Curriculum Structure & Syllabi

(As per National Education Policy 2020)

of

B. Tech.

in

Information Technology

(w.e.f. 2021-22)

Vision

Mission

Program Educational Objectives

Program Outcomes

Program Specific Outcomes

Overall Credit Structure

Curriculum

Syllabus

Offered By

DEPARTMENT OF INFORMATION TECHNOLOGY AND COMPUTER APPLICATION

M. M. M. UNIVERSITY OF TECHNOLOGY

GORAKHPUR-273 010, UP

August 2022

CURRICULA & SYLLABI

B. Tech. Information Technology

VISION

To become pioneer in the field of Information Technology and Computer Applications at global level by imparting quality education with excellent teaching-learning processes and research methodologies.

MISSION

Mission-1 To offer state-of-art education in Information Technology to keep pace with industry requirements.

Mission-2 To promote quality research in the field of IT and its applications.

Mission-3 To ensure the holistic development of the students by inculcating value based socially committed professionalism.

PROGRAMME EDUCATIONAL OBJECTIVES (PEOs)

PEO-1 To inculcate the fundamental knowledge of Mathematics, Science & Engineering disciplines for developing the ability to formulate, solve and analyse the problems of Information Technology field and to provide them the skills for the pursuit of under-graduate studies, research &development and higher education.

PEO-2 To provide the understanding of the prerequisite of the software, technical aspects, and design for coming up with the novel engineering solutions and efficient product developments.

PEO-3 To assist the students in the pursuit of the successful career by adopting the ethical practices and social responsibility.

PEO-4 To provide students the technical as well as soft skills required by the national as well as international organizations.

PEO-5 To elevate cognizance in the students towards the lifelong learning and to inculcate the ethical and moral values.

PEO-6 To give students the knowledge of the contemporary technologies, practical experiences, and possibilities in the field of Information Technology to provide the multidisciplinary knowledge to develop the team spirit and leadership qualities by working on multidisciplinary projects.

PROGRAMME OUTCOMES (POs)

PO-1 The students will develop the ability towards the application of fundamental knowledge of hardware, computing, algorithms, and programming for developing the solutions of the critical problems of computer applications. **(Rudimentary analytical skills)**

PO-2 The students will be able to model and carry out the experiments by using the fundamental knowledge of computing techniques and derive the conclusions by analysing and interpreting the data. **(Computing skills)**

PO-3 The students will be able to analyze, design, implement and assess a computer-based information system, procedure, module, or program to fulfill the requirements along with the consideration of economical, privacy and reliability constraints. **(Innovative skills)**

PO-4 The students will be able to perform efficiently in teams. **(Team spirit)**

PO-5 The students will develop the analytical skills to critically analyze, recognize, formulate, and devise solutions to the computing problems by using the adequate computing skills and knowledge. **(Problem solving skills)**

PO-6 The students will have the awareness towards the professional, legal, and ethical practices. **(Professional integrity)**

PO-7 The students will have the efficient speaking and written/interpersonal communication skills. **(Oral and written communication skill)**

PO-8 To impart the exhaustive education in the students required to understand and analyze the local and global consequences of computing solutions ranging from individuals and organizations to society. **(Computing consequences assessment skills)**

PO-9 The students will develop the realization of the requirements and the ability to indulge in maintaining professional growth and lifelong learning. **(Continuing education cognizance)**

PO-10 The students will have the cognition towards the current issues and problems of the society. **(Societal awareness)**

PO-11 The students will possess the ability to utilize the knowledge of innovative programming and computing equipment required for the problem-solving tasks. **(Pragmatic skills)**

PO-12 The students will be able to apply the design and evolution precepts in the development of software and hardware systems. **(Software hardware interface)**

PROGRAMME SPECIFIC OBJECTIVES (PSOs)

PSO-1 To produce strong Engineers with the latest knowledge and thinking.

PSO-2 To produce the strong engineers having decision-making, design, and development abilities.

PSO-3 To produce Engineers to serve the IT industries with strong analytical bent of mind, research, and innovative thinking.

PSO-4 To promote the students for higher studies and lifelong learning.

PSO-5 To develop the skill of implementing the interdisciplinary application software projects to meet the demands of industry requirements using latest tools and technologies.

PSO-6 To develop analytical skills in the Engineers for analysing the societal needs and providing the novel solutions through technological based research.

PSO-7 To get the knowledge for appearing in the National and International level Exams GRE/GATE, Public-Private sectors, and further higher studies in India and abroad.

PSO-8 To develop professional skills and latest technical knowledge time to time by conducting Board of Studies (BOS), updating syllabus to keep pace with the demands of industries for maximising the employability.

Syllabus and Credit Structure for B. Tech. (Information Technology)

(Session 2021-2022 and onwards)

OVERALL CREDIT STRUCTURE FOR B.TECH. (IT) PROGRAM

Credit Courses			
Core Courses (CC)		**Electives Courses (EC)**	
Category	**Min. Credits**	**Category**	**Min. Credits**
Basic Sciences & Maths (BSM)	18	Program Electives (PE)	12
Engineering Fundamentals (EF)	18	Open Electives (OE) (Other Departments)	3
Professional Skill (PS)	4		
Program Core (PC)	65	Humanities & Social Science elective (HSSE)	2
Management (M)	4		
Humanities & Social Science (HSS)	8		
Project (P)	5		
Seminar (S)	2		
Industrial Practice (IP)/ Industrial Elective (IE)	12		
Program link basic science and engineering courses (PLBSE) (To be decided by the department)	15		
Sub-total	**151**	**Sub-total**	**17**
Grand Total	**168**		

1. Extracurricular Activities Courses (ECA) Two compulsory courses from the following S.No (ii) to (v) non-credit courses: (i) Induction Program (compulsory) (ii) Skill development (iii) Unity and Discipline (NCC or NSS) (iv) Sports, Cultural and Games (v) Personality Development	**Non-Credit**
2. Audit Courses (AC) Two of the Audit Courses are compulsory	**Non-Credit**
3. Industrial Training (Mandatory)	**Non-Credit**
Minor Degree Courses (Optional) from any department	**Credits**
Department Minor (DM) Courses	18-20

