th Edition, Cengage Learning, New Delhi, 2012.
5. Panneerselvam. R, Research Methodology, 2nd Edition, PHI Learning, 2014.

CW8013 **INTRODUCTION TO INNOVATION, IP MANAGEMENT AND ENTREPRENEURSHIP**

                                                                                     L T P C
                                                                                     3 0 0 3

OBJECTIVES:
- To develop and strengthen innovation, IP management and entrepreneurial quality
- To motivate in and to impart basic skills
- To understanding to run a business efficiently and effectively

UNIT I INTRODUCTION TO INNOVATION   **9**
Adoption of Innovations, Exploring Innovations, Idea generation, Developing innovative culture, Executing innovations, Innovation attributes and their adoption rate, Measuring and evaluation of innovation, Exploiting and renewing innovations, Managing innovations in organizations, Innovation and intellectual property rights, Innovation portfolio

UNIT II INTRODUCTION TO IPR   **9**
Basic concepts and need for Intellectual Property - Patents, Copyrights, Geographical Indications, IPR in India and Abroad – Genesis and Development – the way from WTO to WIPO –TRIPS, Nature of Intellectual Property, Industrial Property, technological Research, Inventions and Innovations – Important examples of IPR.

UNIT III REGISTRATION OF IPRs   **9**
Meaning and practical aspects of registration of Copy Rights, Trademarks, Patents, Geographical Indications, Trade Secrets and Industrial Design registration in India and Abroad, Agreements and Legislations

UNIT IV ENTREPRENEURSHIP   **9**
Entrepreneur – Types of Entrepreneurs – Difference between Entrepreneur and Intrapreneur, Major Motives Influencing an Entrepreneur –Achievement Motivation Training, Self Rating, Business Games, Thematic Apperception Test – Stress Management

UNIT V BUSINESS AND FINANCING   **9**
Small Enterprises – Characteristics, Ownership Structures – Steps involved in setting up a Business – identifying, selecting a Good Business opportunity, Market Survey and Research, Techno Economic Feasibility Assessment – Preparation of Preliminary Project Reports – Project

Appraisal –Sources of Finance, Management of working Capital, Costing, Break Even Analysis, Taxation – Income Tax, Excise Duty – Sales Tax.

TOTAL : 45 PERIODS

OUTCOME:

Upon Completion of the course, the students should be able to:

- Understand the concept of innovation
- Ability to manage Intellectual Property portfolio to enhance the value of the firm.
- Gain knowledge and skills needed to run a business successfully.

TEXT BOOKS :

1. V. Scople Vinod, Managing Intellectual Property, Prentice Hall of India pvt Ltd, 2012
2. S.V. Satarkar, Intellectual Property Rights and Copy Rights, Ess Ess Publications, New Delhi, 2002
3. Donald F Kuratko, "Entreprenuership – Theory, Process and Practice", 9 th Edition, Cengage Learning, 2014.
4. Khanka. S.S., "Entrepreneurial Development" S.Chand & Co. Ltd., Ram Nagar, New Delhi, 2013.

REFERENCES :

1. Deborah E. Bouchoux, "Intellectual Property: The Law of Trademarks, Copyrights, Patents and Trade Secrets", Cengage Learning, Third Edition, 2012.
2. Edited by Derek Bosworth and Elizabeth Webster, The Management of Intellectual Property, Edward Elgar Publishing Ltd., 2013.
3. Prabuddha Ganguli,"Intellectual Property Rights: Unleashing the Knowledge Economy", McGraw Hill Education, 2011.
4. EDII "Faulty and External Experts – A Hand Book for New Entrepreneurs Publishers: Entrepreneurship Development", Institute of India, Ahmadabad, 1986.
5. Hisrich R D, Peters M P, "Entrepreneurship" 8 th Edition, Tata McGraw-Hill, 2013.
6. Mathew J Manimala, "Enterprenuership theory at cross roads: paradigms and praxis" 2 nd Edition Dream tech, 2005.

CW8014	DIGITAL MARKETING	L T P C
		3 0 0 3

OBJECTIVES:
- To learn the role of digital marketing in overall marketing strategy
- To understand pertinent concepts in digital marketing, like, marketing datasets, dummy display ads, virtual website optimization, SEO, and so on.
- To learn analytical concepts to measure marketing effectiveness, like, analytical software, launching of dummy display ads, creating optimization of website through Google Adwords, etc.
- To apply the above learned concepts in the creation of a holistic online marketing plan, in line with the main marketing strategy.

