AUTONOMOUS
CURRICULUM & SYLLABUS
I-VIII
SEMESTERS

PRATHYUSHA ENGINEERING COLLEGE

An Autonomous Institution
NAAC "A" Grade | NBA accredited
Poonamallee-Tiruvallur Road, Thiruvallur - 602 025.
www.prathyusha.edu.in

REGULATIONS
2017

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Academic Batch 2020-2024

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DEPARTMENT OF
ARTIFICIAL INTELLIGENCE & DATA SCIENCE

Academic Batch 2020-2024

REGULATIONS 2021
Curriculum & Syllabus

PRATHYUSHA ENGINEERING COLLEGE

VISION

To emerge as a premier technical and Engineering institution in the country by imparting quality education and thus facilitate our students to blossom into dynamic professionals, so that they play a vital role for the progress of the nation and for a peaceful co-existence of our fellow human beings.

MISSION

Prathyusha Engineering College will strive to emerge as a premier Institution in the country by

- To provide state-of-the-art infrastructure facilities
- Imparting quality education and training through qualified, experienced and committed members of the faculty
- Empowering the youth by providing Professional Leadership
- Developing Centres of Excellence in frontier areas of Engineering, Technology and Management
- Networking with Industry, Corporate and Research Organizations centre of excellence

DEPARTMENT OF ARTIFICIAL INTELLIGENCE & DATA SCIENCE

VISION

To strive for global recognition through Research, Innovation and Excellence in imparting Quality Education to provide face lift to the students as solution providers to the modern society.

MISSION.

- To imbibe the skills of simulating human intelligence in the students and to equip them with interdisciplinary skills using modern pedagogy.
- To build digital learning content in the realm of AI&DS under pinning the theories of cognitive science.
- To help learners to develop competency in algorithmic approaches in resolving complexities of real time problems.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1: To equip and enhance the proficiency of Graduates and thus encourage them to utilize the fundamental knowledge of basic sciences, mathematics, Artificial Intelligence, Data Science and Statics to build systems that require management and analysis of large volume of data.

PEO-2: To invite the graduates with required technical skills to enable them pursue pioneering research in the field of Artificial Intelligence and Data Science and thus create disruptive and sustainable solutions for the welfare of Eco System.

PEO-3: To inspire the graduates to think logically and help them to pursue lifelong learning and collaborate with an ethical attitude in a multi-disciplinary team.

PROGRAM OUTCOMES (POs)

A Graduate of Computer Science and Engineering Programme will demonstrate and will be able to:

PO1: Engineering Knowledge: Apply the knowledge of Mathematics, Science, Engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.

PO2: 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.

PO3: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.

PO4: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.

PO5: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.

PO6: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.

PROGRAM OUTCOMES (POs)

PO7:Environment and sustainability: Understand the impact of the professional Engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and the need for sustainable developments.

PO8:Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the Engineering practice.

PO9:Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.

PO10: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.

PO11: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 multi-disciplinary environments.

PO12:Life-Long learning: Recognize the need for, and have the preparation and ability to engage in independent and life- long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES (PSOs)

The graduate will be able to

PSO1: Graduates would be able to evolve Artificial Intelligence based efficient domain specific process for effective and purposeful decision making in various domains including business and governments.

PSO2: Graduates should be able to solve business and engineering problems with foresight and insight from available data within the resources.

PSO3: The application of theoretical knowledge of Artificial Intelligence and data analysis packed with industrial tools and techniques should be able to help the graduates to solve the day-to-day problems emerging out of the social evils.

SEMESTER I

Sl. 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

Sl. 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	BS	3	3	0	0	3
5.	BE8255	Basic Electrical, Electronics, and Measurement Engineering	ES	3	3	0	0	3
6.	AD8252	Digital Principles and Computer Organization	ES	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

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8351	Discrete Mathematics	BS	4	4	0	0	4
2.	AD8301	Introduction to Operating Systems	PC	5	3	0	2	4
3.	AD8302	Fundamentals of Data Science	PC	3	3	0	0	3
4.	CS8392	Object Oriented Programming	PC	3	3	0	0	3
5.	AD8351	Design and Analysis of Algorithms	PC	5	3	0	2	4
PRACTICALS								
6.	AD8311	Data Science Laboratory	PC	4	0	0	4	2
7.	CS8383	Object Oriented Programming Laboratory	PC	4	0	0	4	2
8.	HS8381	Interpersonal Skills/Listening & Speaking	HS	2	0	0	2	1
			TOTAL	**30**	**16**	**0**	**14**	**23**

SEMESTER IV

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	MA8391	Probability and Statistics	BS	4	4	0	0	4
2.	AD8401	Database Design and Management	PC	3	3	0	0	3
3.	AD8402	Artificial Intelligence I	PC	3	3	0	0	3
4.	AD8403	Data Analytics	PC	3	3	0	0	3
5.		Professional Elective I	PE	3	3	0	0	3
PRACTICALS								
6.	AD8411	Database Design and Management Laboratory	PC	4	0	0	4	2
7.	AD8412	Data Analytics Laboratory	PC	4	0	0	4	2
8.	AD8413	Artificial Intelligence – I Laboratory	PC	4	0	0	4	2
9.	HS8461	Advanced Reading and Writing	HS	2	0	0	2	1
			TOTAL	**30**	**16**	**0**	**14**	**23**

SEMESTER V

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AD8501	Optimization Techniques	PC	4	4	0	0	4
2.	CW8691	Computer Networks	PC	5	3	0	2	4
3.	AD8502	Data Exploration and Visualization	PC	5	3	0	2	4
4.	AD8551	Business Analytics	PC	3	3	0	0	3
5.	AD8552	Machine Learning	PC	3	3	0	0	3
6.		Open Elective I	OE	3	3	0	0	3
7.		Naan Mudhalvan	EEC	4	0	0	4	2
PRACTICALS								
8.	AD8511	Machine Learning Laboratory	PC	4	0	0	4	2
9	AD8512	Mini Project on Data Sciences Pipeline	PC	4	0	0	4	2
			TOTAL	**35**	**19**	**0**	**16**	**27**

SEMESTER VI

Sl. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AD8601	Artificial Intelligence II	PC	3	3	0	0	3
2.	AD8602	Data and Information Security	PC	3	3	0	0	3
3.	IT8501	Web Technology	PC	3	3	0	0	3
4.		Naan Mudhalvan	EEC	4	0	0	4	2
5.		Professional Elective III	PE	3	3	0	0	3
PRACTICALS								
6.	IT8511	Web Technology Laboratory	PC	4	0	0	4	2
7.	AD8611	Artificial Intelligence - II Laboratory	PC	4	0	0	4	2
8.	HS8581	Professional Communication	HS	2	0	0	2	1
9.	AD8612	Socially relevant Project	PC	4	0	0	4	2
			TOTAL	**30**	**12**	**0**	**18**	**21**

SEMESTER VII

Sl. No	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
THEORY								
1.	AD8701	Deep Learning	PC	3	3	0	0	3
2.	AD8702	Text Analytics	PC	3	3	0	0	3
3.	AD8703	Basics of Computer Vision	PC	3	3	0	0	3
4.	AD8704	Big Data Management	PC	5	3	0	2	4
5.	AD8705	AI and Robotics	PC	5	3	0	2	4
6.		Naan Mudhalvan	EEC	4	0	0	4	2
PRACTICALS								
7.	AD8711	Deep Learning Laboratory	PC	4	0	0	4	2
8.	AD8712	Mini Project on Analytics	PC	4	0	0	4	2
			TOTAL	**31**	**15**	**0**	**16**	**23**

SEMESTER VIII

Sl. 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.	AD8811	Project Work	PC	20	0	0	20	10
			TOTAL	**26**	**6**	**0**	**20**	**16**

TOTAL NO. OF CREDITS: 183

PROFESSIONAL ELECTIVES (PE)

SEMESTER IV, ELECTIVE - I

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	EC8691	Microprocessors and Microcontrollers	PE	3	3	0	0	3
2.	AD8001	Software Development Processes	PE	3	3	0	0	3
3.	AD8002	Health Care Analytics	PE	3	3	0	0	3
4.	AD8003	Mobile Applications Development	PE	3	3	0	0	3
5.	AD8004	Parallel Computing	PE	3	3	0	0	3

SEMESTER VI, ELECTIVE - II

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	AD8005	Embedded Systems and Programming	PE	3	3	0	0	3
2.	CW8591	Software Architecture	PE	3	3	0	0	3
3.	AD8006	Engineering Predictive Analytics	PE	3	3	0	0	3
4.	CS8603	Distributed Systems	PE	3	3	0	0	3
5.	CS8072	Agile Methodologies	PE	3	3	0	0	3

SEMESTER VI, ELECTIVE - III

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	CS8081	Internet of Things	PE	3	3	0	0	3
2.	AD8007	Software Testing and Quality Assurance	PE	3	3	0	0	3
3.	CS8791	Cloud Computing	PE	3	3	0	0	3
4.	CS8085	Social Network Analytics	PE	3	3	0	0	3
5.	AD8008	Web Services and API Design	PE	3	3	0	0	3

SEMESTER VIII, ELECTIVE - IV

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	AD8009	Operations and Supply Chain Management	PE	3	3	0	0	3
2.	AD8010	Speech Processing and Analytics	PE	3	3	0	0	3
3.	AD8011	Cyber Security	PE	3	3	0	0	3
4.	AD8012	Nonlinear Optimization	PE	3	3	0	0	3
5.	AD8013	Ethics Of Artificial Intelligence	PE	3	3	0	0	3

SEMESTER VIII, ELECTIVE - V

Sl. No.	COURSE CODE	COURSE TITLE	CATE GORY	CONTACT PERIODS	L	T	P	C
1.	AD8014	Engineering Economics	PE	3	3	0	0	3
2.	AD8081	Cognitive Science and Analytics	PE	3	3	0	0	3
3.	MG8591	Principles of Management	PE	3	3	0	0	3
4.	AD8015	Bio-inspired Optimization Techniques	PE	3	3	0	0	3
5.	AD8016	Information Extraction and Retrieval	PE	3	3	0	0	3

SEMESTER V - NAAN MUDALVAN COURSES

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	SB8013	Augmented Reality & Virtual Reality Development	EEC	4	0	0	4	2
2	SB8017	Cloud Essentials	EEC	4	0	0	4	2
3	SB8014	Full Stack	EEC	4	0	0	4	2
4	SB8016	Big Data Analytics	EEC	4	0	0	4	2
5	SB8007	Machine Learning With Application To Object	EEC	4	0	0	4	2

SEMESTER VI - NAAN MUDALVAN COURSES

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1	SB8040	Professional Readinesss for Innovation, Employment and Entrepreneurship	EEC	4	0	0	4	2
2	SB8033	Network Engineering	EEC	4	0	0	4	2

SEMESTER VII - NAAN MUDALVAN COURSES

Sl. No.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1		Full Stack Development with JAVA	EEC	4	0	0	4	2

HUMANITIES AND SOCIAL SCIENCES (HS)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	HS8151	Communicative English	HS	4	4	0	0	4
2.	HS8251	Technical English	HS	4	4	0	0	4
3.	HS8381	Interpersonal Skills/Listening& Speaking	HS	2	0	0	2	1
4.	HS8461	Advanced Reading and Writing	HS	2	0	0	2	1
5.	HS8581	Professional Communication	HS	2	0	0	2	1

BASIC SCIENCES (BS)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	MA8151	Engineering Mathematics–I	BS	4	4	0	0	4
2.	PH8151	Engineering Physics	BS	3	3	0	0	3
3.	CY8151	Engineering Chemistry	BS	3	3	0	0	3
4.	BS8161	Physics and Chemistry Laboratory	BS	4	0	0	4	2
5.	MA8252	Linear Algebra	BS	4	4	0	0	4
6.	MA8351	Discrete Mathematics	BS	4	4	0	0	4
7.	GE8291	Environmental Science and Engineering	BS	3	3	0	0	3
8.	MA8391	Probability and Statistics	BS	4	4	0	0	4

ENGINEERING SCIENCES (ES)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	GE8151	Problem Solving and Python Programming	ES	3	3	0	0	3
2.	GE8152	Engineering Graphics	ES	6	2	0	4	4
3.	GE8161	Problem Solving and Python Programming Laboratory	ES	4	0	0	4	2
4.	BE8255	Basic Electrical, Electronics and Measurement Engineering	ES	3	3	0	0	3
5.	GE8261	Engineering Practices Laboratory	ES	4	0	0	4	2
6.	AD8252	Digital Principles and Computer Organization	ES	5	3	0	2	4

PROFESSIONAL CORE (PC)

SI. NO	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	AD8251	Data Structures Design	PC	3	3	0	0	3
2.	AD8261	Data Structures Design Laboratory	PC	5	0	0	4	2
3.	AD8301	Introduction to Operating Systems	PC	5	3	0	2	4
4.	AD8302	Fundamentals of Data Science	PC	3	3	0	0	3
5.	CS8392	Object Oriented Programming	PC	3	3	0	0	3
6.	AD8351	Design and Analysis of Algorithms	PC	5	3	0	2	4
7.	AD8311	Data Science Laboratory	PC	4	0	0	4	2
8.	CS8383	Object Oriented Programming Laboratory	PC	4	0	0	4	2
9.	AD8401	Database Design and Management	PC	3	3	0	0	3

10.	AD8402	Artificial Intelligence I	PC	3	3	0	0	3
11.	AD8403	Data Analytics	PC	3	3	0	0	3
12.	AD8411	Database Design and Management Laboratory	PC	4	0	0	4	2
13.	AD8412	Data Analytics Laboratory	PC	4	0	0	4	2
14.	AD8413	Artificial Intelligence–I Laboratory	PC	4	0	0	4	2
15.	AD8501	Optimization Techniques	PC	4	4	0	0	4
16.	CW8691	Computer Networks	PC	5	3	0	2	4
17.	AD8502	Data Exploration and Visualization	PC	5	3	0	2	4
18.	AD8551	Business Analytics	PC	3	3	0	0	3
19.	AD8552	Machine Learning	PC	3	3	0	0	3
20.	AD8511	Machine Learning Laboratory	PC	4	0	0	4	2
21.	AD8512	Mini Projector Data Sciences Pipeline	PC	4	0	0	4	2
22.	AD8601	Artificial Intelligence II	PC	3	3	0	0	3
23.	AD8602	Data and Information Security	PC	3	3	0	0	3
24.	IT8501	Web Technology	PC	3	3	0	0	3
25.	IT8511	Web Technology Laboratory	PC	4	0	0	4	2
26.	AD8611	Artificial Intelligence-II Laboratory	PC	4	0	0	4	2
27.	AD8612	Socially relevant Project	PC	4	0	0	4	2
28.	AD8701	Deep Learning	PC	3	3	0	0	3
29.	AD8702	Text Analytics	PC	3	3	0	0	3
30.	AD8703	Basics of Computer Vision	PC	3	3	0	0	3
31.	AD8704	Big Data Management	PC	5	3	0	2	4
32.	AD8705	AI and Robotics	PC	5	3	0	2	4
33.	AD8711	Deep Learning Laboratory	PC	4	0	0	4	2
34.	AD8712	Mini Project on Analytics	PC	4	0	0	4	2
35.	AD8811	Project Work	PC	20	0	0	20	10

SUMMARY:

B.TECH. ARTIFICAL INTELLIGENCE AND DATA SCIENCE									
S.NO.	SUBJECT AREA	Credits per Semester							Credits Total
		I	II	III	IV	V	VI	VII	VIII	
1.	HS	4	4	1	1		1			11
2.	BS	12	7	4	4					27
3.	ES	9	9							18
4.	PC		5	18	15	22	15	21	10	106
5.	PE				3		3		6	12
6.	OE					3				3
7.	EEC					2	2	2		6
	TOTAL	25	25	23	23	27	21	23	16	183

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 RajeevanGeeta. 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.

PH8151 ENGINEERING PHYSICS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To enhance the fundamental knowledge in Physics and its applications relevant to various streams of Engineering and Technology.
- To make the students in understanding the importance of mechanics.
- To equip the students on the knowledge of electromagnetic waves.
- To introduce the basics of oscillations, optics and lasers.

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:

4. Friedrich Emich, "Engineering Chemistry", Scientific International PVT, LTD, New Delhi, 2014.
5. PrasantaRath, "Engineering Chemistry", Cengage Learning India PVT, LTD, Delhi, 2015.
6. 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 sheets.
2. IS 9609 (Parts 0 & 1) – 2001: Technical products Documentation – Lettering.
3. IS 10714 (Part 20) – 2001 & SP 46 – 2003: Lines for technical drawings.
4. IS 11669 – 1986 & SP 46 – 2003: Dimensioning of Technical Drawings.

5. 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.
4. The students will be permitted to use appropriate scale to fit solution within A3 size.
5. 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** **L T P C**

(Common to all branches of B.E. / B.Tech Programmes) **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).

HS8251	TECHNICAL ENGLISH	L	T	P	C
		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/ talkts 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 abie 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, ChetanBhagat 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

1. Test the consistency and solve system of linear equations
2. Find the basis and dimension of vector space
3. Obtain the matrix of linear transformation and its eigenvalues and eigenvectors
4. Find orthonormal basis of inner product space and find least square approximation
5. 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.

REFERENCES:

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 HOURS

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, ECOSYSTEMSAND 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 ENVIRONMENTALPOLLUTION **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 NATURALRESOURCES **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 SOCIALISSUESAND 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 POPULATIONAND 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.

TOTAL: 45 PERIODS

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. DharmendraS.Sengar,'Environmentallaw',PrenticehallofIndiaPVTLTD,NewDelhi, 2007.
2. ErachBharucha, "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 ENGINEERING	L	T	P	C
		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. LalSeksena and KaustuvDasgupta, 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

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

TOTAL:60 PERIODS

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.

AD8301 INTRODUCTION TO OPERATING SYSTEMS **L T P C**
3 0 2 4

COURSE OBJECTIVES

- To understand the structure and functions of OS
- To learn about Processes, Threads and Scheduling algorithms
- To understand the principles of concurrency and Deadlocks
- To learn various memory management schemes
- To study I/O management and File systems.

UNIT I OPERATING SYSTEMS OVERVIEW **9**

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; Operating-System Design and Implementation; Operating-System Debugging

UNIT II PROCESS MANAGEMENT **12**

Processes: Process concept – Process scheduling – Operations on processes – Interprocess communication; Threads: Overview – Multithreading models – Thread issues; CPU Scheduling: FCFS, SJF, Priority, Round robin, Rate Monotonic and EDF scheduling; Process synchronization – Critical section problem – Mutex locks – Semaphores; Deadlocks – Avoidance – Prevention – Detection and Recovery.

UNIT III MEMORY MANAGEMENT **8**

Main Memory: Contiguous memory allocation – Segmentation – Paging – 32 and 64 bit architecture Examples; Virtual Memory: Demand paging – Page replacement algorithms – Allocation of Frames – Thrashing.

UNIT IV STORAGE MANAGEMENT **9**

Mass Storage Structure: Overview – Disk scheduling and management; File System Storage: File concepts – Directory and disk structure – Sharing and protection; File System Implementation: File system structure – Directory structure – Allocation methods – Free space management.

UNIT V CASE STUDY **7**

Linux Vs Windows: Design principles – Process management – Scheduling – Memory management – File systems; Mobile OS: iOS and Android – Introduction and architecture.

TOTAL: 45 PERIODS

SUGGESTIVE EXPERIMENTS:

1. Implement the various CPU Scheduling Algorithms
2. Implement Semaphores
3. Implement Bankers Algorithm for Deadlock Avoidance
4. Develop an application using Threads
5. Implement the following Memory Allocation Methods for variable sized partition: a)
6. First Fit b) Worst Fit c) Best Fit
7. Implement Paging Technique of Memory Management
8. Implement the following Page Replacement Algorithms a) FIFO b) LRU c) LFU
9. Implement the following File Allocation Strategies a) Sequential b) Indexed c) Linked
10. Implement Shared memory and IPC

PRACTICAL: 30 PERIODS
TOTAL: 75 PERIODS

COURSE OUTCOMES

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

- Outline the basic services and functionalities of operating systems
- Analyse various scheduling algorithms, and understand the different deadlock, prevention and avoidance schemes
- Illustrate the different memory management schemes
- Outline the functionality of file systems
- Compare and contrast Linux, Windows and mobile operating systems

TEXT BOOKS

1. Abraham Silberschatz, Peter Baer Galvin, Greg Gagne, "Operating System Concepts", 9th Edition, John Wiley and Sons Inc, 2012.
2. Neil Smyth, "iPhone iOS 4 Development Essentials - Xcode", 4th Edition, Payload media,2011.

REFERENCES

1. Ramez 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", 2nd Edition, Pearson Education, 2004.
4. Harvey M Deitel, "Operating Systems", 3rd Edition, Pearson Education, 2004.
5. Daniel P Bovet, Marco Cesati, "Understanding the Linux Kernel", 3rd edition, O'Reilly,2005.

HARDWARE:

1. Standalone Desktops with Linux OS

SOFTWARE:

1. Python

AD8302 FUNDAMENTALS OF DATA SCIENCE **L T P C**
3 0 0 3

COURSE OBJECTIVES

- Will gain knowledge in the basic concepts of Data Analysis
- To acquire skills in data preparatory and preprocessing steps
- To understand the mathematical skills in statistics
- To learn the tools and packages in Python for data science
- To gain understanding in classification and Regression Model
- To acquire knowledge in data interpretation and visualization techniques

UNIT I INTRODUCTION **9**

Need for data science – benefits and uses – facets of data – data science process – setting the research goal – retrieving data – cleansing, integrating, and transforming data – exploratory data analysis – build the models – presenting and building applications

UNIT II DESCRIBING DATA I **9**

Frequency distributions – Outliers – relative frequency distributions – cumulative frequency distributions – frequency distributions for nominal data – interpreting distributions – graphs – averages – mode – median – mean – averages for qualitative and ranked data – describing variability – range – variance – standard deviation – degrees of freedom – interquartile range – variability for qualitative and ranked data

UNIT III PYTHON FOR DATA HANDLING **9**

Basics of Numpy arrays – aggregations – computations on arrays – comparisons, masks, boolean logic – fancy indexing – structured arrays – Data manipulation with Pandas – data indexing and selection – operating on data – missing data – hierarchical indexing – combining datasets – aggregation and grouping – pivot tables

UNIT IV DESCRIBING DATA II **9**

Normal distributions – z scores – normal curve problems – finding proportions – finding scores – more about z scores – correlation – scatter plots – correlation coefficient for quantitative data – computational formula for correlation coefficient – regression – regression line – least squares regression line – standard error of estimate – interpretation of r^2 – multiple regression equations – regression toward the mean

UNIT V PYTHON FOR DATA VISUALIZATION **9**

Visualization with matplotlib – line plots – scatter plots – visualizing errors – density and contour plots – histograms, binnings, and density – three dimensional plotting – geographic data – data analysis using statmodels and seaborn – graph plotting using Plotly – interactive data visualization using Bokeh

COURSE OUTCOMES

At the end of the course Students will be able to:

- Apply the skills of data inspecting and cleansing.
- Determine the relationship between data dependencies using statistics
- Can handle data using primary tools used for data science in Python
- Represent the useful information using mathematical skills
- Can apply the knowledge for data describing and visualization using tools.

TOTAL:45 PERIODS

TEXT BOOKS

1. David Cielen, Arno D. B. Meysman, and Mohamed Ali, "Introducing Data Science", Manning Publications, 2016. (first two chapters for Unit I)
2. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017. (Chapters 1–7 for Units II and III)
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016. (Parts of chapters 2–4 for Units IV and V)

REFERENCES

1. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

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

COURSE OBJECTIVES

- To understand and apply the algorithm analysis techniques.
- To critically analyze the efficiency of alternative algorithmic solutions for the same problem
- To understand and implement different algorithm design techniques.
- To understand the limitations of Algorithmic power

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

OUTCOMES:

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

- Design algorithms for various computing problems.
- Analyze the time and space complexity of algorithms.
- Critically analyze the different algorithm design techniques for a given problem.
- Modify existing algorithms to improve efficiency
- Ability to implement techniques in solving real time problems

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.

AD8311 **DATA SCIENCE LABORATORY** **L T P C**
0 0 4 2

COURSE OBJECTIVES

- Understand the Python Programming packages Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh Language.
- To prepare data for data analysis through understanding its distribution.
- Exposure on data processing using NUMPY and PANDAS
- To acquire knowledge in plotting using visualization tools.
- To understand and implement classification and Regression Model.

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

1. Working with Numpy arrays
2. Working with Pandas data frames
3. Basic plots using Matplotlib
4. Frequency distributions
5. Averages
6. Variability
7. Normal curves
8. Correlation and scatter plots
9. Correlation coefficient
10. Regression

TOTAL:60 PERIODS

COURSE OUTCOMES

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

- Develop relevant programming abilities.
- Demonstrate knowledge of statistical data analysis techniques
- Exhibit proficiency to build and assess data-based models.
- Demonstrate skill in Data management & processing tasks using Python
- Apply data science concepts and methods to solve problems in real-world contexts and will communicate these solutions effectively

REFERENCES:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
3. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

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.

HS8381	INTERPERSONAL SKILLS/LISTENING&SPEAKING	L	T	P	C
		0	0	2	1

OBJECTIVES:

The Course will enable learners to:

- Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.
- Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.
- improve general and academic listening skills
- Make effective presentation

UNIT I

Listening as a key skill- its importance- speaking - give personal information - ask for personal information - express ability - enquire about ability - ask for clarification Improving pronunciation - pronunciation basics taking lecture notes - preparing to listen to a lecture - articulate a complete idea as opposed to producing fragmented utterances.

UNIT II

Listen to a process information- give information, as part of a simple explanation - conversation starters: small talk - stressing syllables and speaking clearly - intonation patterns - compare and contrast information and ideas from multiple sources- converse with reasonable accuracy over a wide range of everyday topics.

UNIT III

Lexical chunking for accuracy and fluency- factors influence fluency, deliver a five-minute informal talk - greet - respond to greetings - describe health and symptoms - invite and offer - accept - decline - take leave - listen for and follow the gist- listen for detail

UNIT IV

Being an active listener: giving verbal and non-verbal feedback - participating in a group discussion - summarizing academic readings and lectures conversational speech listening to and participating in conversations - persuade.

UNIT V

Formal and informal talk - listen to follow and respond to explanations, directions and instructions in academic and business contexts - strategies for presentations and interactive communication - group/pair presentations - negotiate disagreement in group work.

TOTAL :30PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

- Listen and respond appropriately.
- Participate in group discussions
- Make effective presentations
- Participate confidently and appropriately in conversations both formal and informal

TEXT BOOKS:

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

REFERENCES:

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

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 familiarize 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. Probability and Statistics for Engineering and the Sciences, 9E by Jay L. Devore, 2020.
2. Devore. J.L., "Probability and Statistics for Engineering and the Sciences", Cengage Learning, New Delhi, 8th Edition, 2014.
3. Papoulis, A. and Unnikrishnapillai, S., "Probability, Random Variables and Stochastic Processes", McGraw Hill Education India, 4th Edition, New Delhi, 2010.
4. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists", 3rd Edition, Elsevier, 2004.
5. 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.

6. 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.

AD8401 DATABASE DESIGN AND MANAGEMENT L T P C
3 0 0 3

COURSE OBJECTIVES:

- To introduce database development life cycle and conceptual modelling
- To learn SQL for data definition, manipulation and querying a database
- To learn relational database design using conceptual mapping and normalization
- To learn transaction concepts and serializability of schedules
- To learn data model and querying in object-relational and No-SQL databases

UNIT I CONCEPTUAL DATA MODELING 8

Database environment – Database system development lifecycle – Requirements collection – Database design – Entity-Relationship model – Enhanced-ER model – UML class diagrams.

UNIT II RELATIONAL MODEL AND SQL 10

Relational model concepts – Integrity constraints – SQL Data manipulation – SQL Data definition – Views – SQL programming.

UNIT III RELATIONAL DATABASE DESIGN AND NORMALIZATION 10

ER and EER-to-Relational mapping – Update anomalies – Functional dependencies – Inference rules – Minimal cover – Properties of relational decomposition – Normalization (upto BCNF).

UNIT IV TRANSACTION MANAGEMENT 8

Transaction concepts – properties – Schedules – Serializability – Concurrency Control – Two-phase locking techniques.

UNIT V OBJECT RELATIONAL AND NO-SQL DATABASES 9

Mapping EER to ODB schema – Object identifier – reference types – rowtypes – UDTs – Subtypes and supertypes – user-defined routines – Collection types – Object Query Language; No-SQL: CAP theorem – Document-based: MongoDB data model and CRUD operations; Column-based: Hbase data model and CRUD operations.

TOTAL : 45 PERIODS

COURSE OUTCOMES

After the completion of this course, students will be able to:

- Understand the database development life cycle and apply conceptual modeling
- Apply SQL and programming in SQL to create, manipulate and query the database
- Apply the conceptual-to-relational mapping and normalization to design relational dataabse
- Determine the serializability of any non-serial schedule using concurrency techniques
- Apply the data model and querying in Object-relational and No-SQL databasses.

TEXT BOOKS:

1. Thomas M. Connolly, Carolyn E. Begg, *Database Systems – A Practical Approach to Design, Implementation, and Management*, Sixth Edition, Global Edition, Pearson Education, 2015.
2. Ramez Elmasri, Shamkant B. Navathe, *Fundamental of Database Systems*, 7th Edition,

Pearson, 2017.

REFERENCES:

1. Toby Teorey, Sam Lightstone, Tom Nadeau, H. V. Jagadish, "DATABASE MODELING AND DESIGN - Logical Design", Fifth Edition, Morgan Kaufmann Publishers, 2011.
2. Carlos Coronel, Steven Morris, and Peter Rob, Database Systems: Design, Implementation, and Management, Ninth Edition, Cengage learning, 2012
3. Abraham Silberschatz, Henry F Korth, S Sudharshan, "Database System Concepts", 6th Edition, Tata Mc Graw Hill, 2011.
4. Hector Garcia-Molina, Jeffrey D Ullman, Jennifer Widom, "Database Systems:The Complete Book", 2nd edition, Pearson.
5. S Sumathi, S Esakkirajan, " Fundamentals of Relational Database Management Systems ", (Studies in Computational Intelligence), Springer-Verlag, 2007.
6. Raghu Ramakrishnan, "Database Management Systems", 4th Edition, Tata Mc Graw Hill, 2010.

AD8402 ARTIFICIAL INTELLIGENCE I L T P C
3 0 0 3

OBJECTIVES:

The objective of this course is to enable the students to

- Understand the basic concepts of intelligent agents
- Develop general-purpose problem solving agents, logical reasoning agents, and agents that reason under uncertainty
- Employ AI techniques to solve some of today's real world problems.

UNIT I INTELLIGENT AGENTS **9**

Introduction to AI – Agents and Environments – Concept of rationality – Nature of environments – Structure of agents

Problem solving agents – search algorithms – uninformed search strategies

UNIT II PROBLEM SOLVING **9**

Heuristic search strategies – heuristic functions

Local search and optimization problems – local search in continuous space – search with non-deterministic actions – search in partially observable environments – online search agents and unknown environments

UNIT III GAME PLAYING AND CSP **9**

Game theory – optimal decisions in games – alpha-beta search – monte-carlo tree search – stochastic games – partially observable games

Constraint satisfaction problems – constraint propagation – backtracking search for CSP – local search for CSP – structure of CSP

UNIT IV LOGICAL AGENTS **9**

Knowledge-based agents – propositional logic – propositional theorem proving – propositional model checking – agents based on propositional logic

First-order logic – syntax and semantics – knowledge representation and engineering – inferences in first-order logic – forward chaining – backward chaining – resolution

UNIT V KNOWLEDGE REPRESENTATION AND PLANNING **9**

Ontological engineering – categories and objects – events – mental objects and modal logic – reasoning systems for categories – reasoning with default information

Classical planning – algorithms for classical planning – heuristics for planning – hierarchical planning – non-deterministic domains – time, schedule, and resources – analysis

COURSE OUTCOMES:

On successful completion of this course, the students will be able to

1. Explain autonomous agents that make effective decisions in fully informed, partially observable, and adversarial settings
2. Choose appropriate algorithms for solving given AI problems
3. Design and implement logical reasoning agents
4. Design and implement agents that can reason under uncertainty

TOTAL : 45 PERIODS

TEXT BOOK:

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCES:

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)
5. Artificial Intelligence by Example: Develop machine intelligence from scratch using real artificial intelligence use cases - by Dennis Rothman, 2018

AD8403 DATA ANALYTICS **L T P C**
3 0 0 3

COURSE OBJECTIVES

- To study the basic inferential statistics and sampling distribution.
- To understand the concept of estimation of parameters using fundamental tests and testing of hypotheses.
- To understand the techniques of analysis of variance.
- To gain knowledge in predictive analytics techniques.
- To perform a case study with any available sample data sets.

UNIT I INFERENTIAL STATISTICS I **9**

Populations – samples – random sampling – probability and statistics

Sampling distribution – creating a sampling distribution – mean of all sample means – standard error of the mean – other sampling distributions

Hypothesis testing – z-test – z-test procedure – statement of the problem – null hypothesis – alternate hypotheses – decision rule – calculations – decisions - interpretations

UNIT II INFERENTIAL STATISTICS II **9**

Why hypothesis tests? – Strong or weak decisions – one-tailed and two-tailed tests – case studies

Influence of sample size – power and sample size

Estimation – point estimate – confidence interval – level of confidence – effect of sample size

UNIT III T-TEST **9**

t-test for one sample – sampling distribution of t – t-test procedure – degrees of freedom – estimating the standard error – case studies

t-test for two independent samples – statistical hypotheses – sampling distribution – test procedure – p-value – statistical significance – estimating effect size – meta analysis

t-test for two related samples

UNIT IV ANALYSIS OF VARIANCE **9**

F-test – ANOVA – estimating effect size – multiple comparisons – case studies

Analysis of variance with repeated measures

Two-factor experiments – three f-tests – two-factor ANOVA – other types of ANOVA

Introduction to chi-square tests

UNIT V PREDICTIVE ANALYTICS **9**

Linear least squares – implementation – goodness of fit – testing a linear model – weighted resampling

Regression using StatsModels – multiple regression – nonlinear relationships – logistic regression – estimating parameters – accuracy

Time series analysis – moving averages – missing values – serial correlation – autocorrelation

Introduction to survival analysis

TOTAL: 45 PERIODS

COURSE OUTCOME

- Understand the concept of sampling
- Apply the knowledge to derive hypotheses for given data
- Demonstrate the skills to perform various tests in the given data
- Ability to derive inference using Predictive Analytics
- Perform statistical analytics on a data set

TEXT BOOKS

1. Robert S. Witte and John S. Witte, "Statistics", Eleventh Edition, Wiley Publications, 2017.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014. [Unit V]

REFERENCES

1. David Spiegelhalter, "The Art of Statistics: Learning from Data", Pelican Books, 2020.
2. Peter Bruce, Andrew Bruce, and Peter Gedek, "Practical Statistics for Data Scientists", Second Edition, O'Reilly Publishers, 2020.
3. Charles R. Severance, "Python for Everybody: Exploring Data in Python 3", Shroff Publishers, 2017.
4. Bradley Efron and Trevor Hastie, "Computer Age Statistical Inference", Cambridge University Press, 2016.

AD8411 DATABASE DESIGN AND MANAGEMENT LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES:

- To understand the database development life cycle
- To learn database design using conceptual modelling, Normalization
- To implement database using Data definition, Querying using SQL manipulation and SQL programming
- To implement database applications using IDE/RAD tools
- To learn querying Object-relational databases

SUGGESTIVE EXPERIMENTS

1. Database Development Life cycle:
   Problem definition and Requirement analysis
   Scope and Constraints
2. Database design using Conceptual modeling (ER-EER) – top-down approach
   Mapping conceptual to relational database and validate using Normalization
3. Implement the database using SQL Data definition with constraints, Views
4. Query the database using SQL Manipulation
5. Querying/Managing the database using SQL Programming
   - Stored Procedures/Functions
   - Constraints and securily using Triggers
6. Database design using Normalization – bottom-up approach
7. Develop database applications using IDE/RAD tools (Eg., NetBeans,VisualStudio)
8. Database design using EER-to-ODB mapping / UML class diagrams
9. Object features of SQL-UDTs and sub-types, Tables using UDTs, Inheritance, Method definition
10. Querying the Object-relational database using Objet Query language

COURSE OUTCOMES

After the completion of this course, students will be able to:

- Understand the database development life cycle
- Design relational database using conceptual-to-relational mapping, Normalization
- Apply SQL for creation, manipulation and retrieval of data
- Develop a database applications for real-time problems
- Design and query object-relational databases

TOTAL : 60 PERIODS

HARDWARE:

- Standalone Desktops

SOFTWARE:

- PostgreSQL

AD8412 DATA ANALYTICS LABORATORY **L T P C**
0 0 4 2

COURSE OBJECTIVES

- To study and write simple programs using the basic packages for handling data
- To do various sampling and T,Z,Anova test in various samples
- To perform case study and design a system
- To demonstrate Time Series Analysis in any real time application

Tools: Python, Numpy, Scipy, Matplotlib, Pandas, statmodels, seaborn, plotly, bokeh

Suggested Exercises:

1. Random Sampling
2. Z-test case study
3. T-test case studies
4. ANOVA case studies
5. Regression
6. Logistic Regression
7. Time series Analysis

COURSE OUTCOME

- After the completion of this course, students will be able to:
- To become skilled to use various packages in Python
- Demonstrate the understanding of data distribution with various samples
- Ability to Implement T-Test ,Anova and Z-Test on sample data sets
- Understanding of Mathematical models in real world problems.
- Conduct time series analysis and draw conclusion.

TOTAL : 60 PERIODS

REFERENCES:

1. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
2. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.

HARDWARE:

- Standalone Desktops with Linux OS

SOFTWARE:

- Python with statistical Packages

AD8413	ARTIFICIAL INTELLIGENCE – I LABORATORY	L T P C
		0 0 4 2

COURSE OBJECTIVES

- To design and implement different techniques to develop simple autonomous agents that make effective decisions in fully informed, and partially observable, settings.
- To apply appropriate algorithms for solving given AI problems.
- To Design and implement logical reasoning agents.
- To Design and implement agents that can reason under uncertainty.
- To understand the Implementation of these reasoning systems using either backward or forward inference mechanisms

LIST OF EXPERIMENTS:

1. Develop PEAS descriptions for given AI tasks
2. Implement basic search strategies for selected AI applications
3. Implement A* and memory bounded A* algorithms
4. Implement genetic algorithms for AI tasks
5. Implement simulated annealing algorithms for AI tasks
6. Implement alpha-beta tree search
7. Implement backtracking algorithms for CSP

8. Implement local search algorithms for CSP
9. Implement propositional logic inferences for AI tasks
10. Implement resolution based first order logic inferences for AI tasks
11. Implement classical planning algorithms
12. Mini-Project

TOTAL : 60 PERIODS

COURSE OUTCOMES

After the completion of this course, students will be able to:

- Implement simple PEAS descriptions for given AI tasks
- Develop programs to implement simulated annealing and genetic algorithms
- Demonstrate the ability to solve problems using searching and backtracking
- Ability to Implement simple reasoning systems using either backward or forward inference mechanisms
- Will be able to choose and implement a suitable technics for a given AI task

SOFTWARE:

- C++ or Java Software

HS8461	ADVANCED READING AND WRITING	L	T	P	C
		0	0	2	1

OBJECTIVES:

- Strengthen the reading skills of students of engineering.
- Enhance their writing skills with specific reference to technical writing.
- Develop students' critical thinking skills.
- Provide more opportunities to develop their project and proposal writing skills.

UNIT I **6**

Reading - Strategies for effective reading-Use glosses and footnotes to aid reading comprehension- Read and recognize different text types-Predicting content using photos and title **Writing**-Plan before writing- Develop a paragraph: topic sentence, supporting sentences, concluding sentence –Write a descriptive paragraph

UNIT II **6**

Reading-Read for details-Use of graphic organizers to review and aid comprehension **Writing**-State reasons and examples to support ideas in writing- Write a paragraph with reasons and examples- Write an opinion paragraph

UNIT III **6**

Reading- Understanding pronoun reference and use of connectors in a passage- speed reading techniques-**Writing-** Elements of a good essay-Types of essays- descriptive-narrative- issue-based-argumentative-analytical.

UNIT IV **6**

Reading- Genre and Organization of Ideas- **Writing-** Email writing- visumes – Job application-project writing-writing convincing proposals.

UNIT V **6**

Reading- Critical reading and thinking- understanding how the text positions the reader- identify
Writing- Statement of Purpose- letter of recommendation- Vision statement

TOTAL: 30 PERIODS

OUTCOMES:

At the end of the course Learners will be able to:

- Write different types of essays.
- Write winning job applications.
- Read and evaluate texts critically.
- Display critical thinking in various professional contexts.

TEXT BOOKS:

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

REFERENCES:

1. Davis, Jason and Rhonda Liss.**Effective Academic Writing (Level 3)** Oxford University Press: Oxford, 2006
2. E. Suresh Kumar and et al. **Enriching Speaking and Writing Skills.** Second Edition. Orient Black swan: Hyderabad, 2012
3. Withrow, Jeans and et al. **Inspired to Write. Readings and Tasks to develop writing skills.** Cambridge University Press: Cambridge, 2004
4. Goatly, Andrew. **Critical Reading and Writing.** Routledge: United States of America, 2000
5. Petelin, Roslyn and Marsh Durham. **The Professional Writing Guide: Knowing Well and Knowing Why.** Business & Professional Publishing: Australia, 2004

AD8501 **OPTIMIZATION TECHNIQUES**

L	T	P	C
4	0	0	4

OBJECTIVES:

The objective of this course is to enable the student to

- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models.

UNIT I LINEAR MODELS **12**

Introduction of Operations Research - mathematical formulation of LPP- Graphical Methods to solve LPP- Simplex Method- Big M method, Two-Phase method

UNIT II INTEGER PROGRAMMING AND TRANSPORTATION PROBLEMS **12**

Integer programming: Branch and bound method- Transportation and Assignment problems - Travelling salesman problem.