Semester wise Credit Structure for B. Tech-IT

Category / Semesters	I	II	III	IV	V	VI	VII	VIII	Total
Basic Sciences & Maths (BSM)	4	5	5	4	-	-	-	-	**18**
Engineering Fundamentals (EF)	7	7	4	-	-	-	-	-	**18**
Professional Skill (PS)	2	2	-	-	-	-	-	-	**4**
Program Core (PC)	-	-	9	18	14	12	12	-	**65**
Management (M)	-	-	-	-	2	2	-	-	**4**
Humanities & Social Science (HSS)	4	4	-	-	-	-	-	-	**8**
Project (P)	-	-	-	-	-	2	3	-	**5**
Seminar (S)	-	-	-	-	-	2	-	-	**2**
Industrial Practice (IP) / Industrial Elective (IE)+Minor Project (MP)	-	-	-	-	-	-	-	12/(8+4)	**12/12**
Program link basic science and engineering courses (PLBSE) (To be decided by the department)	2	4	4	-	5	-	-	-	**15**
Program Electives (PE)	-	-	-	-	4	4	4	-	**12**
Open Electives (OE) (Other Departments)	-	-	-	-	-	-	3	-	**3**
Humanities & Social Science Elective (HSSE)	2	-	-	-	-	-	-	-	**2**
Total	**21**	**22**	**22**	**22**	**25**	**22**	**22**	**12**	**168**

Curriculum for B.Tech. (Information Technology)

(Newly admitted students from Session 2021-2022)

First Year, Semester I

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-104	Linear Algebra and Differential Equations	3	1	0	4
2.	EF	BIT-101	Fundamentals of Information Technology	3	1	0	4
3.	HSS*	BHM-102/152	Communication Skill-1	2	1	2	4
4.	PS	BIT-102	Software Tools-I	0	1	2	2
5.	PLBSE	BEC-105	Fundamentals of Electronics Engineering	2	0	0	2
6.	EF	BEE-105	Basic Concepts of Electrical Engineering	2	0	2	3
7.	HSSE**	BHM-104	Human Values & Professional Ethics-1	2	0	0	2
			Total	**14**	**4**	**6**	**21**
8.	ECA-I	ECA-100	Induction Program	-	-	-	**0**

First Year, Semester II

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	EF	BIT-151	Programming Fundamentals	3	1	2	5
2.	BSM	BSM-157	Graph Theory and Discrete Mathematics	3	1	2	5
3.	PS	BIT-152	Software Tools-II	0	1	2	2
4.	EF	BIT-153	Linux Lab	0	1	2	2
5.	HSS*	BHM-103/153	Communication Skill-2	2	1	2	4
6.	PLBSE	BSM-156	Applied Probability and Statistics	3	1	0	4
			Total	**11**	**6**	**10**	**22**
7.	ECA-II			**-**	**-**	**-**	**0**

Second Year, Semester III

S. N.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-204	Applied computational Methods	3	1	2	5
2.	EF	BIT-201	Switching Theory & Logic Design	3	1	0	4
3.	PC	BIT-202	Data Structures	3	1	2	5
4.	PC	BIT-203	Object-Oriented Programming	3	0	2	4
5.	PLBSE	BIT-204	Software Engineering	3	0	2	4
			Total	**15**	**3**	**8**	**22**
6.	ECA-III			-	-	-	0
7.	AC			1/2	-	-	0

Second Year, Semester IV

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	BSM	BSM-255	Optimization Technique	3	0	2	4
2.	PC	BIT-251	Database Management System	3	0	2	4
3.	PC	BIT-252	Computer Organization & Architecture	3	0	2	4
4.	PC	BIT-253	Computer Network	3	1	2	5
5.	PC	BIT-254	Python Programming	3	1	2	5
			Total	**15**	**2**	**10**	**22**
6.	ECA-IV			**-**	**-**	**-**	0
7.	AC			1/2	-	-	0
8.	DM			3	1	0/2	4/5

Third Year, Semester V

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	M	BHM-301/351	Engineering & Managerial Economics	2	0	0	2
2.	PC	BIT-301	AI and Machine Learning	3	1	2	5
3.	PC	BIT-302	Operating System	3	0	2	4
4.	PC	BIT-303	Design & Analysis of Algorithm	3	1	2	5
5.	PE1	BIT 326-328	Program Elective-1	3	1/0	0/2	4
6.	PLBSE	BIT-304	Java Programming	3	1	2	5
			Total	**17**	**4/3**	**8/10**	**25**
7.	ECA-V			-	-	-	0
8.	DM			3	1	0/2	4/5

Third Year, Semester VI

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	M	BHM-354	Business Management	2	0	0	2
2.	PC	BIT-351	Wireless Sensor Network & IoT	3	0	2	4
3.	PC	BIT-352	Cryptography & Cyber Security	3	0	2	4
4.	PC	BIT-353	Cloud Computing	3	0	2	4
5.	PE2	BIT 376-378	Program Elective-2	3	1/0	0/2	4
6.	P	BIT-370	Project Part-I	0	0	4	2
7.	S	BIT-380	Seminar	0	0	4	2
			Total	**14**	**1/0**	**14/16**	**22**
8.	ECA-VI			-	-	-	0
9.	DM			3	1	0/2	4/5

Final Year, Semester VII

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	PC	BIT-401	Data Science and Analytics	3	1	0	4
2.	PC	BIT-402	Distributed Systems	3	0	2	4
3.	PC	BIT-403	Blockchain Technology and its Applications	3	0	2	4
4.	PE3	BIT 426-428	Program Elective-3	3	1/0	0/2	4
5.	OE[#]		Open Elective	2	1	0	3
6.	P	BIT-440	Project Part-II	0	0	6	3
			Total	**14**	**3/2**	**10/12**	**22**
7.	ECA-VII			-	-	-	0
8.	DM			3	1/0	0/2	4/5

#To be taken from the other department.