UNIT I   INTRODUCTION TO DIGITAL MARKETING   9
Digital marketing - Importance of digital marketing-Difference between traditional and digital marketing- Digital marketing platforms- recent trends and current scenario of the industry - digital marketing as a tool for students, professionals and businesses-Tools.

UNIT II   WEBSITE DESIGNING AND OPTIMIZATION   9
On Page Optimisation (OPO)- HTML and CSS basics- Meta tags usage- Using Javascript - Contextual interlinking - Microformats & schemas - Off-Page Optimization - Linking Strategies - Competitor Analysis-Sculpting-Link baiting - Social Book Marking and Promotions- Directory submissions-Search Engine Optimization (SEO)- Growth of SEO-Ecosystem of a search engine-SEO Tools.

UNIT III   SEARCH ENGINE MARKETING   9
SEM platforms- Google Adwords – Ad creation process- Keyword grouping-Bidding techniques – Site targeting & keyword targeting -Ad approval process – Ad extensions- Site, Demographic targeting, CPC-based, CPA-based & CPM-based accounts

UNIT IV   SOCIAL MEDIA MARKETING   9
Social Media Marketing- Email Marketing- Mobile Marketing - Adsense, Blogging and Affiliate Marketing.

UNIT V   WEB ANALYTICS   9
Introduction to Web Analytics- GA Terminology (Dimensions & Metrics)- Introduction to Reports- Audience Reports, Traffic Sources and Content Reports- Campaign Tagging & Reporting- Dashboard- Linking and Using Data from Google Adwords- Case studies on digital marketing strategies.

OUTCOME:
Upon Completion of the course, the students should be able to:

- Explain the role and importance of digital marketing in a rapidly changing business landscape.
- Examine how marketing, operations, and human resources interact in real-time delivery.
- Applying applicable marketing ideas and structures, explain emerging developments in digital marketing and critically evaluate the usage of digital marketing tools.
- Discuss the key elements of a digital marketing strategy.
- Demonstrate advanced practical skills in common digital marketing tools such as SEO, SEM, Social media and Blogs

TEXTBOOKS:
1. Seema Gupta, Digital Marketing, McGraw Hill, 2nd Edition, 2020.
2. Subhankar Das, Search Engine Optimization and Marketing A Recipe for Success in Digital Marketing, CRC Press, 2021.
3. Chuck Hemann, Ken Burbary, Digital Marketing Analytics, Pearson, Second Edition, 2019.

REFERENCES :

1. <u>Dave Chaffey</u>, <u>Fiona Ellis-Chadwick</u>, Digital Marketing: Strategy, Implementation and Practice 7th Edition, Pearson, 2019.
2. Ian Dodson, The Art of Digital Marketing: The Definitive Guide to Creating Strategic, Targeted, and Measurable Online Campaign, Wiley, 2016.
3. Rob Stokes, eMarketing The Essential Guide to Marketing in a digital world, Quirk eMarketing.
4. Shivani Karwal, Digital Marketing Handbook: A Guide to Search Engine Optimization, 2015.
5. Jacobson, Howie, McDonald, Joel and McDonald, Kristie, Google AdWords For Dummies, 3rd Edition, O'Reilly, 2011.
6. http://www.gbv.de/dms/zbw/865712123.pdf
7. https://www.redandyellow.co.za/content/uploads/woocommerce_uploads/2017/10/emarketing_textbook_download.pdf

CW8015   **RISK ANALYTICS**   **L T P C**
                                                                                 3 0 0 3

OBJECTIVES:
- To develop a basic understanding of risk assessment and its role within the risk management process.
- To differentiate between risk assessment and risk management.
- To develop a basic understanding of how to conduct and evaluate an uncertainty analysis for a risk assessment
-

UNIT I   INTRODUCTION   9

Introduction, Fundamentals of Risk- Risk Planning, Assessment and Management Process and the Systems Approach-Types of Risk Assessment- Risk, Hazard, Performance and Engineering Risk Assessment

UNIT II   RISK IDENTIFICATION   9

Risk Identification- Historical data, comparative analysis, and checklist- Taxonomy based, risk breakdown structure, HHM, SWOT, root cause analysis, influence diagram- Expert/ user/ stakeholder-based elicitation (Delphi, brainstorming, interview), Scenario-based, experience based, objective-based analysis.