UNIT III PROJECT SCHEDULING **12**

Project network -Diagram representation – Floats - Critical path method (CPM) – PERT- Cost considerations in PERT and CPM

UNIT IV CLASSICAL OPTIMISATION THEORY **12**

Unconstrained problems – necessary and sufficient conditions - Newton-Raphson method, Constrained problems – equality constraints – inequality constraints - Kuhn-Tucker conditions.

UNIT V QUEUING MODELS **12**

Introduction, Queuing Theory, Operating characteristics of a Queuing system, Constituents of a Queuing system, Service facility, Queue discipline, Single channel models, multiple service channels.

TOTAL PERIODS: 60

COURSE OUTCOMES:

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

- Formulate and solve linear programming problems (LPP)
- Evaluate Integer Programming Problems, Transportation and Assignment Problems.
- Obtain solution to network problems using CPM and PERT techniques.
- Able to optimize the function subject to the constraints.
- Identify and solve problems under Markovian queuing models

TEXT BOOK:

1. Hamdy A Taha, Operations Research: An Introduction, Pearson, 10th Edition, 2017.

REFERENCES:

1. ND Vohra, Quantitative Techniques in Management, Tata McGraw Hill, 4th Edition, 2011.
2. J. K. Sharma, Operations Research Theory and Applications, Macmillan, 5th Edition, 2012.
3. Hiller F.S, Liberman G.J, Introduction to Operations Research, 10th Edition McGraw Hill, 2017.
4. Jit. S. Chandran, Mahendran P. Kawatra, KiHoKim, Essentials of Linear Programming, Vikas Publishing House Pvt.Ltd. New Delhi, 1994.
5. Ravindran A., Philip D.T., and Solberg J.J., Operations Research, John Wiley, 2nd Edition, 2007.

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).

SOFTWARE:

- C/C++/JAVA/Equivalent compiler
- Network Simulator like NS2/OPNET/Wireshark

OUTCOMES:

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

- Comprehend 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.

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

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. James F. Kurose, Keith W. Ross, "Computer Networking: A Top-Down Approach", Seventh Edition, Pearson Education, 2017.
2. William Stallings, Data and Computer Communications, Tenth Edition, Pearson Education, 2013.
3. Nader F. Mir, Computer and Communication Networks, Second Edition, Prentice Hall, 2014.
4. Ying-Dar Lin, Ren-Hung Hwang and Fred Baker, Computer Networks: An Open Source Approach, McGraw Hill Publisher, 2011.

AD8502 **DATA EXPLORATION AND VISUALIZATION** **L T P C 3 0 2 4**

OBJECTIVES:

- To understand the basics of Data Explorations
- To understand the basic concepts of Data visualization
- To study the linear and non-linear ways of Data visualization
- To explore the data visualization using R language
- To apply various data visualization techniques for a variety of tasks

UNIT I INTRODUCTION TO DATA EXPLORATION **9**

Introduction to Single variable: Distribution Variables - Numerical Summaries of Level and Spread - Scaling and Standardising – Inequality - Smoothing Time Series.

UNIT II INTRODUCING TWO VARIABLE AND THIRD VARIABLE **9**

Relationships between Two Variables - Percentage Tables - Analysing Contingency Tables - Handling Several Batches - Scatterplots and Resistant Lines – Transformations - Introducing a Third Variable - Causal Explanations - Three-Variable Contingency Tables and Beyond - Longitudinal Data.

UNIT III BASICS OF DATA VISUALIZATION **9**

The Seven Stages of Visualizing Data - Getting Started with Processing - Mapping - Time Series - Connections and Correlations - Scatterplot Maps - Trees, Hierarchies, and Recursion - Networks and Graphs – Acquiring Data – Parsing Data

UNIT IV DATA EXPLORATION AND DATA VISUALIZATION IN R 9

Introduction to R and RStudio - The Basics of Data Exploration - Loading Data into R - Transforming Data - Creating Tidy Data

UNIT V TECHNIQUES AND APPLICATIONS OF DATA EXPLORATION AND VISUALIZATION IN R 9

Basic Data Exploration Techniques - Basic Data Visualization Techniques - Visualizing Geographic Data with ggmap - R Markdown - Case Study – Wildfire Activity in the Western United States - Case Study – Single Family Residential Home and Rental Values

LIST OF EXPERIMENTS:

1. Install standalone R.
2. Use R tool to explore various commands for descriptive data analytics using bench mark datasets.
3. Explore various variable and row filters in R for cleaning data.
4. Use R commands for probability distributions and probability statistics.
5. Formulate real business problems scenarios to hypothesis and solve using R statistical testing features.
6. Apply various plot features in R on sample data sets and visualize.
7. Write and execute word count, word search and pattern search problems from large text files.
8. Explore various data preprocessing options using bench mark data sets.

SOFTWARE:

- R-Studio

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

OUTCOMES:

- Understand the basics of Data Exploration
- Use Univariate and Multivariate Analysis for Data Exploration
- Explain various Data Visualization methods
- Apply the concept of Data Visualization on various datasets
- Apply the data visualization techniques using R language

TEXT BOOKS

1. Catherine Marsh, Jane Elliott, Exploring Data: An Introduction to Data Analysis for Social Scientists, Wiley Publications, 2nd Edition, 2008.
2. Visualizing Data: Exploring and Explaining Data with the processing Environment, O Reily Publications, 2007
3. Eric Pimpler, Data Visualization and Exploration with R, Geo Spatial Training service, 2017
4. Authors: Xiang Zhou, Sean, Yong Rui, Huang, Thomas S., Exploration of Visual Data, Springer Publications, 2003
5. Claus O.Wilke, Fundamentals of Data Visualization, A primer on making informative and compelling Figures, O'Reily Publications, 2019

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 V MARKETING & 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.

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

AD8511 **MACHINE LEARNING LABORATORY** **L T P C 0 0 4 2**

OBJECTIVES:

- To get practical knowledge on implementing machine learning algorithms in real time problem for getting solutions
- To implement supervised learning and their applications
- To understand unsupervised learning like clustering and EM algorithms
- To understand the theoretical and practical aspects of probabilistic graphical models.

LIST OF EXPERIMENTS:

1. Implement the concept of decision trees with suitable data set from real world problem and classify the data set to produce new sample.
2. Detecting Spam mails using Support vector machine
3. Implement facial recognition application with artificial neural network
4. Study and implement amazon toolkit: Sagemaker
5. Implement character recognition using Multilayer Perceptron
6. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
7. Implement sentiment analysis using random forest optimization algorithm
8. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
9. Choose best machine learning algorithm to implement online fraud detection
10. Mini-project: students work in team on any socially relevant problem that needs a machine learning based solution, and evaluate the model performance.

TOTAL : 60 PERIODS

OUTCOMES:

- Understand the implementation procedures for the machine learning algorithms.
- Design Java/Python programs for various Learning algorithms.
- Apply appropriate Machine Learning algorithms to data sets
- Identify and apply Machine Learning algorithms to solve real world problems.

REFERENCES

1. Sebastain Raschka, "Python Machine Learning", Packt publishing (open source).
2. Ethem Alpaydin, "Introduction to Machine Learning", MIT Press, Fourth Edition, 2020.
3. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

SOFTWARE

- Python/Java with ML packages

AD8512 **MINI PROJECT ON DATA SCIENCE PIPELINE** **L T P C 0 0 4 2**

OBJECTIVES:

- The students are expected to develop a mini project for solving real world problems with the concepts and tools they are familiar with.
- To use the Python packages for performing analytics.

- To learn using analytical tools for real world problems.
- The students are expected to used different platforms and tools that support data analysis; machine learning, deep learning, Apache Spark, R, Weka, Tensor Flow.

LIST OF EXPERIMENTS:

1. Use Twitter data for Sentiment Analysis
2. Mail classification for Spam Detection
3. Use of ML algorithms for Stock market Prediction
4. Designing a Recommendation System
5. Using Apache Spark for Time Series Forecasting
6. Implementation of Disease Prediction System
7. Usage of Image Segmentation
8. Design a Face recognition System
9. Use Natural Language Processing for short text Summarization

TOTAL: 60 PERIODS

OUTCOMES:

- Install analytical tools and configure distributed file system.
- Have skills in developing and executing analytical procedures in various distributed frameworks and databases.
- Develop, implement and deploy simple applications on very large datasets.
- Implement simple to complex data modeling in NoSQL databases.
- Implement real world applications by using suitable analytical framework and tools.

REFERENCES:

1. www.kaggle.com
2. https://amankharwal.medium.com/130-machine-learning-projects-solved-and-explained-605d188fb392
3. Jake VanderPlas, "Python Data Science Handbook", O'Reilly, 2016.
4. Allen B. Downey, "Think Stats: Exploratory Data Analysis in Python", Green Tea Press, 2014.
5. Data Science From Scratch: First Principles with Python, Second Edition by Joel Grus, 2019

AD8601 **ARTIFICIAL INTELLIGENCE II** **L T P C**
3 0 0 3

OBJECTIVES:

- To know the underlying structure behind intelligence mathematically.
- To know the logical implications in probabilistic Reasoning.
- To know the automated learning techniques.
- To explore the techniques in Reinforcement Learning.
- To explore artificial intelligence techniques for Robotics.

UNIT I PROBABILISTIC REASONING I **9**

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

UNIT II PROBABILISTIC REASONING II **9**

Probabilistic reasoning over time – time and uncertainty – inference in temporal models – Hidden Markov Models – Kalman filters – Dynamic Bayesian networks

Probabilistic programming

UNIT III DECISIONS UNDER UNCERTAINTY **9**

Basis of utility theory – utility functions – Multiattribute utility functions – decision networks – value of information – unknown preferences

Sequential decision problems – MDPs – Bandit problems – partially observable MDPs

Multiagent environments – non-cooperative game theory – cooperative game theory – making collective decisions

UNIT IV LEARNING PROBABILISTIC MODELS **9**

Statistical learning theory – maximum-likelihood parameter learning – naive bayes models – generative and descriptive models – continuous models – Bayesisn parameter learning – Bayesian linear regression – learning Bayesian net structures – density estimation

EM Algorithm – unsupervised clustering – Gaussian mixture models – learning Bayes net parameters – learning HMM – learning Bayes net structures with hidden variables

UNIT V REINFORCEMENT LEARNING AND ROBOTICS **9**

Learning from rewards – passive reinforcement learning – active reinforcement learning – generalization in reinforcement learning – policy search – inverse reinforcement learning – applications

Robots – robotic perception – planning movements – reinforcement learning in robotics – robotic frameworks – applications of robotics

Philosophy, ethics, and safety of AI – the future of AI

TOTAL:45 PERIODS

OUTCOMES:

On completion of the course, the students will be able to:

- Explain the probabilistic reasoning using Bayesian inference
- Apply appropriate Probabilistic reasoning techniques for solving uncertainty problems
- Explain use of game theory for decision making.
- Explain and apply probabilistic models for various use cases
- Apply AI techniques for robotics

TEXT BOOK

1. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

REFERENCES

1. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
2. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
3. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
4. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)

AD8602 **DATA AND INFORMATION SECURITY** **L T P C 3 0 0 3**

OBJECTIVES:

- To understand the basics of Number Theory and Security
- To understand and analyze the principles of different encryption techniques
- To understand the security threats and attacks
- To understand and evaluate the need for the different security aspects in real time applications
- To learn the different applications of information security

UNIT I FUNDAMENTALS OF SECURITY **9**

Computer Security Concepts - Threats, Attacks and Assets – Security Functional Requirements – Fundamental Security Design Principles – Attack Surfaces and Attack Trees. Computer Security Strategy– Number Theory: Prime Numbers and Factorization, Modular Arithmetic, GCD and Euclidean Algorithm, Chinese Remainder Theorem, Multiplication Modulo m and the Totient Function, Problems, Fermat and Euler Theorem. Primitive Roots and the Structure of F*p, Number in other Bases, Fast Computation of Powers in Z/mZ, Multiplicative Functions, Group Theory, Fields and Problems

UNIT II ENCRYPTION TECHNIQUES AND KEY MANAGEMENT **9**

Symmetric Encryption Principles – Data Encryption Standard – Advanced Encryption Standard – Stream Ciphers and RC4 - Cipher Block Modes Operation – Digital Signatures - Key Distributions - Public Key Cryptosystem: RSA, Elliptic Curve Cryptography - Key Exchange Algorithms: Diffie Hellmen and ELGamal Key Exchange

UNIT III AUTHENTICATION, INTEGRITY AND ACCESS CONTROL **9**

Authentication: Security Hash Function – HMAC – Electronic User Authentication Principles, Password Based Authentication, Token Based and Remote Authentication; Internet Authentication Applications: Kerberos X.509 – Public Key Infrastructure; Access Control: Access Control Principles - Subjects, Objects, and Access Rights - Discretionary Access Control - Example: UNIX File Access Control – Role Based Access Control - Attribute-Based Access Control - Identity, Credential, and Access Management - Trust Frameworks

UNIT IV SECURITY **9**

System Security: Firewall, Viruses, Worms, Ransomeware, Keylogger, Greyware, IDS, DDoS Network Security: SSL – TLs – HTTPS –IP Security; OS Security: Introduction to Operating System Security - System Security Planning - Operating Systems Hardening - Application Security - Security Maintenance - Linux/Unix Security - Windows Security - Virtualization Security; Wireless Security: Risks and Threats of Wireless- Wireless LAN Security- Wireless Security Policy-Wireless Security Architectures-Wireless security Tools

UNIT V SECURITY APPLICATIONS **9**

IOT security: Introduction- Architectures- Security challenges- Security requirements- Trust, Data confidentiality, and privacy in IOT- Security in future IOT systems; Cloud Security: Security requirements - Security patterns and Architectural elements- Cloud Security Architecture- Security Management in the Cloud- Availability Management- SaaS Availability Management- PaaS Availability Management- IaaS Availability Management- Access control- Security Vulnerability, Patch and Configuration Management.

OUTCOMES:

- Understand the fundamentals of security and the significance of number theory in computer security
- Learn the public key cryptographic standards and authentication scheme
- Able to apply the security frameworks for real time applications
- Understand the security threats and attacks in IoT, Cloud.
- Able to develop appropriate security algorithms understanding the possible threats

TOTAL:45 PERIODS

TEXT BOOKS:

1. William Stallings, "Cryptography and Network Security Principles and Practice", Fifth Edition, 2011, Pearson Education International
2. William Stallings and Lawrie Brown, "Computer Security Principles and Practice", Third Edition,2015, Pearson Education International

REFERENCES:

1. Tim Mather, Subra Kumaraswamy and Shahed Latif, "Cloud Security and Privacy: An Enterprise Perspective on Risks and Compliance", 2009, Oreilly
2. Mikhail Gloukhovtsev, "IoT Security: Challenges, Solutions & Future Prospects", 2018, Knowledge Sharing Article, Dell Inc.
3. Pradip KumarDas, Hrudaya Kumar Tripathy, Shafiz Affendi Mohd yusuf, Privacy and Security Issues in Big Data, An Analytical View on Business Intelligence. Springer 2021.

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

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.
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.

SOFTWARE REQUIRED:

- Dream Weaver or Equivalent, MySQL or Equivalent, Apache Server, WAMP/XAMPP

AD8611	ARTIFICIAL INTELLIGENCE – II LABORATORY	L	T	P	C
		0	0	4	2

OBJECTIVES:

- To impart knowledge about Artificial Intelligence.
- To understand the main abstractions and reasoning for intelligent systems.
- To understand the use of Artificial Intelligence in various applications

LIST OF EXPERIMENTS:

1. To implement Bayesian Belief networks
2. Approximate inferences in Bayesian network
3. To implement decision problems for various real-world applications
4. To learn various Bayesian parameters
5. Implementation of Hidden Markov Models
6. Implement EM algorithm for HMM

7. Implement the Reinforcement learning for various reward based applications
8. Mini-Project

OUTCOMES: **TOTAL PERIODS:60**

- Solve basic AI based problems.
- Implement the concept of Bayesian Network.
- Apply AI techniques to real-world problems to develop intelligent systems
- Implement HMM for real-world application.
- Use Reinforcement Learning to implement various intelligent systems.

SOFTWARE:

- **Python/Java with Machine Learning packages.**

REFERENCES:

1. aimacode · GitHub (https://github.com/aimacode
2. Dan W. Patterson, "Introduction to AI and ES", Pearson Education, 2007
3. Kevin Night, Elaine Rich, and Nair B., "Artificial Intelligence", McGraw Hill, 2008
4. Patrick H. Winston, "Artificial Intelligence", Third edition, Pearson Edition, 2006
5. Deepak Khemani, "Artificial Intelligence", Tata McGraw Hill Education, 2013 (http://nptel.ac.in/)

HS8581	PROFESSIONAL COMMUNICATION	L	T	P	C
		0	0	2	1

OBJECTIVES:

- Enhance the Employability and Career Skills of students
- Orient the students towards grooming as a professional
- Make them Employable Graduates
- Develop their confidence and help them attend interviews successfully.

UNIT I

Introduction to Soft Skills-- Hard skills & soft skills - employability and career Skills—Grooming as a professional with values—Time Management—General awareness of Current Affairs

UNIT II

Self-Introduction-organizing the material - Introducing oneself to the audience – introducing the topic – answering questions – individual presentation practice— presenting the visuals effectively – 5 minute presentations

UNIT III

Introduction to Group Discussion— Participating in group discussions – understanding group dynamics - brainstorming the topic — questioning and clarifying –GD strategies- activities to improve GD skills

UNIT IV

Interview etiquette – dress code – body language – attending job interviews– telephone/skype interview -one to one interview &panel interview – FAQs related to job interviews

UNIT V

Recognizing differences between groups and teams- managing time-managing stress- networking professionally- respecting social protocols-understanding career management-developing a long-term career plan-making career changes

TOTAL:30 PERIODS

OUTCOMES:

At the end of the course Learners will 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

RECOMMENDED SOFTWARE

1. Open Source Software
2. Win English

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,. OrientBalckSwan: Hyderabad, 2016.
4. Raman, Meenakshi and Sangeeta Sharma. Professional Communication. Oxford University Press: Oxford, 2014
5. S. Hariharanetal. Soft Skills. MJP Publishers: Chennai, 2010.

AD8612	SOCIALLY RELEVANT PROJECT	L T P C
		0 0 4 2

OBJECTIVES:

- The students are expected to develop solution for socially existing problems with the concepts and tools they are familiar with.
- A few broad areas related to the course are presented below.
- The list below is only a guideline for the students and the students are motivated to build the projects to portray their own creativity.

PRACTICAL EXERCISES:

1. Solve social problems using Statistical and Mathematical Concepts
2. Solving Big Data related Concepts
3. Solving Business Intelligence related Concepts
4. Solving problems with Machine Learning Algorithms.
5. Solving problems with Deep Learning Algorithms
6. Solving any Security Related Problems.
7. Solving health Related Problems.
9. problems related to Data wrangling

TOTAL: 60 PERIODS

OUTCOMES:

- The students are expected to use different platforms and tools like SAS, Python, R, Scala.
- Big Data: Hadoop Ecosystem (Hive, Pig, Sqoop, Flume), Big Data Lakes,No SQL, Apache

Spark, Spark MLLib , HPCC, Strom.

- Business Intelligence : SQL, Microsoft Power BI, SAP BI, Tableau, Oracle Fusion,
- Machine Learning and Deep Learrning : TensorFlow, Keras, Artificial Neural Networks, Deep NeuralNets, Convolution Neural Networks, Auto encoders.

REFERENCES:

1. https://www.jeremyjordan.me/ml-projects-guide/
2. Problems listed in Smart India Hackathon : www.sih.gov.in

AD8701 **DEEP LEARNING** **L T P C**
3 0 0 3

OBJECTIVES:

1: To understand the basics of deep neural networks
2: To understand CNN of architectures of deep neural networks
3: To understand the concepts of Artificial Neural Networks
4: To learn the basics of Data science in Deep learning
5: To learn about applications of deep learning in AI and Data Science

UNIT I DEEP NETWORKS BASICS **9**

Linear Algebra: Scalars -- Vectors -- Matrices and tensors; Probability Distributions -- Gradient-based Optimization -- Machine Learning Basics: Capacity -- Overfitting and underfitting -- Hyperparameters and validation sets -- Estimators -- Bias and variance
-- Stochastic gradient descent -- Challenges motivating deep learning; Deep Networks: Deep feedforward networks; Regularization -- Optimization.

UNIT II CONVOLUTIONAL NEURAL NETWORKS **9**

Convolution Operation -- Sparse Interactions -- Parameter Sharing -- Equivariance -- Pooling -- Convolution Variants: Strided -- Tiled -- Transposed and dilated convolutions; CNN Learning: Nonlinearity Functions -- Loss Functions -- Regularization -- Optimizers -- Gradient Computation.

UNIT III DEEP LEARNING ALGORITHMS FOR AI **9**

Artificail Neural Netowrks – Linear Associative Networks – Perceptrons -The Backpropagation Algorithm - Hopfield Nets - Boltzmann Machines - Deep RBMs - Variational Autoencoders - Deep Backprop Networks- Autoencoders

UNIT IV DATA SCIENCE AND DEEP LEARNING **9**

Data science fundamentals and responsibilities of a data scientist - life cycle of data science – Data science tools - Data modeling, and featurization - How to work with data variables and data science tools - How to visualize the data - How to work with machine learning algorithms and Artificial Neural Networks

UNIT V APPLICATIONS OF DEEP LEARNING **9**

Detection in chest X-ray images -object detection and classification -RGB and depth image fusion - NLP tasks - dimensionality estimation - time series forecasting -building electric power grid for controllable energy resources - guiding charities in maximizing donations and robotic control in industrial environments.

TOTAL:45 PERIODS

OUTCOMES:

CO1: Explain the basics in deep neural networks (K2)
CO2: Apply Convolution Neural Network for image processing (K3)
CO3: Explain the basics of Artificial Intelligence using deep learning (K2)
CO4: Apply deep learning algorithms for data science
CO5: Apply deep learning algorithms for variety applications

TEXT BOOKS:

1. Ian Goodfellow, Yoshua Bengio, Aaron Courville, ``Deep Learning", MIT Press, 2016
2. Stone, James. (2019). Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning, Sebtel Press, United States, 2019
3. Vance, William , Data Science: A Comprehensive Beginners Guide to Learn the Realms of Data Science (Hardcover - 2020), Joiningthedotstv Limited
4. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), Deep Learning Applications, Volume 3,Springer Publications 2022
5. Charu C. Aggarwal, ``Neural Networks and Deep Learning: A Textbook", Springer International Punlishing, 2018.

AD8702 **TEXT ANALYTICS** **L T P C**
3 0 0 3

OBJECTIVES:

1: To understand the methods for keyword extraction from documents.
2: To learn clustering methods for grouping of documents.
3: To explore the methods for classification of documents and E-mails.
4: To explore text visualization techniques and anomaly detection.
5: To learn about Events and trends in text streams

UNIT I TEXT EXTRACTION **9**

Introduction- Rapid automatic keyword extraction: candidate keywords, keyword scores, adjoining keywords, extracted keywords-Benchmark evaluation: precision and recall, efficiency, stoplist generation, Evaluation on new articles.

UNIT II DOCUMENT CLUSTERING **9**

Multilingual document clustering: Multilingual LSA, Tucker1 method, PARAFAC2 method, LSA with term alignments; LMSA, LMSA with term alignments; Constrained clustering with k-means type algorithms.

UNIT III CONTENT BASED CLASSIFICATION **8**

Classification algorithms for Document Classification, Content-based spam email classification, Utilizing nonnegative matrix factorization for email classification problems.

UNIT IV ANOMALY AND TREND DETECTION **9**

Text visualization techniques: Visualization in text analysis, Tag clouds, tag clouds, authorship and change tracking, Data Exploration and the search for noval patterns, sentiment tracking, visual analytics and FutureLens, scenario discovery.
adaptive threshold setting for novelty mining: Introduction, adaptive threshold for anomaly detection, Experimental study.

UNIT V TEXT STREAMS **10**

Events and trends in text streams: Introduction, Text streams, Feature extraction and data reduction, Event detection, Trend detection, Event and trend descriptions. Embedding semantics in LDA topic models: Introduction, vector space modeling, latent semantic analysis, probabilistic latent semantic analysis, Latent Dirichlet allocation, embedding external semantics from Wikipedia, data-driven semantic embedding.

TOTAL:45 PERIODS

OUTCOMES:

After the completion of this course, students will be able to:

CO1: Design text extraction techniques
CO2: Devise clustering techniques for text mining
CO3: Design classification techniques for text mining
CO4: Apply visualization techniques and perform anomaly & trend detection
CO5: Perform Event operations in Text streams

REFERENCES

1. Michael W. Berry & Jacob Kogan,"Text Mining Applications and Theory", Wiley publications, 2010.
2. Aggarwal, Charu C., and ChengXiangZhai, eds., "Mining text data", Springer Science & Business Media, 2012.
3. Miner, Gary, et al., "Practical text mining and statistical analysis for non-structured text data applications", Academic Press, 2012.
4. Srivastava, Ashok N., and MehranSahami, "Text mining: Classification, clustering, and applications", Chapman and Hall/CRC, 2009.
5. Buitelaar, Paul, Philipp Cimiano, and Bernardo Magnini, eds., "Ontology learning from text: methods, evaluation and applications", Vol. 123. IOS press, 2005.

AD8703 **BASICS OF COMPUTER VISION** **L T P C 3 0 0 3**

OBJECTIVES:

1: To review image processing techniques for computer vision
2: To understand various features and recognition techniques
3: To learn about histogram and binary vision
4: Apply three-dimensional image analysis techniques
5: Study real world applications of computer vision algorithms

UNIT I INTRODUCTION **9**

Image Processing, Computer Vision ,What is Computer Vision - Low-level, Mid-level, High-level ; Fundamentals of Image Formation, Transformation: Orthogonal, Euclidean, Affine, Projective, Fourier Transform, Convolution and Filtering, Image Enhancement, Restoration, Histogram Processing.

UNIT II FEATURE EXTRACTION AND FEATURE SEGMENTATION **9**

Feature Extraction -Edges - Canny, LOG, DOG; Line detectors (Hough Transform), Corners - Harris and Hessian Affine, Orientation Histogram, SIFT, SURF, HOG, GLOH, Scale-Space

Analysis- Image Pyramids and Gaussian derivative filters, Gabor Filters and DWT.
Image Segmentation -Region Growing, Edge Based approaches to segmentation, Graph-Cut, Mean-Shift, MRFs, Texture Segmentation.

UNIT III IMAGES, HISTOGRAMS, BINARY VISION **9**

Simple pinhole camera model – Sampling – Quantisation – Colour images – Noise – Smoothing – 1D and 3D histograms - Histogram/Image Equalisation - Histogram Comparison - Back-projection - k-means Clustering – Thresholding - Threshold Detection Methods - Variations on Thresholding - Mathematical Morphology – Connectivity.

UNIT IV 3D VISION AND MOTION **9**

Methods for 3D vision – projection schemes – shape from shading – photometric stereo – shape from texture – shape from focus – active range finding – surface representations – point-based representation – volumetric representations – 3D object recognition – 3D reconstruction – introduction to motion – triangulation – bundle adjustment – translational alignment – parametric motion–spline-based motion- optical flow – layered motion.

UNIT V APPLICATIONS **9**

Overview of Diverse Computer Vision Applications: Document Image Analysis, Biometrics, Object Recognition, Tracking, Medical Image Analysis, Content-Based Image Retrieval, Video Data Processing , Virtual Reality and Augmented Reality.

OUTCOMES:

- Explain low level processing of image and transformation techniques applied to images.
- Explain the feature extraction, segmentation and object recognition methods.
- Apply Histogram transform for detection of geometric shapes like line, ellipse and objects.
- Illustrate 3D vision process and motion estimation techniques.
- Apply vision techniques to real time applications.

TOTAL:45 PERIODS

TEXT BOOKS:

1. 1. D. A. Forsyth, J. Ponce, "Computer Vision: A Modern Approach", Pearson Education, 2003.
2. Richard Szeliski, "Computer Vision: Algorithms and Applications", Springer Verlag London Limited,2011.

REFERENCES:

1. B. K. P. Horn -Robot Vision, McGraw-Hill.
2. Simon J. D. Prince, Computer Vision: Models, Learning, and Inference, Cambridge University Press, 2012.
3. Mark Nixon and Alberto S. Aquado, Feature Extraction & Image Processing for Computer Vision, Third Edition, Academic Press, 2012.
4. E. R. Davies, (2012), "Computer & Machine Vision", Fourth Edition, Academic Press.
5. Concise Computer Vision: An Introduction into Theory and Algorithms, by Reinhard Klette, 2014

AD8704 **BIG DATA MANAGEMENT** **L T P C**
3 0 2 4

OBJECTIVES:

1. To understand about big data.
2. To learn and use NoSQL big data management.
3. To learn mapreduce analytics using Hadoop and related tools.
4. To work with map reduce applications
5. To understand the usage of Hadoop related tools for Big Data Analytics

UNIT I UNDERSTANDING BIG DATA **9**

What is big data – why big data – convergence of key trends – unstructured data – industry examples of big data – web analytics – big data and marketing – fraud and big data – risk and big data – credit risk management – big data and algorithmic trading – big data and healthcare – big data in medicine – advertising and big data – big data technologies – introduction to Hadoop – open source technologies – cloud and big data – mobile business intelligence – Crowd sourcing analytics – inter and trans firewall analytics.

UNIT II NOSQL DATA MANAGEMENT **9**

Introduction to NoSQL – aggregate data models – aggregates – key-value and document data models – relationships – graph databases – schemaless databases – materialized views – distribution models – sharding – master-slave replication – peer-peer replication – sharding and replication – consistency – relaxing consistency – version stamps – map-reduce – partitioning and combining – composing map-reduce calculations.

UNIT III BASICS OF HADOOP **9**

Data format – analyzing data with Hadoop – scaling out – Hadoop streaming – Hadoop pipes – design of Hadoop distributed file system (HDFS) – HDFS concepts – Java interface – data flow – Hadoop I/O – data integrity – compression – serialization – Avro – file-based data structures.

UNIT IV MAPREDUCE APPLICATIONS **9**

MapReduce workflows – unit tests with MRUnit – test data and local tests – anatomy of MapReduce job run – classic Map-reduce – YARN – failures in classic Map-reduce and YARN – job scheduling – shuffle and sort – task execution – MapReduce types – input formats – output formats.

UNIT V HADOOP RELATED TOOLS **9**

Hbase – data model and implementations – Hbase clients – Hbase examples – praxis.Cassandra – cassandra data model – cassandra examples – cassandra clients – Hadoop integration. Pig – Grunt – pig data model – Pig Latin – developing and testing Pig Latin scripts. Hive – data types and file formats – HiveQL data definition – HiveQL data manipulation – HiveQL queries.

TOTAL:45 PERIODS

OUTCOMES:

After the completion of this course, students will be able to:

- Describe big data and use cases from selected business domains.
- Explain NoSQL big data management.
- Install, configure, and run Hadoop and HDFS.
- Perform map-reduce analytics using Hadoop.
- Use Hadoop related tools such as HBase, Cassandra, Pig, and Hive for big data analytics.

LIST OF EXPERIMENTS: **PRACTICALS:15 PERIODS**

1. Downloading and installing Hadoop; Understanding different Hadoop modes. Startup scripts, Configuration files.
2. Hadoop Implementation of file management tasks, such as Adding files and directories, retrieving files and Deleting files
3. Implement of Matrix Multiplication with Hadoop Map Reduce
4. Run a basic Word Count Map Reduce program to understand Map Reduce Paradigm.
5. Installation of Hive along with practice examples.
7. Installation of HBase, Installing thrift along with Practice examples
8. Patrice importing and exporting data from various data bases.

Software Requirements:

Hadoop, Java, Hive and HBase.

TOTAL:75 PERIODS

TEXT BOOKS:

1. Michael Minelli, Michelle Chambers, and AmbigaDhiraj, "Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses", Wiley, 2013.
2. Eric Sammer, "Hadoop Operations", O'Reilley, 2012.

REFERENCES:

1. E. Capriolo, D. Wampler, and J. Rutherglen, "Programming Hive", O'Reilley, 2012.
2. Lars George, "HBase: The Definitive Guide", O'Reilley, 2011.
3. Eben Hewitt, "Cassandra: The Definitive Guide", O'Reilley, 2010.
4. Alan Gates, "Programming Pig", O'Reilley, 2011.

AD8705 **AI AND ROBOTICS** **L T P C**
3 0 2 4

OBJECTIVES:

1. To study the Robot Locomotion and types of robots.
2. To explore the kinematic models and constraints
3. To Learn sensors of robots and image processing for robotics.
4. To understand the methods for mobile robot Localization
5. To study the Path planning and Navigation of Robots.

UNIT I ROBOT LOCOMOTION **9**

Introduction to AI and Robotics – robot locomotion – legged mobile robots – wheeled mobile robots – aerial mobile robots.

UNIT II MOBILE ROBOT KINEMATICS **9**

Kinematic models and constraints – mobile robot maneuverability – mobile robot workspace – advanced kinematics – motion control.

UNIT III ROBOT PERCEPTION **9**

Sensors for mobile robots – computer vision for robots – image processing for robotics – place recognition – range data.

UNIT IV MOBILE ROBOT LOCALIZATION **9**

Introduction to localization – noise and aliasing – localization-based navigation – belief representation – map representation – probabilistic map-based localization – autonomous map building.

UNIT V ROBOT PLANNING AND NAVIGATION **9**

Planning and navigation – planning and reacting – path planning – obstacle avoidance – navigation architectures.

TOTAL:45 PERIODS

OUTCOMES:

After the completion of this course, students will be able to:

CO1: Explain the types of Robots
CO2: Narrate the kinematics of Robots
CO3: Implement image processing algorithms
CO4: Devise Localization algorithms
CO5: Devise Path planning methods for navigation

LIST OF EXPERIMENTS: **PRACTICALS:15 PERIODS**

1. Line tracing bot
2. Gesture controlled bot
3. 4(Four) DOF Robotic Arm
4. Home Security System using NodeMCU
5. RF Controlled or WiFi controlled Navigation bot
6. Pick and place bot with Object Detetction
7. Wall Following bot
8. Maze solving Robot
9. Forward and reverse kinematics based experiment using open source platforms
10. Computer Visio based robotic tasks execution

Software Requirements:

Open Source Software

TOTAL:75 PERIODS

TEXT BOOKS:

1. R. Siegwart, I. R. Nourbaksh, and D. Scarramuzza, "Introduction to Autonomous Mobile Robots", Second Edition, MIT Press, 2011.
2. Stuart Russel and Peter Norvig, "Artificial Intelligence: A Modern Approach", Fourth Edition, Pearson Education, 2020.

AD8711 **DEEP LEARNING LABORATORY** **L T P C 0 0 4 2**

OBJECTIVES:

1: To learn deep neural networks and apply for simple problems
2: To Learn and apply Convolution Neural Network for image processing
3: To Learn and apply Recurrent Neural Network and its variants for text analysis
4: To augment data using generative models

5: To explore real world applications with deep neural networks

LIST OF EXPERIMENTS:

1. Solving XOR problem using Multilayer perceptron
2. Implement character and Digit Recognition using ANN.
3. Implement the analysis of X-ray image using autoencoders
4. Implement Speech Recognition using NLP
5. Develop a code to design object detection and classification for traffic analysis using CNN
6. Implement online fraud detection of share market data using any one of the data analytics tools.
7. Implement image augmentation using deep RBM.
8. Implement Sentiment Analysis using LSTM.
9. Mini Project: Number plate recognition of traffic video analysis.

Hardware/Software Requirements

Software:

- Understanding on Working of Colab and Transfer Learning Networks
- High end GPU Systems (Huge Computation)

OUTCOMES:

CO1: Apply deep neural network for simple problems
CO2: Apply Convolution Neural Network for image processing
CO3: Apply Recurrent Neural Network and its variants for text analysis
CO4: Apply generative models for data augmentation
CO5: Develop a real world application using suitable deep neural networks

TOTAL:60 PERIODS

REFERENCES

1. Wani, M.A., Raj, B., Luo, F., Dou, D. (Eds.), "Deep Learning Applications", Volume 3, Springer Publications 2022.
2. Stone, James. (2019), " Artificial Intelligence Engines: A Tutorial Introduction to the Mathematics of Deep Learning", Sebtel Press, United States, 2019

EC8691 MICROPROCESSORS AND MICROCONTROLLERS

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the Architecture of 8086 microprocessor.
- To learn the design aspects of I/O and Memory Interfacing circuits.
- To interface microprocessors with supporting chips.
- To study the Architecture of 8051 microcontroller.
- To design a microcontroller based system

UNIT I THE 8086 MICROPROCESSOR **9**

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

UNIT II 8086 SYSTEM BUS STRUCTURE 9

8086 signals – Basic configurations – System bus timing –System design using 8086 – I/O programming – Introduction to Multiprogramming – System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

UNIT III I/O INTERFACING 9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller..

UNIT IV MICROCONTROLLER 9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

UNIT V INTERFACING MICROCONTROLLER 9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation - Comparison of Microprocessor, Microcontroller, PIC and ARM processors

OUTCOMES:

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

- Understand and execute programs based on 8086 microprocessor.
- Design Memory Interfacing circuits.
- Design and interface I/O circuits.
- Design and implement 8051 microcontroller based systems.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Yu-Cheng Liu, Glenn A.Gibson, "Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design", Second Edition, Prentice Hall of India, 2007. (UNIT I - III)

2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, "The 8051 Microcontroller and Embedded Systems: Using Assembly and C", Second Edition, Pearson education, 2011.(UNIT IV-V)

REFERENCES:

1. Doughlas V.Hall, "Microprocessors and Interfacing, Programming and Hardware",TMH,2012
2. A.K.Ray,K.M.Bhurchandi, "Advanced Microprocessors and Peripherals" 3rd edition, Tata McGrawHill, 2012

AD8001 **SOFTWARE DEVELOPMENT PROCESSES** **L T P C**
3 0 0 3

OBJECTIVES:

1: To acquire knowledge on software process management
2: To acquire managerial skills for software project development.
3: To understand software economics
4: To acquire knowledge about real time software development scenarios.

UNIT I SOFTWARE PROCESS **9**

Software Process Maturity Software maturity Framework, Principles of Software Process Change, Software Process Assessment, The Initial Process, The Repeatable Process, The Defined Process, The Managed Process, The Optimizing Process, Process Reference Models Capability Maturity Model (CMM), CMMI, PCMM, PSP, TSP).

UNIT II SOFTWARE ECONOMICS AND LIFECYCLE **9**

Software Project Management Renaissance Conventional Software Management, Evolution of Software Economics, Improving Software Economics, The old way and the new way. Life-Cycle Phases and Process artifacts Engineering and Production stages, inception phase, elaboration phase, construction phase, transition phase, artifact sets, management artifacts, engineering artifacts and pragmatic artifacts, model-based software architectures.

UNIT III SOFTWARE PROCESSES PLANNING **9**

Workflows and Checkpoints of process Software process workflows, Iteration workflows, Major milestones, minor milestones, periodic status assessments. Process Planning Work breakdown structures, Planning guidelines, cost and schedule estimating process, iteration planning process, Pragmatic planning.

UNIT IV PROJECT MANAGEMENT AND METRICS **9**

Project Organizations Line-of- business organizations, project organizations, evolution of organizations, process automation. Project Control and process instrumentation The seven-core metrics, management indicators, quality indicators, life-cycle expectations, Pragmatic software metrics, metrics automation.

UNIT V UNIT TITLE **9**

CCPDS-R Case Study and Future Software Project Management Practices Modern Project Profiles, Next-Generation software Economics, Modern Process Transitions.

OUTCOMES:

CO1: Understand the software process phases in the cycle of software development.
CO2: Gain knowledge of software economics, project organization, project control and process instrumentation
CO3: Analyze the major and minor milestones, artifacts and metrics from management and technical perspective.
CO4: Design and develop software product using conventional and modern principles of software project management
CO5: Analyze the real time software development processes.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Managing the Software Process, Watts S. Humphrey, Pearson Education
2. Software Project Management, Walker Royce, Pearson Education

REFERENCES:

1. An Introduction to the Team Software Process, Watts S. Humphrey, Pearson Education, 2000 Process Improvement essentials, James R. Persse, O'Reilly, 2006
2. Software Project Management, Bob Hughes & Mike Cotterell, fourth edition, TMH, 2006
3. Applied Software Project Management, Andrew Stellman & Jennifer Greene, O'Reilly, 2006.
4. Head First PMP, Jennifer Greene & Andrew Stellman, O'Reilly, 2007
5. Software Engineering Project Management, Richard H. Thayer & Edward Yourdon, 2 nd edition, Wiley India, 2004.
6. Agile Project Management, Jim Highsmith, Pearson education, 2004.

AD8002 HEALTH CARE ANALYTICS

L	T	P	C
3	0	0	3

OBJECTIVES:

1: Understand the health data formats, health care policy and standards
2: Learn the significance and need of data analysis and data visualization
3: Understand the health data management frameworks
4: Learn the use of machine learning and deep learning algorithms in healthcare
5: Apply healthcare analytics for critical care applications

UNIT I INTRODUCTION TO HEALTHCARE ANALYSIS **9**

Overview - History of Healthcare Analysis Parameters on medical care systems- Health care policy- Standardized code sets – Data Formats – Machine Learning Foundations: Tree Like reasoning , Probabilistic reasoning and Bayes Theorem, Weighted sum approach.

UNIT II ANALYTICS ON MACHINE LEARNING **9**

Machine Learning Pipeline – Pre-processing –Visualization – Feature Selection – Training model parameter – Evaluation model : Sensitivity , Specificity , PPV ,NPV, FPR ,Accuracy , ROC , Precision Recall Curves , Valued target variables –Python: Variables and types, Data Structures and containers , Pandas Data Frame :Operations – Scikit –Learn : Pre-processing , Feature Selection.

UNIT III HEALTH CARE MANAGEMENT **9**

IOT- Smart Sensors – Migration of Healthcare Relational database to NoSQL Cloud Database – Decision Support System – Matrix block Cipher System – Semantic Framework Analysis – Histogram bin Shifting and Rc6 Encryption – Clinical Prediction Models – Visual Analytics for Healthcare.