Final Year, Semester VIII

S. No.	Category	Paper Code	Subject	L	T	P	Credit
1.	IP	IIT-400	Industrial Practices	0	0	24	12
	Without Industrial Practices (IP)						
2.	MP	BIT-480	Minor project	0	0	8	4
	IE-1	IIT 401-402	Industrial Elective-1	3	1/0	0/2	4
	IE-2	IIT 405-406	Industrial Elective-2	3	1/0	0/2	4
			Total	**0/6**	**0/2**	**24/8**	**12**
3.	DM	SIT-421	Research Project*	0	0	4	2

*For Theory based Department Minor only

Note: Department may consider PE1, PE2, PE3 to be taught through MOOCs. The MOOC courses may replace any Program Core (PC) subject if the course content of MOOCs courses matches more than 75% with the course content of PC subject.

Programme Electives (PE-I)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	BIT-326	Android Programming	3	0	2	**4**
2	BIT-327	Computer Vision	3	0	2	**4**
3	BIT-328	Mobile Computing	3	1	0	**4**

Programme Electives (PE-II)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	BIT-376	Compiler Design	3	1	0	4
2	BIT-377	Deep Learning	3	1	0	**4**
3	BIT-378	Data Mining & Warehousing	3	1	0	**4**

Programme Electives (PE-III)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	BIT-426	Social Networks	3	1	0	**4**
2	BIT-427	Digital Forensics	3	0	2	**4**
3	BIT-428	Reinforcement Learning	3	1	0	**4**

Industrial Elective (IE-1)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	IIT-401	Full Stack Development	3	0	2	**4**
2	IIT-402	Getting Started with Competitive Programming	3	0	2	**4**

Industrial Elective (IE-2)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	IIT-405	Arduino Programming	3	0	2	**4**

2	IIT-406	Simulation and Modelling	3	0	2	**4**

Open Electives for other department (OE)

Sr.	Paper Code	Subject Name	L	T	P	Cr.
1	OIT-401	Network and Cyber Security	2	1	0	**3**

List of Audit Courses (AC)

S.No.	Subjects	Codes
1.	Constitution of India	AUC01
2.	Indian Culture and Heritage	AUC02
3.	Indian Architecture	AUC03
4.	Indian Festivals	AUC04
5.	Vaidic Mathematics	AUC05
6.	Astronomy	AUC06
7.	Arts of India	AUC07
8.	Intellectual Property Right	AUC08
9.	Human Rights	AUC09
10.	Logical Research	AUC10
11.	Professional Ethics	AUC11
12.	Environmental Law	AUC12
13.	Health Law	AUC13
14.	National Cadet Corps	AUC14
15.	Basics of Human Health and preventive medicines	AUC15

**Note: Detailed syllabus of Audit Courses (AC) is attached as Annexure-01.

List of Extra Curricular Activity (ECA) Courses

ECA-II						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-I	ECA-151	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)-I	ECA-171	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-I	ECA-172	2	0
4.	Open to all Branches	ECA	Games & Sports-I	ECA-181	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-I	ECA-182	2	0

ECA-III

S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-II	ECA-201	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)- II	ECA-221	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-II	ECA-222	2	0
4.	Open to all Branches	ECA	Games & Sports-II	ECA-231	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-II	ECA-232	2	0

ECA-IV

S. No.	Branch	Category	Subject Name	Subject Code	Hours/Week	Credit
1.	Open to all Branches	ECA	Skill Development-III	ECA-251	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)- III	ECA-271	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)- III	ECA-272	2	0
4.	Open to all Branches	ECA	Games & Sports-III	ECA-281	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-III	ECA-282	2	0

ECA-V

S. No.	Branch	Category	Subject Name	Subject Code	Hours/Week	Credit
1.	Open to all Branches	ECA	Skill Development-IV	ECA-301	2	0
2.	Open to all Branches	ECA	Unity and Discipline (NCC)- IV	ECA-321	2	0
3.	Open to all Branches	ECA	Unity and Discipline (NSS)-IV	ECA-322	2	0
4.	Open to all Branches	ECA	Games & Sports-IV	ECA-331	2	0
5.	Open to all Branches	ECA	Cultural, Art & Literary-IV	ECA-332	2	0

ECA-VI

S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-V	ECA-351	2	0

2.	Open to all Branches	ECA	Games & Sports-V	ECA-381	2	0
3.	Open to all Branches	ECA	Cultural, Art & Literary-V	ECA-382	2	0

ECA-VII						
S. No.	Branch	Category	Subject Name	Subject Code	Hours/ Week	Credit
1.	Open to all Branches	ECA	Skill Development-VI	ECA-401	2	0
2.	Open to all Branches	ECA	Games & Sports-VI	ECA-431	2	0
3.	Open to all Branches	ECA	Cultural, Art & Literary-VI	ECA-432	2	0

**Note: Detailed syllabus of Extra Curricular Activity (ECA) Courses is attached as Annexure-02.

FRAMEWORK FOR THE IMPLEMENTATION OF MOOC COURSES IN B. TECH. PROGRAMME

As per the guidelines given by AICTE via GO. No. AICTE/P&AP/SWAYAM/2016 dated 17th August 2016, M. M. M. University of Technology Gorakhpur has decided to implement 20% subjects/courses from MOOCs from SWYAM portal in the curricula of B. Tech programme offered by University from the session 2022-23 onwards. The framework for incorporating the MOOC courses in the curricula of B. Tech programme is given below.

1. The MOOC Courses of Swayam portal will be offered in:
   (a) B. Tech-IInd semester for HSSE Courses of Humanities & Management Science Department.
   (b) B.Tech-IIIrd and IVth semester for Audit Courses (AC) of Humanities & Management Science Department.
   (c) B.Tech-Vth, VIth & VIIth semester as Program Elective (PE) Course of respective Engineering Departments.
   (d) B. Tech-VIIIth semester for Industrial Elective (IE) Course of respective Engineering Departments.
2. It has been indicated in the above GO of AICTE that MOOC Courses of Swayam portal will be announced on 1st June for odd semester and 1st November for the even semester every year. After the announcement of the subjects on Swayam portal, each department of University will identify the subjects against each of the MOCC courses in respective semester from the Swayam portal and send the list of identified subjects to the office of Dean UGS & E after the approval of BOS of respective department. Dean UGS & E will notify the same and notification will be uploaded on the University website well in advance so that students may get registered in the subject in time.