UNIT III   TOOLS AND METHODS FOR RISK ASSESSMENT   9

Preliminary Hazard Analysis (PHA), Hazards and Operability Analysis (HAZOP) - Job Safety Analysis (JSA) - Failure Modes and Effects Analysis (FMEA)- Fault Tree Analysis (FTA), Event Tree Analysis (ETA), Decision Trees- Cause-Consequence Analysis (CCA).

UNIT IV   RISK PRIORITIZATION & TREATMENT   9

Risk Probability and Impact Assessment, Risk Index and Risk Ranking - – Risk Matrix, EV Analysis, Sensitivity and Tradeoff Analysis, Modeling and Simulation- Risk Attitude and Risk Tolerance, As Low As Reasonably Practicable (ALARP)- Avoidance, Separation, Reduction, Transfer, Acceptance- Detection, Control, Response and Recovery- Performance Monitoring.

UNIT V   SPECIAL TOPICS AND APPLICATION   9

ISO3100, Quality and Reliability- Supply Chain Risk Management- Project Risk Management- Positive Risk/ Opportunities Management- Risk and TOC.

OUTCOME:
Upon Completion of the course, the students should be able to:
- Identify the core types of project risks.
- Use qualitative and quantitative risk assessment methods.
- Competently use risk simulation techniques and other risk analysis tools/methods and work in a group to create a risk management plan based on the ISO 31000:2009.
- Identify a range of risk management issues/challenges and the risks as complex systems cascade and be competent to initiate potential actions in response;

TEXTBOOKS:
1. Marvin RausandStein Haugen, Risk Assessment: Theory, Methods, and Applications, John Wiley & Sons, 2020.
2. Vlasta Molak, Fundamentals of Risk Analysis and Risk Management, CRC Press.
3. Mohammad Modarres, Risk Analysis in Engineering Techniques, Tools and Trends, Taylor & Francis, CRC Press, 2016.

REFERENCES :
1. Marvin Rausand Stein Haugen , Risk Assessment: Theory, Methods, and Applications, Wiley, 2020.
2. Mohammad Modarres , Risk Analysis in Engineering Techniques, Tools, and Trends, CRC Press, 2006.

CW8016   CUSTOMER RELATION MANAGEMENT AND CUSTOMER EXPERIENCE
MANAGEMENT   L T P C
3 0 0 3

COURSE OBJECTIVES:
- Learning the fundamentals of strategic, operational and analytical CRM to enhance customer experience.

UNIT I   UNDERSTANDING CUSTOMER RELATIONSHIPS   9

CRM definition and constituencies, understanding and misunderstanding CRM, the social CRM fit, commercial contexts, the third sector- not-for-profit, CRM models. Relationship quality, customer lifetime value, relationships with customers and suppliers. Managing the customer lifecycle – customer acquisition, retention and development.

UNIT II   STRATEGIC CRM   9

Customer portfolio management (CPM) - Customer portfolio, basic disciplines of CPM, CPM in B2B context, CPM models, tools for CPM, strategically significant customers, seven core customer management strategies.

UNIT III   OPERATIONAL CRM   9

Sales force automation (SFA) – SFA and its ecosystem, SFA software functionality, SFA adaptation. Marketing automation (MA) – definition of MA, benefits and software applications.

Service Automation (SA) –customer service definition, modelling service quality, software for SA, benefits of SA, customer service excellence certification.

UNIT IV ANALYTICAL CRM 9
Customer database management –corporate customer data, structured and unstructured data, developing a customer database, data – integration, warehousing and marts in the CRM context, knowledge management, Analytics for – CRM strategy and tactics, customer lifecycle, structured and unstructured data, Big data analytics in CRM, analytical insights.