UNIT IV HEALTHCARE AND DEEP LEARNING **9**

Introduction on Deep Learning – DFF network CNN- RNN for Sequences – Biomedical Image and Signal Analysis – Natural Language Processing and Data Mining for Clinical Data – Mobile Imaging and Analytics – Clinical Decision Support System.

UNIT V CASE STUDIES **9**

Predicting Mortality for cardiology Practice –Smart Ambulance System using IOT –Hospital Acquired Conditions (HAC) program- Healthcare and Emerging Technologies – ECG Data Analysis.

OUTCOMES:

CO1: Use machine learning and deep learning algorithms for health data analysis
CO2: Apply the data management techniques for healthcare data
CO3: Evaluate the need of healthcare data analysis in e-healthcare, telemedicine and other critical care applications
CO4: Design health data analytics for real time applications
CO5: Design emergency care system using health data analysis

TOTAL:45 PERIODS

REFERENCES:

1. Chandan K.Reddy, Charu C. Aggarwal, "Health Care data Analysis", First edition, CRC, 2015.
2. Vikas Kumar, "Health Care Analysis Made Simple", Packt Publishing, 2018.
3. Nilanjan Dey, Amira Ashour , Simon James Fong, Chintan Bhatt, "Health Care Data Analysis and Management, First Edition, Academic Press, 2018.
4. Hui Jang, Eva K.Lee, "HealthCare Analysis : From Data to Knowledge to Healthcare Improvement", First Edition, Wiley, 2016.
5. Kulkarni , Siarry, Singh ,Abraham, Zhang, Zomaya , Baki, "Big Data Analytics in HealthCare", Springer, 2020.

AD8003 MOBILE APPLICATIONS DEVELOPMENT L T P C
3 0 0 3

OBJECTIVES:

1. Understand system requirements for mobile applications
2. Generate suitable design using specific mobile development frameworks
3. Generate mobile application design
4. Implement the design using specific mobile development frameworks
5. Deploy the mobile applications in marketplace for distribution

UNIT I INTRODUCTION TO MOBILE APPLICATIONS 9

Web Vs mobile App – Cost of Development – Myths - Mobile Applications – Marketing - Mobile User Interface Design - Effective Use of Screen – Mobile Users - Mobile Information Design - Mobile Platforms - Tools of Mobile Interface Design

UNIT II ANDROID USER INTERFACE DESIGN 9

Android Architecture – Android SDK Tools - Application Components - Intents - Content providers - Broadcast receivers – Services - User Interface Design - Views - View Groups – Layouts - Event Handling – Listeners – Adapters – Menus - Action Bars – Notifications - Android Localization

UNIT III ANDROID DATA STORAGE 9

Content Providers – Uri - CRUD access –Browser – CallLog – Contacts – Media Store - Data Access and Storage - Shared Preferences - Storage External - Network Connection - SQLite Databases

UNIT IV ANDROID NATIVE CAPABILITIES 9

Camera – Audio - Sensors and Bluetooth - Playing audio/video - Media recording - Sensors - Listening to sensor readings – Bluetooth - Android Communications – GPS - Working with

Location Manager, Working with Google Maps extensions - Maps via Intent - Map Activity - Location based Services - Location Updates - Location Providers - Selecting a Location Provider - Finding Location

UNIT V IOS DESIGN **9**

iPhone Craze – iOS Features – iOS Tools - iOS Project – Objective C Basics – Building iOS App – Actions and Outlets – Delegates - User Interface Elements – Accelerometer – Location Handling - SQLite Database

OUTCOMES:

CO1:Describe the requirements for mobile applications
CO2:Design user interface for mobile applications
CO3:Store mobile data of android applications
CO4:Evaluate native capabilities of android applications
CO5:Design iOS applications with tools

TOTAL:45 PERIODS

REFERENCES:

1. Jeff McWherter and Scott Gowell, "Professional Mobile Application Development", Wrox, 2012.
2. Reto Meier, "Professional Android 4 Development", John Wiley and Sons, 2012.
3. David Mark, Jack Nutting, Jeff LaMarche and Frederic Olsson, "Beginning iOS 6 Development: Exploring the iOS SDK", Apress, 2013.

AD8004 **PARALLEL COMPUTING** **L T P C**
3 0 0 3

OBJECTIVES:

1: To understand different parallelism techniques.
2: To know parallel architecture.
3: To learn about parallel algorithm design
4: Understand parallel programming
5: Learn about the interpretation of parallel programmng

UNIT I INTRODUCTION **9**

Historical progression leading to current state – types of parallism including temporal, data and functional. Instructional level parallelism – pipelined processors – super scalar processors – VLIW processors – multithreaded processors – proposed future processors including trace, multiscalar and super flow – case studies

UNIT II PARALLEL ARCHITECTURES **9**

Classification – inter connection networks – vector computers – shared memory parallel computers – cache coherence – distributed shared memory parallel computers – message passing parallel computers – cluster of workstations.

UNIT III PARALLEL ALGORITHMS PLATFORM **9**

Preliminaries – decomposition techniques – characteristics of tasks and interactions – mapping techniques for load balancing – methods for containing interaction overheads – parallel algorithm models.

UNIT IV PARALLEL PROGRAMMING DESGN **9**

Trends in microprocessor architectures - limitations of memory system performance – parallel computing platforms – communication costs in parallel machines – routing mechanisms for interconnection networks.

UNIT V COMPILER TRANSFORMATIONS AND PERFORMANCE EVALUATION **9**

Dependence analysis loop transformations – transformations for parallel computers including data layouts, computational and communication optimization. Peformance Metrics –performance lows – scalability – performance measurement books.

OUTCOMES:

CO1: Understand different parallel computing technique
CO2: Learn parallel computing architecture
CO3: Learn to design parallel algorithms
CO4: Understand how to develop parallel program
CO5: Know compiler interpretation of parallel programming

TOTAL:45 PERIODS

TEXT BOOKS:

1. V. Rajaraman and C. Siva Ram Murthy, "Parallel Computers – Architecture and Programming", Prentice-Hall of India, 2003.
2. Ananth Grama, Anshul gupta, George Karypis and Vipin Kumar, "Introduction to Parallel Computing", Pearson Education, Second edition, 2004.

REFERENCES:

1. Selim G.Akl – The design and analysis of parallel algorithms – Prentice Hall International Inc, 1989.
2. Hwang K. Briggs F.A. – Computer Architecture and parallel processing – MCGraw Hill – 1985
3. Shameem Akhter and Jason Roberts, "Multi-core Programming", Intel Press, 2006.

AD 8005 EMBEDDED SYSTEMS AND PROGRAMMING **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the architecture of embedded processors, microcontrollers and peripheral devices
- To learn programming the embedded processor in assembly
- To understand the challenges in developing operating systems for embeddedsystems
- To learn programming the embedded systems in high level language such as C
- To understand the Real time operating systems

UNIT I INTRODUCTION TO EMBEDDED SYSTEM **9**

Components of Embedded System – Classification - Characteristic of embedded system- Microprocessors & Micro controllers- Introduction to embedded processors - Embedded software architectures: Simple control loop - Interrupt controlled system - Cooperative multitasking - Preemptive multitasking or multi-threading - Micro kernels and kernels - Monolithic kernels - Exotic custom operating systems.

UNIT II EMBEDDED HARDWARE ARCHITECTURE **9**

ARM 2 TDMI core based 32 Bitmicrocontrollers and family of processors, Register, Memory and Data transfer, Arithmetic and Logic instructions, Assembly Language, I/O operations Interrupt structure, ARM cache, ARMBus, Embedded systems with ARM.

UNIT III REAL TIME OPERATING SYSTEMS **9**

Tasking Models, Task States, Services and Transitions - Real- Time Scheduling Algorithms: Round-Robin, FIFO, Priority-Based Preemptive Scheduling - Rate-Monotonic Scheduling - Priority Inversion and Priority Ceiling - Deadlocks - Process Synchronization – IPC - Shared Memory, Memory Locking, Memory Allocation - Signals – Semaphore Flag or mutex as Resource key – Message Queues – Mailboxes – Pipes – Virtual Sockets.

UNIT IV SOFTWARE DEVELOPMENT **9**

Embedded Programming in C and C++ - Source Code Engineering Toolsfor Embedded C/C++ - Program Modeling Concepts in Single and Multiprocessor Systems - Software Development Process - Software Engineering Practices in the Embedded Software Development – Hardware / Software Co-design in an Embedded System

UNIT V STUDY OF MICRO C/OS-II **9**

RTOS System Level Functions – Task Service Functions Time Delay Functions – Memory Allocation Related Functions – Semaphore Related Functions Mailbox Related Functions – Queue Related Functions – Case Studies of Programming withRTOS.

OUTCOMES:

CO1: Understand the embedded systems
CO2: Learn the embedded systems Architecture
CO3: Understand the embedded systems programming
CO4: Learn about the real time operating systems
CO5: Understand the concept on micro C

TOTAL:45 PERIODS

TEXT BOOKS:

1. Rajkamal, "Embedded System: Architecture, Programming and Design" Tata McGraw- Hill, 2003.
2. Wayne Wolf, "Computers as Components – Principles of Embedded Computing System Design", Harcourt India Pvt. Ltd., Morgan Kaufmann Publishers, First Indian Reprint, 2001.

REFERENCES:

1. Steve Heath, "Embedded Systems Design", Newnes, Second edition, 2003.
2. Noergaard, "Embedded System Architecture", Elsevier India Private Limited, 2005
3. Sriram Iyer and Pankaj Gupta, "Embedded Real Time Systems Programming", Tata McGraw-Hill, 2004.

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.

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.

TOTAL:45 PERIODS

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.

AD8006	ENGINEERING PREDICTIVE ANALYSIS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To explain terminology, technology and applications of predictive analysis
- To apply data preparation techniques and generate appropriate association rules.
- To discuss various descriptive models, their merits, demerits and application.
- To describe various predictive modelling methods.
- To introduce the text mining tools, technologies and case study which is used in day-to-day analytics cycle

UNIT I INTRODUCTION TO PREDICTIVE ANALYTICS **9**

Overview of Predictive Analytics- Setting Up the Problem - Data Understanding- Single Variable- Data Visualization in One Dimension- Data Visualization, Two or Higher Dimensions- The Value of Statistical Significance- Pulling It All Together into a Data Audit.

UNIT II DATA PREPARATION AND ASSOCIATION RULES **9**

Data Preparation- Variable Cleaning- Feature Creation- Item sets and Association Rules- Terminology- Parameter Settings- How the Data Is Organized- Measures of Interesting Rules- Deploying Association Rules- Problems with Association Rules- Building Classification Rules from Association Rules.

UNIT III MODELLING **9**

Descriptive Modeling- Data Preparation Issues with Descriptive Modeling- Principal Component Analysis- Clustering Algorithms- Interpreting Descriptive Models- Standard Cluster Model Interpretation

UNIT IV PREDICTIVE MODELLING **9**

Decision Trees- Logistic Regression -Neural Network Model – K-Nearest Neighbours – Naive Bayes – Regression Models - Linear Regression - Other Regression Algorithms.

UNIT V TEXT MINING **9**

Motivation for Text Mining- A Predictive Modeling Approach to Text Mining- Structured Vs. Unstructured Data- Why Text Mining Is Hard- Data Preparation Steps- Text Mining Features- Modeling with Text Mining Features- Regular Expressions- Case Studies:- Survey Analysis.

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: Explain terminology, technology and applications of predictive analysis
CO2: Apply data preparation techniques to effectively interpret big data
CO3: Discuss various descriptive models, their merits, demerits and application.
CO4: Describe principles of predictive analytics and apply them to achieve real, pragmatic

solutions.

CO5: Illustrate the features and applications of text mining.

REFERENCES:

1. Dean Abbott, "Applied Predictive Analytics-Principles and Techniques for the Professional Data Analyst", Wiley, 2014
2. Jiawei Han and Micheline Kamber, Data Mining Concepts and Techniques, Third Edition, Elsevier, 2012.
3. Conrad Carlberg, "Predictive Analytics: Microsoft Excel", 1st Edition, Que Publishing, 2012.
4. Gareth James, Daniela Witten, Trevor Hastie, Robert Tibshirani. An Introduction to Statistical Learning with Applications in R Springer 2013
5. Alberto Cordoba, "Understanding the Predictive Analytics Lifecycle", Wiley, 2014
6. Anasse Bari, Mohammad Chaouchi, Tommy Jung, Predictive Analytics for Dummies, 2nd Edition, 2017.

CS8603 **DISTRIBUTED SYSTEMS** **L T P C 3 0 0 3**

OBJECTIVES:

- To understand the foundations of distributed systems.
- To learn issues related to clock Synchronization and the need for global state in distributed systems.
- To learn distributed mutual exclusion and deadlock detection algorithms.
- To understand the significance of agreement, fault tolerance and recovery protocols in Distributed Systems.
- To learn the characteristics of peer-to-peer and distributed shared memory systems.

UNIT I Introduction **9**

Introduction: Definition –Relation to computer system components –Motivation –Relation to parallel systems – Message-passing systems versus shared memory systems –Primitives for distributed communication –Synchronous versus asynchronous executions –Design issues and challenges. **A model of distributed computations**: A distributed program –A model of distributed executions –Models of communication networks –Global state – Cuts –Past and future cones of an event –Models of process communications. **Logical Time**: A framework for a system of logical clocks –Scalar time –Vector time – Physical clock synchronization: NTP.

UNIT II MESSAGE ORDERING & SNAPSHOTS **9**

Message ordering and group communication: Message ordering paradigms –Asynchronous execution with synchronous communication –Synchronous program order on an asynchronous system –Group communication – Causal order (CO) - Total order. **Global state and snapshot recording algorithms:** Introduction –System model and definitions –Snapshot algorithms for FIFO channels

UNIT III DISTRIBUTED MUTEX & DEADLOCK **9**

Distributed mutual exclusion algorithms: Introduction – Preliminaries – Lamport's algorithm –

Ricart-Agrawala algorithm – Maekawa's algorithm – Suzuki–Kasami's broadcast algorithm. **Deadlock detection in distributed systems:** Introduction – System model – Preliminaries – Models of deadlocks – Knapp's classification – Algorithms for the single resource model, the AND model and the OR model.

UNIT IV RECOVERY & CONSENSUS **9**

Checkpointing and rollback recovery: Introduction – Background and definitions – Issues in failure recovery – Checkpoint-based recovery – Log-based rollback recovery – Coordinated checkpointing algorithm – Algorithm for asynchronous checkpointing and recovery. **Consensus and agreement algorithms:** Problem definition – Overview of results – Agreement in a failure – free system – Agreement in synchronous systems with failures.

UNIT V P2P & DISTRIBUTED SHARED MEMORY **9**

Peer-to-peer computing and overlay graphs: Introduction – Data indexing and overlays – Chord – Content addressable networks – Tapestry. **Distributed shared memory:** Abstraction and advantages – Memory consistency models –Shared memory Mutual Exclusion.

OUTCOMES:

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

- Elucidate the foundations and issues of distributed systems
- Understand the various synchronization issues and global state for distributed systems.
- Understand the Mutual Exclusion and Deadlock detection algorithms in distributed systems
- Describe the agreement protocols and fault tolerance mechanisms in distributed systems.
- Describe the features of peer-to-peer and distributed shared memory systems

TOTAL:45 PERIODS

TEXT BOOKS:

1. Kshemkalyani, Ajay D., and Mukesh Singhal. Distributed computing: principles, algorithms, and systems. Cambridge University Press, 2011.
2. George Coulouris, Jean Dollimore and Tim Kindberg, "Distributed Systems Concepts and Design", Fifth Edition, Pearson Education, 2012.

REFERENCES:

1. Pradeep K Sinha, "Distributed Operating Systems: Concepts and Design", Prentice Hall of India, 2007.
2. Mukesh Singhal and Niranjan G. Shivaratri. Advanced concepts in operating systems. McGraw-Hill, Inc., 1994.
3. Tanenbaum A.S., Van Steen M., "Distributed Systems: Principles and Paradigms", Pearson Education, 2007.
4. Liu M.L., "Distributed Computing, Principles and Applications", Pearson Education, 2004.
5. Nancy A Lynch, "Distributed Algorithms", Morgan Kaufman Publishers, USA, 2003.

CS8072 **AGILE METHODOLOGIES** **L T P C**
3 0 0 3

OBJECTIVES:

- To provide students with a theoretical as well as practical understanding of agile software development practices and how small teams can apply them to create high-quality software.
- To provide a good understanding of software design and a set of software technologies and APIs.
- To do a detailed examination and demonstration of Agile development and testing techniques.
- To understand the benefits and pitfalls of working in an Agile team.
- To understand Agile development and testing.

UNIT I 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

UNIT II AGILE PROCESSES **9**

Lean Production - SCRUM, Crystal, Feature Driven Development- Adaptive Software Development - Extreme Programming: Method Overview – Lifecycle – Work Products, Roles and Practices.

UNIT III AGILITY AND KNOWLEDGE MANAGEMENT **9**

Agile Information Systems – Agile Decision Making - Earl'S Schools of KM – Institutional Knowledge Evolution Cycle – Development, Acquisition, Refinement, Distribution, Deployment , Leveraging – KM in Software Engineering – Managing Software Knowledge – Challenges of Migrating to Agile Methodologies – Agile Knowledge Sharing – Role of Story-Cards – Story-Card Maturity Model (SMM).

UNIT IV AGILITY AND REQUIREMENTS ENGINEERING **9**

Impact of Agile Processes in RE–Current Agile Practices – Variance – Overview of RE Using Agile – Managing Unstable Requirements – Requirements Elicitation – Agile Requirements Abstraction Model – Requirements Management in Agile Environment, Agile Requirements Prioritization – Agile Requirements Modeling and Generation – Concurrency in Agile Requirements Generation.

UNIT V AGILITY AND QUALITY ASSURANCE **9**

Agile Product Development – Agile Metrics – Feature Driven Development (FDD) – Financial and Production Metrics in FDD – Agile Approach to Quality Assurance - Test Driven Development – Agile Approach in Global Software Development.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Realize the importance of interacting with business stakeholders in determining the requirements for a software system
- Perform iterative software development processes: how to plan them, how to execute them.
- Point out the impact of social aspects on software development success.

- Develop techniques and tools for improving team collaboration and software quality.
- Perform Software process improvement as an ongoing task for development teams.
- Show how agile approaches can be scaled up to the enterprise level.

TEXT BOOKS:

1. David J. Anderson and Eli Schragenheim, "Agile Management for Software Engineering: Applying the Theory of Constraints for Business Results", Prentice Hall, 2003.
2. Hazza and Dubinsky, "Agile Software Engineering, Series: Undergraduate Topics in Computer Science", Springer, 2009.

REFERENCES:

1. Craig Larman, "Agile and Iterative Development: A Manager's Guide", Addison-Wesley, 2004.
2. Kevin C. Desouza, "Agile Information Systems: Conceptualization, Construction, and Management", Butterworth-Heinemann, 2007.

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

AD8007 SOFTWARE TESTING AND QUALITY ASSURANCE

L	T	P	C
3	0	0	3

OBJECTIVES:

- To understand the basics of testing, planning, designing and managing test cases.
- To study the various types of test in the life cycle of the software product.
- To build design concepts for system testing and execution.
- To learn the software quality assurance ,metrics, defect prevention techniques
- To learn the techniques for quality assurance and applying for applications.

UNIT I SOFTWARE TESTING - CONCEPTS, ISSUES, AND TECHNIQUES 9

Quality Revolution, Verification and Validation, Failure, Error, Fault, and Defect, Objectives of Testing, Testing Activities, Test Case Selection White-Box and Black, test Planning and design, Test Tools and Automation, Power of Test. Test Team Organization and Management-Test Groups, Software Quality Assurance Group, System Test Team Hierarchy, Team Building

UNIT II SYSTEM TESTING 9

System Testing - System Integration Techniques-Incremental, Top Down Bottom Up Sandwich and Big Bang, Software and Hardware Integration, Hardware Design Verification Tests, Hardware and Software Compatibility Matrix Test Plan for System Integration. Built- in Testing. Functional testing - Testing a Function in Context. Boundary Value Analysis, Decision Tables. acceptance testing - Selection of Acceptance Criteria, Acceptance Test Plan, Test Execution Test. software reliability - Fault and Failure, Factors Influencing Software, Reliability Models

UNIT III SYSTEM TEST CATEGORIES 10

System test categories Taxonomy of System Tests, Interface Tests Functionality Tests. GUI Tests, Security Tests Feature Tests, Robustness Tests, Boundary Value Tests Power Cycling Tests Interoperability Tests, Scalability Tests, Stress Tests, Load and Stability Tests, Reliability Tests, Regression Tests, Regulatory Tests. Test Generation from FSM models- State-Oriented Model. Finite-State Machine Transition Tour Method, Testing with State Verification. Test Architectures-Local, distributed, Coordinated, Remote system test design- Test Design Factors Requirement Identification, modeling a Test Design Process Test Design Preparedness, Metrics, Test Case Design Effectiveness. System test execution- Modeling Defects, Metrics for Monitoring Test Execution .Defect Reports, Defect Causal Analysis, Beta testing, measuring Test Effectiveness.

UNIT IV SOFTWARE QUALITY 8

Software quality - People's Quality Expectations, Frameworks and ISO-9126, McCall's Quality Factors and Criteria – Relationship, Quality Metrics. Quality Characteristics ISO 9000:2000 Software Quality Standard. Maturity models- Test Process Improvement, Testing Maturity Model.

UNIT V SOFTWARE QUALITY ASSURANCE 9

Quality Assurance - Root Cause Analysis, modeling, technologies, standards and methodologies for defect prevention. Fault Tolerance and Failure Containment - Safety Assurance and Damage Control, Hazard analysis using fault-trees and event-trees. Comparing Quality Assurance Techniques and Activities. QA Monitoring and Measurement, Risk Identification for Quantifiable Quality Improvement. Case Study: FSM-Based Testing of Web-Based Applications.

TOTAL: 45 PERIODS

OUTCOMES:

AT THE END OF THE COURSE, LEARNERS WILL BE ABLE TO:

- Perform functional and non-functional tests in the life cycle of the software product.
- Understand system testing and test execution process.
- Identify defect prevention techniques and software quality assurance metrics.
- Apply techniques of quality assurance for typical applications.

TEXT BOOKS:

1. Software Testing And Quality Assurance-Theory and Practice, Kshirasagar Naik, Priyadarshi Tripathy, John Wiley & Sons Inc,2008

2. Software Quality Assurance - From Theory to Implementation, Daniel Galin, Pearson Education Ltd UK, 2004

REFERENCES:

1. Software Quality Engineering: Testing, Quality Assurance, and Quantifiable Improvement, Jeff Tian, John Wiley & Sons, Inc., Hoboken, New Jersey. 2005.
2. Software Quality Assurance, Milind Limaye, TMH ,New Delhi, 2011
3. Aditya P. Mathur, "Foundations of Software Testing _ Fundamental Algorithms and Techniques", Dorling Kindersley (India) Pvt. Ltd., Pearson Education, 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 9

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 9

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 9

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 9

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.

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.

TOTAL:45 PERIODS

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.

CS8085 SOCIAL NETWORK ANALYTICS **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the concept of semantic web and related applications.
- To learn knowledge representation using ontology.
- To understand human behaviour in social web and related communities.
- To learn visualization of social networks.

UNIT I INTRODUCTION **9**

Introduction to Semantic Web: Limitations of current Web - Development of Semantic Web - Emergence of the Social Web - Social Network analysis: Development of Social Network Analysis - Key concepts and measures in network analysis - Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities - Web-based networks - Applications of Social Network Analysis.

UNIT II MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION **9**

Ontology and their role in the Semantic Web: Ontology-based knowledge Representation - Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of

social relationships - Aggregating and reasoning with social network data - Advanced representations.

UNIT III EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS **9**

Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - Multi-Relational characterization of dynamic social network communities.

UNIT IV PREDICTING HUMAN BEHAVIOUR AND PRIVACY ISSUES **9**

Understanding and predicting human behaviour for social communities - User data management - Inference and Distribution - Enabling new human experiences - Reality mining - Context - Awareness - Privacy in online social networks - Trust in online environment - Trust models based on subjective logic - Trust network analysis - Trust transitivity analysis - Combining trust and reputation - Trust derivation based on trust comparisons - Attack spectrum and countermeasures.

UNIT V VISUALIZATION AND APPLICATIONS OF SOCIAL NETWORKS **9**

Graph theory - Centrality - Clustering - Node-Edge Diagrams - Matrix representation - Visualizing online social networks, Visualizing social networks with matrix-based representations - Matrix and Node-Link Diagrams - Hybrid representations - Applications - Cover networks - Community welfare - Collaboration networks - Co-Citation networks.

OUTCOMES:

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

- Develop semantic web related applications.
- Represent knowledge using ontology.
- Predict human behaviour in social web and related communities.
- Visualize social networks.

TOTAL PERIODS:45

TEXT BOOKS:

1. Peter Mika, "Social Networks and the Semantic Web", First Edition, Springer 2007.
2. Borko Furht, "Handbook of Social Network Technologies and Applications", 1st Edition, Springer, 2010.

REFERENCES:

1. Guandong Xu ,Yanchun Zhang and Lin Li, "Web Mining and Social Networking – Techniques and applications", First Edition, Springer, 2011.
2. Dion Goh and Schubert Foo, "Social information Retrieval Systems: Emerging Technologies and Applications for Searching the Web Effectively", IGI Global Snippet, 2008.
3. Max Chevalier, Christine Julien and Chantal Soulé-Dupuy, "Collaborative and Social Information Retrieval and Access: Techniques for Improved user Modelling", IGI Global Snippet, 2009.
4. John G. Breslin, Alexander Passant and Stefan Decker, "The Social Semantic Web", Springer, 2009.

AD8008 **WEB SERVICES AND API DESIGN** **L T P C**
3 0 0 3

OBJECTIVES:

1. To understand the types of web services, resources, APIs and their architectures
2. To analyze the web service / API design patterns
3. To understand the design principles and best practices
4. To develop, deploy RESTful web service APIs in JAVA
5. To understand the security concerns.

UNIT I INTRODUCTION **9**

Web Services - Building Blocks, Types; Service Oriented architectures - resource oriented architectures, API architectures, Micro services and architectures, HATEOAS, REST, URI, Code on Demand.

UNIT II RESOURCES AND DESIGN PATTERNS **9**

Resources - Identification, Resource Relations, Representations, Parameters, types, methods, Requirements for APIs, Architectural Patterns. Basic and Advanced RESTful API patterns.

UNIT III RESTFUL API DESIGN PRINCIPLES **9**

API front End Design, API back end Design, Identifier Design, Interaction Design with HTTP, Metadata Design, Representation Design, URI design, REST constraints, Best Practices.

UNIT IV DEVELOPMENT AND DEPOLYMENT **9**

Frameworks, Standard Languages, API Description Languages, Handover points, Development and Deployment of RESTful web service applications in Java, microservice API, Best Practices.

UNIT V PERFORMANCE AND SECURITY **9**

Performance and availability - caching - Traffic shaping - Evolution and versioning, Security concerns - Mechanisms, Authentication, Validation, Access Control, Token Based Authentication, Authorization.

OUTCOMES:

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

- Use a suitable architecture for a given design problem
- Analyze the types of resources and suitable design patterns for development and deployment
- Create and Analyze front-end and Back end designs
- Deploy RESTful API web services using JAVA
- Implement security best practices for preventing security attacks

TOTAL:45 PERIODS

TEXT BOOK:

1. Matthias Biehl, "RESTful API Design, API University Series, 1st Edition, CreateSpace Independent Publishing Platform, 2016.
2. Mark Masse, "REST API Design Rulebook: Designing Consistent RESTful Web Service Interfaces", 1st Edition, O' Reilly, 2011.
3. Harihara Subramanian, Pethuru Raj, "Hands-On RESTful API Design Patterns and Best Practices: Design, develop, and deploy highly adaptable, scalable, and secure "RESTful web APIs", Packt Publishing, 2019.

REFERENCES:

1. JJ Geewax, "API Design Patterns", 1st Edition, Manning Publications, 2021.
2. Bogunuva Mohanram Balachandar, "Restful Java Web Services: A pragmatic guide to designing and building RESTful APIs using Java, 3rd Edition, Ingram Short Title, 2017.

AD8009	OPERATIONS AND SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To provide an insight on the operations, quality management and sampling tools and fundamentals of supply chain networks, tools and techniques

UNIT I INTRODUCTION TO OPERATIONS AND SUPPLY CHAIN MANAGEMENT **9**

Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles - The Operations Function - The Evolution of Operations and Supply Chain Management – Globalization - Productivity and Competitiveness - Strategy and Operations-Operational Decision-Making Tools: Decision Analysis-Decision Analysis with and without Probabilities

UNIT II QUALITY MANAGEMENT **9**

Quality and Value in Athletic Shoes -What Is Quality-Quality Management System-Quality Tools-Quality in Services-Six Sigma-Quality Costs and Productivity-Quality Awards-ISO 9000-Statistical Process Control-Operational Decision-Making Tools: Acceptance Samp

UNIT III NETWORK DESIGN AND TRANSPORTATION **9**

Factors influencing Distribution network design – Design options for Distribution Network— factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation

UNIT IV SOURCING AND COORDINATION **9**

Role of sourcing supply chain - supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect – Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY **9**

The role IT in supply chain- The supply chain IT frame work - Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL:45 PERIODS

OUTCOMES:

- To know about the operations and fundamentals of supply chain
- To understand the quality management tools and sampling process
- To understand the design factors and various design options of distribution networks in industries and the role of transportation and warehousing
- To understand the various sourcing decisions in supply chain

- To understand the supply chain management in IT industries

TEXT BOOKS:

1. Roberta S. Russell, Bernard W. Taylor, "Operations and Supply Chain Management, 10th Edition, Wiley Publications,2019
2. Sunil Chopra, Peter Meindl and Kalra, Supply Chain Management, Strategy, Planning, and Operation, Pearson Education, 2010.

REFERENCES:

1. Jeremy F.Shapiro, Modeling the Supply Chain, Thomson Duxbury, 2002.
2. Srinivasan G.S, Quantitative models in Operations and Supply Chain Management, PHI, 2010
3. David J.Bloomberg , Stephen Lemay and Joe B.Hanna, Logistics, PHI 2002.
4. James B.Ayers, Handbook of Supply Chain Management, St.Lucie press, 2000
5. F. Robert Jacobs (Author), Richard B. Chase, Operations and Supply Chain Management McGraw Hill 2017

AD8010	SPEECH PROCESSING AND ANALYTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

1. To understand the need for morphological processing and their representation
2. To know about the various techniques used for speech synthesis and recognition
3. To appreciate the syntax analysis and parsing that is essential for natural language processing
4. To learn about the various representations of semantics and discourse
5. To have knowledge about the applications of natural language processing

UNIT I SPEECH PROCESSING **9**

Phonetics –Articulatory Phonetics -Phonological Categories -Acoustic Phonetics and Signals - Speech Synthesis –Text Normalization –Phonetic and Acoustic Analysis -Diphone Waveform synthesis –Evaluation-Automatic Speech Recognition –Architecture -Hidden Markov Model to Speech -MFCC vectors -Acoustic Likelihood Computation -Evaluation. Triphones – Discriminative Training -Modeling Variation. Computational Phonology- Finite-State Phonology –Computational Optimality Theory -Syllabification -Learning Phonology and Morphology

UNIT II SPEECH ANALYSIS **9**

Features, Feature Extraction and Pattern Comparison Techniques: Speech distortion measures – mathematical and perceptual – Log Spectral Distance, Cepstral Distances, Weighted Cepstral Distances and Filtering, Likelihood Distortions, Spectral Distortion using a Warped Frequency Scale, LPC, PLP and MFCC Coefficients, Time Alignment and Normalization – Dynamic Time Warping, Multiple Time – Alignment Paths

UNIT III SPEECH MODELING **9**

Hidden Markov Models: Markov Processes, HMMs – Evaluation, Optimal State Sequence – Viterbi Search, Baum-Welch Parameter Re-estimation, Implementation issues.

UNIT IV SPEECH RECOGNITION **9**

Large Vocabulary Continuous Speech Recognition: Architecture of a large vocabulary

continuous speech recognition system – acoustics and language models – n-grams, context dependent sub-word units; Applications and present status.

UNITV SPEECH SYNTHESIS 9

Text-to-Speech Synthesis: Concatenative and waveform synthesis methods, sub-word units for TTS, intelligibility and naturalness – role of prosody, Applications and present status.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Identify the different linguistic components of natural language
- Design a morphological analyser for a given natural language
- Decide on the appropriate parsing techniques necessary for a given language and application
- Design new tagset and a tagger for a given natural language
- Design applications involving natural language

REFERENCES:

1. Jurafsky and Martin, "Speech and Language Processing", Pearson Prentice Hall, Second Edition, 2008.
2. Lawrence Rabinerand Biing-Hwang Juang, "Fundamentals of Speech Recognition", Pearson Education, 2003
3. Steven W. Smith, "The Scientist and Engineer's Guide to Digital Signal Processing", California Technical Publishing.
4. Thomas F Quatieri, "Discrete-Time Speech Signal Processing – Principles and Practice", Pearson Education.
5. Claudio Becchetti and Lucio Prina Ricotti, "Speech Recognition", John Wiley and Sons, 1999.
6. Ben gold and Nelson Morgan, "Speech and audio signal processing", processing and perception of speech and music, Wiley- India Edition, 2006 Edition.
7. Frederick Jelinek, "Statistical Methods of Speech Recognition", MIT Press

AD8011 CYBER SECURITY L T P C

3 0 0 3

OBJECTIVES:

1. To study the basics of Cyber security.
2. To know about the security aspects operating systems and networks.
3. To explore Cryptography , IDS and IPS
4. To study the privacy principles and policies.
5. To know about the Security management and incidents.

UNIT I INTRODUCTION TO CYBER SECURITY 9

Introduction -Computer Security - Threats -Harm - Vulnerabilities - Controls – Authentication- Access Control and Cryptography - Web-User Side - Browser Attacks - Web Attacks- Targeting Users - Obtaining User or Website Data - Email Attacks.

UNIT II SECURITY IN OPERATING SYSTEM & NETWORKS 9

Security in Operating Systems - Security in the Design of Operating Systems -Rootkit - Network security attack- Threats to Network Communications - Wireless Network Security - Denial of Service - Distributed Denial-of-Service.

UNIT III DEFENCES: SECURITY COUNTER MEASURES 9

Cryptography in Network Security - Firewalls - Intrusion Detection and Prevention Systems - Network Management - Databases - Security Requirements of Databases - Reliability and Integrity - Database Disclosure - Data Mining and Big Data.

UNIT IV PRIVACY IN CYBERSPACE 9

Privacy Concepts -Privacy Principles and Policies -Authentication and Privacy - Data Mining - Privacy on the Web - Email Security - Privacy Impacts of Emerging Technologies.

UNIT V MANAGEMENT AND INCIDENTS 9

Security Planning - Business Continuity Planning - Handling Incidents - Risk Analysis - Dealing with Disaster - Emerging Technologies - The Internet of Things - Economics - Electronic Voting - Cyber Warfare- Cyberspace and the Law - International Laws - Cyber crime - Cyber Warfare and Home Land Security.

OUTCOMES:

After the completion of this course, students will be able to:

CO1: Explain the basic concepts of computer security

CO2: Devise methods for Security in operating system & networks

CO3: Differentiate the various security counter measures

CO4: Devise Privacy principles and policies

CO5: Manage the Cyber space.

TOTAL:45 PERIODS

TEXT BOOKS:

1. Jan L.Harrington,"Network Security – A Practical Approach", Morgan Kaufmann Publishers –An Imprint of Elsevier, 2005,
2. William Stallings, "Cryptography and Network Security – Principles and Practice", Pearson Education Asia, Fourth Edition, 2005

REFERENCES:

1. Edward Amoroso, "Cyber Security", Silicon Press, 2006
2. Charles P. Pfleeger Shari Lawrence Pfleeger Jonathan Margulies, Security in Computing, 5th Edition , Pearson Education , 2015
3. George K.Kostopoulous, Cyber Space and Cyber Security, CRC Press, 2013.
4. MarttiLehto, PekkaNeittaanmäki, Cyber Security: Analytics, Technology and Automation edited, Springer International Publishing Switzerland 2015
5. Nelson Phillips and EnfingerSteuart, "Computer Forensics and Investigations", Cengage Learning, New Delhi, 2009.

AD8012 **NONLINEAR OPTIMIZATION**

L	T	P	C
3	0	0	3

OBJECTIVES:

1.To understand the role of optimization techniques and its importance in engineering
2. To introduce the concept of nonlinear optimization methods.
3. To realize the application of non-traditional optimization algorithms
4. To choose appropriate optimization method and solve real world problems.

UNIT I CLASSICAL OPTIMIZATION TECHNIQUES 9

Single variable optimization, Constrained and unconstrained multi-variable optimization, Direct substitution method, Lagrange's method of multipliers,Karush-Kuhn-Tucker conditions

UNIT II NON-LINEAR PROGRAMMING: ONE-DIMENSIONAL MINIMIZATION METHOD 9

Unimodal function, Unrestricted search, Exhaustive search, Dichotomous search, Interval halving method, Fibonacci method, Golden section method, Direct root methods

UNIT III NON-LINEAR PROGRAMMING: UNCONSTRAINED OPTIMIZATION TECHNIQUES 9

Direct Search Methods: Random search methods, Grid search method, Univariate method, Hookes and Jeeves' method, Powell's method Indirect Search Methods: Steepest descent method, Fletcher-Reeves method, Newton's method

UNIT IV NON-LINEAR PROGRAMMING: CONSTRAINED OPTIMIZATION TECHNIQUES 9

Direct Methods: Random search method, Sequential linear programming, Indirect methods: Transformation techniques, Exterior penalty function method, Interior penalty function method

UNITV ADVANCED NON-LINEAR OPTIMIZATION 9

Genetic Algorithms -Working principle-Genetic operators-Numerical problem-Simulated Annealing – Numerical problem - Neural network based optimization-Optimization of fuzzy systems-fuzzy set theory-computational procedure

TOTAL: 45 PERIODS

OUTCOMES:

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

- Comprehend the need and applications of the optimization methods
- understand basic theoretical principles for formulation of optimization models and its solution.
- learn the unified and exact mathematical basis as well as the general principles of various soft computing techniques
- apply detailed theoretical and practical aspects of intelligent modelling, optimization and control of non-linear systems.

REFERENCES:

1. Engineering Optimization Theory and Practice, S.S.Rao, New Age International (P),5th edition,2019

2. C. B Gupta ,Optimization Techniques in Operation Research, I.K.International House

Pvt.Ltd 2007.
3. Godfrey C. Onwubolu, B. V. Babu,New Optimization Techniques in Engineering, 2004
4. Cesar Lopez,MATLAB Optimization Techniques,2014

AD8013 **ETHICS OF ARTIFICIAL INTELLIGENCE** **L T P C**
3 0 0 3

OBJECTIVES:

1: To understand the need for ensuring ethics in AI
2: To understand ethical issues with the development of AI agents
3: To apply the ethical considerations in different AI applications
4: To evaluate the relation of ethics with nature
5: To overcome the risk for Human rights and other fundamental values.

UNIT I INTRODUCTION TO ETHICS OF AI **9**

Role of Artificial Intelligence in Human Life, Understanding Ethics, Why Ethics in AI? Ethical Considerations of AI, Current Initiatives in AI and Ethics, Ethical Issues with our relationship with artificial Entities

UNIT II FRAMEWORK AND MODELS **9**

AI Governance by Human-right centered design, Normative models, Role of professional norms, Teaching Machines to be Moral

UNIT III CONCEPTS AND ISSUES **9**

Accountability in Computer Systems, Transparency, Responsibility and AI. Race and Gender, AI as a moral right-holder

UNIT IV PERSPECTIVES AND APPROACHES **9**

Perspectives on Ethics of AI, Integrating ethical values and economic value, Automating origination, AI a Binary approach, Machine learning values, Artificial Moral Agents

UNIT V CASES AND APPLICATION **9**

Ethics of Artificial Intelligence in Transport, Ethical AI in Military, Biomedical research, Patient Care, Public Health, Robot Teaching, Pedagogy, Policy, Smart City Ethics

OUTCOMES:

CO1: Understand the ethical issues in the development of AI agents
CO2: Learn the ethical considerations of AI with perspectives on ethical values
CO3: Apply the ethical policies in AI based applications and Robot development
CO4: To implement the AI concepts to societal problems by adapting the legal concepts by securing fundamental rights.
CO5: This study will help to overcome the evil genesis in the concepts of AI.

TOTAL:45 PERIODS

REFERENCES

1. Paula Boddington, "Towards a Code of Ethics for Artificial Intelligence", Springer, 2017
2. Markus D. Dubber, Frank Pasquale, Sunit Das, "The Oxford Handbook of Ethics of AI", Oxford University Press Edited book, 2020
3. S. Matthew Liao, "Ethics of Artificial Intelligence", Oxford University Press Edited

Book, 2020
4. N. Bostrom and E. Yudkowsky. "The ethics of artificial intelligence". In W. M. Ramsey and K. Frankish, editors, The Cambridge Handbook of Artificial Intelligence, pages 316–334. Cambridge University Press, Cambridge, 2014.
5. Wallach, W., & Allen, C, "Moral machines: ceaching robots right from wrong", Oxford University Press, 2008.

AD8014 ENGINEERING ECONOMICS L T P C
3 0 0 3

OBJECTIVES:

1: To Learn the fundamental of Economics.
2: To Understand different methods of depreciation use for calculation
3: To know the various method of comparison used in economic
4: To Understand how funds are managed in an organization.
5: Different methods of production and marketing adopted in an industry.

UNIT I MICRO AND MACRO ECONOMICS AND ITS APPLICATIONS 9

Introduction – Micro Economics – Macro Economics – Economic decisions and Technical Decisions – Demand and Supply Concepts – Elasticity of Demand – Cost of Products – Price of products – Break-Even Analysis – Nature of Functioning of Money –Notional Income – GNP and Savings – Inflation and Deflation Concepts

UNIT II METHODS OF DEPRECIATION 9

Straight line method of Depreciation- Declining Balance Method of Depreciation-Sum of the Years Digits Method of Depreciation-Sinking Fund Method of Depreciation- Service-output Method of Depreciation.