3. Concern department will nominate one of its faculty as a departmental MOOCs Coordinator for each of the MOOC Course and same will be intimated to Dean UGS & E along with the teaching load of the department. The departmental MOOCs Coordinator will be responsible for the registration, assignment submission, term end examination and result of the students who have opted MOOC courses.
4. For the reimbursement of MOOCs registration fee, student will write an application addressed to Dean UGS & E through the concerned Head of Department and departmental MOOCs Coordinator along with the receipt of MOOCs registration fee and admit card/hall ticket. The application of student for the reimbursement of fee will be entertained only if it is recommended by concerned MOOCs Coordinator and Head of Department.
5. Credit will be defined as per clause 6.1.5.5 of B. Tech ordinance for the MOOC Courses on Swayam portal in which credit is not mentioned,
6. If better practical facility is available at virtual lab of different premier institution of national and international importance, then the practical facility of that subject could be availed through the virtual lab. In any practical based subject, if practical lab is not assigned and better practical facility is available on virtual lab then it may be conducted on the virtual lab and one credit will be added through the BOS of concerned department.
7. The evaluation scheme for practical based subjects conducted through virtual lab will be same as the existing evaluation scheme of practical courses of the University.

Syllabus

BSM-104 Linear Algebra and Differential Equations

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Two Minor tests and One Major Theory Examination
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use of basic differential operators in various engineering problems.
2. To understand the concept of convergence and divergence of sequences.
3. Solve linear system of equations using matrix algebra.
4. Application of ordinary differential equations in various engineering problem.
5. To know the applications of double and triple integration in finding the area and volume.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Sequences and Series of Real Numbers Sequence of real numbers, convergence of sequences, bounded and monotone sequences, convergence criteria for sequences of real numbers, Cauchy sequences, sub sequences, Bolzano-Weierstrass theorem. Series of real numbers, absolute convergence, tests of convergence for series of positive terms, comparison test, ratio test, and root test; Leibniz test for convergence of alternating series.

UNIT-II 9

Linear Algebra: Symmetric, Skew-symmetric matrices, Hermitian, Skew Hermitian Matrices, orthogonal and unitary matrices and basic properties, linear independence and dependence of vectors, Rank of Matrix, Inverse of a Matrix, Elementary transformation, Consistency of linear system of equations and their solution, Characteristic equation, Eigenvalues, Eigenvectors, Cayley-Hamilton theorem, Diagonalization of matrices.

UNIT-III 9

Functions of Two or Three Real Variables: Limit, continuity, partial derivatives, differentiability, Taylors Theorem, maxima, and minima. **Integral Calculus:** Double and triple integrals, change of order of integration, change of variables, calculating surface areas and volumes using double integrals, Dirichlet's Integral, calculating volumes using triple integrals.

UNIT-IV 9

Differential Equations: Linear differential equations with constant coefficients ($n^{th} order$), complementary function and particular integral. Simultaneous linear differential equations, solution of second order differential equations by changing dependent and independent variables, Method of variation of parameters.

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers
2. Erwin kreyszig: Advanced Engineering Mathematics, John Wiley & Sons.

3. R. K. Jain and Iyenger: Advanced Engineering Mathematics, Narosa Publications.

4. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd.,

BIT-101 FUNDAMENTALS OF INFORMATION TECHNOLOGY

Course category : Engineering Fundamentals (EF)
Pre-requisite Subject :NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical:0
Number of Credits : 4
Course Assessment methods :Continuous assessment through tutorials, attendance, home assignments, quizzes, Two Minor test and Major Theory Examination

Course Objective: Students will gain an understanding of the fundamentals of hardware, software, number systems, operating systems and computer networks.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. understand the basics of computers Hardware/Software
2. understand the execution methodology of the programming languages
3. understand the techniques of different number systems
4. know the importance and algorithms of lossy and lossless data compression
5. learn the basic concepts of operating system
6. learn the fundamentals of computer networks

TOPICS TO BE COVERED

UNIT-I **09**

Introduction to Computer Hardware/Software: Processor, Motherboard, I/O Devices, peripherals, Memory Types & Hierarchy: Cache, Primary & Secondary memories with examples, Concept of Computer Languages: Low-Level, Assembly and High-Level, System Software: Assembler, Compiler, Interpreter, Loader/Linker

UNIT-II **09**

Data & Information, Digital representation of Information, Number Systems & Comparisons: Binary, Octal, Decimal, Hexadecimal, Text Representation: ASCII, EBCDIC, Unicode, Multimedia Data, Data Compression Types and Techniques: Lossy / Lossless, Huffman, Shannon-Fano, Dictionary Based Compression techniques

UNIT-III **09**

Operating System: Concept, Functions, Types, Single-user/Multi-user operating system, Architectural differences, Shell fundamentals, Exemplary commands: Internal & External, Basics of Primary and Secondary Memory Management

UNIT-IV **09**

Network Basics: Concept, Types, Transmission modes, Topologies, OSI & TCP/IP Models: Functions of different Layers, concept of MAC, IP (Private/Public) and TCP addresses, Basic Introduction to CSMA/CD, IP & TCP/UDP and HTTP Protocols, Current Internet Applications

Textbooks

1. Mark Nelson and Jean-Loup Gailly "The Data Compression Book", M&T Books, A Division of MIS: Press, Inc.
2. K Sayood, "Introduction to Data Compression" 3/e, Elsevier2006
3. Forouzan, Data Communication and Networking,TMH
4. Silberschatz, A., Galvin, P. and Gagne, G., Applied Operating Systems Concepts, John Wiley& SonsInc.