UNIT V MANAGING CUSTOMER EXPERIENCE AND VALUE 9
Understanding Value and when do customers experience value, Modelling customer-perceived value, Sources of customer value, Value through the marketing mix, Customisation for customer value. Understanding customer experience and concepts, how to manage customer experience, CRM vs CEM, Use of CRM software in CEM

TOTAL : 45 PERIODS

COURSE OUTCOMES
- Understanding and applying the elements and tools of CRM to manage customer portfolios.

TEXT BOOK(S)
1. Buttle Francis and Maklan Stan, Customer Relationship Management – Concepts and Technologies, Special Indian edition, Fourth edition, Routledge, 2019.
2. Gerardus Blokdyk, Customer Relationship Management – A complete guide 2020 edition, 5starcooks, 2019.

REFERENCES :
1. Henry Assael, Consumer Behavior, Cengage Learning, 6th Edition, 2008
2. Kumar, Customer Relationship Management - A Database Approach, Wiley India, 2012.
3. V. Kumar and Werner Reinartz, Customer Relationship Management, Concept, Strategy and Tools, Springer 2018.
4. Zikmund, Customer Relationship Management, Wiley 2012.
5. G. Shainesh, J. Jagdish N Seth. Customer Relationship Management : Emerging Concepts, Tools and Application, McGraw Hill Education, 2017.

CW8017	IT PROJECT MANAGEMENT	L T P C
		3 0 0 3

OBJECTIVES:
- To learn the concepts of managing IT projects.
- To learn more about planning, budgeting and scheduling
- To understand resource allocation, control, and completion
- To learn software quality management

UNIT I INTRODUCTION TO PROJECT MANAGEMENT 9
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   9
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   9
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   9
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   9
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.

TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:
- Apply project management principles in business situations
- Learn more about planning, budgeting and scheduling
- Optimize resource utilization and time optimization
- Understand resource allocation, control, and completion
- Learn software quality management

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.

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

CW8018   **ENTERPRISE SECURITY**   **L T P C**
                                                                          3 0 0 3

COURSE OBJECTIVE:
- The course provides students with a framework for understanding enterprise security in today's world. Students learn how to evaluate business processes related to risk management, business continuity, auditing, and security issues in software development.

UNIT I   INTRODUCTION   9
Developing a Secure Foundation-threat and vulnerabilities-Security Categorization Applied to Information Types & Information Systems-Minimum Security Requirements-Infrastructure Security Model Components-Systems Security Categorization-Business Impact Analysis-Risk Management.

UNIT II   PLANNING , MANAGEMENT AND MONITORING   9
Phases of Security-Focused Configuration Management-Security Configuration Management Plan-Baseline Identification-Roles and Responsibilities-Measurements-Configuration Audits-Types of Plans-Continuous Monitoring Strategy-Continuous Monitoring Program-Monitoring and Assessment Frequencies.

UNIT III   SECURITY ARCHITECTURE   9
The Meaning of Security - Measuring and Prioritizing Business Risk-Empowering the Customers-Protecting Relationships and Leveraging Trust-The Meaning of Architecture-Information Systems Architecture-Enterprise Security Architecture-Security Architecture Model-The SABSA Model-Contextual and Conceptual Security Architecture

UNIT IV   SECURITY POLICY , OPERATIONAL RISK AND ASSURANCE MANAGEMENT
                                                                               9

Structuring the Content of a Security Policy-Policy Hierarchy and Architecture-Policy Principles-Types of Security Policies-Complexity of Operational Risk Management-Approaches to Risk Assessment-Risk Mitigation-Risk Financing-Assurance of Operational Continuity-Security Audits-Functional & Penetration Testing.

UNIT V   SECURITY ADMINISTRATION, OPERATIONS AND VALIDATION   9
Introduction-Managing the People-Managing Physical and Environmental Security-Managing ICT Operations and Support-Access Control Management-Compliance Management-Security-Specific Operations- Managed Security Services-Product Evaluation and Selection-Business Continuity Management-Certification and Accreditation Process-General Process Phase I & II.

COURSE OUTCOMES:
At the end of this course, the students will be able to:
- Design appropriate security architecture with an understanding of the technology
- Create and deploy enterprise solutions in support of organizational goals
- Plan and implement projects related to infrastructure, security, software development.
- Interpret and manage IT governance policies.