UNIT III METHODS OF COMPARISON OF ALTERNATIVES 9

Introduction – Elementary Economic Analysis – Interest Formulas and their Applications Comparisons – Present Worth Method – Future Worth Method – Annual Equivalent Method – Rate of Return Method.

UNIT IV FINANCIAL MANAGEMENT 9

Sources of finance, internal and external-preparation of balance sheet and profit and loss statements, Types of accounting and significance of each type, interest formulas and their applications.

UNIT V PRODUCTION & MARKETING MANAGEMENT 9

Types of Production, process of planning, scheduling, Routing, material control; product concept concepts of productivity, Core concepts of Marketing- Needs, Wants, Demand-Marketing Vs Selling- Products and Markets- Pricing and its related factors- Channels of Distribution- Promotion- Advertising- Market Research- Sales Forecasting.

OUTCOMES:

CO1: The basic concepts of economics are learned
CO2: Understand the various types depreciation used
CO3: Learn the different comparison technique used in industries.
CO4: The fund flow in the industries are learned

CO5: Understand the different Production and Marketing techniques used in the industries.

TOTAL:45 PERIODS

TEXT BOOKS

1. O.P. Khanna, 'Industrial Engineering and Management', Dhanpat Rai and Sons,201
2. R. Pannerselvam, 'Engineering Economics', Prentice Hall of India Pvt. Ltd,2014

REFERENCES

1. S.K. Jain, "Applied Economics for Engineers and Managers", Vikas Publications House, New Delhi, 1997.
2. Mote Paul, Gupta, "Managerial Economics" Tata Mc Graw Hill, 1987.
3. Joseph L. Massie, "Essentials of Management", Prentice-Hall of India, Third edition, 1979.

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.

MG8591 PRINCIPLES OF MANAGEMENT **L T P C**
3 0 0 3

OBJECTIVES:

- To enable the students to study the evolution of Management, to study the functions and principles of management and to learn the application of the principles in an organization.

UNIT I INTRODUCTION TO MANAGEMENT AND ORGANIZATIONS 9

Definition of Management – Science or Art – Manager Vs Entrepreneur - types of managers - managerial roles and skills – Evolution of Management – Scientific, human relations , system and contingency approaches – Types of Business organization - Sole proprietorship, partnership, company-public and private sector enterprises - Organization culture and Environment – Current trends and issues in Management.

UNIT II PLANNING 9

Nature and purpose of planning – planning process – types of planning – objectives – setting objectives – policies – Planning premises – Strategic Management – Planning Tools and Techniques – Decision making steps and process.

UNIT III ORGANISING 9

Nature and purpose – Formal and informal organization – organization chart – organization structure – types – Line and staff authority – departmentalization – delegation of authority – centralization and decentralization – Job Design - Human Resource Management – HR Planning, Recruitment, selection, Training and Development, Performance Management , Career planning and management

UNIT IV DIRECTING 9

Foundations of individual and group behaviour – motivation – motivation theories – motivational techniques – job satisfaction – job enrichment – leadership – types and theories of leadership – communication – process of communication – barrier in communication – effective communication –communication and IT.

UNIT V CONTROLLING 9

System and process of controlling – budgetary and non-budgetary control techniques – use of computers and IT in Management control – Productivity problems and management – control and performance – direct and preventive control – reporting.

TOTAL: 45 PERIODS

OUTCOMES:

- Upon completion of the course, students will be able to have clear understanding of managerial functions like planning, organizing, staffing, leading & controlling and have same basic knowledge on international aspect of management

TEXTBOOKS:

1. Stephen P. Robbins & Mary Coulter, "Management", Prentice Hall (India) Pvt. Ltd., 10th Edition, 2009.
2. JAF Stoner, Freeman R.E and Daniel R Gilbert "Management", Pearson Education, 6th Edition, 2004.

REFERENCES:

1. Stephen A. Robbins & David A. Decenzo & Mary Coulter, "Fundamentals of Management" Pearson Education, 7th Edition, 2011.
2. Robert Kreitner & Mamata Mohapatra, " Management", Biztantra, 2008.
3. Harold Koontz & Heinz Weihrich "Essentials of management" Tata McGraw Hill,1998.
4. Tripathy PC & Reddy PN, "Principles of Management", Tata McGraw Hill, 1999

AD8015 **BIO-INSPIRED OPTIMIZATION TECHNIQUES** **L T P C 3 0 0 3**

OBJECTIVES:

- To understand fundamental topics in bio-inspired optimization techniques
- To Learn the collective systems such as ACO, PSO, and BCO
- To develop skills in biologically inspired algorithm design with an emphasis on solving real world problems
- To understand the most appropriate types of algorithms for different data analysis problems and to introduce some of the most appropriate implementation strategies.
- To implement the Bio-inspired technique with other traditional algorithms.

UNIT I INTRODUCTION **9**

Optimization Techniques: Introduction to Optimization Problems – Single and Muti- objective Optimization – Classical Techniques – Overview of various Optimization methods – Evolutionary Computing: Genetic Algorithm and Genetic Programming: Basic concept – encoding – representation – fitness function – Reproduction – differences between GA and Traditional optimization methods – Applications – Bio- Inspired Computing (BIC): Motivation – Overview of BIC – usage of BIC – merits and demerits of BIC.

UNIT II SWARM INTELLIGENCE **9**

Introduction – Biological foundations of Swarm Intelligence – Swarm Intelligence in Optimization – Ant Colonies: Ant Foraging Behavior – Towards Artificial Ants – Ant Colony Optimization (ACO) – S-ACO – Ant Colony Optimization Metaheuristic: Combinatorial Optimization – ACO Metaheuristic – Problem solving using ACO – Other Metaheuristics – Simulated annealing – Tabu Search – Local search methods – Scope of ACO algorithms.

UNIT III NATURAL TO ARTIFICIAL SYSTEMS **9**

Biological Nervous Systems – artificial neural networks – architecture – Learning Paradigms – unsupervised learning – supervised learning – reinforcement learning – evolution of neural networks – hybrid neural systems – Biological Inspirations in problem solving – Behavior of Social Insects: Foraging –Division of Labor – Task Allocation – Cemetery Organization and Brood Sorting – Nest Building – Cooperative transport.

UNIT IV SWARM ROBOTICS **9**

Foraging for food – Clustering of objects – Collective Prey retrieval –Scope of Swarm Robotics – Social Adaptation of Knowledge: Particle Swarm – Particle Swarm Optimization (PSO) – Particle Swarms for Dynamic Optimization Problems – Artificial Bee Colony (ABC) Optimization biologically inspired algorithms in engineering.

UNIT V CASE STUDIES **9**

Other Swarm Intelligence algorithms: Fish Swarm – Bacteria foraging – Intelligent Water Drop Algorithms – Applications of biologically inspired algorithms in engineering. Case Studies: ACO and PSO for NP-hard problems – Routing problems – Assignment problems – Scheduling problems – Subset problems – Machine Learning Problems –Travelling Salesman problem.

OUTCOMES:

CO1: Familiarity with the basics of several biologically inspired optimization techniques.
CO2: Familiarity with the basics of several biologically inspired computingparadigms.
CO3: Ability to select an appropriate bio-inspired computing method and implementfor any application and data set.

CO4: Theoretical understanding of the differences between the major bio-inspired computing methods.
CO5: Learn Other Swarm Intelligence algorithms and implement the Bio-Inspired technique with other traditional algorithms.

TOTAL PERIODS:45

TEXT BOOK

1. A. E. Elben and J. E. Smith, "Introduction to Evolutionary Computing", Springer, 2010.
2. Floreano D. and Mattiussi C., "Bio-Inspired Artificial Intelligence: Theories, Methods, and Technologies", MIT Press, Cambridge, MA, 2008.
3. Leandro Nunes de Castro, " Fundamentals of Natural Computing. Basic Concepts, Algorithms and Applications", Chapman & Hall/ CRC, Taylor and Francis Group, 2007 .

REFERENCES

1. Eric Bonabeau, Marco Dorigo, Guy Theraulaz, "Swarm Intelligence: FromNatural to Artificial Systems", Oxford University press, 2000.
2. Christian Blum, Daniel Merkle (Eds.), "Swarm Intelligence: Introduction and Applications", Springer Verlag, 2008.
3. Leandro N De Castro, Fernando J Von Zuben, "Recent Developments in Biologically Inspired Computing", Idea Group Inc., 2005.
4. Albert Y.Zomaya, "Handbook of Nature-Inspired and Innovative Computing", Springer, 2006.
5. C. Ebelhart et al., "Swarm Intelligence", Morgan Kaufmann, 2001.

AD8016 INFORMATION EXTRACTION AND RETRIEVAL L T P C
3 0 0 3

OBJECTIVES:

1: To understand the different ways for extraction of multimedia data
2: To learn and analyze the information retrieval techniques
3: To apply the information retrieval algorithms for real time applications
4: To understand and evaluate the applications of information retrieval techniques
5: To understand the role of information retrieval systems in web applications

UNIT I INTRODUCTION TO INFORMATION EXTRACTION 9

Introduction – Origins – Text, Audio ,Image, Video Extraction – Visual object Feature Localization - Entropy based Image Analysis – 3D shape Extraction Techniques - Semantic Multimedia Extraction using Audio & Video – Multimedia Web Documents.

UNIT II TEXT EXTRACTION 9

Pre-processing Techniques – Clustering – Probabilistic Models – Browsing and Query Refinement on presentation Layer- Link Analysis – Visualization Approaches and its Operations.

UNIT III INFORMATION RETRIEVAL SYSTEMS 9

Text formats –Retrieval and Ranking –Evaluation strategies – Tokens –Query processing –Static Inverted Indices – Dynamic Inverted Indices – Index compression –Categorization and Filtering Classifiers –Probabilistic, Linear ,Similarity based, Generalized Linear, Information Theoretic models- XML Retrieval.

UNIT IV ALGORITHMS ON INFORMATION RETRIEVAL **9**

Introduction – Strategies - Utilities – Crossing the language barrier- Cross Language strategies with Utilities – Efficiency Multidimensional data model- Parallel Information Retrieval – Distributed Information Retrieval.

UNIT V APPLICATIONS **9**

Sound Authoring Data with Audio MME-CBR Systems-Implementation of Message Recognition Systems – Paralinguistic Information Retrieval in Broadcast – Text mining Applications- Pre-processing Applications using Probabilistic and Hybrid Approaches – Web Search.

OUTCOMES:

- Able to apply the information extraction techniques for real time applications
- Design systems based on the concepts of information retrieval
- Apply data specific information extraction and retrieval
- Create web applications by understanding the information extraction and retrieval techniques
- Use the concepts of information classification and clustering in wide range of other applications

TOTAL PERIODS:45

TEXT BOOKS:

1. Mark T. Maybury, "Multimedia Information Extraction", Wiley (IEEE), John Wiley & Sons, 2012.
2. Ronen Feldman, James Sanger, "Text Mining Handbook", Cambridge University press, 2006.

REFERENCES:

1. David A. Grossman, Ophir Frieder, "Information Retrieval: Algorithms and Heuristics", Second Edition, Springer, 2004.
2. Stefan Buttcher LA Clarke Gox v.Cormack, "Information Retrieval: Implementing and Evaluating Search Engines", MIT Press, 2016.
3. Big Data Security and Privacy Handbook:100 Best Practices in Big Data security and Privacy", 2016.

B.TECH. ARTIFICIAL INTELLIGENCE AND DATA SCIENCE
REGULATIONS – 2017
CHOICE BASED CREDIT SYSTEM

OPEN ELECTIVES (Offered by Other Branches)

SEMESTER V
OPEN ELECTIVE - I

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OCE551	Air Pollution and Control Engineering	OE	3	3	0	0	3
2.	OMD551	Basic of Biomedical Instrumentation	OE	3	3	0	0	3
3.	OBT552	Basics of Bioinformatics	OE	3	3	0	0	3
4.	OBM551	Bio Chemistry	OE	3	3	0	0	3
5.	OTL552	Digital Audio Engineering	OE	3	3	0	0	3
6.	OME551	Energy Conservation and Management	OE	3	3	0	0	3
7.	OBT553	Fundamentals of Nutrition	OE	3	3	0	0	3
8.	OCE552	Geographic Information System	OE	3	3	0	0	3
9.	OPY551	Herbal Technology	OE	3	3	0	0	3
10.	OMD552	Hospital Waste Management	OE	3	3	0	0	3
11.	OCH551	Industrial Nanotechnology	OE	3	3	0	0	3
12.	OBT551	Introduction to Bioenergy and Biofuels	OE	3	3	0	0	3
13.	OME553	Industrial Safety Engineering	OE	3	3	0	0	3
14.	OEI551	Logic and Distributed Control Systems	OE	3	3	0	0	3
15.	OBM552	Medical Physics	OE	3	3	0	0	3
16.	OML552	Microscopy	OE	3	3	0	0	3
17.	OBT554	Principles of Food Preservation	OE	3	3	0	0	3
18.	OMF551	Product Design and Development	OE	3	3	0	0	3
19.	OAN551	Sensors and Transducers	OE	3	3	0	0	3
20.	OTL551	Space Time Wireless Communication	OE	3	3	0	0	3
21.	OTL553	Telecommunication Network Management	OE	3	3	0	0	3
22.	OMD553	Telehealth Technology	OE	3	3	0	0	3
23.	OTL554	Wavelets and its Applications	OE	3	3	0	0	3
24.	OIM551	World Class Manufacturing	OE	3	3	0	0	3

SEMESTER VII

OPEN ELECTIVE - II

SL NO.	COURSE CODE	COURSE TITLE	CATEGORY	CONTACT PERIODS	L	T	P	C
1.	OAI751	Agricultural Finance, Banking and Co-operation	OE	3	3	0	0	3
2.	OEE751	Basic Circuit Theory	OE	3	3	0	0	3
3.	OBM751	Basics of Human Anatomy and Physiology	OE	3	3	0	0	3
4.	OGI751	Climate Change and its Impact	OE	3	3	0	0	3
5.	OPY751	Clinical Trials	OE	3	3	0	0	3
6.	OEC751	Electronic Devices	OE	3	3	0	0	3
7.	OML752	Electronic Materials	OE	3	3	0	0	3
8.	OCH752	Energy Technology	OE	3	3	0	0	3
9.	OCE751	Environmental and Social Impact Assessment	OE	3	3	0	0	3
10.	OGI752	Fundamentals of Planetary Remote Sensing	OE	3	3	0	0	3
11.	OEN751	Green Building Design	OE	3	3	0	0	3
12.	OBM752	Hospital Management	OE	3	3	0	0	3
13.	OEE752	Introduction to Renewable Energy Systems	OE	3	3	0	0	3
14.	OBT753	Introduction of Cell Biology	OE	3	3	0	0	3
15.	OMF751	Lean Six Sigma	OE	3	3	0	0	3
16.	OAN751	Low Cost Automation	OE	3	3	0	0	3
17.	OEC754	Medical Electronics	OE	3	3	0	0	3
18.	OEC756	MEMS and NEMS	OE	3	3	0	0	3
19.	OBT752	Microbiology	OE	3	3	0	0	3
20.	OCH751	Process Modeling and Simulation	OE	3	3	0	0	3
21.	OIE751	Robotics	OE	3	3	0	0	3
22.	OEC753	Signals and Systems	OE	4	4	0	0	4
23.	OME752	Supply Chain Management	OE	3	3	0	0	3
24.	OME753	Systems Engineering	OE	3	3	0	0	3
25.	OTL751	Telecommunication System Modeling and Simulation	OE	3	3	0	0	3
26.	OCY751	Waste Water Treatment	OE	3	3	0	0	3

OCE551 AIR POLLUTION AND CONTROL ENGINEERING L T P C
3 0 0 3

OBJECTIVE:

- To impart knowledge on the principle and design of control of Indoor/ particulate/ gaseous air pollutant and its emerging trends.

UNIT I INTRODUCTION 7

Structure and composition of Atmosphere – Definition, Scope and Scales of Air Pollution – Sources and classification of air pollutants and their effect on human health, vegetation, animals, property, aesthetic value and visibility- Ambient Air Quality and Emission standards.

UNIT II METEOROLOGY 6

Effects of meteorology on Air Pollution - Fundamentals, Atmospheric stability, Inversion, Wind profiles and stack plume patterns- Atmospheric Diffusion Theories – Dispersion models, Plume rise.

UNIT III CONTROL OF PARTICULATE CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Gas Particle Interaction – Working principle - Gravity Separators, Centrifugal separators Fabric filters, Particulate Scrubbers, Electrostatic Precipitators.

UNIT IV CONTROL OF GASEOUS CONTAMINANTS 11

Factors affecting Selection of Control Equipment – Working principle - absorption, Adsorption, condensation, Incineration, Bio filters – Process control and Monitoring.

UNIT V INDOOR AIR QUALITY MANAGEMENT 10

Sources, types and control of indoor air pollutants, sick building syndrome and Building related illness- Sources and Effects of Noise Pollution – Measurement – Standards –Control and Preventive measures.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have

- An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management
- Ability to identify, formulate and solve air and noise pollution problems
- Ability to design stacks and particulate air pollution control devices to meet applicable standards.
- Ability to select control equipments.
- Ability to ensure quality, control and preventive measures.

TEXTBOOKS:

1. Lawrence K. Wang, Norman C. Pareira, Yung Tse Hung, "Air Pollution Control Engineering", Tokyo, springer science + science media LLC,2004.
2. Noel de Nevers, "Air Pollution Control Engineering", Waveland press,Inc 2017.
3. Anjaneyulu Y, "Air Pollution and Control Technologies", Allied Publishers (P) Ltd., India 2002.

REFERENCES:

1. David H.F. Liu, Bela G. Liptak, "Air Pollution", Lweis Publishers, 2000.
2. Arthur C. Stern, "Air Pollution (Vol.I – Vol.VIII)", Academic Press, 2006.
3. Wayne T.Davis, "Air Pollution Engineering Manual", John Wiley & Sons, Inc, 2000.
4. M.N Rao and HVN Rao, "Air Pollution", Tata Mcgraw Hill Publishing Company limited,2007.
5. C.S.Rao, "Environmental Pollution Control Engineering", New Age International(P) Limited Publishers,2006.

OMD551 BASICS OF BIOMEDICAL INSTRUMENTATION L T P C
3 0 0 3

OBJECTIVES:

- To study about the different bio potential and its propagation
- To understand the different types of electrodes and its placement for various recording
- To study the design of bio amplifier for various physiological recording
- To learn the different measurement techniques for non-physiological parameters.
- To familiarize the different biochemical measurements.

CO-PO MAPPING:

Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11
CO1				✓		✓					
CO2				✓		✓					
CO3	✓	✓	✓	✓	✓	✓					
CO4			✓	✓	✓	✓					
CO5			✓	✓	✓	✓					

UNIT I BIO POTENTIAL GENERATION AND ELECTRODES TYPES 9

Origin of bio potential and its propagation. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.

UNIT II BIOSIGNAL CHARACTERISTICS AND ELECTRODECONFIGURATIONS 9

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven's triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.

UNIT III SIGNAL CONDITIONING CIRCUITS 9

Need for bio-amplifier - differential bio-amplifier, Impedance matching circuit, isolation amplifiers, Power line interference, Right leg driven ECG amplifier, Band pass filtering.

UNIT IV MEASUREMENT OF NON-ELECTRICALPARAMETERS 10

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - Auscultatory method, direct methods: electronic manometer, Systolic, diastolic pressure, Blood flow and cardiac output measurement: Indicator dilution, and dye dilution method, ultrasound blood flow measurement.

UNIT V BIO-CHEMICAL MEASUREMENT 8

Blood gas analyzers and Non-Invasive monitoring, colorimeter, Sodium Potassium Analyser, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

TOTAL: 45 PERIODS

OUTCOMES:

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

CO1: To Learn the different bio potential and its propagation.
CO2: To get Familiarize the different electrode placement for various physiological recording.
CO3: Students will be able design bio amplifier for various physiological recording.
CO4: Students will understand various technique non electrical physiogical measurements
CO5: Understand the different biochemical measurements

TEXT BOOKS:

1. Leslie Cromwell, "Biomedical Instrumentation and measurement", Prentice hall of India, New Delhi, 2007.
2. John G. Webster, "Medical Instrumentation Application and Design", John Wiley and sons, New York, 2004. (Units I, II & V)

REFERENCES:

1. Myer Kutz, "Standard Handbook of Biomedical Engineering and Design", McGraw Hill Publisher, 2003.
2. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw-Hill, New Delhi, 2003 (Units II & IV)
3. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson Education, 2004

OBT552 BASICS OF BIOINFORMATICS L T P C
3 0 0 3

UNIT I BIOLOGICAL DATA ACQUISITION 9

The form of biological information. Retrieval methods for DNA sequence, protein sequence and protein structure information

UNIT II DATABASES 9

Format and Annotation. Conventions for database indexing and specification of search terms. Common sequence file formats. Annotated sequence databases - primary sequence databases, protein sequence and structure databases, Organism specific databases

UNIT III DATA PROCESSING 9

Data – Access, Retrieval and Submission: Standard search engines, Data retrieval tools – Entrez, DBGET and SRS; Submission of (new and revised) data; Sequence Similarity Searches: Localversus global. Distance metrics. Similarity and homology. Scoring matrices.

UNIT IV METHODS OF ANALYSIS 9

Dynamic programming algorithms, Needleman-wunsch and Smith-waterman. Heuristic Methods of sequance alignment, FASTA , and PSI BLAST. Multiple Sequence Alignment and software tools for pairwise and multiple sequence alignment

UNIT V APPLICATIONS 9

Genome Annotation and Gene Prediction, ORF finding; Phylogenetic Analysis : Comparative genomics, orthologs, paralogs. Genome analysis – Genome annotation

TOTAL: 45 PERIODS

TEXT BOOKS:

1. Introduction to Bioinformatics by Arthur K. Lesk , Oxford University Press.
2. Algorithms on Strings, Trees and Sequences by Dan Gusfield, Cambridge University Press.
3. Biological Sequence Analysis Probabilistic Models of proteins and nucleic acids by Durbin, S.Eddy, A.Krogh, G.Mitchison.
4. Bioinformatics Sequence and Genome Analysis by David W. Mount, Cold Spring Harbor Laboratory Press.
5. Beginning Perl for Bioinformatics: An introduction to Perl for Biologists by James Tindall, O'Reilley Media.

REFERENCE

1. Bioinformatics The Machine Learning Approach by Pierre Baldi and Soren Brunak.

OBM551 BIO CHEMISTRY L T P C
3 0 0 3

OBJECTIVES:

- To study the structural and functional properties of carbohydrates, proteins, lipids and nucleic acids
- To discuss the impairments in metabolism of the above, including inborn errors of metabolism.

UNIT I BIOLOGICAL PRINCIPLE 8

Composition & properties of the cell membrane, membrane transports, permeability Coefficient & partition coefficient, body fluids, electrolytes, acid-base balance, blood viscosity and Newtonian nature, colloids, filtration, diffusion, osmosis, dialysis, ultrafiltration, ultracentrifugation, cellular fractionation, electrophoresis, radioimmunoassay, Photochemical reaction, law of photochemistry, fluorescence and phosphorescence.

UNIT II MACROMOLECULES 10

Classification and functions of carbohydrates, glycolysis, TCA cycle, Blood Sugar analysis and glucose tolerance test, Classification and functions of proteins, architecture of proteins, Classification of amino acids, Oxidative and non oxidative deamination, transamination, decarboxylation, urea cycle, Purification/separation of proteins, Classification and functions of lipids, biosynthesis of long chain fatty acids, oxidation and degradation of fatty acids.

UNIT III ENZYMES 9

Chemical Nature, General Properties, Spectrophotometric measurement of enzymes, Isolation techniques, Diagnostic enzymes.

Hormones: Chemical Nature, Properties of hormones, Hormonal Assay and their Significance.

UNIT IV METABOLIC DISORDER 9

Diabetes mellitus, Diabetic ketoacidosis, lactose intolerance, Glycogen storage disorders, Lipid storage disorders, obesity, atherosclerosis, Plasma proteins in health and disease, Inborn error of amino acid metabolism, Disorders associated with abnormalities in the metabolism of bilirubin – Jaundice.

UNIT V 9

Liver Function tests, Renal Function Tests, Blood gas Analysis, Measurement of Electrolytes. Their abnormal and Normal Values and Conditions. Biochemistry of Urine and Stools testing.

TOTAL: 45 PERIODS

OUTCOMES:

After the successful completion of this course, the students will be able to,

- Explain the fundamentals of biochemistry
- Have in-depth knowledge about the classification, structures and properties of carbohydrates, lipid, protein and amino acid.
- Demonstrate about the mechanism of actions of enzymes and co-enzymes, clinical importance of enzymes, hormonal assay and significance.

TEXT BOOKS:

1. Keith Wilson & John Walker, "Practical Biochemistry - Principles & Techniques", Oxford University Press, 2009.
2. Rafi MD —Text book of biochemistry for Medical Student, Second Edition, University Press, 2014.
3. W. Rodwell, David Bender, Kathleen M. Botham, Peter J. Kennelly, P. Anthony Weil—Harper's Review of biochemistry, 30 th Edition, LANGE Medical Publications, 2015.
4. Trevor palmer and Phillip L Bonner "Enzymes: Biochemistry, Biotechnology, Clinical Chemistry", 2 nd Edition, Woodhead Publishing, 2009.

REFERENCES:

1. Lehninger Principles of Biochemistry, Fourth Edition - by David L. Nelson & Michael M.Cox ,-W. H. Freeman; 4 edition (April 23, 2004)
2. Fundamentals of Biochemistry: Life at the Molecular Level - by Donald J. Voet , Judith G. Voet & Charlotte W. Pratt. - Wiley; 2 edition (March 31, 2005)
3. Pamela.C.Champe & Richard.A.Harvey, —Lippincott Biochemistry Lippincott's Illustrated Reviews, 6 th Edition, LWW publishers, 2013

OTL552 DIGITAL AUDIO ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To understand the concept of fundamentals of digital audio.
- To understand the concept of audio in digital TV broadcasting.
- To understand the various codes of digital coding.
- To understand the concept of digital audio tape recorder.
- To analyze the concept internet audio in digital audio engineering

UNIT I FUNDAMENTALS OF DIGITAL AUDIO 9

Discrete time sampling - sampling theorem - Nyquist frequency – aliasing – prevention – quantization – signal to error ratio – distortion – other architectures – dithers – types of dither.

UNIT II RECORDING AND TRANSMISSION PRINCIPLES 9

PCM – record processing – recording oriented codes – transmission oriented codes – audio in digital TV broadcasting – DAB.

UNIT III DIGITAL CODING & COMPRESSION 9

Block & convolutional codes – cyclic codes – Reed Solomon codes – interleaving – compression principles – lossless & perceptive coding – subband codes – transform coding – compression formats – MPEG audio – Dolby AC 3 – ATRAC.

UNIT IV DIGITAL AUDIO TECHNIQUES 9

Digital audio tape recorder – cassettes – modes – track format – digital audio editing – editing with random access media & recording media – editor structure – digital audio in optical disks – CD, MD, DVD, playing optical disk – Minidisk.

UNIT V APPLICATIONS OF DIGITAL AUDIO 9

Internet audio – MP3 – SDMI – audio MPEG 4 – PC – MIDI – sound cards.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course, students would be able to

- Analyze the type of dither
- Analyze the recording and transmission principles in digital audio.
- Analyze the various compression techniques.
- Design and analyze the digital audio editing
- Analyze the various application of digital audio.

TEXT BOOKS:

1. John Watkinson, "An Introduction to Digital Audio", Focal Press, Second edition, 2013
2. Ken C Pohlmann, "Principles of Digital audio", McGraw Hill, Sixth edition, 2010

REFERENCES:

1. Then Ballin, " Handbook for sound Engineers Taylor & Francis", Fifth edition, 2015
2. John Watkinson, "The art of Digital Audio" Focal Press, Third edition, 2013

OME551 ENERGY CONSERVATION AND MANAGEMENT L T P C
3 0 0 3

OBJECTIVES:

At the end of the course, the student is expected to

- Understand and analyse the energy data of industries
- Carryout energy accounting and balancing
- Conduct energy audit and suggest methodologies for energy savings and
- Utilise the available resources in optimal ways

UNIT I INTRODUCTION 9

Energy - Power – Past & Present scenario of World; National Energy consumption Data – Environmental aspects associated with energy utilization – Energy Auditing: Need, Types, Methodology and Barriers. Role of Energy Managers. Instruments for energy auditing.

UNIT II ELECTRICAL SYSTEMS 9

Components of EB billing – HT and LT supply, Transformers, Cable Sizing, Concept of Capacitors, Power Factor Improvement, Harmonics, Electric Motors - Motor Efficiency Computation, Energy Efficient Motors, Illumination – Lux, Lumens, Types of lighting, Efficacy, LED Lighting and scope of Encon in Illumination.

UNIT III THERMAL SYSTEMS 9

Stoichiometry, Boilers, Furnaces and Thermic Fluid Heaters – Efficiency computation and encon measures. Steam: Distribution &U sage: Steam Traps, Condensate Recovery, Flash Steam Utilization, Insulators & Refractories

UNIT IV ENERGY CONSERVATION IN MAJOR UTILITIES 9

Pumps, Fans, Blowers, Compressed Air Systems, Refrigeration and Air Conditioning Systems – Cooling Towers – D.G. sets

UNIT V ECONOMICS 9

Energy Economics – Discount Rate, Payback Period, Internal Rate of Return, Net Present Value, Life Cycle Costing –ESCO concept

TOTAL: 45 PERIODS

OUTCOMES:

Upon completion of this course, the students can able to analyse the energy data of industries.

- Can carryout energy accounting and balancing
- Can suggest methodologies for energy savings

TEXT BOOK:

1. Energy Manager Training Manual (4 Volumes) available at www.energymanager training.com,a website administered by Bureau of Energy Efficiency (BEE), a statutory body under Ministry of Power, Government of India, 2004.

REFERENCES:

1. Witte, L.C., P.S. Schmidt, D.R. Brown, "Industrial Energy Management and Utilisation" Hemisphere Publ, Washington, 1988.
2. Callaghn, P.W. "Design and Management for Energy Conservation", Pergamon Press, Oxford, 1981.
3. Dryden, I.G.C., "The Efficient Use of Energy" Butterworths, London, 1982
4. Turner, W.C., "Energy Management Hand book", Wiley, New York, 1982.
5. Murphy, W.R. and G. Mc KAY, "Energy Management", Butterworths, London 1987.

OBT553 FUNDAMENTALS OF NUTRITION L T P C
3 0 0 3

OBJECTIVES:

- The course aims to develop the knowledge of students in the basic area of Food Chemistry.
- This is necessary for effective understanding of food processing and technology subjects.
- This course will enable students to appreciate the similarities and complexities of the chemical components in foods.

UNIT I OVERVIEW OF NUTRITION 9

Definition, six classes of nutrients, calculating energy values from food, using the RDA, nutritional status, nutritional requirement, malnutrition, nutritional assessment of individuals and populations, dietary recommendations, Balanced diet planning. Diet planning principles, dietary guidelines, food groups, exchange lists, personal diet analysis.

UNIT II DIGESTION 9

Digestion, Absorption and Transport: Anatomy and physiology of the digestive tract, mechanical and chemical digestion, absorption of nutrients.

UNIT III CARBOHYDRATES 9

Glycemic and Non-glycemic carbohydrates, blood glucose regulation, recommendations of sugar intake for health, health effects of fiber and starch intake, Artificial sweeteners; Importance of blood sugar regulation, Dietary recommendations for NIDDM and IDDM

UNIT IV PROTEINS & LIPIDS 9

Proteins; Food enzymes ; Texturized proteins; Food sources, functional role and uses in foods. Review of structure, composition & nomenclature of fats. Non-Glyceride components in fats & oils; Fat replacements; Food sources, functional role and uses in foods. Health effects and recommended intakes of lipids. Recommended intakes of proteins, Deficiency- short term and long term effects.

UNIT V METABOLISM, ENERGY BALANCE AND BODY COMPOSITION 9

Energy Balance; body weight and body composition; health implications; obesity, BMR and BMI calculations; Weight Control: Fat cell development; hunger, satiety and satiation; dangers of unsafe weight loss schemes; treatment of obesity, attitudes and behaviours toward weight control. Food and Pharmaceutical grades; toxicities, deficiencies, factors affecting bioavailability, Stability under food processing conditions.

TOTAL : 45 PERIODS

TEXT BOOKS:

1. Chopra, H.K. and P.S. Panesar. " Food Chemistry". Narosa, 2010.
2. Vaclavik, V. A. and Christian E. W. "Essentials of Food Science". II Edition, Kluwer-Academic, Springer, 2003.
3. Mann, Jim and Stewart Truswell "Essentials of Human Nutrition". 3rd Edition. Oxford University Press, 2007.
4. Gibney, Michael J., et al., "Introduction to Human Nutrition". 2nd Edition. Blackwell,2009.
5. Gropper, Sareen S. and Jack L.Smith "Advanced Nutrition and Human Metabolism". 5th Edition. Wadsworth Publishing, 2008.

REFERENCES:

1. Gopalan C., B.V. Rama Sastri, and S.C. Balasubramanian S. C. "Nutritive Value of Indian Foods". NIN, ICMR, 2004.
2. Damodaran, S., K.L. Parkin and O.R. Fennema. "Fennema's Food Chemistry". 4th Edition, CRC Press, 2008
3. Belitz,H.-D, Grosch W and Schieberle P. "Food Chemistry". 3rd Rev. Edition, Springer-Verlag, 2004.
4. Walstra, P. " Physical Chemistry of Foods". Marcel Dekker Inc. 2003.
5. Owusu-Apenten, Richard. "Introduction to Food Chemistry". CRC Press, 2005

OCE552 GEOGRAPHIC INFORMATION SYSTEM L T P C
3 0 0 3

OBJECTIVES:

- To Introduce the fundamentals and components of Geographic Information System
- To provide details of spatial data structures and input, management and output processes

UNIT I FUNDAMENTALS OF GIS 9

Introduction to GIS - Basic spatial concepts - Coordinate Systems - GIS and Information Systems – Definitions – History of GIS - Components of a GIS – Hardware, Software, Data, People, Methods – Proprietary and open source Software - Types of data – Spatial, Attribute data- types of attributes – scales/ levels of measurements.

UNIT II SPATIAL DATA MODELS 9

Database Structures – Relational, Object Oriented – ER diagram - spatial data models – Raster Data Structures – Raster Data Compression - Vector Data Structures - Raster vs Vector Models-TIN and GRID data models - OGC standards - Data Quality.

UNIT III DATA INPUT AND TOPOLOGY 9

Scanner - Raster Data Input – Raster Data File Formats – Vector Data Input –Digitiser – Topology - Adjacency, connectivity and containment – Topological Consistency rules – Attribute Data linking – ODBC – GPS - Concept GPS based mapping

UNIT IV DATA ANALYSIS 9

Vector Data Analysis tools - Data Analysis tools - Network Analysis - Digital Education models - 3D data collection and utilisation.

UNIT V APPLICATIONS 9

GIS Applicant - Natural Resource Management - Engineering - Navigation - Vehicle tracking and fleet management - Marketing and Business applications - Case studies.

TOTAL: 45 PERIODS

OUTCOME:

This course equips the student to

- Have basic idea about the fundamentals of GIS.
- Understand the types of data models.
- Get knowledge about data input and topology.
- Gain knowledge on data quality and standards.
- Understand data management functions and data output.

TEXT BOOKS:

1. Kang - Tsung Chang, Introduction to Geographic Information Systems, McGraw Hill Publishing, 2nd Edition, 2011.
2. Ian Heywood, Sarah Cornelius, Steve Carver, Srinivasa Raju, "An Introduction Geographical Information Systems, Pearson Education, 2nd Edition,2007.

REFERENCE:

1. Lo.C.P., Albert K.W. Yeung, Concepts and Techniques of Geographic Information Systems, Prentice-Hall India Publishers, 2006

OPY551 HERBAL TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To acquire the basic knowledge of Indian system of medicines.
- To enable the students to know about the plant tissue culture techniques and learn about the instruments used in the extraction, isolation, purification and identification of herbal drugs.

UNIT I INDIAN SYSTEMS OF MEDICINE 9

Introduction, basic principles and treatment modalities of Ayurveda – Unani – Homeopathy – Siddha –naturopathy- Introduction and streams of Yoga. Classification of herbs - Harvesting – Post harvesting – Conditions of storage.-seasonal and geographical variation.

UNIT II IN-VITRO CULTURE OF MEDICINAL PLANTS 9

Requirements – Setting up a tissue culture lab – Basic laboratory procedure – Processing of plant tissue culture – Growth profile – Growth measurement – Plant tissue culture methods – Callus culture – Types of tissue culture – Tissue culture of medicinal plants – Applications of plant tissue culture.

UNIT III PHYTO PHARMACEUTICALS 9

Traditional and modern extraction techniques: Successive solvent extraction- Super critical fluid extraction – Steam distillation – Head space techniques – Sepbox –General extraction process: Carbohydrates – Proteins – Alkaloids –Glycosides. Isolation and purification of phytochemicals (Eg. Quinine from cinchona, vincristine from Vinca, sennoside from senna, Euginol from clove oil.)

UNIT IV SCREENING METHODS FOR HERBAL DRUGS 9

Screening methods for anti-fertility agents – Antidiabetic drugs – Anti anginal drugs – Diuretic – Analgesic activity – Antipyretic activity – Anti cancer activity –Evaluation of hepatoprotective agents – anticonvulsive- Anti ulcer drugs.

UNIT V STANDARDIZATION AND CONSERVATION OF HERBAL DRUGS 9

Importance of standardization - Standardization of single drugs and compound formulations – WHO guidelines for the quality assessment herbal drugs - Conservation strategies of medicinal plants – Government policies for protecting the traditional knowledge.

TOTAL: 45 PERIODS

OUTCOMES:

The student will be able to

- Understand the basic principle, design, control and processing techniques of medicinal plants and their derivatives.
- Find a solution to problems, including social, scientific and ethical issues connected with the use of medicinal plants in the different field of applications.
- Describe the biological effects of medicinal plants with legislation and governmental policies for conserving medicinal plants.

TEXT BOOKS:

1. Agarwal, S.S. & Paridhavi, M., "Herbal Drug Technology" Universities Press,Pvt Limited, 2007.
2. Wallis, T.E., "Textbook of Pharmacognosy" 5th Edition, CBS Publishers and Distributors,2005.
3. Indian System of Medicine and Homeopathy, Planning and Evaluation Cell, Govt.of India, New Delhi, 2001.
4. Yoga- The Science of Holistic Living by V.K.Yoga, VKY Prakashna Publishing, Bangalore, 2005.
5. Quality Control Methods for medicinal plant material, WHO Geneva, 1998.

REFERENCES:
1. Evans, W.C., "Trease and Evans Pharmacognosy" 15th Edition, Elsevier HealthSciences, 2001.
2. Pulok K. Mukherjee., "Quality control of Herbal Drugs" Reprintedn, Business Horizons, New Delhi, 2012.
3. Daniel, M., "Herbal Technology: Concepts and Advances" Satish Serial PublishingHouse, 2008.

OMD552 **HOSPITAL WASTE MANAGEMENT** **L T P C**
3 0 0 3

OBJECTIVES:
The student should be made to:
- Know about the healthcare hazard control and accidents
- Understand biomedical waste management
- Learn the facility guidelines, infection control and patient safety.

UNIT I HEALTHCARE HAZARD CONTROL AND UNDERSTANDING ACCIDENTS **9**
Healthcare Hazard Control: Introduction, Hazard Control: Management & Responsibilities, Hazard Analysis, Hazard Correction, Personal Protective Equipment, Hazard Control Committees, Accident Causation Theories, Accident Reporting, Accident Investigations, Accident Analysis, Accident Prevention, Workers' Compensation, Orientation, Education, and Training.

UNIT II BIOMEDICAL WASTE MANAGEMENT **9**
Biomedical Waste Management : Types of wastes, major and minor sources of biomedical waste, Categories and classification of biomedical waste, hazard of biomedical waste, need for disposal of biomedical waste, waste minimization, waste segregation and labeling, waste handling and disposal.

UNIT III HAZARDOUS MATERIALS **9**
Hazardous Materials : Hazardous Substance Safety, OSHA Hazard Communication Standard, DOT Hazardous Material Regulations, Healthcare Hazardous Materials, Medical Gas Systems, Respiratory Protection.

UNIT IV FACILITY SAFETY **9**
Introduction, Facility Guidelines: Institute, Administrative Area Safety, Slip, Trip, and Fall Prevention, Safety Signs, Colors, and Marking Requirements, Tool Safety, Electrical Safety, Control of Hazardous Energy, Landscape and Ground Maintenance, Fleet and Vehicle Safety.

UNIT V INFECTION CONTROL, PREVENTION AND PATIENT SAFETY **9**
Healthcare Immunizations, Centers for Disease Control and Prevention, Disinfectants, Sterilants, and Antiseptics, OSHA Bloodborne Pathogens Standard, Tuberculosis: Healthcare Opportunistic Infections, Healthcare-Associated Infections, Medication Safety.

TOTAL : 45 PERIODS

OUTCOMES:
After successful completion of the course, the students will be able to know the concepts of healthcare waste management, its prevention and safety.

REFERENCES:
1. Tweedy, James T., Healthcare hazard control and safety management-CRC Press_Taylor and Francis (2014).
2. Anantpreet Singh, Sukhjit Kaur, Biomedical Waste Disposal, Jaypee Brothers Medical Publishers (P) Ltd (2012).

OCH551 INDUSTRIAL NANOTECHNOLOGY L T P C
3 0 0 3

OBJECTIVES:

- To elucidate on advantages of nanotechnology based applications in each industry
- To provide instances of contemporary industrial applications of nanotechnology
- To provide an overview of future technological advancements and increasing role of nanotechnology in each industry

UNIT I NANO ELECTRONICS 9

Advantages of nano electrical and electronic devices –Electronic circuit chips – Lasers - Micro and NanoElectromechanical systems – Sensors, Actuators, Optical switches,- Data memory –Lighting and Displays – Batteries - Fuel cells and Photo-voltaic cells – Electric double layer capacitors – Lead-free solder – Nanoparticle coatings for electrical products.