BHM-102/152 **COMMUNCATION SKILLS - I**

Course Category: Humanities & Social Science (HSS)
Pre-requisite Subject: None
Contact hours/week: 05 Hours Per Week
No of Credits: Lecture: 2, Tutorial: 1, Practical: 2 (Total Credit: 04)
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor test and one Major Theory Exam.

Course Objective: The course aims:

To sensitize the students to understand the role & importance of communication for personal & professional success and enable learners to exhibit knowledge, skills, and judgment in and around human communication that facilitate their ability to work collaboratively with others in an interpersonal environment.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1) Use of various facets of communication skills, such as, Reading, Writing, Listening and speaking skills.
2) To identify, formulate and solve the real-life problems with positive attitude.
3) To inculcate the habit of learning and developing the communication and soft skills by practice.
4) To create an amicable ambience to make them learn the different part of English language with the correction of the language.
5) Enhancing word power by counselling scientific literature.
6) Focusing on effortless speaking and writing.

Unit I: - Art of Good Communication

1. **Introduction**
   - ✓ Verbal & Non-Verbal Communication
   - ✓ Difference between Oral and Written Communication
   - ✓ 7'Cs of Effective Communication
   - ✓ Importance of Effective Communication

Unit II: - Acquisition of Effective Communicative Skills by the application of English Grammar and Composition

1. **Introduction**
   - ✓ Clarity, Consistency and Economy of using words in sentences
   - ✓ Different Patterns of Verbs, Nouns and Adjectives in writing variety of sentences
   - ✓ Different Orders/Methods to be followed in composition of sentences and paragraphs

Unit III: - Body Language and Communication

1. **Introduction**
   - ✓ Non-Verbal Communication
   - ✓ Types of Body Language
   - ✓ Functions of Body Language
   - ✓ Role of Body Language
   - ✓ Proxemics

Unit IV: - Team and Group Discussion

1. **Introduction**
   - ✓ Team Behaviour
   - ✓ Types of Teams
   - ✓ Team Roles and Behaviour
   - ✓ Group Discussion
   - ✓ Do's and Don't

References:

1. Bansal, R.K. & Harrison J.B., (1972) *Spoken English*, Orient Longman, India.

2. Chauhan, Narender Kr. & Singh, Sudhir N., (2013) *Formal Letters*, Pankaj Publication International, New Delhi.

3. Chhabra T.N., (2019) *Business Communication*, Sun India Publication, New Delhi.

4. Dixon Robert J., (1986) *Complete Course in English*, Prentice Hall of India, New Delhi.

5. Jones, Daniel., (2012) *Cambridge English Pronouncing Dictionary*, 18th Edition, Paperback, CUP, India.

6. Lewis, Norman, (2015) *Word Power Made Easy*, Penguin India.

7. Sethi J. & Jindal, (1993) *Handbook of Pronunciation of English Words* - D.V.A, Prentice Hall of India, New Delhi.

8. Sharma R.C. & Mohan Krishna, (2017) *Business Correspondence and Report Writing*, Tata McGraw Hill.

Thomson, A. J. & and Martinet A. V., (1997) *A Practical English Grammar*, Paperback, Ed. IVth, Oxford.

BIT-102 **SOFTWARE TOOLS-I**

Course category : Professional Skill (PS)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 0, Tutorial: 1, Practical:2

Number of Credits : 2
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, and Major Practical Examination

Course Objective: Students will gain an understanding of the fundamentals of web designing languages viz., HTML, CSS and JavaScript.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Discuss the process of editing a web page using text editors
2. Discuss the process of editing a web page using web page editors.
3. Cover commonly used HTML tags
4. Discuss the importance of HTML to a web designer
5. Demonstrate an understanding of basics of CSS
6. Understand the basics of Java Script

Experiments are based on the following topics

HTML

Learning the basic structure of HTML Document, HTML basic elements like title, head, body, metadata, script, no script, working with elements and attributes used to format web page like Horizontal Rules and line breaks and paragraph, working with citation, quotation, definitions and comments, types of Tags in HTML, Aligning text, exploring the hyperlinks and linking to a mail system, exploring the link relations, Working with Images and embedding media like video, audio etc., formatting text with HTML physical style elements, formatting text with HTML logical style elements, Displaying Plain, Bold, Italic, Small, Subscripted, Superscripted text, Displaying Program Code, Program Output, Keyboard text, Emphasizing text, Defining New Terms, Short and long Quotations, Tables, frames and lists, Form Elements like Action, Id, On submit, on reset, Target Attribute, Form Controls Like Text Inputs, Button, Check Boxes, Radio Buttons, Select, File Select, understanding GET and POST

CSS

Introduction to CSS and syntax, Learning about Selectors, CSS properties like text controlling, text formatting and positioning, CSS pseudo class and pseudo elements, working with gradients, media query, shadows, rounded corners etc., Introduction to CSS framework – Bootstrap

JavaScript

Overview, JavaScript Versions, Incorporating JavaScript in the <head> and <body> element, JavaScript using External JavaScript file, learning JavaScript syntax, comments, variables and

operators, Type Conversion, control statements such as if...else, switch, break and continue, looping statements such as while, do...while, for ,Popup boxes such as Alert, Confirm, and Prompt, JavaScript Events - on click, on load, on reset, on submit, on dbl click, on mouse over, on mouse out, on mouse move, on mouse up, on mouse down etc.

EXPERIMENTS

HTML

1. Introduction to basic HTML elements.
2. Use table tag to format web page. Also create the Time Table of your class using table tag.
3. Write an HTML document with an example of Ordered List and Unordered List..

4. Write an HTML document with an example of Table format to print your Bio-Data..
5. Write an HTML document with an example of Table format to print your Telephone Bill.

CSS

1. Design a CSS to create menu.
2. Design a webpage i.e. Bio data using CSS.
3. WAP to create table and list using CSS.
4. To create a web page that displays college information using various Style sheets.
5. Write a program to Use different font, styles: In the style definition you define how each selector should work (font, color etc.). Then, in the body of your pages, you refer to these selectors to activate the styles.