TEXTBOOKS:
1. James A. Scholz, Enterprise Architecture and Information Assurance Developing a Secure Foundation, CRC Press, 2013.(UNIT –I &II)

2. John Sherwood, Andrew Clark, David Lynas, Enterprise Security Architecture A Business-Driven Approach, CRC Press, 2005. (UNIT-III,IV and V)

REFERENCE BOOKS:
1. John R.Vacca, Computer and Information Security Handbook, Second Edition, Elsevier 2013.
2. Michael E. Whitman, Herbert J. Mattord, Principal of Information Security, Fourth Edition, Cengage Learning, 2012.

CW8019	QUANTUM COMPUTATION AND QUANTUM INFORMATION	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To learn quantum computation and quantum information
- To understand quantum entanglement, quantum algorithms
- To understand quantum channels
- To learn quantum information theory

UNIT I   INTRODUCTION   9

Quantum states, density operators, generalized measurements, quantum operations/channels, no-cloning theorem.

UNIT II   QUANTUM CORRELATIONS   9

Bell inequalities and entanglement, Schmidt decomposition, super-dense coding, teleportation, PPT criterion.

UNIT III   QUANTUM GATES AND ALGORITHMS   9

Universal set of gates, quantum circuits, Solovay-Kitaev theorem, Deutsch-Jozsa algorithm, period-finding, factoring, Shor's algorithm, quantum search, Abelian quantum hidden subgroup problem.

UNIT IV   QUANTUM INFORMATION THEORY AND QUEANTUM CRYPTOGRAPHY   9

Shannon entropy, noiseless coding theorem, von Neumann entropy and properties, Schumacher compression, noisy-coding theorem. **Quantum cryptography:** quantum key distribution, entropic uncertainty relations

UNIT V   QUANTUM NOISE AND ERROR-CORRECTION   9

Distance measures, Knill-Laflamme conditions, quantum error-correcting codes, Hamming bound.

TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:
- Learn quantum computation and quantum information
- Understand quantum entanglement, quantum algorithms
- Understand quantum channels
- Learn quantum information theory

TEXT BOOKS :

1. Quantum Computation and Quantum Information, M. A. Nielsen & I.Chuang, Cambridge University Press (2000).
2. Lecture notes by Prof. John Preskill, California Institute of Technology

REFERENCES :

1. The mathematical language of quantum theory: from uncertainty to entanglement, T. Hienosaari & M. Ziman, Cambridge University Press (2011).
2. Quantum systems, channels, information, A.S. Holevo, de Gruyter Studies in Mathematical Physics (2012).
3. Quantum information Theory, Mark M. Wilde, Cambridge University Press (2012).
4. Quantum error correction, D. A. Lidar & T. A. Brun, Cambridge University Press (2013).

CW8020	EMBEDDED SYSTEMS AND ROBOTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To know about different components of Embedded System
- To understand embedded Networking Technologies &Various scheduling algorithms.
- To understand the concepts of RTOS, memory interface, communication process.
- To know more about embedded System Applications.
- To understand the parts of Robot and fields of robotics.
- To know about robotic control for some specific applications.

UNIT I   INTRODUCTION TO EMBEDDED SYSTEMS   9

Introduction to Embedded Systems –Structural units in Embedded processor , selection of processor & memory devices- DMA – Memory management methods- Timer and Counting devices, Watchdog Timer, Real Time Clock, In circuit emulator, Target Hardware Debugging.

UNIT II   EMBEDDED NETWORKING & RTOS   9

Introduction, I/O Device Ports & Buses– Serial Bus communication protocols-Bus -Serial Peripheral Interface (SPI) – Inter Integrated Circuits (I2C) –need for device drivers.Introduction to basic concepts of RTOS- Task, process & threads, interrupt routine,task scheduling & communication,inter process communication,semaphore, priority inversion & inheritance.

UNIT III   EMBEDDED SYSTEM APPLICATION AND DEVELOPMENT   9

Case Study of Washing Machine- Automotive Application- Smart card System Application-ATM machine –Digital camera.

UNIT IV   INTRODUCTION TO ROBOTICS   9

Definition and origin of robotics – different types of robotics – various generations of robots – degrees of freedom – Robot classifications and specifications- Asimov's laws of robotics – dynamic

stabilization of robots.