UNIT II BIONANOTECHNOLOGY 9

Nanoparticles in bone substitutes and dentistry – Implants and Prosthesis – Nanorobotics in Surgery –Nanosensors in Diagnosis– Neuro-electronic Interfaces– Therapeutic applications.

UNIT III NANOTECHNOLOGY IN CHEMICAL INDUSTRY 9

Nanocatalyts – Smart materials – Heterogenous nanostructures and composites – Nanostructures for Molecular recognition (Quantum dots, Nanorods, Nanotubes) – Molecular Encapsulation and its applications – Nanoporous zeolites – Self-assembled Nanoreactors.

UNIT IV NANOTECHNOLOGY IN AGRICULTURE AND FOOD TECHNOLOGY 9

Nanotechnology in Agriculture -Precision farming, Smart delivery system – Insecticides using nanotechnology – Potential of nano-fertilizers - Nanotechnology in Food industry

UNIT V NANOTECHNOLOGY IN TEXTILES AND COSMETICS 9

Nanofibre production - Electrospinning – Controlling morphologies of nanofibers – Tissue engineering application– Polymer nanofibers - Nylon-6 nanocomposites from polymerization - Nano-filled polypropylene fibers - Nano finishing in textiles (UV resistant, antibacterial, hydrophilic, self-cleaning, flame retardant finishes) – Modern textiles Cosmetics – Formulation of Gels, Shampoos, Hair-conditioners

TOTAL: 45 PERIODS

REFERENCES:

1. Neelina H. Malsch (Ed.),Biomedical Nanotechnology, CRC Press (2005)
2. Udo H. Brinker, Jean-Luc Mieusset (Eds.), Molecular Encapsulation: Organic Reactions in Constrained Systems,Wiley Publishers (2010)
3. Jennifer Kuzma and Peter VerHage, Nanotechnology in agriculture and food production, Woodrow Wilson International Center, (2006).
4. Lynn J. Frewer, Willehm Norde, R. H. Fischer and W. H. Kampers, Nanotechnology in the Agri-food sector, Wiley-VCH Verlag, (2011).
5. P. J. Brown and K. Stevens, Nanofibers and Nanotechnology in Textiles, Woodhead Publishing Limited, Cambridge, (2007).
6. Y-W. Mai,Polymer Nano composites, Woodhead publishing, (2006).
7. W.N. Chang,Nanofibres fabrication, performance and applications, Nova Science Publishers Inc, (2009)

OBT551 INTRODUCTION TO BIOENERGY AND BIOFUELS L T P C
3 0 0 3

OBJECTIVES:

- This course will be focussed on achievement, acquisition of knowledge and enhancement of comprehension of information regarding bioenergy and biofuel technologies and their sustainable applications.

UNIT I CONCEPTS 9

Biopower, Bioheat, Biofuesl, advanced liquid fuels, drop-in fuels, biobased products

UNIT II FEEDSTOCKS 9

Harvested Feedstocks: First generation biofuels, Second generation biofuels, third generation biofuels. Residue Feedstocks: Agricultural wastes, forestry wastes, farm waste, organic components of residential, commercial, institutional and insdustrial waste.

UNIT III CONVERSION TECHNOLOGIES 9

Biorefinery concept – biorefineries and end products, Biochemical conversion – hydrolysis, enzyme and acid hydrolysis, fermentation, anaerobic digestion and trans-esterification, Thermochemical conversion – Combustion, Gasification, Pyrolysis, other thermochemical conversion technologies. Scaling up of emerging technologies.

UNIT IV BIOFUELS 9

Pros and cons of Biofuels, Algal biofuels, Cyanobacteria and producers of biofuels, Jatropha as biodiesel producer, Bioethanol, Biomethane, biohydrogen, biobutanol, metabolic engineering of fuel molecules, Engineering aspects of biofuels, Economics of biofuels

UNIT V SUSTAINABILITY & RESILIENCE 9

Environmental Sustainability, bioenergy sustainability, emissions of biomass to power generation applications, emissions from biofuels. ILUC issues, Carbon footprint, Advanced low carbon fuels

TOTAL :45 PERIODS

TEXTBOOKS:

1. Biorenewable Resources – Engieering new products. Robert C Brown. Blackwell Publishing Professional, 2003.
2. Biofuels. Wim Soetaert and Erik Vandamme (Editors) Wiley, 2009.
3. Biomass for Renewable Energy, Fuels and Chemicals. Donald Klass. Academic press, 1998

REFERENCES:

1. Introduction to Bioenergy.Vaughn C. Nelson and Kenneth L. Starcher.
2. Bioenergy: Biomass to Biofuels by by Anju Dahiya
3. Bioenergy: Principles and Applications by Yebo Li and Samir Kumar Khanal
4. Bioenergy by Judy D. Wall and Caroline S. Harwood
5. Bioenergy: Sustainable Perspectives by Ted Weyland

OME553 INDUSTRIAL SAFETY ENGINEERING L T P C
3 0 0 3

OBJECTIVES:

- To provide in depth knowledge in Principles of Environmental safety and its applications in various fields.
- To provide the knowledge of air and water pollution and their control.
- To expose the students to the basics in hazardous waste management.

UNIT I SAFETY IN METAL WORKING AND WOOD WORKING MACHINES 9

General safety rules, principles, maintenance, Inspections of turning machines, boring machines, milling machine, planning machine and grinding machines, CNC machines, Wood working machinery, types, safety principles, electrical guards, work area, material handling, inspection, standards and codes- saws, types, hazards. Inspection of material handling equipments.

UNIT II SAFETY IN WELDING AND GAS CUTTING 9

Gas welding and oxygen cutting, resistances welding, arc welding and cutting, common hazards, personal protective equipment, training, safety precautions in brazing, soldering and metalizing – explosive welding, selection, care and maintenance of the associated equipment and instruments – safety in generation, distribution and handling of industrial gases-colour coding – flashback arrestor – leak detection-pipe line safety-storage and handling of gas cylinders.

UNIT III SAFETY IN COLD FORMING AND HOT WORKING OF METALS 9

Cold working, power presses, point of operation safe guarding, auxiliary mechanisms, feeding and cutting mechanism, hand or foot-operated presses, power press electric controls, power press set up and die removal, inspection and maintenance-metal sheers-press brakes - Hot working safety in forging, hot rolling mill operation, safe guards in hot rolling mills – hot bending of pipes, hazards and control measures - Safety in Gas Furnace Operation, Cupola, Crucibles, Ovens, Foundry Health Hazards, Work Environment, Material Handling in Foundries, Foundry Production Cleaning And Finishing Foundry Processes.

UNIT IV SAFETY IN FINISHING, INSPECTION AND TESTING 9

Heat treatment operations, Electro Plating, Paint Shops, Sand And Shot Blasting, Safety In Inspection And Testing, Dynamic Balancing, Hydro Testing, Valves, Boiler Drums And Headers, Pressure Vessels, Air Leak Test, Steam Testing, Safety In Radiography, Personal Monitoring Devices, Radiation Hazards, Engineering And Administrative Controls, Indian Boilers Regulation.

UNIT V INDUSTRIAL SAFETY 9

Advances in Industrial Ergonomics and safety, Work and protective clothing, Theory and practice of Industrial safety, Industrial Noise and Vibration, Machine Guarding and Industrial machine safety, Manual material handling, Modeling for safety and health.

TOTAL:45 PERIODS

OUTCOMES:

Students will be able to

- Illustrate and familiarize the basic concepts and scope of engineering safety.
- Understand the standards of professional conduct that are published by professional safety organizations and certification bodies.
- Illustrate the importance of safety of employees while working with machineries.

REFERENCES:

1. Philip E. Hagan, John Franklin Montgomery, James T. O'Reilly, Accident Prevention Manual – NSC, Chicago, 2009.
2. Charles D. Reese, Occupational Health and Safety Management, CRC Press, 2003.
3. John V. Grimaldi and Rollin H. Simonds Safety Management by All India Travelers Book seller, New Delhi, 1989.
4. John Davies, Alastair Ross, Brendan Wallace, Safety Management A Qualitative Systems Approach, CRC Press, 2003.
5. Health and Safety in welding and Allied processes, welding Institute, UK, High Tech. Publishing Ltd., London, 1989.
6. Anil Mital Advances in Industrial Ergonomics and Safety Taylor and Francis Ltd, London, 1989
7. Dr. Vincent Matthew Ciriello (Prediction of the maximum acceptable weight of lift from the frequency of lift, journal of industrial ergonomics,(2014), pg .225–237.

OEI551 LOGIC AND DISTRIBUTED CONTROL SYSTEMS L T P C
3 0 0 3

OBJECTIVES:

- To give an introductory knowledge on Programmable Logic Controller (PLC) and their programming languages
- To give adequate knowledge about applications of PLC
- To give basic knowledge about Computer Controlled Systems
- To give basic knowledge on the architecture and local control unit of Distributed Control System (DCS)
- To give adequate information with respect to interfaces used in DCS

UNIT I PROGRAMMABLE LOGIC CONTROLLER 9

Evolution of PLCs – Components of PLC – Architecture of PLC – Discrete and analog I/O modules – Programming languages -Ladder diagram – Function block diagram (FBD) - Programming timers and counters

UNIT II APPLICATIONS OF PLC 9

Instructions in PLC – Program control instructions, math instructions, data manipulation Instructions, sequencer and shift register instructions – Case studies in PLC

UNIT III COMPUTER CONTROLLED SYSTEMS 9

Basic building blocks of computer controlled systems – Data acquisition system – Supervisory control – Direct digital control- SCADA:- Hardware and software, Remote terminal units, Master Station and Communication architectures

UNIT IV DISTRIBUTED CONTROL SYSTEM 9

DCS – Various Architectures – Comparison – Local control unit – Process interfacing issues – Communication facilities

UNIT V INTERFACES IN DCS 9

Operator interfaces - Low level and high level operator interfaces – Displays - Engineering Interfaces – Low level and high level engineering interfaces – Factors to be considered in selecting DCS – Case studies in DCS

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to understand and analyze Instrumentation systems and their applications to various industries.
- Ability to understand and analyse, linear and digital electronic circuits

TEXT BOOKS:

1. F.D. Petruzella, Programmable Logic Controllers, Tata Mc-Graw Hill, Third edition, 2010
2. Michael P. Lukas, *Distributed Control Systems: Their Evaluation and Design*, Van Nostrand Reinhold Co., 1986
3. D. Popovic and V.P.Bhatkar,' Distributed computer control for industrial Automation' Marcel Dekker, Inc., Newyork ,1990.

REFERENCES:

1. T.A. Hughes, Programmable Controllers, Fourth edition, ISA press, 2005
2. Krishna Kant, Computer Based Industrial Control, Second edition, Prentice Hall of India, New Delhi, 2010.
3. John W. Webb and Ronald A. Reis, 'Programmable Logic Controllers, Fifth edition, Prentice Hall of India, New Delhi, 2010.
4. John R. Hackworth and Frederick D. Hackworth Jr, Programmable Logic Controllers, Pearson, New Delhi, 2004.
5. Clarke, G., Reynders, D. and Wright, E., "Practical Modern SCADA Protocols: DNP3,4. 60870.5 and Related Systems", Newnes, 1st Edition, 2004.
6. E.A.Parr, Programmable Controllers, An Engineer's Guide, Elsevier, 2013.

OBM552 MEDICAL PHYSICS L T P C
3 0 0 3

OBJECTIVES:

- To study the complete non-ionizing radiations including light and its effect in human body.
- To understand the principles of ultrasound radiation and its applications in medicine.
- To learn about radioactive nuclides and also the interactions of radiation with matters and how isotopes are produced.
- To study the harmful effects of radiation and radiation protection regulations.

UNIT I NON-IONIZING RADIATION AND ITS MEDICAL APPLICATIONS 9

Introduction to EM waves - Tissue as a leaky dielectric - Relaxation processes: Debye model, Cole–Cole model- Overview of non-ionizing radiation effects-Low Frequency Effects- Higher frequency effects. Physics of light-Measurement of light and its unit- limits of vision and color vision an overview - Applications of ultraviolet in medicine, Thermography.

UNIT II ULTRASOUND IN MEDICINE 9

Ultrasound fundamentals – Generation of ultrasound (Ultrasound Transducer) - Interaction of Ultrasound with matter: Cavitation, Reflection, Transmission- Scanning systems – Artefacts- Ultrasound- Doppler-Double Doppler shift-Clinical Applications- Ultrasonography.

UNIT III PRINCIPLES OF RADIOACTIVE NUCLIDES AND DECAY 9

Introduction to Radioisotopes - Radioactive decay : Spontaneous Fission, Isomeric Transition, Alpha Decay, Beta Decay, Positron Decay, Electron Capture- Radioactive decay equations – Half life- Mean Life- Effective half-life - Natural and Artificial radioactivity. - Production of radionuclide – Cyclotron produced Radionuclide - Reactor produced Radionuclide fission and electron Capture reaction, Target and Its Processing Equation for Production of Radionuclide - Radionuclide Generator-Technetium generator.

UNIT IV INTERACTION OF RADIATION WITH MATTER 9

Interaction of charged particles with matter –Specific ionization, Linear energy transfer, range, Bremsstrahlung, Annihilation - Interaction of X and Gamma radiation with matter: Photoelectric effect, Compton Scattering, Pair production- Attenuation of Gamma Radiation - Interaction of neutron with matter and their clinical significance- Radionuclide used in Medicine and Technology.

UNIT V RADIATION EFFECTS AND REGULATIONS 9

Classification of Radiation Damage, Stochastic and Deterministic Effects, Acute Effects of Total Body Irradiation, Long-Term Effects of Radiation, Risk Versus Benefit in Diagnostic Radiology and Nuclear Medicine, Risk of Pregnant Women, Nuclear Regulatory Commission, ALARA Program, Medical Uses of Radioactive Materials, Survey for Contamination and Exposure Rate, Dose Calibrators and Survey Meters, Bioassay, Radioactive Waste Disposal.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Analyze the low frequency and high frequency effects of non-ionizing radiation and physics of light.
- Define various clinical applications based on ultrasound wave.
- Explain the process of radioactive nuclide production using different techniques
- Analyze radiation mechanics involved with various physiological systems
- Outline the detrimental effects of radiation and regulations for radiation safety.

TEXT BOOKS:

1. B H Brown, R H Smallwood, D C Barber, P V Lawford and D R Hose, Medical Physics and Biomedical Engineering, 2nd Edition, IOP Publishers 2001. (Unit I & II)
2. Gopal B. Saha, Physics and Radiobiology of Nuclear Medicine, 4th Edition, Springer, 2013. (Unit III & IV)
3. R Hendee and Russell Ritenour "Medical Imaging Physics", Fourth Edition William, Wiley-Liss, 2002. (Unit V)

REFERENCES:

1. S.Webb " The Physics of Medical Imaging", Taylor and Francis, 1988
2. HyltonB Meire and Pat Farrant "Basic Ultrasound" John Wiley & Sons, 1995
3. John R Cameran , James G Skofronick "Medical Physics" John-Wiley & Sons. 1978
4. W.J.Meredith and J.B. Massey " Fundamental Physics of Radiology" Third edition ,Varghese Publishinghouse. 1992

OML552 MICROSCOPY L T P C
3 0 0 3

OBJECTIVE:

This course will cover the basic principles and techniques of optical and electron microscopy. This course also deals with the sample preparation techniques for the microstructural analysis.

UNIT I INTRODUCTION 9

History of Microscopy, Overview of current microscopy techniques. Light as particles and waves, Fundamental of optics: Diffraction and interference in image formation, real and virtual images, Resolution, Depth of field and focus, Magnification, Numerical aperture, Aberration of lenses: Components of Light Microscopy, Compound light microscopy and its variations.

UNIT II MICROSCOPY 9

Phase contrast microscopy: optical design, theory, image interpretation, Dark-field microscopy: optical design, theory , image interpretation, Polarization Microscopy: Polarized light, optical design, theory , image interpretation, Differential Interference Contrast (DIC): equipment and optics, image interpretation, Modulation contrast microscopy: contrast methods using oblique illumination.

UNIT III ELECTRON MICROSCOPY 9

Interaction of electrons with matter, elastic and inelastic scattering, secondary effects, Components of electron microscopy: Electron sources, pumps and holders, lenses, apertures, and resolution: Scanning Electron and Transmission Electron Microscopy: Principle, construction, applications and limitations.

UNIT IV SAMPLE PREPARATION FOR MICROSTRUCTURAL ANALYSIS 9

Optical Microscopy sample preparation: Grinding, polishing and etching, SEM sample preparation: size constrains, TEM sample preparation: Disk preparation, electro polishing, ion milling, lithography, storing specimens.

UNIT V CHEMICAL ANALYSIS 9

Surface chemical composition (Principle and applications) - Mass spectroscopy and X-ray emission spectroscopy - Energy Dispersive Spectroscopy- Wave Dispersive Spectroscopy. Electron spectroscopy for chemical analysis (ESCA), Ultraviolet Photo Electron Spectroscopy (UPS), X ray Photoelectron Spectroscopy (XPS), Auger Electron Spectroscopy (AES)-Applications.

TOTAL: 45 PERIODS

OUTCOMES:

- Able to understand the physics behind the microscopy.
- Ability to describe the principle, construction and working of light microscopy.
- Ability to appreciate about electron microscopy.
- Ability to understand about the important of sample preparation technique.
- Ability to identify the appropriate spectroscopy technique for chemical analysis.

TEXT BOOKS:

1. Douglas B. Murphy, Fundamentals of light microscopy and electronic Imaging, 2001, Wiley-Liss, Inc. USA
2. David B. Williams and C. Barry Carter, Transmission Electron Microscopy-A Textbook for Materials Science, Springer US, 2nd edition, 2009.

REFERENCES:

1. Brandon D. G. "Modern Techniques in Metallography", Von Nostrand Inc. NJ, USA,1986.
2. Whan R E (Ed), ASM Handbook, Volume 10, Materials Characterisation", Nineth Edition, ASM International, USA, 1986.
3. Thomas G., "Transmission electron microscopy of metals", John Wiley, 1996

OBT554 PRINCIPLES OF FOOD PRESERVATION L T P C 3 0 0 3

OBJECTIVE:

- The course aims to introduce the students to the area of Food Preservation. This is necessary for effective understanding of a detailed study of food processing and technology subjects

UNIT I FOOD PRESERVATION AND ITS IMPORTANCE 9

Introduction to food preservation. Wastage of processed foods; Shelf life of food products; Types of food based on its perishability. Traditional methods of preservation

UNIT II METHODS OF FOOD HANDLING AND STORAGE 9

Nature of harvested crop, plant and animal; storage of raw materials and products using low temperature, refrigerated gas storage of foods, gas packed refrigerated foods, sub atmospheric storage, Gas atmospheric storage of meat, grains, seeds and flour, roots and tubers; freezing of raw and processed foods.retort pouch packing, Aseptic packaging.

UNIT III THERMAL METHODS 9

Newer methods of thermal processing; batch and continuous; In container sterilization- canning; application of infra-red microwaves, ohmic heating; control of water activity, preservation by concentration and dehydration, osmotic methods

UNIT IV DRYING PROCESS FOR TYPICAL FOODS 9

Rate of drying for food products, design parameters of different type of dryers; properties of air-water mixtures. Psychrometric chart, freezing and cold storage.freeze concentration, dehydro-freezing, freeze drying, IQF; calculation of refrigeration load, design of freezers and cold storages.

UNIT V NON-THERMAL METHODS 9

Super Critical Technology for Preservation - Chemical preservatives, preservation by ionizing radiations, ultrasonics, high pressure, fermentation, curing, pickling, smoking, membrane technology. Hurdle technology.

TOTAL: 45 PERIODS

OUTCOMES:

On completion of the course the students are expected to

- Be aware of the different methods applied to preserving foods.

TEXT BOOKS:

1. Karnal, Marcus and D.B. Lund "Physical Principles of Food Preservation", Rutledge, 2003.
2. VanGarde, S.J. and Woodburn, M "Food Preservation and Safety Principles and Practice" Surbhi Publications, 2001.
3. Sivasankar, B. "Food Processing & Preservation", Prentice Hall of India, 2002.
4. Khetarpaul, Neelam, "Food Processing and Preservation", Daya Publications, 2005.

REFERENCES:

1. Rahman, M. Shafiur "Handbook of Food Preservation", Marcel & Dekker, 2006.
2. Zeuthen, Peter and Bogh-Sarensen, Leif. "Food Preservation Techniques", CRC / Wood Head Publishing, 2003.
3. Ranganna, S. "Handbook of Canning and Aseptic Packaging", Tata McGraw-Hill, 2000.
4. Ranganna, S. "Handbook of Canning and Aseptic Packaging", Tata McGraw-Hill, 2000.

OMF551	PRODUCT DESIGN AND DEVELOPMENT	L	T	P	C
		3	0	0	3

OBJECTIVE:

The course aims at providing the basic concepts of product design, product features and its architecture so that student can have a basic knowledge in the common features a product has and how to incorporate them suitably in product.

UNIT I INTRODUCTION 9

Need for IPPD – Strategic importance of Product development – integration of customer, designer, material supplier and process planner, Competitor and customer – Behaviour analysis. Understanding customer – prompting customer understanding – involve customer in development and managing requirements – Organization – process management and improvement – Plan and establish product specifications.

UNIT II CONCEPT GENERATION AND SELECTION 9

Task – Structured approaches – clarification – search – externally and internally – explore systematically – reflect on the solutions and processes – concept selection – methodology – benefits.

UNIT III PRODUCT ARCHITECTURE 9

Implications – Product change – variety – component standardization – product performance – manufacturability – product development management – establishing the architecture – creation – clustering – geometric layout development – fundamental and incidental interactions – related system level design issues – secondary systems – architecture of the chunks – creating detailed interface specifications.

UNIT IV INDUSTRIAL DESIGN 9

Integrate process design – Managing costs – Robust design – Integrating CAE, CAD, CAM tools – Simulating product performance and manufacturing processes electronically – Need for industrial design – impact – design process – investigation of for industrial design – impact – design process – investigation of customer needs – conceptualization – refinement – management of the industrial design process – technology driven products – user – driven products – assessing the quality of industrial design.

UNIT V DESIGN FOR MANUFACTURING AND PRODUCT DEVELOPMENT 9

Definition – Estimation of Manufacturing cost – reducing the component costs and assembly costs – Minimize system complexity – Prototype basics – principles of prototyping – planning for prototypes – Economic Analysis – Understanding and representing tasks – baseline project planning – accelerating the project – project execution.

TOTAL: 45 PERIODS

OUTCOME:

- The student will be able to design some products for the given set of applications, also the knowledge gained through prototyping technology will help the student to make a prototype of a problem and hence product design and development can be achieved.

TEXT BOOK:

1. Karl T Ulrich and Steven D Eppinger, "Product Design and Development", McGraw-Hill International Edns. 1999.

REFERENCES:

1. Kemnneth Crow, "Concurrent Engg./Integrated Product Development", DRM Associates, 26/3,Via Olivera, Palos Verdes, CA 90274(310) 377-569, Workshop Book.
2. Stephen Rosenthal, "Effective Product Design and Development", Business One Orwin, Homewood, 1992, ISBN 1-55623-603-4.
3. Staurt Pugh, "Tool Design –Integrated Methods for Successful Product Engineering", Addison Wesley Publishing, New york, NY.

OAN551 ENSORS AND TRANSDUCERS L T P C 3 0 0 3

OBJECTIVES:

- To understand the concepts of measurement technology.
- To learn the various sensors used to measure various physical parameters.
- To learn the fundamentals of signal conditioning, data acquisition and communication systems used in mechatronics system development.

UNIT I INTRODUCTION 9

Basics of Measurement – Classification of errors – Error analysis – Static and dynamic characteristics of transducers – Performance measures of sensors – Classification of sensors – Sensor calibration techniques – Sensor Output Signal Types.

UNIT II MOTION, PROXIMITY AND RANGING SENSORS 9

Motion Sensors – Potentiometers, Resolver, Encoders – Optical, Magnetic, Inductive, Capacitive, LVDT – RVDT – Synchro – Microsyn, Accelerometer – GPS, Bluetooth, Range Sensors – RF beacons, Ultrasonic Ranging, Reflective beacons, Laser Range Sensor (LIDAR).

UNIT III FORCE, MAGNETIC AND HEADING SENSORS 9

Strain Gage, Load Cell, Magnetic Sensors –types, principle, requirement and advantages: Magneto resistive – Hall Effect – Current sensor Heading Sensors – Compass, Gyroscope, Inclinometers.

UNIT IV OPTICAL, PRESSURE AND TEMPERATURE SENSORS 9

Photo conductive cell, photo voltaic, Photo resistive, LDR – Fiber optic sensors – Pressure – Diaphragm, Bellows, Piezoelectric – Tactile sensors, Temperature – IC, Thermistor, RTD, Thermocouple. Acoustic Sensors – flow and level measurement, Radiation Sensors - Smart Sensors - Film sensor, MEMS & Nano Sensors, LASER sensors.

UNIT V SIGNAL CONDITIONING and DAQ SYSTEMS 9

Amplification – Filtering – Sample and Hold circuits – Data Acquisition: Single channel and multi channel data acquisition – Data logging - applications - Automobile, Aerospace, Home appliances, Manufacturing, Environmental monitoring.

TOTAL : 45 PERIODS

OUTCOMES:

The students will be able to

CO1. Expertise in various calibration techniques and signal types for sensors.
CO2. Apply the various sensors in the Automotive and Mechatronics applications
CO3. Study the basic principles of various smart sensors.
CO4. Implement the DAQ systems with different sensors for real time applications

TEXT BOOKS:

1. Ernest O Doebelin, "Measurement Systems – Applications and Design", Tata McGraw-Hill, 2009.
2. Sawney A K and Puneet Sawney, "A Course in Mechanical Measurements and Instrumentation and Control", 12th edition, Dhanpat Rai & Co, New Delhi, 2013.

REFERENCES

1. Patranabis D, "Sensors and Transducers", 2nd Edition, PHI, New Delhi, 2010.
2. John Turner and Martyn Hill, "Instrumentation for Engineers and Scientists", Oxford Science Publications, 1999.
3. Richard Zurawski, "Industrial Communication Technology Handbook" 2nd edition, CRC Press, 2015.

OTL551 SPACE TIME WIRELESS COMMUNICATION **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the concept of multiple antenna propagation.
- To understand the concept of capacity of frequency flat deterministic MIMO channel.
- To understand the concept of transmitter and receiver diversity technique.
- To design the coding for frequency flat channel.
- To analyze the concept of micro multi user detection.

UNIT I MULTIPLE ANTENNA PROPAGATION AND ST CHANNEL CHARACTERIZATION 9

Wireless channel – Scattering model in macrocells – Channel as a ST random field – Scattering functions: Polarization and field diverse channels – Antenna array topology – Degenerate channels – reciprocity and its implications – Channel definitions – Physical scattering model – Extended channel model – Channel measurements – sampled signal model – ST multiuser and ST interference channels – ST channel estimation.

UNIT II CAPACITY OF MULTIPLE ANTENNA CHANNELS 9

Capacity of frequency flat deterministic MIMO channel: Channel unknown to the transmitter – Channel known to the transmitter – capacity of random MIMO channels – Influence of ricean fading – fading correlation – XPD and degeneracy on MIMO capacity – Capacity of frequency selective MIMO channels.

UNIT III SPATIAL DIVERSITY 9

Diversity gain – Receive antenna diversity – Transmit antenna diversity – Diversity order and channel variability – Diversity performance in extended channels – Combined space and path diversity – Indirect transmit diversity – Diversity of a space-time – frequency selective fading channel.

UNIT IV MULTIPLE ANTENNA CODING AND RECEIVERS 9

Coding and Interleaving architecture – ST coding for frequency flat channels – ST coding for frequency selective channels – Receivers–SISO–SIMO–MIMO–Iterative MIMO receivers – Exploiting channel knowledge at the transmitter: linear pre-filtering – optimal pre-filtering for maximum rate – optimal pre-filtering for error rate minimization – selection at the transmitter – Exploiting imperfect channel knowledge

UNIT V ST OFDM, SPREAD SPECTRUM AND MIMO MULTIUSER DETECTION 9

SISO-OFDM modulation, MIMO-OFDM modulation – Signaling and receivers for MIMO– OFDM – SISO–SS modulation – MIMO-SS modulation – Signaling and receivers for MIMO – S.MIMO – MAC – MIMO – BC – Outage performance for MIMO-MU – MIMO - MU with OFDM – CDMA and multiple antennas.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course , students would be able to

- Design and analyze the channel characterization.
- Analyze the capacity of random MIMO channel.
- Design and analyze the order diversity and channel variability.
- Analyze the multiple antenna coding and receivers.
- Analyze the MIMO multi user detection

TEXT BOOKS:

1. Sergio Verdu, "Multi User Detection" , Cambridge University Press, 2011
2. A. Paulraj, Rohit Nabar, Dhananjay Gore, "Introduction to Space Time Wireless Communication Systems", Cambridge University Press , 2008

REFERENCES

1. Don Tarrieri, " Principles of Spread Spectrum Communication systems" ,Springer, Third edition, 2015

OTL553 TELECOMMUNICATION NETWORK MANAGEMENT L T P C 3 0 0 3

OBJECTIVES:

- To understand the concept of network management standards.
- To design the common management information service element model.
- To understand the various concept of information modelling.
- To analyze the concept of SNMPv1 and SNMPv2 protocol.
- To analyze the concept of examples of network management.

UNIT I FOUNDATIONS 9

Network management standards–network management model– organization model– information model abstract syntax notation 1 (ASN.1) – encoding structure– macros–functional model. Network management application functional requirements:Configuration management– fault management–performance management–Error correlation technology– security management– accounting management– common management–report management– polity based management–service level management–management service–community definitions– capturing the requirements– simple and formal approaches–semi formal and formal notations.

UNIT II COMMON MANAGEMENT INFORMATION SERVICE ELEMENT 9

CMISE model–service definitions–errors–scooping and filtering features– synchronization– functional units– association services– common management information protocol specification.

UNIT III INFORMATION MODELING FOR TMN 9

Rationale for information modeling–management information model–object oriented modeling paradigm– structure of management information–managed object class definition–management information base.

UNIT IV SIMPLE NETWORK MANAGEMENT PROTOCOL 9

SNMPv1: managed networks–SNMP models– organization model–information model–SNMPv2 communication model–functional model–major changes in SNMPv2–structure of management information, MIB–SNMPv2 protocol– compatibility with SNMPv1– SNMPv3– architecture–applications–MIB security, remote monitoring–SMI and MIB– RMON1 and RMON2.

UNIT V NETWORK MANAGEMENT EXAMPLES 9

ATM integrated local management interface–ATM MIB–M1– M2–M3– M4– interfaces–ATM digital exchange interface management–digita1 subscriber loop and asymmetric DSL technologies–ADSL configuration management–performance management Network management tools: Network statistics management–network management system–management platform case studies: OPENVIEW–ALMAP.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course , students would be able to

- Design and analyze of fault management.
- Analyze the common management information protocol specifications
- Design and analyze of management information model.
- Design the simple network management protocol
- Design the various types of network management tools.

TEXT BOOKS:

1. Mani Subramanian, "Network Management: Principles and Practice" Pearson Education, Second edition, 2010
2. Lakshmi G Raman, "Fundamentals of Telecommunications Network Management" ,Wiley, 1999

REFERENCES:

1. Henry Haojin Wang, "Telecommunication Network Management", Mc- Graw Hill ,1999
2. Salah Aldarous & Thomas Plevyak, "Telecommunication Network Management: Technologies and Implementations" , Wiley,1997

OMD553 TELEHEALTH TECHNOLOGY **L T P C**
3 0 0 3

OBJECTIVES:

The student should be made to:

- Learn the key principles for telemedicine and health.
- Understand telemedical technology.
- Know telemedical standards, mobile telemedicine and it applications

UNIT I TELEMEDICINE AND HEALTH 9

History and Evolution of telemedicine, Organs of telemedicine, Global and Indian scenario, Ethical and legal aspects of Telemedicine - Confidentiality, Social and legal issues, Safety and regulatory issues, Advances in Telemedicine.

UNIT II TELEMEDICAL TECHNOLOGY 9

Principles of Multimedia - Text, Audio, Video, data, Data communications and networks, PSTN, POTS, ANT, ISDN, Internet, Air/ wireless communications Communication infrastructure for telemedicine – LAN and WAN technology. Satellite communication, Mobile communication.

UNIT III TELEMEDICAL STANDARDS 9

Data Security and Standards: Encryption, Cryptography, Mechanisms of encryption, phases of Encryption. Protocols TCP/IP, ISO-OSI, Standards to followed DICOM, HL7, H. 320 series Video Conferencing, Security and confidentiality of medical records, Cyber laws related to telemedicine

UNIT IV MOBILE TELEMEDICINE 9

Tele radiology: Image Acquisition system Display system, Tele pathology, Medical information storage and management for telemedicine- patient information, medical history, test reports, medical images, Hospital information system

UNIT V TELEMEDICAL APPLICATIONS 9

Telemedicine – health education and self care. - Introduction to robotics surgery, Telesurgery. Telecardiology, Teleoncology, Telemedicine in neurosciences, Business aspects - Project planning and costing, Usage of telemedicine.

TOTAL : 45 PERIODS

OUTCOMES

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

- Apply multimedia technologies in telemedicine.
- Explain Protocols behind encryption techniques for secure transmission of data.
- Apply telehealth in healthcare.

TEXT BOOK:

1. Norris, A.C. "Essentials of Telemedicine and Telecare", Wiley, 2002.

REFERENCES:

1. Wootton, R., Craig, J., Patterson, V. (Eds.), "Introduction to Telemedicine. Royal Society of Medicine" Press Ltd, Taylor & Francis 2006
2. O'Carroll, P.W., Yasnoff, W.A., Ward, E., Ripp, L.H., Martin, E.L. (Eds), "Public Health Informatics and Information Systems", Springer, 2003.
3. Ferrer-Roca, O., Sosa - Iudicissa, M. (Eds.), Handbook of Telemedicine. IOS Press (Studies in Health Technology and Informatics, Volume 54, 2002.
4. Simpson, W. Video over IP. A practical guide to technology and applications. Focal Press Elsevier, 2006.
5. Bemmel, J.H. van, Musen, M.A. (Eds.) Handbook of Medical Informatics. Heidelberg, Germany: Springer, 1997.
6. Mohan Bansal " Medical Informatics", Tata McGraw-Hill, 2004.

OTL554 WAVELETS AND ITS APPLICATIONS **L T P C**
3 0 0 3

OBJECTIVES:

- To understand the concept of Fourier transform and short time Fourier transform.
- To understand the concept of continuous time wavelet transform.
- To analyze the concept of interpolation and decimation.

- To understand the types of filter bank.
- To analyze the concept of image compression.

UNIT I FOURIER ANALYSIS 9

Fourier basis & Fourier Transform – failure of Fourier Transform – Need for Time-Frequency Analysis – Heisenberg's Uncertainty principle – Short time Fourier transform (STFT) – short comings of STFT– Need for Wavelets.

UNIT II CWT AND MRA 9

Wavelet basis – Continuous time Wavelet Transform (CWT) – need for scaling function – Multi Resolution Analysis – important wavelets: Haar– Mexican hat– Meyer– Shannon– Daubachies.

UNIT III INTRODUCTION TO MULTIRATE SYSTEMS 9

Decimation and Interpolation in Time domain - Decimation and Interpolation in Frequency domain – Multi rate systems for a rational factor.

UNIT IV FILTER BANKS AND DWT 9

Two channel filter bank – Perfect Reconstruction (PR) condition – relationship between filter banks and wavelet basis – DWT – Filter banks for Daubachies wavelet function.

UNIT V APPLICATIONS 9

Feature extraction using wavelet coefficients– Image compression– interference suppression– Microcalification cluster detection– Edge detection–Faulty bearing signature identification.

TOTAL: 45 PERIODS

OUTCOMES:

At the end of the course , students would be able to

- Analyze the need for time frequency analysis.
- Design the concept of multi resolution analysis.
- Analyze the multirate system for rational factor.
- Analyze the relationship between the filter bank and wavelet.
- Analyze the application of wavelet.

TEXT BOOK:

1.K.P.Soman , K.I. Ramachandran, N.G. Rasmi,"Insight Into Wavelets: From Theory to Practice" PHI Learning Private Limited, Third Edition, 2010.

REFERENCE BOOKS:

1.Sidney Burrus C, " An Introduction to Wavelets " Academic press, 2014
2.Stephane G. Mallat, A Wavelet Tour of Signal Processing:The sponse way" Academic Press, Third edition, 2008

OIM551 WORLD CLASS MANUFACTURING L T P C
3 0 0 3

OBJECTIVES

- Understanding of the concept and importance of strategy planning for manufacturing industries
- To apply principles and techniques in the identifiable formulation and implementation of manufacturing strategy for competitive in global context.

UNIT I INDUSTRIAL DECLINE AND ASCENDANCY 9

Manufacturing excellence - US Manufacturers - French Manufacturers - Japan decade – American decade - Global decade

UNIT II BUILDING STRENGTH THROUGH CUSTOMER – FOCUSED PRINCIPLES 9

Customer - Focused principles - General principles - Design - Operations - Human resources - Quality and Process improvement - Promotion and Marketing

UNIT III VALUE AND VALUATION 9

Product Costing - Motivation to improve - Value of the enterprises QUALITY - The Organization : Bulwark of stability and effectiveness - Employee stability – Quality Individuals Vs. Teams - Team stability and cohesiveness - Project cohesiveness and stability

UNIT IV STRATEGIC LINKAGES 9

Product decisions and customer service - Multi-company planning - Internal manufacturing planning - Soothing the demand turbulence

UNIT V IMPEDIMENTS 9

Bad plant design - Mismanagement of capacity - Production Lines - Assembly Lines – Whole Plant Associates - Facilitators - Teamsmanship - Motivation and reward in the age of continuous Improvement

TOTAL : 45 PERIODS

OUTCOMES:

- Able to understand the concept and the importance of manufacturing strategy for industrial enterprise competitiveness.
- Apply appropriate techniques in the analysis an devaluation of company's opportunities for enhancing competitiveness in the local regional and global context.
- Identify formulation and implement strategies for manufacturing and therefore enterprise competitiveness.

TEXT BOOKS:

1. By Richard B. Chase, Nicholas J. Aquilano, F. Robert Jacobs – "Operations Management for Competitive Advantage", McGraw-Hill Irwin, ISBN 0072323159
2. Moore Ran, "Making Common Sense Common Practice: Models for Manufacturing Excellence", Elsevior Multiworth
3. Narayanan V. K., "Managing Technology & Innovation for Competitive Advantage", Pearson Education Inc.
4. Korgaonkar M. G., "Just In Time Manufacturing", MacMillan Publishers India Ltd.,
5. Sahay B. S., Saxena K. B. C., Ashish Kumar, "World Class Manufacturing", MacMillan Publishers.

OAI751 AGRICULTURAL FINANCE, BANKING AND COOPERATION L T P C
3 0 0 3

OBJECTIVES:

- To make the students aware about the agricultural Finance, Banking and Cooperation.
- To acquaint the students with the basic concepts, principles and functions of management.
- To understand the process of finance banking and cooperation.

UNIT I AGRICULTURAL FINANCE - NATURE AND SCOPE 9

Agricultural Finance: Definition, Importance, Nature and Scope - Agricultural Credit: Meaning, Definition, Need and Classification - Sources of credit - Role of institutional and non - Institutional agencies: Advantages and Disadvantages - Rural indebtedness: consequences of rural indebtedness - History and Development of rural credit in India.

UNIT II FARM FINANCIAL ANALYSIS 9

Principles of Credit - 5C's, 5R's and & 7P's of Credit - Project Cycle and Management - Preparation of bankable projects / Farm credit proposals - Feasibility - Time value of money: Compounding and Discounting - Appraisal of farm credit proposals - Undiscounted and discounted measures - Repayment plans - Farm Financial Statements: Balance Sheet, Income Statement and Cash Flow statement - Financial Ratio Analysis.

UNIT III FINANCIAL INSTITUTIONS 9

Institutional Lending Agencies - Commercial banks: Nationalization, Agricultural Development Branches - Area Approach - Priority Sector Lending - Regional Rural Banks, Lead bank, Scale of finance - Higher financial institutions: RBI, NABARD, AFC, ADB, World Bank and Deposit Insurance and Credit Guarantee Corporation of India - Microfinance and its role in poverty alleviation - Self-Help Groups - Non -Governmental Organizations - Rural credit policies followed by State and Central Government - Subsidized farm credit, Differential Interest Rate (DIR), Kisan Credit Card (KCC) Scheme - Relief Measures and Loan Waiver Scheme and Know Your Customer (KYC).

UNIT IV CO-OPERATION 9

Co-operation: Philosophy and Principles - History of Indian Cooperative Credit Movement: Pre and Post-Independence periods and Cooperation in different plan periods - Cooperative credit institutions: Two tier and three tier structure, Functions: provision of short term and long term credit, Strength and weakness of cooperative credit system, Policies for revitalizing cooperative credit: Salient features of Vaithiyananthan Committee Report on revival of rural cooperative credit institutions, Reorganisation of Cooperative credit structure in Andhra Pradesh and single window system and successful cooperative credit systems in Gujarat, Maharashtra, Punjab etc, - Special cooperatives: LAMPS and FSS: Objectives, role and functions - National Cooperative Development Corporation (NCDC) and National Federation of State Cooperative Banks Ltd., (NAFSCOB) - Objectives and Functions.

UNIT V BANKING AND INSURANCE 9

Negotiable Instruments: Meaning, Importance and Types - Central Bank: RBI - functions - credit control - objectives and methods: CRR, SLR and Repo rate - Credit rationing - Dear money and cheap money - Financial inclusion and Exclusion: Credit widening and credit deepening monetary policies: Credit gap: Factors influencing credit gap - Non - Banking Financial Institutions (NBFI) - Assessment of crop losses, Determination of compensation - Crop insurance: Schemes, Coverage, Advantages and Limitations in Implementation - Estimation of crop yields - Livestock Insurance schemes - Agricultural Insurance Company of India Ltd (AIC): Objectives and functions.