JavaScript

1. Embedding JavaScript in HTML pages.
2. Design a registration form and validate its field by using JavaScript.
3. To design the scientific calculator and make event for each button using JavaScript.
4. WAP to create popup boxes in JavaScript.
5. Program to create a class calculator that contains an overloaded method called "add" to calculate the sum of two integers, two float numbers and, one integer and one float.

BEC-105 Fundamentals of Electronics Engineering

Course category : PLBSE
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 2, Tutorial: 0, Practical: 0
Number of Credits : 2
Course Assessment methods : Continuous assessment through, attendance, home assignments, quizzes, practical work, record, viva voce, two minor test and one major theory Examination
Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand the basic concept of Electronics Engineering.
2. Able to identify schematic symbols and understand the working principles of electronic devices, e.g., Diode, Zener Diode, semiconductor sensors, BJT, JFET and MOSFET etc.
3. Able to understand the working principles of electronic circuits e.g., Rectifiers, Clipper, Clamper, Amplifiers and Operational Amplifiers etc.
4. Understand methods to analyse and characterize the electronic circuits.
5. Able to understand the functioning and purposes of Measuring equipment such as multimeter, CROs and function generator sets.
6. Able to rig up and test small electronics circuits.

Topics Covered

UNIT-I **6**

Semiconductor materials and properties: electron-hole concepts, Basic concepts of energy bands in materials, Intrinsic and extrinsic semiconductors, p-n junction diode, V-I characteristics of p-n junction diode, Shockley equation of diode. Diode Applications in rectifier, clipper, and clamper circuits. Breakdown mechanism and characteristics (Zener and avalanche), Zener diode application.

UNIT-II **6**

Basic construction, transistor action, CB, CE and CC configurations, input/output characteristics, Biasing of transistors, comparison of biasing circuits, Concept of early effect, Ebers-Moll model. Applications of BJT as an amplifier and switch, Graphical analysis of CE amplifier, concept of voltage gain, current gain, h- parameter model (low frequency).

UNIT-III **6**

JFET: Basic construction, transistor action, concept of pinch off, input and transfer characteristics, characteristic equation CG, CS and CD configurations, fixed & self-biasing. MOSFET: depletion and enhancement type MOSFET-construction, operation, and characteristics. Concept and applications of CMOS circuits.

UNIT-IV **6**

Basics of semiconductor sensors and integrated circuits (IC). Operational Amplifiers: Concept of ideal operational amplifiers, ideal op-amp parameters, inverting, non-inverting and unity gain amplifiers, adders, difference amplifiers, integrators. Electronics Instruments: Working principle of digital voltmeter, digital multimeter, cathode ray oscilloscope (CRO).

List of Books:

1. Robert L. Boylestand / Louis Nashelsky "Electronic Devices and Circuit Theory", Latest Edition, Pearson Education.
2. H S Kalsi, "Electronic Instrumentation", Latest Edition, TMH Publication.
3. George Kennedy, "Electronic Communication Systems", Latest Edition, TMH.
4. David A. Bell, "Electronic Devices and Circuits", Latest Edition, Oxford University Press.
5. Jacob Millman, C.C. Halkias, Staya brataJit, "Electronic Devices and Circuits", Latest Edition, TMH.
6. David A. Bell, Electronic Instrumentation and Measurements, Latest Edition, Oxford University Press India.

BEE-105 **Basic Concepts of Electrical Engineering**

Course category : Engineering Fundamentals (EF)

Pre-requisite Subject : NIL

Contact hours/week : Lecture: 2, Tutorial: 0, Practical: 2

Number of Credits : 3

Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce and two minor test and One Major Theory & Practical Examination.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course

1. Understand the basic properties of electrical elements.
2. Solve problem based on basic electrical circuits & DC network theorems.
3. Understand the fundamental behaviour of AC circuits and solve AC circuit problems.
4. Explain operative principle of transformer with background of magnetic circuits.
5. Understand the basics of semiconductor sensors and integrated circuits (IC).
6. Understand the working principles of various Electronic Instruments.

Topic Covered

UNIT I

D C Circuit Analysis:

Circuit Concepts: Concepts of network, Active and passive elements, Voltage and current sources, Concept of linearity and linear network, Unilateral and bilateral elements, R, L and C as linear elements, Source transformation, Kirchhoff's laws, Loop and nodal methods of analysis, Star-delta transformation. **6**

UNIT II

Network Theorems: **6**

Superposition theorem, Thevenin's theorem, Norton's theorem, Maximum Power Transfer theorem.

UNIT III

Single-Phase AC Circuits **6**

AC fundamentals: Sinusoidal, square and triangular waveforms – Average and effective values, Form and peak factors, Concept of phasor, phasor representation of sinusoidally varying voltage and current, Analysis of series, parallel and series-parallel RLC Circuits, Resonance in series and Parallel circuit

UNIT IV

Magnetic Circuit & Single-Phase Transformers: **6**

Magnetic circuit, concepts, analogy between electric & magnetic circuits, B-H curve, Hysteresis and eddy current losses.

Single Phase Transformer: Principle of operation, Construction, EMF equation, Power losses, Efficiency.

EXPERIMENTS

Verification of Kirchhoff's Law.
Verification of Norton's Theorem.
Verification of Thevenin's Theorem.
Verification of Maximum Power Transfer Theorem.
Verification of Series& Parallel R-L-C circuit.
To perform O.C. and S.C. test of a single phase transformer.

Text Books:

1. Fundamentals of Electric Circuits, C.K. Alexander and M.N.O. Sadiku; TATA McGraw-Hill.
2. Principles of Electrical Engineering, V. Del Toro; Prentice Hall International.
3. Electrical and Electronics Technology, Edward Hughes; Pearson.
4. Basic Electrical Engineering, D P Kothari, I.J. Nagarath; Tata McGraw Hill
5. Electrical Technology, B. L. Thareja and A. K. Thareja; S. Chand.