UNIT V   MANIPULATORS AND GRIPPERS DIFFERENTIAL MOTION   9

Construction of manipulators – manipulator dynamics and force control – electronic and pneumatic manipulator control circuits – end effectors – U various types of grippers – design considerations.

TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:
- Learn the basic concept of embedded processor ,I/O ports and Buses and RTOS
- Analyze the various communication protocols for different applications
- Apply the processor scheduling algorithms in embedded systems application
- Summarize inter process communication, semaphore, priority inversion & inheritance
- Design and develop embedded system for various applications
- Summarize basic robotic concepts, types & various robotics control schemes

TEXT BOOKS :
1. Rajkamal, 'Embedded System-Architecture, Programming, Design', McGraw Hill, 2013.
2. Peckol, "Embedded system Design", John Wiley & Sons,2010
3. Mikell P. Weiss G.M., Nagel R.N., Odraj N.G., Industrial Robotics, McGraw-Hill Singapore,2015.
4. Saeed B Niku, Introduction to Robotics, Analysis, Systems, Applications Prentice Hall, 3 edition 2104.

REFERENCES :
1. Shibu. K.V, "Introduction to Embedded Systems", Tata Mcgraw Hill,2009.
2. Elicia White," Making Embedded Systems", O' Reilly Series,SPD,2011.
3. Tammy Noergaard, "Embedded Systems Architecture", Elsevier, 2006.
4. Deb.S.R., Robotics technology and flexible Automation, John Wiley, USA 1992.
5. R.K.Mittal and I.J.Nagrath, Robotics and Control, Tata McGraw Hill, New Delhi,4th Reprint,2005

CW8021	CLOUD, MICRO SERVICES AND APPLICATION	L	T	P	C
		3	0	0	3

OBJECTIVES:
- To introduce service-oriented and micro-services architecture.
- To understand the technology underlying service design and micro-services applications.
- To be familiar with DevOps practices
- To integrate DevOps with Cloud

UNIT I   SOA AND MICROSERVICE ARCHITECTURE BASICS   9
SOA and MSA – Basics – Evolution of SOA & MSA – Drivers for SOA – Dimensions, Standards and Guidelines for SOA – Emergence of MSA – Enterprise-wide SOA – Strawman and SOA

Reference Architecture – OOAD Process & SOAD Process – Service Oriented Application – Composite Application Programming Model.

UNIT II   MICROSERVICE BASED APPLICATIONS   9
Implementing Microservices with Python – Microservice Discovery Framework – Coding, Testing & Documenting Microservices – Interacting with Other Services – Monitoring and Securing the Services – Containerized Services – Deploying on Cloud.

UNIT III   DEVOPS   9
DevOps: Motivation-Cloud as a platform-Operations- Deployment Pipeline: Over all Architecture Building and Testing-Deployment- Case study: Migrating to Micro services.

UNIT IV   CLOUD AND DEVOPS   9
Origin of DevOps - The developers versus operations dilemma - Key characteristics of a DevOps culture – Deploying a Web Application - Creating and configuring an account - Creating a web server - Managing infrastructure with Cloud Formation - Adding a configuration management system

UNITV   WORKING WITH APIs   9
Working with Third Party APIs: Overview of interconnectivity in cloud ecosystems. Working with Twitter API, Flickr API, Google Maps API. Advanced use of JSON and REST.

                     TOTAL : 45 PERIODS

OUTCOME:
Upon Completion of the course, the students should be able to:
- Understand the advantages of DevOps practices
- Implement SOA with Micro Services applications
- Analyze a real world problem and develop a cloud based software solution.

REFERENCES:
1. Shankar Kambhampaty, "Service-oriented Architecture &Microservice Architecture: For Enterprise, Cloud, Big Data and Mobile", Third Edition, Wiley, 2018.
2. Tarek Ziadé , "Python Microservices Development", O'REILLY publication,2017.
3. Len Bass, Ingo Weber and Liming Zhu, "DevOps: A Software Architect"s Perspective", Pearson Education, 2016
4. Nathaniel Felsen, "Effective DevOps with AWS", Packt Publishing, [ISBN:9781786466815], 2017
5. Jim Webber, SavasParastatidis, Ian Robinson, "REST in Practice" O'Reilly Media; 1 edition, [ISBN: 978-0596805821] 2010.