TOTAL: 45 PERIODS

OUTCOME:

After completion of this course, the students will

- Be familiar with agricultural finance, Banking, cooperation and basic concepts, principles and functions of management.

REFERENCES:

1. Muniraj, R., 1987, Farm Finance for Development, Oxford & IBH, New Delhi
2. Subba Reddy S and P.Raghu Ram 2011, Agricultural Finance and Management, Oxford & IBH, New Delhi.
3. Lee W.F., M.D. Boehlje A.G., Nelson and W.G. Murray, 1998, Agricultural Finance, Kalyani Publishers, New Delhi.
4. Mammoria, C.B., and R.D. Saxena 1973, Cooperation in India, Kitab Mahal, Allahabad.

OEE751 BASIC CIRCUIT THEORY L T P C
3 0 0 3

OBJECTIVES:

- To introduce electric circuits and its analysis
- To impart knowledge on solving circuit equations using network theorems
- To introduce the phenomenon of resonance in coupled circuits
- To introduce Phasor diagrams and analysis of three phase circuits

UNIT I BASIC CIRCUITS ANALYSIS 9

Resistive elements - Ohm's Law Resistors in series and parallel circuits – Kirchoffs laws – Mesh current and node voltage - methods of analysis.

UNIT II NETWORK REDUCTION AND THEOREMS FOR DC CIRCUITS 9

Network reduction: voltage and current division, source transformation – star delta conversion. Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNITIII AC CIRCUITS 9

Introduction to AC circuits , Inductance reactance, capacitive reactance, Phasor diagrams, real power, reactive power, apparent power, power factor, R-L R-C , RLC networks, Network reduction: voltage and current division, source transformation –mesh and node analysis, Thevenins and Norton Theorems – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem – Millman's theorem.

UNIT IV THREE PHASE CIRCUITS 9

A.C. circuits – Average and RMS value - Phasor Diagram – Power, Power Factor and Energy.- Analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & un balanced – phasor diagram of voltages and currents – power measurement in three phase circuits.

UNIT V RESONANCE AND COUPLED CIRCUITS 9

Series and parallel resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

TOTAL: 45 PERIODS

OUTCOMES:

- Ability to introduce electric circuits and its analysis
- Ability to impart knowledge on solving circuit equations using network theorems
- Ability to introduce the phenomenon of resonance in coupled circuits
- Ability to introduce Phasor diagrams and analysis of three phase circuits

TEXT BOOKS:

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, "Engineering Circuits Analysis", McGraw Hill publishers, edition, New Delhi, 2013.
2. Charles K. Alexander, Mathew N.O. Sadiku, "Fundamentals of Electric Circuits", Second Edition, McGraw Hill, 2013.
3. Allan H. Robbins, Wilhelm C. Miller, "Circuit Analysis Theory and Practice", Cengage Learning India, 2013.

REFERENCES:

1. Chakrabarti A, "Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, 1999.
2. Jegatheesan, R., "Analysis of Electric Circuits," McGraw Hill, 2015.
3. Joseph A. Edminister, Mahmood Nahri, "Electric circuits", Schaum's series, McGraw-Hill, New Delhi, 2010.
4. M E Van Valkenburg, "Network Analysis",Prentice-Hall of India Pvt Ltd, New Delhi, 2015.

5. Mahadevan, K., Chitra, C., "Electric Circuits Analysis," Prentice-Hall of India Pvt Ltd., New Delhi, 2015.
6. Richard C. Dorf and James A. Svoboda, "Introduction to Electric Circuits", 7th Edition, John Wiley & Sons, Inc. 2015.
7. Sudhakar A and Shyam Mohan SP, "Circuits and Network Analysis and Synthesis", McGraw Hill, 2015.

OBM751 BASICS OF HUMAN ANATOMY AND PHYSIOLOGY **L T P C**
3 0 0 3

OBJECTIVES

- To learn the basic components of formation of systems
- To identify all the organelles of an animal cell and their function.
- To understand structure and functions of the various types of systems of human body.
- To demonstrate their knowledge of importance of anatomical features and physiology of human systems

UNIT I INTRODUCTION **9**

Level of Organization – Metabolism and Homeostasis – Plan of Body – Body Parts and Areas, Planes and Sections. Elements in the Human Body – Inorganic Compounds and Organic Compounds

UNIT II BASIC STRUCTURE AND FUNCTION OF ANIMAL CELL **9**

Structure of Cell – Structure and Function of Cell Membrane and Sub organelles. Cellular Transport Mechanism – Cell Division – Mitosis and Meiosis

UNIT III TISSUES, MEMBRANE AND SKELETAL SYSTEM **9**

Epithelial tissue – Connective tissue – Muscle tissue – Nerve tissue – Membrane. Types of Bone tissue - Classification of Bones – Functions of the Skeleton system – Skull, Vertebral Column. Joint - Articulation

UNIT IV NERVOUS AND CARDIOVASCULAR SYSTEMS **10**

Nervous system: Types and Structure of Neuron – Mechanism of Nerve Impulse - Structure and Parts of Brain. **Sensory organ:** Eye and Ear **Cardiovascular:** Composition of Blood and functions – Structure of Heart – Conduction system of Heart – Types of Blood vessel – Blood Pressure.

UNIT V DIGESTIVE AND URINARY SYSTEMS **8**

Digestive: Organs of Digestive system – Digestion and Absorption. **Urinary:** Structure of Kidney and Nephron – Mechanisms of Urine formation – Regulation of Blood pressure by Urinary System.

TOTAL:45 PERIODS

OUTCOMES

At end of the course

- Students would be familiar with the requirements for formation of systems
- Students would be understand the basic structural and functional elements of human body
- Students would have knowledge on Skeletal and muscular systems
- Students would be able to comprehend circulatory and nervous systems and their components
- Students would study importance of digestive and urinary systems in Human body

TEXT BOOKS:

1. Prabhjot Kaur. Text Book of Anatomy and Physiology. Lotus Publsihers. 2014
2. Elaine.N. Marieb , "Essential of Human Anatomy and Physiology", Eight Edition, Pearson Education, New Delhi 2007
3. Valerie C. Scanlon and Tina Sanders, "Essential of Human Anatomy and Physiology", Fifth Edition, F.A. Davis Company, Philadelphia 2007

REFERENCES:

1. Frederic H. Martini, Judi L. Nath, Edwin F. Bartholomew, Fundamentals of Anatomy and Physiology, Tenth Edition, Pearson Publishers, 2014
2. William F.Ganong, "Review of Medical Physiology", 22nd Edition, Mc Graw Hill, New Delhi, 2005
3. Eldra Pearl Solomon, "Introduction to Human Anatomy and Physiology", Third Edition, W.B. Saunders Company, 2008
4. Guyton & Hall, "Medical Physiology", 13th Edition, Elsevier Saunders, 2015

COURSE OUTCOMES	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12
Students would be familiar with the requirements for formation of systems	√								√			√
Students would be understand the basic structural and functional elements of human body	√	√										√
Students would have knowledge on Skeletal and muscular systems	√	√	√									√
Students would be able to comprehend circulatory and nervous systems and their components	√	√						√				√
Students would study importance of digestive and urinary systems in Human body	√	√										√

OGI751 CLIMATE CHANGE AND ITS IMPACT L T P C
3 0 0 3

OBJECTIVES:

- To understand the basics of weather and climate
- To have an insight on Atmospheric dynamics and transport of heat
- To develop simple climate models and evaluate climate changes using models

UNIT I BASICS OF WEATHER AND CLIMATE: 9

Shallow film of Air– stratified & disturbed atmosphere – law – atmosphere Engine. Observation of parameters. Temperature – Humidity – Wind - Pressure – precipitation-surface – networks. Constitution of atmosphere. well stirred atmosphere – process around turbopause – in dry air – ozone – carbon Dioxide – Sulphur Dioxide– Aerosol - water. Evolution of Atmosphere. State of atmosphere. Air temperature – pressure – hydrostatic – Chemistry – Distribution – circulation

UNIT II ATMOSPHERIC DYNAMICS: 9

Atmosphere dynamics: law – isobaric heating and cooling – adiabatic lapse rates – equation of motion - solving and forecasting. Forces – Relative and absolute acceleration – Earth's rotation *coriolis* on sphere – full equation of motion – Geostrophy - Thermal winds –departures – small-scale motion. Radiation, convection and advections: sun & solar radiation – energy balance – terrestrial radiation and the atmosphere – Green house effect- Global warming - Global budget –

radiative fluxes - heat transport. Atmosphere and ocean systems convecting & advecting heat. Surface and boundary layer – smaller scale weather system – larger scale weather system.

UNIT III GLOBAL CLIMATE 9

Components and phenomena in the climate system: Time and space scales: – interaction and parameterization problem. Gradients of Radiative forcing and energy transports by atmosphere and ocean – atmospheric circulation – latitude structure of the circulation - latitude – longitude dependence of climate features. Ocean circulation: latitude – longitude dependence of climate features – ocean vertical structure – ocean *thermohaline* circulation – land surface processes – carbon cycle.

UNIT IV CLIMATE SYSTEM PROCESSES 9

Conservation of motion: Force – *coriolis* - pressure gradient- velocity equations – Application – geotropic wind – pressure co-ordinates. Equation of State – atmosphere – ocean. Application: thermal circulation – sea level rise. Temperature equation: Ocean – air – Application – decay of sea surface temperature. Continuity equation: ocean – atmosphere. Application: coastal upwelling – equatorial upwelling – conservation of warm water mass. Moisture and salinity equation: conservation of mass – moisture. Source & sinks – latent heat. Moist processes – saturation – convection – Wave processes in atmosphere and ocean.

UNIT V CLIMATE CHANGE MODELS 9

Constructing a climate model – climate system modeling – climate simulation and drift – Evaluation of climate model simulation – regional (RCM) – global (GCM) – Global average response to warming – climate change observed to date.

TOTAL:45 PERIODS

OUTCOMES:

At the end of the course the student will be able to understand

- The concepts of weather and climate
- The principles of Atmospheric dynamics and transport of heat and air mass
- The develop simple climate models and to predict climate change

TEXTBOOKS:

1. Fundamentals of weather and climate (2nd Edition) Robin Mollveen (2010), Oxford University Press.
2. Climate change and climate modeling, J. David Neelin (2011) Cambridge University press.

OPY751 CLINICAL TRIALS L T P C 3 0 0 3

OBJECTIVES:

- To highlight the epidemiologic methods, study design, protocol preparation
- To gain knowledge in the basic bio-statistical techniques involved in clinical research.
- To describe the principles involved in ethical, legal and regulatory issues in clinical trials.

UNIT I ROLE OF CLINICAL TRIALS IN NEW DRUG DEVELOPMENT 9

Drug Discovery, regulatory guidance and governance, pharmaceutical manufacturing, nonclinical research, clinical trials, post-marketing surveillance, ethical conduct during clinical trials.

UNIT II FUNDAMENTALS OF TRIAL DESIGN 9

Randomised clinical trials, uncontrolled trials. Protocol development, endpoints, patient selection, source and control of bias, randomization, blinding, sample size and power.

UNIT III ALTERNATE TRIAL DESIGNS 9

Crossover design, factorial design, equivalence trials, bioequivalence trials, non-inferiority trials, cluster randomized trials, multi-center trials.

UNIT IV BASICS OF STATISTICAL ANALYSIS 9

Types of data and normal distribution, significance tests and confidence intervals, comparison of means, comparison of proportions, analysis of survival data, subgroup analysis, regression analysis, missing data.

UNIT V REPORTING OF TRIALS 9

Overview of reporting, trial profile, presenting baseline data, use of tables, figures, critical appraisal of report, meta-analysis.

TOTAL: 45 PERIODS

OUTCOMES:

The student will be able to

- Explain key concepts in the design of clinical trials.
- Describe study designs used, identify key issues in data management for clinical trials.
- Describe the roles of regulatory affairs in clinical trials.

TEXT BOOKS:

1. Fundamentals of Clinical Trials, Lawrence M. Friedman, Springer Science & Business Media, 2010
2. Textbook of Clinical Trials, David Machin, Simon Day, Sylvan Green, John Wiley & Sons, 2007
3. Clinical Trials: A Practical Approach, Stuart J. Pocock, John Wiley & Sons, 17-Jul-2013

REFERENCES:

1. Clinical trials, A practical guide to design, analysis and reporting, Duolao Wang and AmeetBakhai, Remedica, 2006.
2. Introduction to statistics in pharmaceutical clinical trials, T.A. Durham and J Rick Turner, Pharmaceutical Press.
3. Clinical Trials: Study Design, Endpoints and Biomarkers, Drug Safety, and FDA and ICH Guidelines, Tom Brody, Academic Press, 2016.

OEC751	ELECTRONIC DEVICES	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made to:

- Introduce the concept of diodes, Bipolar Junction Transistors and FET
- Study the various model parameters of Transistors
- Learn the concept of special semiconductor devices, Power & Display devices
- Impart the knowledge of various configurations, characteristics and applications.

UNIT I SEMICONDUCTOR DIODE 9

PN junction diode, Current equations, Energy Band diagram, Diffusion and drift current densities, forward and reverse bias characteristics, Transition and Diffusion Capacitances, Switching Characteristics, Breakdown in PN Junction Diodes.

UNIT II BIPOLAR JUNCTION TRANSISTORS 9

NPN -PNP -Operations-Early effect-Current equations – Input and Output characteristics of CE, CB, CC - Hybrid -π model - h-parameter model, Ebers Moll Model- Gummel Poon-model, Multi Emitter Transistor.

UNIT III FIELD EFFECT TRANSISTORS 9

JFETs – Drain and Transfer characteristics,-Current equations-Pinch off voltage and its significance- MOSFET- Characteristics- Threshold voltage -Channel length modulation, D-MOSFET, E-MOSFET- Characteristics – Comparison of MOSFET with JFET.

UNIT IV SPECIAL SEMICONDUCTOR DEVICES 9

Metal-Semiconductor Junction - MESFET, FINFET, PINFET, CNTFET, DUAL GATE MOSFET, Point Contact Diode, p-i-n Diode, Avalanche Photodiode, Schottky barrier diode-Zener diode-Varactor diode –Tunnel diode- Gallium Arsenide device, LASER diode, LDR.

UNIT V POWER DEVICES AND DISPLAY DEVICES 9

UJT, Thyristor - SCR, Diac, Triac, Power BJT- Power MOSFET- DMOS-VMOS. LED, LCD, Opto Coupler, Solar cell, CCD.

TOTAL: 45 PERIODS

OUTCOMES:

After this course, the student should be able to:

- Analyze the characteristics of semiconductor diodes.
- Analyze and solve problems of Transistor circuits using model parameters.
- Identify and characterize diodes and various types of transistors.
- Analyze the characteristics of special semiconductor devices.
- Analyze the characteristics of Power and Display devices.

TEXT BOOKS:

1. Millman and Halkias, "Electronic Devices and Circuits", 4th Edition, McGraw Hill, 2015.
2. Mohammad Rashid, "Electronic Devices and Circuits", Cengage Learning Pvt. Ltd, 2015.
3. Salivahanan. S, Suresh Kumar. N, "Electronic Devices and circuits", 4th Edition, McGraw Hill, 2016.

REFERENCES:

1. Donald A Neaman, "Semiconductor Physics and Devices", 4th Edition, McGraw Hill, 2012.
2. Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory" Pearson Prentice Hall, 11th Edition, 2014.
3. Bhattacharya and Sharma, "Solid State Electronic Devices", 2nd Edition, Oxford University Press, 2014.
4. R.S.Sedha, "A Textbook of Electronic Devices and Circuits", 2nd Edition, S.Chand Publications, 2008.
5. David A. Bell, "Electronic Devices and Circuits", 5th Edition, Oxford University Press, 2008.

OML752 ELECTRONIC MATERIALS L T P C 3 0 0 3

OBJECTIVE:

- Understanding the various materials and its properties contribution towards electrical and electronics field. This course covers the properties of materials behind the electronic applications.

UNIT I INTRODUCTION 7

Structure: atomic structures and bonding, types of bonding, band formation. Defects and imperfections in solids: Point, Line and Planer defects; Interfacial defects and volume defects. Classification of materials based on bonding: conductors, semiconductors and insulators.

UNIT II CONDUCTING MATERIALS 9

Introduction, factors affecting the conductivity of materials, classification based on conductivity of materials, temperature dependence of resistivity. Low resistivity materials (graphite, Al, Cu and steel) and its applications, high resistivity materials (manganin, constantin, nichrome, tungsten) and their applications. Superconductors. Meissner effect, classification and applications.

UNIT III SEMICONDUCTING AND MAGNETIC MATERIALS 10

Semiconductors: Introduction, types of semiconductors, temperature dependence of semiconductors, compound semiconductors, basic ideas of amorphous and organic semiconductors. Magnetic Materials: classification of magnetic materials, ferromagnetism-B-H curve (Qualitative), hard and soft magnetic materials, magneto materials applications.

UNIT IV DIELECTRIC AND INSULATING MATERIALS 9

Dielectric Materials: Introduction, classification, temperature dependence on polarization, properties,dielectric loss, factors influencing dielectric strength and capacitor materials, applications. Insulators: Introduction, thermal and mechanical properties required for insulators, Inorganic materials, organic materials, liquid insulators, gaseous insulators and ageing of insulators, applications.

UNIT V OPTOELECTRONIC ANDNANO ELECTRONIC MATERIALS 10

Optoelectronic materials: Introduction, properties, factor affecting optical properties, role of optoelectronic materials in LEDs, LASERs, photodetectors, solar cells. Nano electronic Materials: Introduction, advantage of nanoelectronic devices, materials, fabrication, challenges in Nano electronic materials.

TOTAL : 45 PERIODS

OUTCOME:

- With the basis, students will be able to have clear concepts on electronic behaviors of materials

TEXT BOOKS:

1. S.O. Kasap "Principles of Electronic Materials and Devices", 3rd edition, McGraw-Hill Education (India) Pvt. Ltd., 2007.
2. W.D. Callister, "Materials Science & Engineering – An Introduction", Jr., John Willey & Sons, Inc, New York, 7th edition, 2007.

REFERENCES:

1. B.G. Streetman and S. Banerjee, Solid State Electronic Devices, 6th edition, PHI Learning, 2009.
2. Eugene A. Irene, Electronic Materials Science, Wiley, 2005
3. Wei Gao, Zhengwei Li, Nigel Sammes, An Introduction to Electronic Materials for Engineers, 2nd Edition, World Scientific Publishing Co. Pvt. Ltd., 2011

OCH752 ENERGY TECHNOLOGY L T P C
3 0 0 3

OBJECTIVES

- Students will gain knowledge about different energy sources

UNIT I ENERGY 8

Introduction to energy – Global energy scene – Indian energy scene - Units of energy, conversion factors, general classification of energy, energy crisis, energy alternatives.

UNIT II CONVENTIONAL ENERGY 8

Conventional energy resources. Thermal, hydel and nuclear reactors, thermal, hydel and nuclear power plants, efficiency, merits and demerits of the above power plants, combustion processes, fluidized bed combustion.

UNIT III NON-CONVENTIONAL ENERGY 10

Solar energy, solar thermal systems, flat plate collectors, focusing collectors, solar water heating, solar cooling, solar distillation, solar refrigeration, solar dryers, solar pond, solar thermal power generation, solar energy application in India, energy plantations. Wind energy, types of windmills, types of wind rotors, Darrieus rotor and Gravian rotor, wind electric power generation, wind power in India, economics of wind farm, ocean wave energy conversion, ocean thermal energy conversion, tidal energy conversion, geothermal energy.

UNIT IV BIOMASS ENERGY 10

Biomass origin - Resources – Biomass estimation. Thermochemical conversion – Biological conversion, Chemical conversion – Hydrolysis & hydrogenation, solvolysis, biocrude, biodiesel power generation gasifier, biogas, integrated gasification.

UNIT V ENERGY CONSERVATION 9

Energy conservation - Act; Energy management importance, duties and responsibilities, Energy audit – Types methodology, reports, instruments, Benchmaicing and energy performance, material and energy balance, thermal energy management.

TOTAL : 45 PERIODS

OUTCOMES:

- Understand conventional Energy sources, Non- conventional Energy sources, biomass sources and develop design parameters for equipment to be used in Chemical process industries. Understand energy conservation in process industries

TEXTBOOKS:

1. Rao, S. and Parulekar, B.B., Energy Technology, Khanna Publishers, 2005
2. Rai, G.D., Non-conventional Energy Sources, Khanna Publishers, New Delhi, 1984.
3. Nagpal, G.R., Power Plant Engineering, Khanna Publishers, 2008.
4. Energy Management, Paul W.O'Callaghan McGraw – Hill, 1993

REFERENCES:

1. Nejat Vezirog, Alternate Energy Sources, IT, McGraw Hill, New York.
2. El. Wakil, Power Plant Technology, Tata McGraw Hill, New York, 2002.
3. Sukhatme. S.P., Solar Enery - Thermal Collection and Storage, Tata McGraw hill, New Delhi, 1981.
4. Handbook of Energy Audit by 7th edition Albert Thumann, P.E., C.E.M & William J. Younger C.E.M, Faiment Press 2008.

OCE751 ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT L T P C
3 0 0 3

OBJECTIVE:

- To impart the knowledge and skills to identify, assess and mitigate the environmental and social impacts of developmental projects

UNIT I INTRODUCTION 9

Impacts of Development on Environment – Rio Principles of Sustainable Development-Environmental Impact Assessment (EIA) – Objectives – Historical development – EIA Types – EIA in project cycle –EIA Notification and Legal Framework.

UNIT II ENVIRONMENTAL ASSESSMENT 9

Screening and Scoping in EIA – Drafting of Terms of Reference,Baseline monitoring, Prediction and Assessment of Impact on land, water, air, noise, flora and fauna - Matrices – Networks – Checklist Methods - Mathematical models for Impact prediction.

UNIT III ENVIRONMENTAL MANAGEMENT PLAN 9

Plan for mitigation of adverse impact on water, air and land, water, energy, flora and fauna – Environmental Monitoring Plan – EIA Report Preparation – Public Hearing-Environmental Clearance

UNIT IV SOCIO ECONOMIC ASSESSMENT 9

Baseline monitoring of Socio economic environment – Identification of Project Affected Personal – Rehabilitation and Resettlement Plan- Economic valuation of Environmental Impacts – Cost benefit Analysis-

UNIT V CASE STUDIES 9

EIA case studies pertaining to Infrastructure Projects – Roads and Bridges – Mass Rapid Transport Systems - Airports - Dams and Irrigation projects - Power plants.

TOTAL: 45 PERIODS

OUTCOMES:

The students completing the course will have ability to

- carry out scoping and screening of developmental projects for environmental and social assessments
- explain different methodologies for environmental impact prediction and assessment
- plan environmental impact assessments and environmental management plans
- evaluate environmental impact assessment reports

TEXTBOOKS:

1. Canter, R.L. "Environmental impact Assessment ", 2nd Edition, McGraw Hill Inc, New Delhi,1995.
2. Lohani, B., J.W. Evans, H. Ludwig, R.R. Everitt, Richard A. Carpenter, and S.L. Tu, "Environmental Impact Assessment for Developing Countries in Asia", Volume 1 – Overview, Asian Development Bank,1997.
3. Peter Morris, Riki Therivel "Methods of Environmental Impact Assessment", Routledge Publishers,2009.

REFERENCES:

1. Becker H. A., Frank Vanclay,"The International handbook of social impact assessment" conceptual and methodological advances, Edward Elgar Publishing,2003.
2. Barry Sadler and Mary McCabe, "Environmental Impact Assessment Training Resource Manual", United Nations Environment Programme,2002.
3. Judith Petts, "Handbook of Environmental Impact Assessment Vol. I and II", Blackwell Science New York, 1998.
4. Ministry of Environment and Forests EIA Notification and Sectoral Guides, Government of India, New Delhi, 2010.

OGI752 FUNDAMENTALS OF PLANETARY REMOTE SENSING L T P C
3 0 0 3

OBJECTIVES:

- To provide an insight to the basics of planetary Remote Sensing
- To demonstrate how the Remote Sensing technique is applied to explore the surface characteristics of the planets and its environ

UNIT I PLANETARY SCIENCE 9

History and inventory of solar system – planet-definition –properties – Formation of solar system. Planetary Atmospheres composition - thermal structure – clouds – meteorology – photo chemistry – Eddy Diffusion. Surfaces and Interiors: Mineralogy and Petrology – Planetary interiors – surface morphology. Terrestrial planets and the Moon: The moon & Mercury – surface – Atmosphere – Interior – Magnetic Field.

UNIT II SATELLITE ORBIT 9

Equation of 2 body motion: Energy, orbits and energy – Circular Orbits-EOS Terra-Geosynchronous satellite orbit- orbital elements. Launching Satellites and space probes – Retrograde orbits-Inter planetary Transfer – Hohmann Transfer – Gravity Assist-Cassini-Messenger. Breaking into orbit or landing- Retro Rockets-Aerobraking- Parachutes- Impact.

UNIT III PROPERTIES OF EMR 9

Definition of Remote Sensing – Electro Magnetic Radiation. Electromagnetic Spectrum-Development of EM theory – White Light – Excited hydrogen gas – Quantum physics – Definition. EM Radiation: Properties – Radiant energy – Sun's luminosity calculation. Other Energy: Black body radiation – Plank curve of black body. Properties of EMR: Kinetic energy – Polarization, laws of Max Plank, Wien's and Stephen Boltzmann.

UNIT IV RADIOMETRY AND SCATTEROMETRY 9

Radiometry – Radar Altimetry – Effect of surface roughness – Altimetry derived data – Reflectivity – Radiometry and Derived emissivity – Incorporation of data set into image analysis – Introduction to SAR – convolution – bidirectional reflectance distribution – Microwave scatterometry - side looking RADAR , SAR – Interferometry.

UNITV PLANETARY APPLICATION 9

Planetary Imaging Spectroscopy- USGS Tetracoder and Expert system - Mars Global Surveyor Mission (MGS) – Digital Elevation Model(DEM) of Mars – Mars Orbiter Camera (MOC) – Stereo and photoclinometric techniques for DEM.

OUTCOMES:

On completion of the course, the students have

- Exposure to fundamentals of planetary science or orbital mechanics
- The principles of observing the planets.
- Knowledge of Remote Sensing methods for determining surface elevation and mapping of planets.

REFERENCES:

1. Fundamental Planetary Science : Physics, Chemistry and Habitability, Jack J. Lissauer, Imke de Pater (2013) Cambridge University Press
2. Physical principles of Remote Sensing, Rees, W.G.(2013) 3rd Edn, Cambridge University Press.
3. Radar Remote Sensing of Planetary Surfaces, Bruce A Campbell (2011) Cambridge University Press

4. Remote Sensing Application for Planetary Surfaces, Kumar Deepak (2014) Lambert Publication.

OEN751	GREEN BUILDING DESIGN	L T P C 3 0 0 3

UNIT I ENVIRONMENTAL IMPLICATIONS OF BUILDINGS 9

Energy use, carbon emissions, water use, waste disposal; Building materials: sources, methods of production and environmental implications. Embodied Energy in Building Materials: Transportation Energy for Building Materials; Maintenance Energy for Buildings.

UNIT II IMPLICATIONS OF BUILDING TECHNOLOGIES EMBODIED ENERGY OF BUILDINGS 9

Framed Construction, Masonry Construction. Resources for Building Materials, Alternative concepts. Recycling of Industrial and Buildings Wastes. Biomass Resources for buildings.

UNIT III COMFORTS IN BUILDING 9

Thermal Comfort in Buildings- Issues; Heat Transfer Characteristic of Building Materials and Building Techniques. Incidence of Solar Heat on Buildings-Implications of Geographical Locations.

UNIT IV UTILITY OF SOLAR ENERGY IN BUILDINGS 9

Utility of Solar energy in buildings concepts of Solar Passive Cooling and Heating of Buildings. Low Energy Cooling. Case studies of Solar Passive Cooled and Heated Buildings.

UNIT V GREEN COMPOSITES FOR BUILDINGS 9

Concepts of Green Composites. Water Utilisation in Buildings, Low Energy Approaches to Water Management. Management of Solid Wastes. Management of Sullage Water and Sewage. Urban Environment and Green Buildings. Green Cover and Built Environment.

TOTAL: 45 PERIODS

TEXT BOOKS:

1. K.S.Jagadish, B. U. Venkataramareddy and K. S. Nanjundarao. Alternative Building Materials and Technologies. New Age International, 2007.
2. Low Energy Cooling For Sustainable Buildings. John Wiley and Sons Ltd, 2009.
3. Sustainable Building Design Manual. Vol 1 and 2, Teri, New Delhi, 2004.

REFERENCES:

1. Osman Attmann Green Architecture Advanced Technologies and Materials. McGraw Hill, 2010.
2. Jerry Yudelson Green building Through Integrated Design. McGraw Hill, 2009.
3. Fundamentals of Integrated Design for Sustainable Building By Marian Keeler, Bill Burke.

OBM752	HOSPITAL MANAGEMENT	L T P C 3 0 0 3

OBJECTIVES:

- To understand the fundamentals of hospital administration and management.
- To know the market related research process.
- To explore various information management systems and relative supportive services.
- To learn the quality and safety aspects in hospital.

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 9

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning- Equipment Planning – Functional Planning

UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL 9

Principles of HRM – Functions of HRM – Profile of HRD Manager –Human Resource Inventory – Manpower Planning.

UNIT III RECRUITMENT AND TRAINING 9

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV SUPPORTIVE SERVICES 9

Medical Records Department – Central Sterilization and Supply Department – Pharmacy – Food Services - Laundry Services.

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL 9

Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

TOTAL : 45 PERIODS

OUTCOMES:

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

- Explain the principles of Hospital administration.
- Identify the importance of Human resource management.
- List various marketing research techniques.
- Identify Information management systems and its uses.
- Understand safety procedures followed in hospitals.

TEXT BOOKS:

1. R.C.Goyal, "Hospital Administration and Human Resource Management", PHI – Fourth Edition, 2006.
2. G.D.Kunders, "Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007.

REFERENCES:

1. Cesar A.Caceres and Albert Zara, "The Practice of Clinical Engineering, Academic Press, New York, 1977.
2. Norman Metzger, "Handbook of Health Care Human Resources Management", 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.
3. Peter Berman "Health Sector Reform in Developing Countries" - Harvard University Press, 1995.
4. William A. Reinke "Health Planning For Effective Management" - Oxford University Press 1988.
5. Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21st Century", Eric Calrendon Press 2002.
6. Arnold D. Kalcizony & Stephen M. Shortell, "Health Care Management", 6th Edition Cengage Learning, 2011.

OEE752 INTRODUCTION TO RENEWABLE ENERGY SYSTEMS L T P C
3 0 0 3

OBJECTIVES:
To Provide knowledge
- About the stand alone and grid connected renewable energy systems.
- Design of power converters for renewable energy applications.
- Wind electrical generators and solar energy systems.
- Power converters used for renewable energy systems.

UNIT I INTRODUCTION 9
Environmental aspects of electric energy conversion: impacts of renewable energy generation on environment (cost-GHG Emission) - Qualitative study of different renewable energy resources: Solar, wind, ocean, Biomass, Fuel cell, Hydrogen energy systems and hybrid renewable energy systems.

UNIT II ELECTRICAL MACHINES FOR RENEWABLE ENERGY CONVERSION 9
Reference theory fundamentals-principle of operation and analysis: IG and PMSG

UNIT III POWER CONVERTERS 9
Solar: Block diagram of solar photo voltaic system -Principle of operation: line commutated converters (inversion-mode) - Boost and buck-boost converters- selection of inverter, battery sizing, array sizing Wind: Three phase AC voltage controllers

UNIT IV ANALYSIS OF WIND AND PV SYSTEMS 9
Stand alone operation of fixed and variability speed wind energy conversion systems and solar system-Grid connection Issues -Grid integrated PMSG, SCIG Based WECS, grid Integrated solar system

UNIT V HYBRID RENEWABLE ENERGY SYSTEMS 9
Need for Hybrid Systems- Range and type of Hybrid systems- Case studies of Wind-PV Maximum Power Point Tracking (MPPT).

TOTAL : 45 PERIODS

OUTCOMES:
- Ability to understand and analyze power system operation, stability, control and protection.
- Ability to handle the engineering aspects of electrical energy generation and utilization.
- Ability to understand the stand alone and grid connected renewable energy systems.
- Ability to design of power converters for renewable energy applications.
- Ability to acquire knowledge on wind electrical generators and solar energy systems.
- Ability to design power converters used for hybrid renewable energy systems.

TEXT BOOK:
1. S. N. Bhadra, D.Kastha, S.Banerjee, "Wind Electrical Systems", Oxford University Press, 2005.
2. B.H.Khan Non-conventional Energy sources Tata McGraw-hill Publishing Company, New Delhi,2009.

REFERENCES:
1. Rashid .M. H "power electronics Hand book", Academic press, 2001.
2. Ion Boldea, "Variability speed generators", Taylor & Francis group, 2006.
3. Rai. G.D, "Non conventional energy sources", Khanna publishes, 1993.
4. Gray, L. Johnson, "Wind energy system", prentice hall linc, 1995.
5. Andrzej M. Trzynnadlowski, 'Introduction to Modern Power Electronics', Second edition, wiley India Pvt. Ltd, 2012.

OBT753 INTRODUCTION OF CELL BIOLOGY L T P C
3 0 0 3

AIM

- To provide knowledge on cell structure and its function.

UNIT I CELL STRUCTURE 9

Cell organization, structure of organelles, extra cellular matrix and cell junctions.

UNIT II CELL ORGANELLE AND FUNCTION 9

Nucleus, Mitochondria, Lysosomes, Endoplasmic reticulum, Golgi apparatus, vesicles, centrosomes, cell membranes, ribosomes, cytosol, chloroplasts, flagella, cell wall.

UNIT III DIVISION 9

Cell cycle – mitosis, meiosis, cell cycle regulation and apoptosis.

UNIT IV MACROMOLECULES 9

DNA, RNA and Proteins – basic units, architectural hierarchy and organisation, functions.

UNIT V ENZYMES 9

Enzymes – Structure, Mechanism of action, Factors that affect enzyme activity, Common enzymes used in industrial setup of plant and animal origin.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Lodish, Harvey etal., "Molecular Cell Biology", 5 th Edition, W.H.Freeman, 2005.
2. Cooper, G.M. and R.E. Hansman "The Cell - A Molecular Approach", 4 th Edition, ASM Press, 2007.
3. Alberts, Bruce etal., "Molecular Biology of the Cell", 4 th Edition, Garland Science (Taylors Francis), 2002.

REFERENCES

1. McDonald, F etal., " Molecular Biology of Cancer" 2nd Edition, Taylor & Francis, 2004.
2. King, Roger J.B. "Cancer Biology" Addison Wesley Longman, 1996.

OMF751 LEAN SIX SIGMA L T P C
3 0 0 3

OBJECTIVE:

- To gain insights about the importance of lean manufacturing and six sigma practices.

UNIT I LEAN & SIX SIGMA BACKGROUND AND FUNDAMENTALS 9

Historical Overview – Definition of quality – What is six sigma -TQM and Six sigma - lean manufacturing and six sigma- six sigma and process tolerance – Six sigma and cultural changes – six sigma capability – six sigma need assessments - Implications of quality levels, Cost of Poor Quality (COPQ), Cost of Doing Nothing – assessment questions.

UNIT II THE SCOPE OF TOOLS AND TECHNIQUES 9

Tools for definition – IPO diagram, SIPOC diagram, Flow diagram, CTQ Tree, Project Charter – Tools for measurement – Check sheets, Histograms, Run Charts, Scatter Diagrams, Cause and effect diagram, Pareto charts, Control charts, Flow process charts, Process Capability Measurement, Tools for analysis – Process Mapping, Regression analysis, RU/CS analysis, SWOT, PESTLE, Five Whys, interrelationship diagram, overall equipment effectiveness, TRIZ

innovative problem solving – Tools for improvement – Affinity diagram, Normal group technique, SMED, 5S, mistake proofing, Value stream Mapping, forced field analysis – Tools for control – Gantt chart, Activity network diagram, Radar chart, PDCA cycle, Milestone tracker diagram, Earned value management.

UNIT III SIX SIGMA METHODOLOGIES 9

Design For Six Sigma (DFSS),Design For Six Sigma Method - Failure Mode Effect Analysis (FMEA), FMEA process - Risk Priority Number (RPN)- Six Sigma and Leadership, committed leadership – Change Acceleration Process (CAP)- Developing communication plan – Stakeholder

UNIT IV SIX SIGMA IMPLEMENTATION AND CHALLENGES 9

Tools for implementation – Supplier Input Process Output Customer (SIPOC) – Quality Function Deployment or House of Quality (QFD) – alternative approach –implementation – leadership training, close communication system, project selection – project management and team – champion training – customer quality index – challenges – program failure, CPQ vs six sigma, structure the deployment of six sigma – cultural challenge – customer/internal metrics

UNIT V EVALUATION AND CONTINUOUS IMPROVEMENT METHODS 9

Evaluation strategy – the economics of six sigma quality, Return on six Sigma (ROSS), ROI, poor project estimates – continuous improvement – lean manufacturing – value, customer focus, Perfection, focus on waste, overproduction – waiting, inventory in process (IIP), processing waste, transportation, motion, making defective products, underutilizing people – Kaizen – 5S

TOTAL: 45 PERIODS

OUTCOME:

- The student would be able to relate the tools and techniques of lean sigma to increase productivity

REFERENCES:

1. Michael L George, David Rownalds, Bill Kastle, What is Lean Six Sigma, McGraw – Hill 2003
2. Thomas Pyzdek, The Six Sigma Handbook, McGraw-Hill,2000
3. Fred Soleimannejed , Six Sigma, Basic Steps and Implementation, AuthorHouse, 2004
4. Forrest W. Breyfogle, III, James M. Cupello, Becki Meadows, Managing Six Sigma:A Practical Guide to Understanding, Assessing, and Implementing the Strategy That Yields Bottom-Line Success, John Wiley & Sons, 2000
5. James P. Womack, Daniel T Jones, Lean Thinking, Free Press Business, 2003

OAN751 LOW COST AUTOMATION L T P C
3 0 0 3

OBJECTIVES

- To give basic knowledge about automation
- To understand the basic hydraulics and pneumatics systems for automation
- To understand the assembly automation

UNIT I AUTOMATION OF ASSEMBLY LINES 9

Concept of automation - mechanization and automation - Concept of automation in industry - mechanization and automation - classification, balancing of assembly line using available algorithms - Transfer line-monitoring system (TLMS) using Line Status - Line efficiency - Buffer stock Simulation in assembly line

UNIT II AUTOMATION USING HYDRAULIC SYSTEMS 9

Design aspects of various elements of hydraulic systems such as pumps, valves, filters, reservoirs, accumulators, actuators, intensifiers etc. - Selection of hydraulic fluid, practical case

studied on hydraulic circuit design and performance analysis - Servo valves, electro hydraulic valves, proportional valves and their applications.

UNIT III AUTOMATION USING PNEUMATIC SYSTEMS 9

Pneumatic fundamentals - control elements, position and pressure sensing -logic circuits - switching circuits - fringe conditions modules and these integration - sequential circuits - cascade methods - mapping methods – step counter method - compound circuit design - combination circuit design. Pneumatic equipments - selection of components - design calculations -application - fault finding – hydro pneumatic circuits - use of microprocessors for sequencing - PLC, Low cost automation - Robotic circuits.

UNIT IV AUTOMATION USING ELECTRONIC SYSTEMS 9

Introduction - various sensors – transducers - signal processing - servo systems - programming of microprocessors using 8085 instruction - programmable logic controllers

UNIT V ASSEMBLY AUTOMATION 9

Types and configurations - Parts delivery at workstations - Various vibratory and non vibratory devices for feeding - hopper feeders, rotary disc feeder, centrifugal and orientation - Product design for automated assembly.

TOTAL : 45 PERIODS

OUTCOMES:

- Upon completion of this course, the students can able to do low cost automation systems
- Students can do some assembly automation

TEXT BOOKS:

1. Anthony Esposito, "Fluid Power with applications", Prentice Hall International, 2009.
2. Mikell P Groover, "Automation, Production System and Computer Integrated
3. Manufacturing", Prentice Hall Publications, 2007.

REFERENCES

1. Kuo .B.C, "Automatic control systems", Prentice Hall India, New Delhi, 2007.
2. Peter Rohner, "Industrial hydraulic control", Wiley Edition, 1995.
3. Mujumdar.S.R, "Pneumatic System", Tata McGraw Hill 2006

OEC754	MEDICAL ELECTRONICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

The student should be made:

- To gain knowledge about the various physiological parameters both electrical and non electrical and the methods of recording and also the method of transmitting these parameters
- To study about the various assist devices used in the hospitals
- To gain knowledge about equipment used for physical medicine and the various recently developed diagnostic and therapeutic techniques.

UNIT I ELECTRO-PHYSIOLOGY AND BIO-POTENTIAL RECORDING 9

Sources of bio medical signals, Bio-potentials, Biopotential electrodes, biological amplifiers, ECG, EEG, EMG, PCG, typical waveforms and signal characteristics

UNIT II BIO-CHEMICAL AND NON ELECTRICAL PARAMETER MEASUREMENT 9

pH, PO2, PCO2, Colorimeter, Blood flow meter, Cardiac output, respiratory, blood pressure, temperature and pulse measurement, Blood Cell Counters.

UNIT III ASSIST DEVICES 9

Cardiac pacemakers, DC Defibrillator, Dialyser, Ventilators, Magnetic Resonance Imaging

Systems, Ultrasonic Imaging Systems.

UNIT IV PHYSICAL MEDICINE AND BIOTELEMETRY 9

Diathermies- Shortwave, ultrasonic and microwave type and their applications, Surgical Diathermy, Biotelemetry.

UNIT V RECENT TRENDS IN MEDICAL INSTRUMENTATION 9

Telemedicine, Insulin Pumps, Radio pill, Endomicroscopy, Brain machine interface, Lab on a chip.