BHM-104/154 HUMAN VALUES & PROFESSIONAL ETHICS-1

Course Category: Humanities & Social Science Elective (HSSE)
Pre-requisite Subject: None
Contact hours/week: Lecture: 2, Tutorial:0, Practical: 0
No of Credits: 2
Course Assessment Methods: Continuous assessment through, attendance, home assignments, quizzes and two minor test, one major theory examination.

Course Objective: The Course aims:

To give basic insights and inputs to the students to inculcate Human values to grow as a responsible human being with holistic personality and enable them to understand and

appreciate versatility and universality of human values and their pivotal role in professional field.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1) To create conducive environment for professionals to grow as good and responsible human beings imbibing values and ethics.
2) Understanding the significance of environment.
3) Developing humanitarian outlook.
4) Able to understand nature of the individual and legal aspects of environment.
5) Understanding g major ideas, values, beliefs, and experiences.
6) These issues will help to sensitise students to be broader towards the social, cultural and human issues involved in social changes.

UNIT-I

Origin, Meaning, and Definition of Value, Types of Values, Individual Value, Family Value, Societal Value, Human Value, Value in Education System, Understanding Happiness and Prosperity, Self-Exploration and Natural Acceptance.

UNIT-II

Harmony in family, Harmony in Society, Values Leading to Harmony, Creating a world family, Harmony in Nature, Environment and Sustainable Developmental, Legal aspects of Environment, Holistic Perspectives of Values, Existence and Co-existence.

UNIT-III

Origin, Meaning and Definition of Ethics, Ethics: The science of the Morality of The Art of Correct Living, Ethics in Human Acts, Ethics and Religion, Ethical Norms and Laws, Ethics in Literature, Ethics in Science and Technology.

UNIT-IV

Ethical Approaches: Theistic Approach, Atheistic Approach, General and Special Ethics, Professional Ethics: Ethics at work-place, Ethics as Skill, Values and Ethics, Ethics with Value Education, Managerial and Business & Corporate Ethics, Corporate Social Responsibilities.

References:

1. Bangaria, G. P et.al, (2010) *A foundation course in Human Values and Professional Ethics*, Excel books.
2. Govindrajan, M. (2013) *Professional Ethics and Human Values*, Eastern Economy Edition.
3. Naagrazan, R.S. (2018) *Textbook on Professional Ethics and Human Values*, New age International. Misra, Anuranjan and Shukla, Dr. R.K., *Human values and Professional Ethics*.
4. Fernando, A. C., (2009) *Business Ethics: An Indian Perspective*, Pearson, India.

BIT-151 PROGRAMMING FUNDAMENTALS

Course category	: Engineering Fundamentals(EF)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical:2
Number of Credits	: 5
Course Assessment methods	:Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor test and one Major Theory and practical examination.

Course Objective: Students will gain an understanding of the fundamentals of computers and programming. The objective is to prepare them for various dimensions of C Programming language.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Describing the basics of terminologies used in computer programming.
2. Practicing C language programming by writing, compiling and debugging the code.
3. Designing programs involving simple statements, conditional statements, iterative statements, array, strings, functions, recursion and structure.
4. Discussing the dynamic memory allocations and use of the pointers.
5. Applying basic operations on files through programs.
6. Studying and implementing the codes using macros, pre-processor directives and command line arguments

TOPICS TO BE COVERED

UNIT-I **09**

Basics of Computers and Programming: Functional diagram of computer; Language Processors; Approaches to problem solving, Concept of algorithm and flow charts. **Simple Statements:** Data types; Tokens and its types; Variable declaration and initialization; User defined type declaration: type def, enum; Comments; Format specifiers; Standard I/O: taking input and displaying output; **Operators:** types, precedence and associativity; Expressions; Type conversion, Cshort-hands.

UNIT-II **09**

Conditional Statements: Simple if, if-else, nested if-else, else-if ladder, switch statements, nested switch, advantages of switch over nested if, restrictions on switch values. **Iterative Statements:** Concepts of entry and exit controlled loops; Uses of for, while and do while loops; Nested Loops; Printing various patterns using nested loops; Using break, continue and goto statements.

UNIT-III **09**

Arrays: Single-dimensional, multi-dimensional array and their applications; declaration and manipulation of arrays; strings and string handling functions. **Pointers:** Pointer and address arithmetic; dereferencing; pointers and arrays; dynamic memory allocation and de-allocation. **Functions:** Function prototype; Arguments and its types: actual, formal and default arguments; Scope of a variable; Argument passing methods; Passing pointer as the function argument;

Recursion: types, advantages and disadvantages; Storage class specifies; Character test functions.

UNIT-IV **09**

Structure: Declaring and defining structures; Array within structure; Array of structure; Defining and using some data structures: Stack, Queue, and Linked lists. **File Handling:** Types of files; Text files and different operations on text files, opening a file, closing a file; Data structure of a file; EOF; I/O operations on files; Random access to the files. **Standard C Pre-processors & C Library:** Pre-processor, Directives, Macro, Macro substitution; Conditional Compilation; Command Line Arguments; Standard C Library.

Textbooks

1. Brian W. Kernighan and Dennis M. Ritchie, "The C programming language", Pearson
2. E. Balagurusamy, "Programming in ANSI C", McGraw Hill Education
3. Yashavant Kanetkar, "Let Us C", bpb publication
4. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", Pearson
5. Herbert Schildt,"C: The Complete Reference", McGraw Hill Education

EXPERIMENTS

Implementing programs in following categories using programming language 'C':

1. Programs of simple statements, conditional statements, and iterative statements with the applications.
2. Programs of single and multi-dimensional arrays and their applications.
3. Programs of strings and the applications
4. Programs of pointer and the applications
5. Programs of function and the applications
6. Programs of structure and the applications
7. Codes of file handling and management
8. Codes with Pre-processor, Macro, Conditional Compilation and Command Line Arguments

BSM-157 Graph Theory and Discrete Mathematics

Course category	:	Basic Sciences & Maths (BSM)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record file, two minor tests and One Major Theory & Practical Examination.
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use logical notation to define different function such as set, function and relation.