TOTAL: 45 PERIODS

OUTCOMES:

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

- Know the human body electro- physiological parameters and recording of bio-potentials
- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies , and bio-telemetry principles and methods
- Know about recent trends in medical instrumentation

TEXT BOOK:

1. Khandpur, R.S., "Handbook of Biomedical Instrumentation", TATA Mc Graw-Hill, New Delhi, 2003.

REFERENCES:

1. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Prentice Hall of India, New Delhi, 2007.
2. John G.Webster, "Medical Instrumentation Application and Design", 3rd Edition, Wiley India Edition, 2007.
3. Joseph J.Carr and John M.Brown, "Introduction to Biomedical Equipment Technology", John Wiley and Sons, New York, 2004.

OEC756 MEMS AND NEMS L T P C 3 0 0 3

OBJECTIVES:

- To introduce the concepts of micro and nano electromechanical devices
- To know the fabrication process of Microsystems
- To know the design concepts of micro sensors and micro actuators
- To introduce the concepts of quantum mechanics and nano systems

UNIT I INTRODUCTION TO MEMS AND NEMS 9

Introduction to Design of MEMS and NEMS, Overview of Nano and Microelectromechanical Systems, Applications of Micro and Nanoelectromechanical systems, Materials for MEMS and NEMS: Silicon, silicon compounds, polymers, metals.

UNIT II MEMS FABRICATION TECHNOLOGIES 9

Photolithography, Ion Implantation, Diffusion, Oxidation, CVD, Sputtering Etching techniques, Micromachining: Bulk Micromachining, Surface Micromachining, LIGA.

UNIT III MICRO SENSORS 9

MEMS Sensors: Design of Acoustic wave sensors, Vibratory gyroscope, Capacitive Pressure sensors, Case study: Piezoelectric energy harvester

UNIT IV MICRO ACTUATORS 9

Design of Actuators: Actuation using thermal forces, Actuation using shape memory Alloys, Actuation using piezoelectric crystals, Actuation using Electrostatic forces, Case Study: RF Switch.

UNIT V NANO DEVICES 9

Atomic Structures and Quantum Mechanics, Shrodinger Equation, ZnO nanorods based NEMS device, Gas sensor.

TOTAL:45 PERIODS

OUTCOMES:

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

- Interpret the basics of micro/nano electromechanical systems including their applications and advantages
- Recognize the use of materials in micro fabrication and describe the fabrication processes including surface micromachining, bulk micromachining and LIGA.
- Analyze the key performance aspects of electromechanical transducers including sensors and actuators
- Comprehend the theoretical foundations of quantum mechanics and nanosystems

REFERENCES:

1. Marc Madou, "Fundamentals of Microfabrication", CRC press 1997.
2. Stephen D. Senturia," Micro system Design", Kluwer Academic Publishers,2001
3. Tai Ran Hsu ,"MEMS and Microsystems Design and Manufacture" ,Tata Mcraw Hill, 2002.
4. Chang Liu, "Foundations of MEMS", Pearson education India limited, 2006.
5. Sergey Edward Lyshevski, "MEMS and NEMS: Systems, Devices, and Structures" CRC Press, 2002

OBT752 MICROBIOLOGY L T P C
3 0 0 3

OBJECTIVE

- To introduce students to the principles of Microbiology ,to emphasize the structure and biochemical aspects of various microbes.

UNIT I INTRODUCTION TO MICROBIOLOGY 9

classification and nomenclature of microorganisms, microscopic examination of microorganisms: light, fluorescent, dark field, phase contrast, and electron microscopy.

UNIT II MICROBES- STRUCTURE AND REPRODUCTION 9

Structural organization and multiplication of bacteria, viruses (TMV, Hepatitis B), algae (cyanophyta, rhodophyta) and fungi (Neurospora), life history of actinomycetes (Streptomyces), yeast (Sacharomyces), mycoplasma (M. pneumoniae) and bacteriophages (T4 phage, λ phage)

UNIT III MICROBIAL NUTRITION, GROWTH AND METABOLISM 9

Nutritional classification of microorganisms based on carbon, energy and electron sourcesDefinition of growth, balanced and unbalanced growth, growth curve and different methods to quantify bacterial growth.(counting chamber, viable count method, counting without equipment,different media used for bacterial culture (defined, complex, selective, differential, enriched) themathematics of growth-generation time, specific growth rate.

UNIT IV CONTROL OF MICROORGANISMS 9

Physical and chemical control of microorganisms Definition of sterilization, dry and moist heat, pasteurization, tyndalization; radiation, ultrasonication, filtration. Disinfection sanitization, antiseptics sterilants and fumigation. mode of action and resistance to antibiotics; clinically important microorganisms

UNIT V INDUSTRIAL MICROBIOLOGY 9

Microbes involved in preservation (Lactobacillus,bacteriocins), spoilage of food and food borne pathogens *(E.coli, S.aureus, Bacillus, Clostridium)*. Industrial use of microbes (production of penicillin, alcohol, vitamin B-12); biogas; bioremediation(oil spillage leaching of ores by microorganisms ,pollution control); biofertilizers, biopesticides. Biosensors

TOTAL: 45 PERIODS

OUTCOMES:

- To provide to the students the fundamentals of Microbiology , the scope of microbiology and solve the problems in microbial infection and their control,

TEXT BOOKS:

1. Pelczar, M.J. "Microbiology", 5th Edition, Tata McGraw-Hill, 1993.
2. Prescot, Harley, Klein. " Microbiology ", McGraw-Hill Higher Education, 2008
3. Ananthanarayanan, R. and C.K. Jayaram Paniker, "Textbook of Microbiology",4th Edition, Orient Longman, 1990.

OCH751 PROCESS MODELING AND SIMULATION L T P C
3 0 0 3

OBJECTIVE:

- To give an overview of various methods of process modeling, different computational techniques for simulation.

UNIT I INTRODUCTION 7

Introduction to modeling and simulation, classification of mathematical models, conservation equations and auxillary relations.

UNIT II STEADY STATE LUMPED SYSTEMS 9

Degree of freedom analysis, single and network of process units, systems yielding linear and non-linear algebraic equations, flow sheeting – sequential modular and equation oriented approach, tearing, partitioning and precedence ordering, solution of linear and non-linear algebraic equations.

UNIT III UNSTEADY STATE LUMPED SYSTEMS 9

Analysis of liquid level tank, gravity flow tank, jacketed stirred tank heater, reactors, flash and distillation column, solution of ODE initial value problems, matrix differential equations, simulation of closed loop systems.

UNIT IV STEADY STATE DISTRIBUTED SYSTEM 7

Analysis of compressible flow, heat exchanger, packed columns, plug flow reactor, solution of ODE boundary value problems.

UNIT V UNSTEADY STATE DISTRIBUTED SYSTEM & OTHER MODELLING APPROACHES 13

Analysis laminar flow in pipe, sedimentation, boundary layer flow, conduction, heat exchanger, heat transfer in packed bed, diffusion, packed bed adsorption, plug flow reactor. Empirical modeling, parameter estimation, population balance and stochastic modeling.

TOTAL : 45 PERIODS

OUTCOME:

- Upon completing the course, the student should have understood the development of process models based on conservation principles and process data and computational techniques to solve the process models.

TEXT BOOKS:

1. Ramirez, W., " Computational Methods in Process Simulation ", 2nd Edn., Butterworths Publishers, New York, 2000.
2. Luyben, W.L., " Process Modelling Simulation and Control ",2nd Edn, McGraw-Hill Book Co., 1990

REFERENCES:

1. Felder, R. M. and Rousseau, R. W., " Elementary Principles of Chemical Processes ", John Wiley, 2000.
2. Franks, R. G. E., " Mathematical Modelling in Chemical Engineering ", John Wiley, 1967.
3. Amiya K. Jana,"Process Simulation and Control Using ASPEN", 2nd Edn.PHI Learning Ltd (2012).
4. Amiya K. Jana,"ChemicalProcess Modelling and Computer Simulation" 2nd Edn,PHI Learning Ltd,(2012).

OIE751	ROBOTICS	L	T	P	C
		3	0	0	3

OBJECTIVES:

- To understand the functions of the basic components of a Robot.
- To study the use of various types of End of Effectors and Sensors
- To impart knowledge in Robot Kinematics and Programming
- To learn Robot safety issues and economics.

UNIT I FUNDAMENTALS OF ROBOT 6

Robot - Definition - Robot Anatomy - Co ordinate Systems, Work Envelope Types and Classification- Specifications-Pitch, Yaw, Roll, Joint Notations, Speed of Motion, Pay Load-Robot Parts and their Functions-Need for Robots-Different Applications.

UNIT II ROBOT DRIVE SYSTEMS AND END EFFECTORS 9

Pneumatic Drives-Hydraulic Drives-Mechanical Drives-Electrical Drives-D.C. Servo Motors, Stepper Motors, A.C. Servo Motors-Salient Features, Applications and Comparison of all these Drives. End Effectors-Grippers-Mechanical Grippers, Pneumatic and Hydraulic- Grippers, Magnetic Grippers,

Vacuum Grippers, Two Fingered and Three Fingered Grippers, Internal Grippers and External Grippers, Selection and Design Considerations.

UNIT III SENSORS AND MACHINE VISION 12

Requirements of a sensor, Principles and Applications of the following types of sensors- Position sensors - Piezo Electric Sensor, LVDT, Resolvers, Optical Encoders, pneumatic Position Sensors, Range Sensors Triangulations Principles, Structured, Lighting Approach, Time of Flight, Range Finders, Laser Range Meters, Touch Sensors ,binary Sensors., Analog Sensors, Wrist Sensors, Compliance Sensors, Slip Sensors, Camera, Frame Grabber, Sensing and Digitizing Image Data- Signal Conversion, Image Storage, Lighting Techniques, Image Processing and Analysis-Data Reduction, Segmentation, Feature Extraction, Object Recognition, Other Algorithms, Applications- Inspection, Identification, Visual Serving and Navigation.

UNIT IV ROBOT KINEMATICS AND ROBOT PROGRAMMING **13**

Forward Kinematics, Inverse Kinematics and Difference; Forward Kinematics and Reverse Kinematics of manipulators with Two, Three Degrees of Freedom (in 2 Dimension), Four Degrees of freedom (in 3 Dimension) Jacobians, Velocity and Forces-Manipulator Dynamics, Trajectory Generator, Manipulator Mechanism Design-Derivations and problems. Lead through Programming, Robot programming Languages-VAL Programming-Motion Commands, Sensor Commands, End Effector commands and simple Programs.

UNIT V IMPLEMENTATION AND ROBOT ECONOMICS **5**

RGV, AGV; Implementation of Robots in Industries-Various Steps; Safety Considerations for Robot Operations - Economic Analysis of Robots.

TOTAL: 45 PERIODS

OUTCOME:

- Upon completion of this course, the students can able to apply the basic engineering knowledge for the design of robotics

TEXT BOOKS:

1. Klafter R.D., Chmielewski T.A and Negin M., "Robotic Engineering - An Integrated Approach", Prentice Hall, 2003.
2. Groover M.P., "Industrial Robotics -Technology Programming and Applications", McGraw Hill, 2001.

REFERENCES:

1. Craig J.J., "Introduction to Robotics Mechanics and Control", Pearson Education, 2008.
2. Deb S.R., "Robotics Technology and Flexible Automation" Tata McGraw Hill Book Co., 1994.
3. Koren Y., "Robotics for Engineers", Mc Graw Hill Book Co., 1992.
4. Fu.K.S.,Gonzalz R.C. and Lee C.S.G., "Robotics Control, Sensing, Vision and Intelligence", McGraw Hill Book Co., 1987.
5. Janakiraman P.A., "Robotics and Image Processing", Tata McGraw Hill, 1995.
6. Rajput R.K., "Robotics and Industrial Automation", S.Chand and Company, 2008.
7. Surender Kumar, "Industrial Robots and Computer Integrated Manufacturing", Oxford and IBH Publishing Co. Pvt. Ltd., 1991.

OEC753	SIGNALS AND SYSTEMS	L	T	P	C
		4	0	0	4

OBJECTIVES:

- To understand the basic properties of signal & systems
- To know the methods of characterization of LTI systems in time domain
- To analyze continuous time signals and system in the Fourier and Laplace domain
- To analyze discrete time signals and system in the Fourier and Z transform domain

UNIT I CLASSIFICATION OF SIGNALS AND SYSTEMS **12**

Standard signals- Step, Ramp, Pulse, Impulse, Real and complex exponentials and Sinusoids. Classification of signals – Continuous time (CT) and Discrete Time (DT) signals, Periodic & Aperiodic signals, Deterministic & Random signals, Energy & Power signals - Classification of systems- CT systems and DT systems- – Linear & Nonlinear, Time-variant & Time-Invariant, Causal & Non-causal, Stable & Unstable.

UNIT II ANALYSIS OF CONTINUOUS TIME SIGNALS **12**

Fourier series for periodic signals - Fourier Transform – properties- Laplace Transforms and properties

UNIT III LINEAR TIME INVARIANT CONTINUOUS TIME SYSTEMS **12**

Impulse response - convolution integrals- Differential Equation- Fourier and Laplace transforms in

Analysis of CT systems - Systems connected in series / parallel.

UNIT IV ANALYSIS OF DISCRETE TIME SIGNALS **12**

Baseband signal Sampling – Fourier Transform of discrete time signals (DTFT) – Properties of DTFT - Z Transform & Properties

UNIT V LINEAR TIME INVARIANT-DISCRETE TIME SYSTEMS **12**

Impulse response – Difference equations-Convolution sum- Discrete Fourier Transform and Z Transform Analysis of Recursive & Non-Recursive systems-DT systems connected in series and parallel

TOTAL: (L:45+T:15): 60 PERIODS

OUTCOMES:

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

- To be able to determine if a given system is linear/causal/stable
- Capable of determining the frequency components present in a deterministic signal
- Capable of characterizing LTI systems in the time domain and frequency domain
- To be able to compute the output of an LTI system in the time and frequency domains

TEXT BOOK:

1. Allan V.Oppenheim, S.Wilsky and S.H.Nawab, "Signals and Systems", Pearson, 2015.

REFERENCES:

1. B. P. Lathi, "Principles of Linear Systems and Signals", Second Edition, Oxford, 2009.
2. R.E.Zeimer, W.H.Tranter and R.D.Fannin, "Signals & Systems - Continuous and Discrete", Pearson, 2007.
3. John Alan Stuller, "An Introduction to Signals and Systems", Thomson, 2007.

OME752	SUPPLY CHAIN MANAGEMENT	L	T	P	C
		3	0	0	3

OBJECTIVE:

- To provide an insight on the fundamentals of supply chain networks, tools and techniques

UNIT I INTRODUCTION **9**

Role of Logistics and Supply chain Management: Scope and Importance- Evolution of Supply Chain - Decision Phases in Supply Chain - Competitive and Supply chain Strategies – Drivers of Supply Chain Performance and Obstacles.

UNIT II SUPPLY CHAIN NETWORK DESIGN **9**

Role of Distribution in Supply Chain – Factors influencing Distribution network design – Design options for Distribution Network Distribution Network in Practice-Role of network Design in Supply Chain – Framework for network Decisions.

UNIT III LOGISTICS IN SUPPLY CHAIN **9**

Role of transportation in supply chain – factors affecting transportations decision – Design option for transportation network – Tailored transportation – Routing and scheduling in transportation.

UNIT IV SOURCING AND COORDINATION IN SUPPLY CHAIN **9**

Role of sourcing supply chain supplier selection assessment and contracts- Design collaboration - sourcing planning and analysis - supply chain co-ordination - Bull whip effect –

Effect of lack of co-ordination in supply chain and obstacles – Building strategic partnerships and trust within a supply chain.

UNIT V SUPPLY CHAIN AND INFORMATION TECHNOLOGY 9

The role IT in supply chain- The supply chain IT frame work Customer Relationship Management – Internal supply chain management – supplier relationship management – future of IT in supply chain – E-Business in supply chain.

TOTAL: 45 PERIODS

OUTCOME:

- The student would understand the framework and scope of supply chain networks and functions.

TEXTBOOK:

1. Sunil Chopra, Peter Meindl and Kalra, "Supply Chain Management. Strategy, Planning, and Operation", Pearson Education, 2010.

REFERENCES:

1. Jeremy F.Shapiro, "Modeling the Supply Chain", Thomson Duxbury, 2002.
2. Srinivasan G.S, "Quantitative models in Operations and Supply Chain Management, PHI, 2010
3. David J Bloomberg , Stephen Lemay and Joe B.Hanna, "Logistics", PHI 2002.
4. James B.Ayers, "Handbook of Supply Chain Management", St.Lucle press, 2000.

OME753 SYSTEMS ENGINEERING L T P C 3 0 0 3

OBJECTIVE:

- To introduce system engineering concepts to design the manufacturing system for optimum utilization of source for effectlve functioning.

UNIT I INTRODUCTION 9

Definitions of Systems Engineering, Systems Engineering Knowledge, Life cycles, Life-cycle phases, logical steps of systems engineering, Frame works for systems engineering.

UNIT II SYSTEMS ENGINEERING PROCESSES 9

Formulation of issues with a case study, Value system design, Functional analysis, Business Process Reengineering, Quality function deployment, System synthesis, Approaches for generation of alternatives.

UNIT III ANALYSIS OF ALTERNATIVES- I 9

Cross-impact analysis, Structural modeling tools, System Dynamics models with case studies, Economic models: present value analysis – NPV, Benefits and costs over time, ROI, IRR; Work and Cost breakdown structure,

UNIT IV ANALYSIS OF ALTERNATIVES–II 9

Reliability, Availability, Maintainability, and Supportability models; Stochastic networks and Markov models, Queuing network optimization, Time series and Regression models, Evaluation of large scale models

UNIT V DECISION ASSESSMENT 9

Decision assessment types, Five types of decision assessment efforts, Utility theory, Group decision making and Voting approaches, Social welfare function; Systems Engineering methods for Systems Engineering Management.

TOTAL : 45 PERIODS

OUTCOMES:

- The Student must be able to apply systems engineering principles ot make decision for

optimization.
- Hence an understanding of the systems engineering discipline and be able to use the core principles and processes for designing effective system.

TEXT BOOK:
1. Andrew P. Sage, James E. Armstrong Jr. "Introduction to Systems Engineering", John Wiley and Sons, Inc,2000.

OTL751 TELECOMMUNICATION SYSTEM MODELING AND SIMULATION L T P C
3 0 0 3

OBJECTIVES:
- To gain knowledge in modeling of different communication systems.
- To know the techniques involved in performance estimation of telecommunication systems.
- To learn the use of random process concepts in telecommunication system simulation.
- To study the modeling methodologies of a telecommunication system.
- To study about the QAM digital radio link environment.

UNIT I SIMULATION OF RANDOM VARIABLES RANDOM PROCESS 9
Generation of random numbers and sequence – Gaussian and uniform random numbers Correlated random sequences – Testing of random numbers generators – Stationary and uncorrelated noise – Goodness of fit test.

UNIT II MODELING OF COMMUNICATION SYSTEMS 9
Radio frequency and optical sources – Analog and Digital signals – Communication channel and model – Free space channels – Multipath channel and discrete channel noise and interference.

UNIT III ESTIMATION OF PERFORMANCE MEASURE FOR SIMULATION 9
Quality of estimator – Estimation of SNR – Probability density function and bit error rate – Monte Carlo method – Importance sampling method – Extreme value theory.

UNIT IV SIMULATION AND MODELING METHODOLOGY 9
Simulation environment – Modeling considerations – Performance evaluation techniques – Error source simulation – Validation.

UNIT V CASE STUDIES 9
Simulations of QAM digital radio link environment – Light wave communication link – Satellite system.

TOTAL: 45 PERIODS

OUTCOMES:
At the end of the course , students would be able to
- Apply the constituents of a telecommunication systems.
- Analyze various modeling methodologies and simulation techniques.
- Estimate the performance measures of telecommunication systems.
- Apply system modeling in telecommunication.
- Demonstrate light wave communication and satellite communication systems.

TEXTBOOKS:
1. Jeruchim MC Balaban P Sam K Shanmugam, " Simulation of communication Systems: Modeling, Methodology and Techniques", Plenum press , New York,2002
2. Jerry banks & John S Carson, " Discrete Event System Simulation",Prentice Hall of India,1996

REFERENCES:
1. Averill M Law, "Simulation Modeling and Analysis",McGraw-Hill Inc,2007
Geoffrey Gorden, "System Simulation",Prentice Hall of India,1992
2.Turin W, "Performance Analysis of Digital Communication Systems", Computer Science Press, New York,1990

OCY751 **WASTE WATER TREATMENT** L T P C
3 0 0 3

OBJECTIVES
- To make the student conversant with the water treatment methods including adsorption and oxidation process.
- To provide basic under standings about the requirements of water, its preliminary treatment.

UNIT I WATER QUALITY AND PRELIMINARY TREATMENT 9

Water Quality-physical- chemical and biological parameters of water- water quality requirement - potable water standards -wastewater effluent standards -water quality indices. Water purification systems in natural systems- physical processes-chemical processes and biological processes-primary, secondary and tertiary treatment-Unit operations-unit processes. Mixing, clarification - sedimentation: Types, aeration and gas transfer – coagulation and flocculation, coagulation processes - stability of colloids - destabilization of colloids- transport of colloidal particles, clariflocculation.

UNIT II INDUSTRIAL WATER TREATMENT 9

Filtration – size and shape characteristics of filtering media – sand filters hydraulics of filtration – design considerations – radial, upflow, highrate and multimedia filters, pressure filter. Water softening – lime soda, zeolite and demineralization processes – industrial water treatment for boilers.

UNIT III CONVENTIONAL TREATMENT METHODS 9

Taste and odour control – adsorption – activated carbon treatment – removal of color – iron and manganese removal – aeration, oxidation, ion exchange and other methods – effects of fluorides – fluoridation and defluoridation –desalination - corrosion prevention and control – factors influencing corrosion – Langelier index – corrosion control measures.

UNIT IV WASTEWATER TREATMENT 9

Wastewater treatment – pre and primary treatment – equalization neutralization – screening and grid removal – sedimentation – oil separation gas stripping of volatile organics – biological oxidation – lagoons and stabilization basins – aerated lagoons – activated sludge process – trickling filtration – anaerobic decomposition.

UNIT V ADSORPTION AND OXIDATION PROCESSES 9

Chemical process – adsorption – theory of adsorption – ion exchange process – chemical oxidation – advanced oxidation process – sludge handling and disposal – miscellaneous treatment processes.

TOTAL: 45 PERIODS

OUTCOMES
- Will have knowledge about adsorption and oxidation process.
- Will gain idea about various methods available for water treatment.
- Will appreciate the necessity of water and acquire knowledge of preliminary treatment.

TEXTBOOKS:
1. Metcalf and Eddy, "Wastewater Engineering", 4th ed., McGraw Hill Higher Edu., 2002.
2. W. Wesley Eckenfelder, Jr., "Industrial Water Pollution Control", 2nd Edn., McGraw Hill Inc., 1989.

REFERENCES:

1. S.P. Mahajan, "Pollution control in process industries", 27th Ed. Tata McGraw Hill Publishing Company Ltd., 2012.
2. M. Lancaster, "Green Chemistry: An Introductory Text", 2nd edition, RSC publishing, 2010.
3. C.S. Rao, "Environmental Pollution Control Engineering", New Age International, 2007.

NAAN MUDHALVAN SYLLABUS

SB8007	MACHINE LEARNING WITH APPLICATION TO OBJECT RECOGNITION	L T P C 1 0 2 2

COURSE OBJECTIVE

The objective of this course is to provide a view of data science, recognize why data science is gaining importance in today's business world to comprehend where data science can be applied across industry domains to understand major components of data science stack to learn how a data science project is implemented step-by-step in each business use-case

Pre-requisite courses:

Pre-requisite Knowledge	Courses Available on Springboard
Probability and Statistics	Probability and Statistics Probabilty distribution using Python Statistical Interence using Python
Python Programming Language	Programming Fundamentals using Python - Part 1
Linear Algebra	Basics of Linear Algebra
Regression Analysis	Regression Analysis
Deep Learning	Deep Learning for Developers
Exploratory Data Analysis	Exploratory data analysis

UNIT I INTRODUCTION TO AI AND DATA SCIENCE 7

Why AI? - What is AI? - AI in Practice - AI in Business - AI Platforms. Data Science. The Data Revolution - Components of Data Science - Data Science in Action - Conclusion.

UNIT II PYTHON FOR DATA SCIENCE 14

Why Python Libraries – NumPy - Introduction to NumPy - Operations on NumPy - Pandas - Introduction to Pandas - Introduction to Pandas Object - Working with datasets - Pandas Plots - Matplotlib - Introduction to Matplotlib - Types of Plots - Scikit-learn – Machine Learning using sklearn. [Practical hands-on exercises using NumPy, Pandas, Matplotlib]

UNIT III DATA VISUALIZATION USING PYTHON 6

Data visualization using Python: Data Visualization. Developing insights from data using Basic Plots using Matplotlib (Box, Scatter, Line, Bar, Pie, Histogram), Statistical analysis using Heatmap, Kernel Density plot using Seaborn, Network Graphs, Choropleth Map Using Ploty, Word Cloud. [Practical hands-on exercises for creating charts]

UNIT IV EXPLORE MACHINE LEARNING USING PYTHON 15

Introduction to Machine Learning - Regression - Classification - Clustering – Introduction to Artificial Neural Network. [Hands-on Exercises for Practicing Machine Learning Models Using Capstone Project]

UNIT V OBJECT DETECTION AND RECOGNITION USING DEEP LEARNING IN OPENCV 3

Basic Operations and Algorithms in OpenCV - Object Detection and Recognition Using Features - Deep Learning in OpenCV - Object Classification Using Deep Learning
Recognizing Text in an Image.

TOTAL : 45 PERIODS

SUGGESTED ACTIVITIES

- Continuous / Self-Assessment (MCQ)
- Capstone Project - Build a ML model using a sample image dataset, to detect or identify specific features in sample image such as mask on human face etc.

SUGGESTED EVALUATION METHODS

- Video Proctored Exam
- Self-Assessment

COURSE OUTCOMES

On completion of the course, students will be able to:

CO1: Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
CO2: Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
CO3: Assess and select appropriate data analysis models for solving real-world problem.
CO4: Demonstrate the importance of data visualization, design, and use of visual components.
CO5: Demonstrate fundamental understanding of applications of machine learning for object recognition.

REFERENCE(Course Material)

1. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_8840337130015322000_shared/overview (Introduction to AI)
2. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_12666306402263577000_shared/overview (Introduction to Data Science)
3. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_013330636980609024 94_shared/overview (Python for Data Science)
4. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260519134369382 41455_shared/overview (Data visualization using Python)
5. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01260040079074918 4237_shared/overview (Explore Machine Learning)
6. https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01309443964041625 62520_shared/overview (Object Detection and Recognition Using Deep Learning in OpenCV)

SB8013 AUGMENTED REALITY & VIRTUAL REALITY DEVELOPMENT L T P C

1 0 2 2

In response to the the Expression of Interest (EoI) invitation by Tamil Nadu Skill Development Corporation , the receipt of which is hereby duly acknowledged, we, the undersigned intend to submit the following proposal in response to the EoI for selection of Skill Training provider for Naan Mudhalvan Program of Government of TamilNadu

Course Topic: Augmented Reality & Virtual Reality Development

Subject	AR VR Development specific to CS, IT, EEE, ECE	**Total duration of the training in Hours**	45 hours (2 credits)
Theory Class Training in Hrs	15 hours (1 credit)	**Practical class Training in Hrs**	30 hours (1 credit)
Theory class focus area	Basic introduction, 3D design, metaverse, NFT, Block chain, business cases, use models	**Practical class focus area**	AR VR development for CS & other departments
Total credits	2 credits	**Type of training**	Hybrid

About the training Program:

Students will learn the fundamentals of AR & VR and introduction to application development through unity and other software.

Training Objective:

1. Introduce students to the concept of AR,VR, digital twins and Metaverse
2. Familiarise students with the HW and SW used in the field of AR & VR
3. Develop an understanding of the structure and architecture involved in the AR VR & metaverse application development
4. Develop AR VR application specific to their engineering field

Unit - I Fundamentals of AR VR 3

Fundamental AR VR concepts and characteristics. Nature of virtuality, introduced to AR VR hardware and software. AR VR applications across different industries. Introduction to Metaverse, Digital twin, Web3.0, NFT, Blockchain & Crypto currencies.

Lab component: 6

- Experience VR AR MR and its production tools
- Introduction to Unity

Outcome:

- Install and configure Unity software
- Differentiate between various realities (AR, VR, MR) and use the right terminology associated to present concepts and solutions

Unit - II Interactive Media Development 3

Taxonomy of Interactive Applications - immersive nature of AR VR technology - creative storytelling - gaming industry applications - concept for game - building a prototype - Consider Graphic styles and optimisation - communication and collaboration - Digital distribution - google play - iOS Store - Mac store

Lab component: 6

- Create your first 3D prototype of the AR/VR experience

Outcome: Create design journey documents for developing AR VR experiences

Unit - III Fundamentals for Realtime scripting (c#) 3

Introduction to Variables, Conditions, Loops, Patterns, - Scope of variables - OOPS in Realtime environments - Setting IDE - Scripting vs Programming - Enumeration - Memory management - Program states - Handing exceptions - Device considerations - Input systems - Hardware and Haptics feedback

Lab component: 6

- Learning Realtime programming (c#)

Outcome: Development of software code (C#) to optimise for Realtime programming pattern for AR VR Experiences

Unit - IV Level Design for AR VR using Unity 3

Basic concepts of Level designing, Level mapping - Level creation techniques - Grey boxing techniques, Focus on the layout and composition - Prioritize assets based on block out - Accessing Unity asset store - importing FBX assets - Building a level for VR/AR, Level Optimization

Lab component: 6

- Level Creation using Unity

Outcome: Develop Level design within considerations of Unity Real-time rendering concepts

Unit - V Solution Design for AR VR 3

Design process - mood board - design specification document - technical project management - AR architecture & frameworks - ARKit - Arcore - Vuforia - VR architecture & frameworks - HTC - Windows Mixed reality - Oculus - XR and definition - XR over cloud - Emerging trends in AR VR MR

Lab component: 6

- Mini Project on the Selected AR or VR device

Outcome: Design, Develop & Deploy AR or VR application in devices after building design flow that reflects user experiences

Training Hours - 15 Hrs (Theory) + 30 Hrs (Practical) = 45 Hrs

Course Delivery Plan

Sl. No	Hourly Content Plan	Delivery Tools	Delivery Mode	Project/ Exercises	T/P
1	Fundamental AR VR concepts and characteristics, Nature of virtuality, Introduction to Metaverse	PowerPoint, Live Instructor Sessions	Online	Create a digital profile	T
2	Introduction to AR VR hardware and software, Hardware features, analogue, digital, haptics, and trackers systems	PowerPoint, Live Instructor Sessions	Online	Write about the haptics profile of mobile	T
3	AR VR applications across	PowerPoint,	Online	Write a report of	T

	different industries, Digital twin, Web3.0, NFT, Blockchain & Crypto	Live Instructor Sessions		AR VR in day-to-day usage	
4	Installing Unity	Recorded video with instructor voice over	Online	Setup Unity IDE and other dependency	P
5	Taxonomy of Interactive Applications - immersive nature of AR VR technology	PowerPoint, Live Instructor Sessions	Online	Report on Immersion vs interactivity	T
6	creative storytelling - gaming industry applications - concept for game - building a prototype	PowerPoint, Live Instructor Sessions	Online	Story Map and User Journey	T
7	Consider Graphic styles and optimisation - communication and collaboration - Digital distribution - google play - iOS Store - Mac store	PowerPoint, Live Instructor Sessions	Online	Choose and define a art style, with a relevant distribution platform	T
8	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Install blender and create a primitive shape	P
9	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Create static meshes and detail meshes	P
10	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Create Materials and optimise textures	P
11	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Enable and build colliders and other physics	P
12	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Animate objects and setup state machines	P
13	Create your first 3D level in Unity	Recorded Video/ PowerPoint	Online	Bake and build lighting	P
14	Introduction to Variables,	PowerPoint,	Online	Simple	T

	Conditions, Loops, Patterns, - Scope of variables - OOPS in Realtime environments	Live Instructor Sessions		programs for numerical operations	
15	Program states - Device considerations - Input systems - Hardware and Haptics feedback	PowerPoint, Live Instructor Sessions	Online	Flow chart expressing input and feedback systems	T
16	Setting IDE - Scripting vs Programming - Enumeration - Memory management - Handing exceptions - Device considerations	PowerPoint, Live Instructor Sessions	Online	Data structures & Programming patterns	T
17	C# Unity functions and variables, Addition of two numbers and printing a series of numbers	PowerPoint, Live Instructor Sessions	Online	Lab programs on numerical operations	P
18	String operations in C# and finding greatest numbers	PowerPoint, Live Instructor Sessions	Online	Lab programs on string operations	P
19	Controlled Loops, enumerations & coroutines in C#	PowerPoint, Live Instructor Sessions	Online	Lab programs on program states	P
20	Translate, rotate, and scale objects using code	PowerPoint, Live Instructor Sessions	Online	Lab programs on vector operations	P
21	Awake, Start, Update, FixedUpdate and LateUpdate	PowerPoint, Live Instructor Sessions	Online	Lab program about coroutines	P
22	Vehicle moving and input handling	PowerPoint, Live Instructor Sessions	Online	Lab programs on input operations	P
23	Basic concepts of Level designing - Level sketching, Level creation techniques	PowerPoint, Live Instructor Sessions	Online	Select and define a 3D model layers	T
24	Level design using Greybox - Focus on the layout and composition - Prioritize assets based on block out	PowerPoint, Live Instructor Sessions	Online	Find examples of unwrapping and list them	T
25	Basic Animation using	PowerPoint,	Online	Explain	T

	Mixmo, Building Scene for VR/AR, Optimization	Live Instructor Sessions		zoetrope and its function	
26	3D Asset importation using Unity Asset store	PowerPoint, Live Instructor Sessions	Online	Create a simple 3D digital identy	P
27	Design process - mood board - design specification document - technical project management	PowerPoint, Live Instructor Sessions	Online	Create a project plan for the given design document	T
28	AR architecture & frameworks - ARKit - Arcore - Vuforia -	PowerPoint, Live Instructor Sessions	Online	Compare various AR types and submit a report	T
29	VR architecture & frameworks - HTC - Windows Mixed reality - Oculus - XR and definition - XR over cloud - Emerging trends in AR VR MR	PowerPoint, Live Instructor Sessions	Online	List and build a list of new VR headsets in market	T
30	3D asset importation for AR using Unity asset store	PowerPoint, Live Instructor Sessions	Online	Build a simple AR space model through textures and Image markers	P
31	Experience with AR VR	PowerPoint, Live Instructor Sessions	Onsite	Experience VR Horizon line, cyber sickness	P
32	Experience with AR VR	PowerPoint, Live Instructor Sessions	Onsite	Experience space to comfort ratio	P
33	3D VR Asset from Unity asset store & create an environment	PowerPoint, Live Instructor Sessions	Onsite	Create your 3D asset with Kit bashing	P
34	3D Integration with Unity Engine	PowerPoint, Live Instructor Sessions	Onsite	Create your 3D Project and create your level	P
35	AR Project - Vuforia Integration	PowerPoint, Live Instructor Sessions	Onsite	Setup Vuforia and link developer setup	P

36	AR Project - Vuforia Integration	PowerPoint, Live Instructor Sessions	Onsite	Create markers and build & test on device	P
37	VR Project Setup - Oculus/Carboard Integration	PowerPoint, Live Instructor Sessions	Onsite	Install VR Framework and level optimisation	P
38	VR Project Setup - Oculus/Carboard Integration	PowerPoint, Live Instructor Sessions	Onsite	Complete Manager and Interaction script for deployment	P
39	VR Mini Project (scope mentioned in the next section)	Selected Device	Onsite		P
40	VR Mini Project (scope mentioned in the next section)	Selected Device	Onsite		P
41	VR Mini Project (scope mentioned in the next section)	Selected Device	Onsite		P
42	VR Mini Project (scope mentioned in the next section)	Selected Device	Onsite		P
43	VR Mini Project	Selected Device	Onsite		P
44	VR Mini Project	Selected Device	Onsite		P
45	Photogrammetric Modelling	iPhone, PowerPoint, Agisoft	Onsite		P

COURSE OUTCOMES:

On successful completion of the course, students will be able to:
LO1: Create a 3D model in blender of any given object and apply texturing and animation.

LO 2: Convert the 3D asset in blender into a ready-to-use model for unity.

LO 3 : Apply functionalities to the model such as movement, rotation, etc., by importing appropriate AR/VR plugins and setup any lighting if required in Unity.

LO4 : Create AR/VR application for visualizing through any AR/VR devices.

STUDENTS ASSESSMENT :

Model a simple conference room with furniture, electrical devices (Light, Fan,Switches), etc. and develop a marker-less based Augmented Reality and/or Virtual Reality application.

There will one assignment & MCQ planned at the end of each unit and one final project which will be used for the final exam marks.

Evaluation Plan & Grading Criteria:

Continuous Learning Assignment :

Unit	Unit -I	Unit-II	Unit - III	Unit IV	Unit V	Total
MCQ	10 Questions	10 Questions	10 Questions	10 Questions	10 Questions	
Points	10	10	10	10	10	50
Assignment	1. Report on AR/VR HW. 2 Install Unity & confugure	Create a design journey document	Convert the given program to realtime Program	Create a level with all required optimizations	Submit your AR Marker for AR application	
Points	10	10	10	10	10	50
					Total	100

Summative or Final Mandatory Project at the end of the course (Unit 5):

Criteria	Idea	Technology structure	Mechanics	Code optimization	Final Build	Total
Points	20	20	20	20	20	100

Mandatory Project details:

Identify a content from your field of study and convert the learning content into an interactive VR experience in your field. Follow the steps below to complete the pipeline requirements.

- The content plan, Experience design, technical specifications, Test cases are to be defined before start of Production
- Choose Target devices and the right VR framework and explain the procedure to be followed
- Create any assets required and integrate them in any VR tool of your choice
- Build the experience using programming concepts for handling inputs
- Create a test group and record findings for publishing the final report

Mode of Delivery: Hybrid

Hybrid of 45 hours with:

- 22.5 hours of physical practical/lab classes
- 15 hours of on-line theory classes
- 7.5 hours of on-line lab classes

Execution: A total of 5 weeks

- 1 week of on-line training
- 4 weeks of Physical training across 4 clusters with 25 colleges per cluster
    - Each college will get 5 days of physical training with 4.5 hrs per day for a total of 22.5 hours.
    - Similar training will be provided to 25 colleges in parallel.
- A total of 5 weeks will be required to finish the training
    - Each cluster of 25 colleges will get 1 week of on-line & 1 week of physical training.

Hardware & Software to be used:

- Hardware/Devices that will be demonstrated to the students: Oculus Quest VR, Google VR, Smartphone AR, and Smartphone VR
- Software Licenses that will be taught/used: Blender based tools/plugins, GIMP/Photoshop, Unity with c#, Visual Studio, Vuforia, Oculus SDKS
- All software chosen are open source or free for students. It would be available for students even after the course
- Smartphone hardware available with the students can be used to develop and AR VR applications even after the course. Specialized VR hardware like Oculus Quest can be accessed at 50 AR VR locations in TN and the college can also invest.

SB8014	FULL STACK	L	T	P	C
		2	0	2	4

COURSE OBJECTIVE

The objective of this course is to provide a view of design principles to present ideas, information, products, and services on websites and how to apply programming principles to the construction of website and effective use of available resources for website projects.

PRE-REQUISITE COURSES:

Pre-requisite Knowledge	Courses Available on Springboard
HTML5	HTML 5
Javascript	Javascript
Typescript	Typescript

UNIT-I ANGULAR **36**

Getting Started with Angular - Angular Development Environment Setup - Creating Components and Modules - Templates - Directives - Data Binding - Pipes - Nested Components - Forms - Services - Routing - Angular Capstone Projects [Hands-on Exercises for Web Application Development Using Capstone Project]

UNIT-II NODE.JS AND EXPRESS. JS **12**

Node.js: Why and What Node.js - How to use Node.js - Create a web server in Node.js - Node Package Manager - Modular programming in Node.js - Restarting Node Application - File Operations. Express.js: Express Development Environment - defining a route - Handling Routes - Route and Query Parameters - How Middleware works - Chaining of Middleware's - Types of Middleware's - connecting to MongoDB with Mongoose - Validation Types and Defaults - Models - CRUD Operations - API Development - Why Session management - Cookies - Sessions - Why and What Security - Helmet Middleware - Using a Template Engine Middleware - Stylus CSS Pre-processor. [Hands-on Exercises to practice the topics using problem statements]

UNIT-III MONGO DB **12**

MongoDB: Introduction Module Overview- Document Database Overview- Understanding JSON- MongoDB Structure and Architecture- MongoDB Remote Management- Installing MongoDB on the local computer (Mac or Windows)- Introduction to MongoDB Cloud- Create MongoDB Atlas Cluster- GUI tools Overview- Install and Configure MongoDB Compass- Introduction to the MongoDB Shell- MongoDB Shell JavaScript Engine- MongoDB Shell JavaScript Syntax- Introduction to the MongoDB Data Types- Introduction to the CRUD Operations on documents- Create and Delete Databases and Collections- Introduction to MongoDB Queries.[Demos to practice the topics mentioned]

TOTAL: 60 PERIODS

SUGGESTED ACTIVITIES

CONTINUOUS / SELF-ASSESSMENT (MCQ)

Capstone Project - Develop an Ecommerce site or similar web applications with cross platform responsiveness. The application must possess search, sort, review, rating, ordering features and be connected with a database to be published across HTTP and HTTPS protocols.

SUGGESTED EVALUATION METHODS

Video Proctored Exam

Self-Assessment

COURSE OUTCOMES

On completion of the course, students will be able to,

CO1 : Develop component-based application using Angular Components.
CO2 : Create Angular forms and bind them with model data using data binding.
CO3 : Explain Node.js and identify when to use, create and run Node.js.
CO4 : Design schema using advanced queries.

REFERENCE

1 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_20858515543254600000_shared/overview (Angular)

2 https://infyspringboard.onwingspan.com/en/app/toc/lex_32407835671946760000_shared/overview (Node.js & Express.js)

3 https://infyspringboard.onwingspan.com/en/app/toc/lex_auth_013177169294712832113_shared/overview (MongoDB)

Mode of Delivery	Online (Self-Learning)
Software Configuration to be arranged in Institution Premises	Node.js Typescript Angular CLI Visual studio code MongoDB
Hardware Configuration to be arranged in Instituion Premises	Windows 10, 16GB RAM
Course Evaluation	Online Assessment
Multiple Hybrid Branch of Students	Applicable for IT/CSE
Internship/Placement Opportunities	https://infytq.onwingspan.com/
NOS Alignment	Yes- Infosys Industry Standard
Train-the-Trainer	Faculty Enablement Program
Commercials	Free of Cost

B8015	CYBERSECURITY	L	T	P	C
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COURSE OBJECTIVE

The objective of this course is to provide a view of data science, machine learning, basic implementation using Python and how machine learning is applied in various domains in the industry

UNIT-I NETWORKING AND WEB TECHNOLOGY 7

Network Components - Network Basics - Network Communication -Web Technologies TCPIP - Web Services

UNIT-II INTRODUCTION TO CYBER SECURITY 8

Recent Cyber Attacks - Cyber Security Concepts - Layers of Cyber Security - Introduction to Application Security - Secure Coding OWASP Top 10 - Coding Practices Secure Design - Closure [Practical demos and code on OWASP vulnerabilities and how to mitigate them]

UNIT-III FUNDAMENTALS OF INFORMATION SECURITY & FUNDAMENTALS OF CRYPTOGRAPHY 7

Why information security? - What is information security? - Data Security - Network security - Application Security - Closure Why Cryptography? - Cryptography - Shared Key Cryptography - Illustration - Shared Key Cryptography - Public Key Cryptography - Illustration - Public Key Cryptography - Hashing -Digital Signature - Illustration - Digital Signature - Applications of cryptography - Conclusion [Algorithmic representation of cryptographic methods]

UNIT-IV THREAT MODELING & IDENTITY AND ACCESS MANAGEMENT 6

Basics of Threat Modeling - Learn Threat Modeling with a Use Case - Tool Walkthrough - MS Threat Modeling Tool - Assignment - Introduction to Identity and Access Management - What next

UNIT-V JAVA SE 11 PROGRAMMER II: SECURE CODING IN JAVA SE 11 APPLICATIONS 7

Course Overview - Managing Denial of Service - Securing Information - Managing Data Integrity - Accessibility and Extensibility - Securing Objects - Serialization and Deserialization Security - JCA and its Principles - Provider Architecture - Engine Class - Key Pair Generation - Signature Management - Unsecure to Secure Object - Course Summary. [Demos of Secure Coding in Java]

UNIT-VI SECURITY STANDARDS AND REGULATIONS 5

PCI DSS - ISMS -FIPS and NIST Special Publications - FISMA - GDPR - HIPAA - SOX - Conclusion

UNIT-VII IDENTITY GOVERNANCE AND ADMINISTRATION 5

Need for IGA & basics concepts - IGA Basic Concepts and On boarding - IGA Governance - Identity Administration in IGA - What next?

TOTAL: 45 PERIODS

SUGGESTED ACTIVITIES

CONTINUOUS / SELF-ASSESSMENT (MCQ)

CAPSTONE PROJECT

Activity 1 : Converge system configuration details listed below for a given machine

Firewall configuration (Policy Setup)

Network Configuration (IP address, DNS etc)

Activity 2 :

Evaluate the website vulnerabilities for a given webpage

Activity 3 : Implement security audit for an organization with the basic security requirements such as

- Firewall Policy Details
- Access Control Mechanism
- Router Configuration

SUGGESTED EVALUATION METHODS

- Video Proctored Exam
- Self-Assessment

COURSE OUTCOMES

On completion of the course, students will be able to:

CO1 : Demonstrate network components, DHCP, DNS Server and TCP/IP architecture
CO2 : Apply and validate the design of web applications by applying Threat modelling.
CO3 : Analyze some of the applications of these cryptographic primitives in cryptographic protocols and technologies.
CO4 : Apply Microsoft Threat Modeling Tool for creating threat models.
CO5 : Investigate how to secure sensitive objects, and secure serialization and deserialization in Java. You will describe JCA, including its architecture and the principles surrounding it
CO6: Demonstrate important Security Standards and Regulations like PCI DSS, ISMS, FIPS, NIST Special Publications, FISMA, GDPR, HIPAA and SOX.
CO7: Recognize Identity Governance and Administration (IGA), what problems IGA solutions solve; governance models like - roles, certifications, policies; and identity life cycle management.

REFERENCE

1 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01254512784165273671_shared/overview (Networking and Web Technology)

2 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_3388902307073574000_shared/overview (Introduction to Cyber Security)

3 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_01263916424608972842_shared/overview (Fundamentals of Information security)

4 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012666884706803712703_shared/overview (Fundamentals of Cryptography)

5 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012608842478059520307_shared/overview (Threat Modeling)

6 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012656885529346048298_shared/overview (Identity and Access Management)

7 https://infyspringboard.onwingspan.com/web/en/viewer/html/lex_auth_01350159172969267213125 (Java SE 11 Programmer II: Secure Coding in Java SE 11 Applications)

8 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012623588482621440286 5_shared/overview (Security Standards and Regulations)

9 https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_012642863703580672158 4_shared/overview (Identity Governance and Administration)

Mode of Delivery	Online (Self-Learning)
Course Evaluation	Online Assessment
Multiple Hybrid Branch of Students	Applicable for ECE/EEE/IT/CSE
Internship/Placement Opportunities	https://infytq.onwingspan.com/
NOS Alignment	Yes- Infosys Industry Standard
Train-the-Trainer	Faculty Enablement Program
Commercials	Free of Cost

SB8016 Big Data Analytics L T P C

1 0 2 2

Modules	Duration in Hours
Introduction to Big Data & Hadoop	45
Scala Essentials	
In Memory Computation for Big Data	
SQL Like Query Processing Engine for Big Data: Hive	
Real time Big Data Processing	

SB8017 Cloud Essentials L T P C

1 0 2 2

Modules	Duration in Hours
Linux	45
Cloud Computing Fundamentals	
Architecting Cloud Solutions	
Managing Cloud Solutions	
Migrating to Cloud	

Big Data Analytics | Objectives

After the completion of respective modules, learners will be able to:

Module	Outcomes	No. of hours of theory	No. of hours of labs
Introduction to Big Data & Hadoop	Identify the various types of data Store large amount of data into HDFS Process data using Hadoop Navigate through Hadoop Web UI Analyse various metrics using Hadoop Web UI Run various Hadoop Terminal Commands Ingest structured data into HDFS using Sqoop	2	4
Scala Essentials	Perform basic Scala operations Use control structures in Scala Create functions in Scala Use Collections framework in Scala Write basic programs using Scala Create Classes and objects using Scala Write programs using OOPs concepts	2	4

Big Data Analytics | Objectives

After the completion of respective modules, learners will be able to

Module	Outcomes	No. of hours of theory	No. of hours of labs
In Memory Computation for Big Data	Differentiate between Disk-based and In-memory Processing Systems Use Spark in Different Deployment Modes Run Spark applications on Spark shell Configure Spark properties & view them in Web UI Perform data loading and saving through RDDs Write Spark applications using RDDs concepts Query structured data inside Spark programs using Spark SQL	3	6
SQL Like Query Processing Engine for Big Data: Hive	Write Hive Queries & Hive Scripts Execute Hive Queries on top of HDFS Create Dynamic and Static Partitions Create Buckets for Data Sampling Perform various Joins in Hive Perform ETL operations & data analytics using Hive Implement Partitioning, Bucketing, and Indexing in Hive Use various file formats in Hive	3	6
Real time Big Data Processing	Ingest unstructured data into HDFS using Flume Perform real-time data processing using Spark Work with various Kafka Command Line Tools Create data pipelines using Kafka	5	10

Cloud Essentials | Objectives

After the completionof respective modules, learners will be able to:

Module	Outcomes	No. of hours of theory	No. of hours of labs
Linux	Work with various Linux commands Manage and perform user administration Differentiate between IPV4 and IPV6 address	2	4
Cloud Computing Fundamentals	Explain the concept of Virtualization Define Cloud Computing Categorize different Cloud Computing service models Categorize different Cloud Computing deployment models Describe AWS Global Infrastructure Work with AWS CLI Identity and Access Management	2	4

Cloud Essentials | Objectives

After the completionof respective modules, learners will be able to:

Module	Outcomes	No. of hours of theory	No. of hours of labs
Architecting Cloud Solutions	Create EC2 compute instances Store data into S3 buckets Create a virtual private network Query data using various database services such as RDS Configure various AWS core services such as EC2, RDS, VPC, S3 Choose AWS services to architect a cloud solutions for any given requirement	4	8
Managing Cloud Solutions	Monitor various AWS resources using CloudWatch Perform load balancing and auto scaling Manage and optimize cloud cost Build resilient and robust cloud architectures	4	8
Migrating to Cloud	Gather information about various on-premise resources using application discovery Perform homogeneous and heterogeneous database migration to AWS cloud Migrate on-premise resources to AWS cloud Migrate application to AWS cloud	3	6

Evaluation Process

Assessment Methodology

- Learning = practical application of various tools covered in the course
- Course Assessment
  - Multiple Choice Questions
- Assessments are auto graded
- Learning effectiveness for any learner
  - Completion of all the course modules and assessments
- A short project will be provided to the students at the end of the course for assessment
  - Faculty in the college should guide the students locally to help them clarify their queries
  - Faculty also should assess the project & provide marks to Veranda for consolidation
  - Sample project (indicative to demonstrate the complexity) is shared as separate files for reference

MCQ based assessment help the learner s to clear their interviews

Continuous Evaluation

- Self-paced video consumption through LMS portal
- Hands-on practice through practical labs
- Graded assessments (MCQs) after every module of course content
- Module Assessment
  - Real-time scenario based MCQs
- Course-completion certification

Big Data Analytics – Evaluation Parameters

Sr. No.	Aspect of description	Extra aspect of description	Maximum marks
1	Data Identification	Identify whether the data is structured, semi-structured or unstructured	5
2	Data Ingestion	Ingesting Structured or unstructured data using Sqoop and Flume	6
3	Data pre-processing	Data cleaning and Data transformation	5
4	Data Store	Storing pre-processed data into HDFS	4
5	Data processing	Processing data to get meaningful insights using Spark and Kafka	5
Total			25

Sr. No.	Aspect of description	Extra aspect of description	Maximum marks
1	Linux	Implement Linux Commands to work with AWS CLI	5
2	Cloud Computing	Identify cloud service and deployment model	5
3	Cloud Solution Designing	Identify and configure various AWS services for a given requirement	5
4	Monitor cloud resources	Monitor AWS resources and design scalable solutions	5
5	Cost Optimization	Optimize the cloud solution cost	5
Total			25

LMS FEATURES

- *Byte sized learning videos*
- *Accessible through PC and mobile devices*
- *Integrated MCQ assessments*
- *Personal content library for additional readings*

Questions	Cloud Essentials	Big Data Analytics
MODE of Course	Online	Online
SECTOR	Information Technology	Information Technology
DEGREE	UG/PG	UG/PG
SPECIALIZATION (Engineering, Arts & Science, Polytechnic, ITI, ParaMedicine)	Engineering, Arts & Science, Polytechnic, ITI	Engineering, Arts & Science, Polytechnic, ITI
BRANCH	Any	Any
SEMESTER	7	5
DURATION in HOURS*	45	45
DESIGNED DURATION in WEEKS	15 weeks (1 Semester)	15 weeks (1 Semester)
COURSE MODULE	Linux, Cloud Computing Fundamentals, Architecting Cloud Solutions, Managing Cloud Solutions, Migrating to Cloud	Introduction to Big Data & Hadoop, Scala Essentials, In Memory Computation for Big Data, SQL Like Query Processing Engine for Big Data: Hive, Real time Big Data Processing

Questions	Cloud Essentials	Big Data Analytics
COURSE OUTCOME	Developing and implementing policies for the use of cloud services, managing requests for new technology, establishing a secure cloud environment, and ensuring appropriate availability of services	• This course provides an overview of approaches facilitating data analytics on huge datasets. • Different strategies are presented including sampling to make classical analytics tools amenable for big datasets. • Students will be exposed to various analytics tools such as Apache hive, apache flume, Kafka, MySQL
COURSE TYPE	Paid	Free
TOTAL NUMBER OF ENROLMENTS	6300	6400
TOTAL NUMBER OF COMPLETION	1061	1200
TOTAL NUMBER OF CERTIFIED	1061	1200
CERTIFICATION (Mention Global and Industrial recognition)	None	None
MODEL CERTIFICATION (Need to upload)	Shown in earlier slides	Shown in earlier slides
NOS Aligned (Yes/No)	No (applied for it)	No (applied for it)

Questions	Cloud Essentials	Big Data Analytics
Personalized student support system intervention plan if student not following the course.	Progress of each student can be tracked in the LMS. College faculty members can access this info from the LMS. VLS will train the college faculty members in the beginning for providing onsite support to the students. • We will be creating online 1 doubt clearing sessions for faculties and the students can share the doubts with the faculties, which will be in turn cleared in these sessions • We will provide pre recorded videos for frequently asked questions	Progress of each student can be tracked in the LMS. College faculty members can access this info from the LMS. VLS will train the college faculty members in the beginning for providing onsite support to the students. • We will be creating online 1 doubt clearing sessions for faculties and the students can share the doubts with the faculties, which will be in turn cleared in these sessions • We will provide pre recorded videos for frequently asked questions
Personalized student support system intervention plan if student fail in the final assessment.	VLS will train the college faculty members in the beginning for providing onsite support to the students. We provide unlimited retake option and student can also discuss the assessment related queries in their doubt clearing sessions	VLS will train the college faculty members in the beginning for providing onsite support to the students. We provide unlimited retake option and student can also discuss the assessment related queries in their doubt clearing sessions

Questions	Cloud Essentials	Big Data Analytics
Hardware Requirement	Laptop -- 16 GB RAM 250 HDD Minimum i5 8th gen X64 bit Internet connectivity - 100 Mbps and above	Laptop -- 16 GB RAM 250 HDD Minimum i5 8th gen X64 bit Internet connectivity - 100 Mbps and above
Additional Requirements	All students should activate individual cloud accounts (AWS, Azure or Google) using their credit cards. Veranda will add a session to the course to educate the students how to activate/deactivate the account	
Personalized student support system intervention plan to clear doubts during the course.	Onsite faculty & Webinar	Onsite faculty & Webinar

Cloud Essentials - Project

Background: A start-up company wants to host its Python and React-based application (Backend: Python API and Frontend React) using AWS. But they are not familiar with the AWS cloud platform. They want to ensure that the application is secure, scalable, highly available, and cost-efficient. As a solutions architect, you have to design a proper solution to meet their below requirements.

Goal: To architect a solution that is secure, scalable, highly available, and cost-effective using AWS.

Requirements:

• They are concerned about the security of the application, so they have decided to isolate their network from the rest of the customers virtually. Set-up a secure virtual network where the only frontend of application is accessible by users and not the database

• Execute the React application code using AWS Elastic Beanstalk. Ensure that the source code of Web application is automatically picked, pushed to the master branch, and deployed on the servers

• Ensure all the UI images served to the frontend application code are provisioned via a secure storage unit

• There should be enough backups for both the Web and Database server, so if the set-up crashes, we can launch a new one from the disaster recovery backups

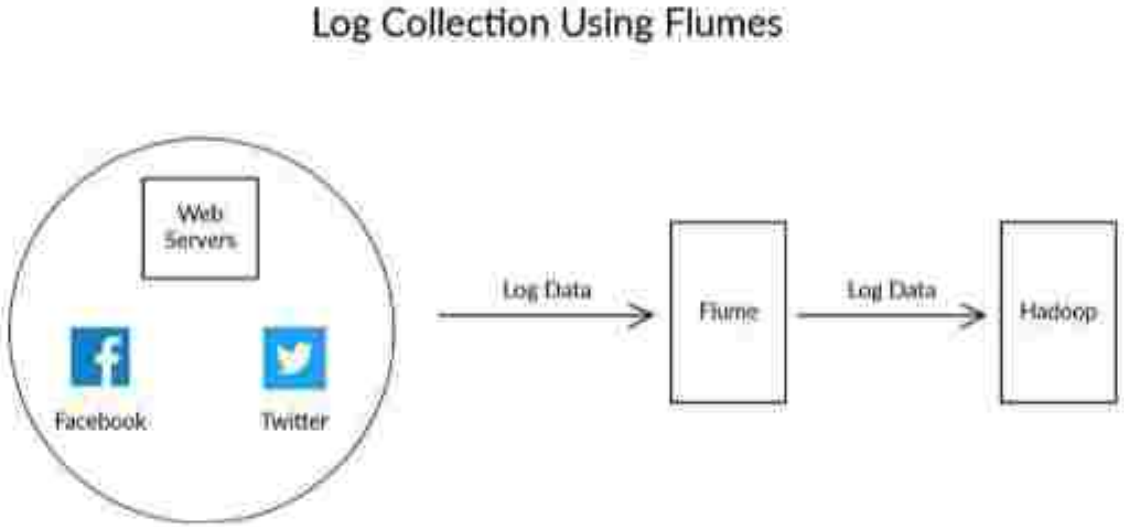
• They are uncertain about the traffic pattern that how low or high it can be, so they want the Web application to be running on at least two EC2 instances all time, and when there is a high load, they must burst up to four instances in total

• The Web application should be highly available, even if any VM fails to respond to queries, there should be a mechanism to switch the connection to another healthy VM automatically

• The Web application should also be cached globally, so users worldwide can access it with low latency

Problem Statement: Real-time Data Collection Imagine you are a Big Data Engineer, and you need to fetch logs from the web servers into your Hadoop Cluster for doing some analyses to generate some business insights.

The following figure illustrates a scenario where we need to ingest logs from sources like web servers, facebook, twitter, etc. into the Hadoop clusters and then use the ingested data as required.



As a Big Data Engineer, your task is to ingest the logs generated by the given LogGenerator.jar file into HDFS using the two Flume agents.

NOTE: 1. Configure the Flume agent 1 to consolidate the logs from the spoolDir source to an Avro sink. 2. Configure the Flume agent 2 to consolidate the logs from the Avro source to an HDFS sink

SB8040 PROFESSIONAL READINESS FOR INNOVATION, EMPLOYMENT AND ENTREPRENEURSHIP

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COURSE LEARNING OBJECTIVES

- To empower the students with technical skills to require solving a real-world challenge
- To train the students on the approach to building solutions by applying critical thinking and problem-solving capabilities in a collaborative environment
- To mentor the students in building proof-of-concept solutions by applying design thinking concepts
- To introduce the standard project development methodologies followed in the industry to the students
- To develop the professional skills like teamwork, leadership qualities, communication in the students
- To enhance the employability of students in order to get them internships and job opportunities

Course Content:

Artificial Intelligence

- Introduction to Artificial Intelligence
- Python for Artificial Intelligence
- Data Wrangling Techniques
- Introduction to Neural Networks
- Tensorflow & Keras
- Convolutional Neural Networks
- Natural Language Processing
- Build and Deploy AI Applications

Data Science

- Introduction to Data Science
- Python for Data science
- Data Wrangling Techniques
- Data visualization

- Supervised Learning - Regression
- Supervised Learning - Classification
- Unsupervised Learning
- IBM Cloud & Watson Services Build and Deploy Machine Learning Applications

Data Analytics & Visualizations

- Introduction to Data Analytics
- Python for Data Analysis
- Extract data from database, txt files, webscrapping
- Data Visualization using Matplotlib, seaborn
- Data Visualization using Plotly
- Data Visualization using Pygal, Bokeh etc
- Build Visualization Dashboards & Stories

Internet of Things (IoT)

- Introduction to Internet of Things (IoT)
- Building Blocks of IoT
- Design an IoT Device
- Getting Started with Arduino UNO & Tinkercad Platform
- Getting started with ESP32
- Integrate TMP36 Sensor with Arduino UNO
- Integrate Ultrasonic Sensor with Arduino UNO
- Integrate Servo Motor with Arduino UNO
- IoT Communication Technologies
- IoT protocols
- HTTP & MQTT Practical's
- Introduction to Python
- Python - Collection Data Types, Functions
- Modules Files I/O
- Getting started with Raspberry PI
- Raspberry Pi as a Gateway
- Introduction to Cloud

- IBM Cloud & IoT Platform Architecture
- Create and Configure IBM IoT Platform
- IBM Watson IoT Platform Hands-on with online simulator
- Getting Started Node-RED Service
- Web Application Development using Node-RED Service
- Mobile Application Development using MIT App Inventor
- IBM Cloudant DB & its Practical's
- Introduction to Computer Vision with Python
- Introduction to IBM Watson AI & Building Intelligent Devices

Cloud Application Developer Modern Application Development

- Hands-on with web application development
- Python - Flask Framework
- IBM DB2
- IBM Object Storage
- IBM Watson Assistant
- Containers & Kubernetes
- IBM Container Register

TOTAL : 45 PERIODS

Course Outcomes

- Understand the leading technologies and apply them for solving real-world problems
- Understand the concepts of design thinking and agile methodologies
- Develop professional skills like teamwork, time management, communication and project management skills
- Understand various digital tools & best practices followed in the industry
- Develop the products from scratch i.e. idea to working prototype
- Industry course completion certificate from IBM

SB8033 NETWORK ENGINEERING L T P C

1 0 2 2

COURSE CONTENT:

UNIT I Basics of Networking and Protocols 3 + 6

Networking - Components, types, Internet Connections, Requirements of a reliable network, Internet Connections - LAN, WAN Interconnection Network trends - BYOD, online collaboration, video, and cloud computing, Network security threats, Basic Switch and End Device Configuration - Cisco IOS Access, IOS Navigation, command structure of Cisco IOS software, Basic Device Configuration - Configuring a Cisco IOS device using CLI, Save Configurations, Ports and Addresses, Configuring IP Addressing, Verify Connectivity

Network Protocols - Rules, protocol suites, role of standards organizations in establishing protocols for network interoperability, TCP/IP model and the OSI model in standardization of communication process, Data Encapsulation, Data Access

UNIT II Introduction to data layer, physical layer 3 + 6

Physical layer protocols, services, and network media support communications across data networks, Physical Layer Characteristic, Copper Cabling, UTP Cabling, Fiber-Optic Cabling, Connection using wired and wireless media

Number systems: decimal, binary, and hexadecimal systems - Data Link Layer- media access control in the data link layer in communication across networks - The characteristics of media access control methods on WAN and LAN topologies; the characteristics and functions of the data link frame - Ethernet Switching - Ethernet Frame, Ethernet MAC Address, MAC Address Table, Switch Speeds and Forwarding Methods

UNIT III Introduction to Network layer and Addressing 3 + 6

Network Layer: Network Layer Characteristics, IPv4 & IPv6 Packet, routing tables to direct packets to a destination network in network devices , function of fields in the routing table of a router.

MAC & IP addressing, ARP, Operation of IPv6 neighbor discovery - Basic Router Configuration- Configure Initial Router Setting, Interfaces on a Cisco IOS router, default Gateway IPv4 Addressing - IPv4 Address Structure - public, private, and reserved IPv4 addresses., IPv4 Unicast, Broadcast, and Multicast, Types of IPv4 Addresses, Network Segmentation, Subnet an IPv4 Network - a /24 prefix, a /16 and /8 prefix - Variable Length Subnet Masking, VLSM addressing scheme - IPv6 Addressing - Implementation & the need for IPv6 addressing, Representation, IPv6 Address types, GUA and LLA Static Configuration - configuring static global unicast and linklocal IPv6 network addresses. Dynamic Addressing for IPv6 LLAs - Configuration of link-local addresses, IPv6 Multicast Addresses, Subnetting an IPv6 Network

UNIT IV Introduction to Transport layer **3 + 6**

ICMP Messages- how ICMP is used to test network connectivity, Ping and Traceroute Testing - Transport Layer - Operations of transport layer protocols in supporting end-to-end communication.

Transportation of Data - the purpose of the transport layer in managing the transportation of data in end-to-end communication - Characteristics of the TCP & UDP, Port Numbers of TCP & UDP, TCP Communication Process - TCP session establishment and termination processes facilitate reliable communication, Reliability and Flow Control, UDP Communication - the UDP client processes to establish communication with a server.

UNIT VIntroduction to Application Layer & Network Security **3 + 6**

Application Layer - operation of application layer protocols in providing support to end-user applications - Application, Presentation, and Session - functions of the application layer, session layer, and presentation layer work together to provide network services to end user applications. - Operation of end user application in a peer-to-peer network, Web and Email Protocols, IP Addressing Services - DNS and DHCP operation, File Sharing Services - File transfer Protocols - Network Security Fundamentals - Security Threats and Vulnerabilities, Network Attacks - security vulnerabilities, Network Attack Mitigation - general mitigation techniques, Device Security - Configuring network devices with device hardening features to mitigate security threats. - Building a Small Network - Devices in a Small Network, protocols and applications used in a small network, Scale to Larger Network - how a small network serves as the basis of larger networks - Verify Connectivity - Using the output of the ping and tracert commands to verify connectivity and establish relative network performance - Host and IOS Commands, Troubleshooting Methodologies & Scenarios

COURSE OUTCOME: **TOTAL : 45 PERIODS**

- Configure a Cisco IOS device using CLI.
- Configure a host device with an IP address.
- Configure initial settings on a Cisco IOS router.
- Implement initial settings including passwords, IP addressing, and default gateway parameters on a network switch and end devices.
- Configure devices to use the default gateway.
- Configure two active interfaces on a Cisco IOS router.
- Implement a VLSM addressing scheme.
- Configure link-local addresses dynamically.
- Implement a subnetted IPv6 addressing scheme.
- Configure switches and routers with device hardening features to enhance security.
- Configure network devices with device hardening features to mitigate security threats.
- Troubleshoot issues with devices in the network.

HARDWARE REQUIREMENT:

- 2 x ISR4221/K9 Routers
- 2 x WS-C2960+24TC-L Catalyst switches
- 1 wireless router (generic brand) with WPA2 support
- Ethernet patch cables
- PCs - minimum system requirements
  - o CPU: Intel Pentium 4, 2.53 GHz or equivalent
  - o OS: Microsoft Windows 7, Microsoft Windows 8.1, Microsoft Windows 10, Ubuntu 14.04 LTS,macOS High Sierra and Mojave
  - o RAM: 4 GB
  - o Storage: 500 MB of free disk space
  - o Display resolution: 1024 x 768
  - o Language fonts supporting Unicode encoding (if viewing in languages other than English)
  - o Latest video card drivers and operating system updates
- Internet connection for lab and study PCs
- Optional equipment for connecting to a WLAN
  - o 1 printer or integrated printer/scanner/copier for the class to share
  - o Smartphones and tablets are desirable for use with the labs

SOFTWARE REQUIREMENT

- Cisco IOS versions:
  - Routers: Version 15.0 or higher, IP Base feature set
  - Switches: Version 15.0 or higher, lanbaseK9 feature set
- Packet Tracer 8.0
- Open-source server software:
  - For various services and protocols, such as Telnet, SSH, HTTP, DHCP, FTP, TFTP, etc.
- Tera Term source SSH client software for lab PCs.
- Oracle VirtualBox, most recent version.
- Wireshark version 2.5 or higher.

INDUSTRY USE CASE:

1. Create network and assign Static IP address to the host using Supernetting and subnetting.

2. Design a network using VLANs, Wireless LANs and InterVLAN routing.

3. Design a simple firewall for host and network.

4. Configure and troubleshoot redundancy on a switched network using EtherChannel.

5. Simulation of Transport Layer Protocols and analysis of congestion control techniques in network 6. Develop a DNS client server and DHCP server to resolve the given host name or IP address

7. Implementation of Layers for security protocols and server configuration

SB8037	FULL STACK DEVELOPMENT	L T P C
		1 0 2 2

COURSE OBJECTIVE

The objective of this course is to provide conceptual understanding of how full stack development can be used to innovate and improve tech processes. This course will allow you to learn how to create full-stack web applications using frontend and backend JavaScript technologies. Learn both the theoretical and practical implementation of full stack web development solutions.

This Full Stack Java Developer Course is designed to give you the essence of front-end, middleware, and back-end Java web developer technologies. You will learn to build an end-to-end application, test and deploy code, store data, and much more.

COURSE CONTENT

UNIT I **Software Development Process (Agile & Scrum)** **3 + 6**

Software Lifecycle Models - SRS (Software Requirement Specification) - SPS (Software Project Scheduling) - GITHub (End to End Journey) - Project Management Frameworks like Scrum, Agile etc.

UNIT II **Introduction to Development Frameworks** **3 + 6**

Project Bucketing - Different Shades of Fullstack development - Angular.Js (Introduction) - Vue.Js (Introduction) - React.Js (Introduction) - React.Js - Components and Props - State and Lifecycle - Handling Events - Hooks & Forms

UNIT III **Front End Development Framework & Tools** **3 + 6**

Web client server architecture - HTML Structure Tags - Forms field - Bootstrap - React.Js - jQuery- ajax - Promises - API integration

UNIT IV **Back End Development Frameworks & Tools** **3 + 6**

API Development services - Express.Js -nNode.js - mongoDB - Manual Authentication using JWT, Passport.Js etc

UNIT V **Full Stack Application Development and Deployment in Cloud (Web, Mobile)** **3 + 6**

Computer Networking - Basic Linux Commands - Cloud hosting using AWS - DevOps

TOTAL : 45 PERIODS

COURSE OUTCOME

- Planning and implementing the software lifecycle models to have a hands-on understanding with GIThub, agile & Scrum methodologies.
- Implementing the framework i.e react.js to align state & lifecycle, conditional rendering, Hooks etc.
- Inplementing the frontend technologies to build client architecture, to integrate APIs using react js.
- Implementing the tech stack like mongoDB, Express.Js & Node.js to build the back-end services.
- Hosting & deployment to ensure the microservices using DevOps, Cloud hosting using AWS.

FOR FURTHER READING:

- Full Stack Web Development for Beginners: Learn Ecommerce Web Development Using HTML5, CSS3, Bootstrap, JavaScript, MySQL, and PHP - By Riaz Ahmed
- A full stack data acquisition, archive and access solution for J-TEXT based on web technologies by Wei Zheng, Yuxing Wang Ming, Zhang Feiyang Wu, Zhou Yang
- Design and development of software stack of an autonomous vehicle using robot operating by Abhisek Omkar Prasada, Pradumn Mishraa, Urja Jaina, Anish Pandey, Anushka Sinhaa, Anil Singh Yadav, Rajan Kumar, Abhishek Sharma, Gaurav Kumar

REFERENCES:

1. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer - Chris Northwood

2. Hands-On Full Stack Development with spring root 2 and react by Jua Hinkula

3. React and React Native, Third Edition by Adam Boduch, Roy Derks

ONLINE REFERENCES:

1. Beginner Full Stack Development Course: HTML, CSS, React and Node

https://www.udemy.com/course/ultimate-web/

2. Full Stack Web Developer: MEAN Stack https://intellipaat.com/full-stack-web-developer-mean-stack-certification-training/

SOFTWARE REQUIREMENT:

Javascript, HTMS, CSS, Bootstrap, JQuery, Node Js, MongoDB, SQLite

INDUSTRY SCOPE:

By completion of this course, the students can get industry scope in website development, frontend and backend development across industries and domains.

20 INDUSTRY USE CASES

1. E-Commerce Website

An e-commerce website or app is one of the best full-stack development projects you can practice at the advanced level. It is a vast project involving front and back-end technologies and database knowledge for efficient execution and implementation. The project takes time and effort because you must maintain a huge database with multiple product categories and prices.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the Items selected.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the articles, especially for those who may have difficulty physically going to market to purchase some.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered items are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the buyer seller Journey and reduce the time and resources required to complete the process
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for aligning the E-commerce web page at one place with proper categorisation with the help of development scripting.

Task 2: Enable the data with the customer manifestation to enroute the requisite web development with the help of suitable programming language.

Task 3: Design the web server to engage with the operating system user is using.

Task 4: Develop a system which showcases the inserted result on the ground of inputs user made over the webpage.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

2. Video Conferencing Website and Application

You can try your hands on the video conferencing website and application projects and help develop features like textual chatting, audio-video interactions, video recording, etc. The project requires you to implement your ideas and ensure a creative application or website.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the time-zones according to the countries.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to plan their meetings, especially for those who may have difficulty physically going to meet them in person.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the caller & receiver Journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as registration is verified electronically.

Task1: Develop the framework for creating the video conferencing application/website with the project management tools like JIRA & Trello.

Task 2: Enable the data with the system control of version based servers like GIT & Grunt .

Task 3: Design the database server to resemble the implementation of MongoDb, MySQL etc.

Task 4: Develop a frontend framework which showcases the inserted result Jquery, Javascript and HTML.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

3. Social Media Website and Application

The present-day world revolves around social media, and we already use many websites and applications. You can try your hands on an efficient full-stack project and develop a social media app or website with unique features to attract users.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the legitimacy of the users onboarded
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to add, remove, post etc , especially for those who may have difficulty expressing their well-being in terms of words.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered people are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the mutual interaction between two or more individuals and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the social media application/website with the proper implementation of web technologies.

Task 2: Enable and enhance the data with the system control of version based servers i.e MySql & others

Task 3: Build and Nourish the database server to resemble the implementation of NoSql.

Task 4: Design a unique frontend framework which showcases the valued results with the use of Express JS & IONIC

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

4. Content Management Tool and System

Content Management Tool or System is a significant factor that plays a crucial role in creating blogs. You can use the full stack development items and other drag-and-drop interfaces to create a web page that helps you add text, images, videos, and other elements required to create a blog.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the articles written.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the articles, especially for those who may have difficulty physically going to market to purchase books.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more enriching, as all the written articles are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the traction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the content management website using the tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite & NOSql etc

Task 4: Develop a frontend framework which showcases the inserted result with Express JS & IONIC

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment

5. Project Management Tool

A project management tool is one of the toughest full-stack projects and requires many features for proper execution. The project includes a framework of social media sites where users can communicate with one another. The users also get the functionality to assign tasks to others and comment on the dashboard at their convenience.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the basics of the projects and their guidelines.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for users to select the project, especially for those who may have difficulty physically going on-site or doing remote work.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the user & UI Interaction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the project management application/website with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite

Task 4: Develop a frontend framework which showcases the inserted result with IONIC

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment

6. To-Do List Projects

A to-do list is one of the simplest and best full-stack projects for beginners. You can create a to-do list efficiently with the feature to add items to the list. You can also provide functionalities to move content from the list after completing the task. The project will help you improve your front-end development skills and learn crucial database operations.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the time & task aligned.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select their time & manually design their planner especially for those who usually are not able to manage their time efficiently.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the day to day activities of the user and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the To-Do List Project management application/website with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the To-Do List Project.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the To-Do List Project.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

7. Chat Application and Website: Everyone chats with their family members and friends daily, and because of this, chatting applications have become an inevitable part of our lives. Chatting apps are one of the best full-stack beginner projects. You can create a chat application or website to serve the purpose of individual or group chats between networks.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and reply instantly.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to chat & connect especially for those who may have difficulty physically connecting with people.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the users Journey and reduce the time and resources required to complee the process.

- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the Chat application/website with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating the Chat application/website.

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the Chat application/website.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the Chat application/website.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

8. Portfolio Website

Developers build portfolio websites as full-stack developer sample projects to showcase their skills and impress clients. As a student or professional learning web development, you must practice making portfolio websites to gain knowledge and experience in efficient front-end web development technology.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the portfolios selected.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to select the portfolios.

- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all the created portfolios are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the buyer seller Journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the portfolio website with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the portfolio website.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the portfolio website.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

9. Blog Website and Application

A blog website allows users to opine their thoughts and comment on anything and everything. You can make a creative website or application using full-stack technology and take inspiration from other blogs. Ensure that you add proper authentication features so individuals with valid credentials can log in to the platform.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the articles written.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the articles, especially for those who may have difficulty physically going to market to purchase books.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more enriching, as all the written articles are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the traction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the blogging website with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating the blogging website.

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the blogging website.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the blogging website.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

10. Application For Grocery Delivery

A grocery delivery website or application is among the best projects for full-stack developers to showcase their tslent and skills. You can learn multiple factors related to large-scale full-stack apps or websites by making the grocery delivery applicstion project. It involves back-end knowledge and helps you excel in making major projects in the future.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily select and verify the accuracy of the Items selected.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the articles, especially for those who may have difficulty physically going to market to purchase some.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered items are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the buyer seller Journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the grocery delivery application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating the grocery delivery application.

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the grocery delivery application.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the grocery delivery application.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

11. Food Delivery Website and Application

A food delivery website or application is slightly different from grocery delivery. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making food delivery websites or applications.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the items selected.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to select the dishes, especially for those who may have difficulty physically going to market to purchase some.

- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered items are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the buyer seller Journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the food delivery application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the food delivery application.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the food delivery application.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

12. Workout Tracker Application

A workout tracking website or application is slightly different from a to-do project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making workout tracking applications.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the inputs made.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to select the workout style especially for those who may have difficulty to track their workout routine.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all workout style & patterns are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the UI & user interaction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the workout tracking application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating the workout tracker application

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the workout tracker application

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the workout tracker application

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

13. Calendar Scheduler Application

A calendar scheduler application is slightly different from a to-do project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making calendar scheduler applications.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the time & task aligned.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select their time & manually design their planner especially for those who usually are not able to manage their time efficiently.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the day to day activities of the user and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the calendar scheduler application with the project management tools like Java & kotlin.

Task 2: Enable the data with the system control of version based servers like SQL for creating the calendar scheduler application

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the calendar scheduler application.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the calendar scheduler application.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

14. Money Transfer Application

A Money Transfer application is slightly different from a chat project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making money transfer applications.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily check and verify the accuracy of the payments made.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to make the transactions, especially for those who may have difficulty physically going in-person to do the needful.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the Journey between receiver sender and the bank and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the money transfer application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating the money transfer application

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating the money transfer application.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for creating the money transfer application.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

15. Internet Banking Application and Website

An Internet Banking application and website is slightly different from a money transfer project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making internet banking applications and websites.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily check and verify the accuracy of the payments made.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to make the transactions, especially for those who may have difficulty physically going in-person to do the needful.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger
- Develop a full stack-based system that can offer greater efficiency and can streamline the Journey between receiver sender and the bank and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the internet banking application with the project management tools like Java & kotlin for Internet banking application

Task 2: Enable the data with the system control of version based servers like SQL.

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for Internet banking application

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for Internet banking application.

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

16. Astrology Application and Website

An Astrology application and website is slightly different from a social media project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making astrology applications and websites.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the predictions made.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the sunshine.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the UI & user Interaction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task1: Develop the framework for creating the astrology application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for creating astrology application

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for creating astrology applications.

Task 4: Develop a frontend framework which showcases the inserted result with IONIC

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

17. Horoscope Application and Website

A Horoscope application and website is slightly different from a social media project framework. However, it also works on the same grounds as the latter and may require full-stack development. You can practice and improve your front- and back-end development skills when making horoscope applications and websites.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the predictions made.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the sunshine.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the UI & user Interaction and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task 1: Develop the framework for creating the horoscope application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for horoscope application and website

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for horoscope application and website

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for horoscope application and website

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

18. Stock Inventory Application

Stock Inventory Tool or System is a significant factor that plays a crucial role in managing the stock reviewed. You can use the full stack development items and other drag-and-drop interfaces to create a web page that helps you add text, images, videos, and other elements required to create an Inventory.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the accuracy of the items selected.
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to select the articles, especially for those who may have difficulty physically maintaining their sale & purchase some.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered items are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the Inventory & user Journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task 1: Develop the framework for creating the Stock Inventory application with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for stock inventory application

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for developing the application

Task 5: Implement industry specific data modeling frameworks to enhance the backend specification like Ruby on rails, Laravel for stock inventory application

19. News Media Application

News Media application is a significant factor that plays a crucial role in keeping yourself updated. You can use the full stack development items and other drag-and-drop interfaces to create a web page that helps you add text, images, videos, and other elements required to create a news media application.

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily react and verify the legitimacy of the users onboarded
- Develop a full stack-based system that can offer Improved accessibility and can make it easier for people to add, remove, post etc. , especially for those who may have difficulty expressing their well-being in terms of words.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered people are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the mutual interaction between two or more individuals and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task 1: Develop the framework for creating the news media application with the project management tools like Java & kotlin for developing the application

Task 2: Enable the data with the system control of version based servers like SQL

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite for the application

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for developing the application

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment.

20. Job Search Application

Job Search application is a significant factor that plays a crucial role in keeping yourself updated. You can use the full stack development items and other drag-and-drop interfaces to create a web page that helps you add text, images, videos, and other elements required to create a job search portal

Learning outcome:

- Develop a full stack-based system that can offer high-end webpage through the use of front-end techniques, as well as the visibility to easily post and verify the accuracy of the candidates.
- Develop a full stack-based system that can offer improved accessibility and can make it easier for people to apply for the jobs, especially for those who may have difficulty physically hustling for applying resumes.
- Develop a full stack-based system that can offer enhanced transparency and can make the user journey more transparent, as all registered users are recorded and verified on a publicly-available ledger.
- Develop a full stack-based system that can offer greater efficiency and can streamline the candidate and recruiter journey and reduce the time and resources required to complete the process.
- Develop a full stack-based system that can offer enhanced accuracy and can reduce the risk of faults and errors in the Journey, as the registration is recorded and verified electronically.

Task 1: Develop the framework for creating the job search portal with the project management tools like Java & kotlin

Task 2: Enable the data with the system control of version based servers like SQL for developing job search application

Task 3: Design the database server to resemble the implementation of MongoDb, SQLite

Task 4: Develop a frontend framework which showcases the inserted result with IONIC for the application

Task 5: Implement industry specific hosting using cloud at AWS, to ensure the microservices functionality and deployment