2. Use of basic properties of group theory in computer science.
3. Use of graph theory models to solve problems of connectivity and constraint satisfaction.
4. Use of induction hypotheses to prove formulae.
5. Application of Euler and Hamiltonian graph in real life.
6. To inculcate the habit of mathematical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Set Theory, Relation and Function: Operations on sets, relations and functions, binary relations, partial ordering relations, equivalence relations, principles of mathematical induction. Finite and infinite sets, countable and uncountable sets, Cantor's diagonal argument and the power set theorem, Schröder-Bernstein theorem.

UNIT-II 9

Algebraic Structures: Algebraic structures with one binary operation - semigroups, monoids and groups, congruence relation and quotient structures. Free and cyclic monoids and groups, permutation groups, substructures, normal subgroups. Algebraic structures with two binary operations - rings, integral domains and fields. Boolean algebra and Boolean ring.

UNIT-III 9

Combinatorics: Basic counting techniques: inclusion and exclusion, pigeon-hole principle, permutation, combination, summations. Introduction to recurrence relations and generating functions.

UNIT-IV 9

Graphs: Graphs and their basic properties - degree, path, cycle, subgraphs, isomorphism, digraphs, Undirected graph, duality principle, Eulerian and Hamiltonian walks, graph coloring, planar graphs, trees. Applications.

Books & References

1. Kenneth H Rosen, Discrete Mathematics and its Applications, TMH.
2. C L Liu, Elements of Discrete Mathematics, Second Edition, Tata McGraw-Hill.
3. Bernard Kolman, Robert C Busby, and Sharon Cutler Ross, Discrete Mathematical Structures, fifth edition, Prentice-Hall of India.
4. Ralph P Grimaldi, Discrete and Combinatorial Mathematics, Pearson Education Asia.
5. J P Tremblay and R Manohar, Discrete mathematical structures with applications to Computer Science, Tata McGraw-Hill.

List of Practical's

1. Write a program in C to create two sets and perform the union and intersection operations on sets.
2. Write a program in C to find the complement of a set.
3. Write a program in C to create two sets and perform symmetric differences operations on these two sets.
4. Write a program to find the Cartesian product of two sets.
5. Write a C program to verify Truth table of AND, OR and NOT Gate
6. Write a program in C to find power set of a given set.
7. Write a Program in C for Graph Coloring.
8. Write a program in C to verify:
   a. Given relation is equivalence or not.
   b. Given algebraic system is Abelian group or not.
9. Write a program in C to perform following operation:
   a. Is the given relation is reflexive?

b. Is the given relation is symmetric?
c. Is the given relation ids Transitive?

10. Write a program in C for finding the shortest path in a graph.
11. Write a program in C to implement a recursive counting technique
12. Write a program in C to find permutation of the set.
13. Write program in C for minimum cost spanning tree.

BIT- 152 **SOFTWARE TOOLS-II**

Course category : Professional Skill (PS)
Pre-requisite Subject :NIL
Contact hours/week : Lecture: 0, Tutorial: 1, Practical:2
Number of Credits : 2
Course Assessment methods :Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, and Major Practical Examination.

Course Objective: Students will gain an understanding of the advanced concepts of web designing scripting language like JavaScript.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Use JavaScript as an interactive tool for web development
2. Hand code a number of interactive processes
3. Implement interactive responses in your web pages
4. Modify CSS styles and presentation properties with JavaScript
5. Control images as interactive objects and use JavaScript for specific tasks effectively and have the confidence to explore it further.
6. Understand the Document Object Model (DOM)

EXPERIMENTS

1. Write a JavaScript program to converts a specified number to an array of digits
2. Write a JavaScript program to convert the length of a given string in bytes.
3. Write a JavaScript program to return the minimum-maximum value of an array, after applying the provided function to set comparing rule
4. Write a JavaScript program to remove specified elements from the left of a given array of elements.
5. Write a JavaScript program to remove specified elements from the right of a given array of elements
6. Write a JavaScript program to get every nth element in a given array
7. Write a JavaScript program to get a random number in the specified range
8. Write a JavaScript program to get a sorted array of objects ordered by properties and orders.
9. Write a JavaScript program to chain asynchronous functions.
10. Write a JavaScript program to get the maximum value of an array, after mapping each element to a value using the provided function

BIT- 153 **LINUX LAB**

Course category : Engineering Fundamentals(EF)

Pre-requisite Subject :NIL
Contact hours/week : Lecture: 0, Tutorial: 1, Practical:2
Number of Credits : 2
Course Assessment methods :Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, and Major Practical Examination

Course Objective: Students will gain an understanding for the fundamentals of Linux operating system, its booting process, system commands and shell programming.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understanding of Booting Process
2. Understand the installation of Operating System
3. Understand the usage of Operating System commands
4. Understanding basics of the Shell
5. Demonstrate the usage of Shell as a programming language
6. Understanding of Computer Networking concepts

EXPERIMENTS

1. Installation of Linux operating system using virtualization technique
2. Understanding and practice of various Linux commands
3. Creation/usage of various types of files supported by Linux
4. 4.Practice of Computer networking commands
5. Write a shell script that receives any number of file names as arguments checks if every argument supplied is a file or a directory and reports accordingly. Whenever the argument is a file, the number of lines on it is also reported
6. Illustrate by writing script that will print, message “Hello World, in Bold and Blink effect, and in different colors like red, brown etc using echo commands?
7. Write a shell script that accepts a file name, starting and ending line numbers as arguments and displays all the lines between the given line numbers.
8. Illustrate by writing script using for loop to print the pyramid patterns?
9. 9 Write a shell script that accepts a list of file names as its arguments, counts and reports the occurrence of each word that is present in the first argument file on other argument files.
10. Write a shell script to find factorial of a given number
11. Write other simple programs using shell programming

BHM-103/153 COMMUNICATION SKILLS - 2

Course Category: Humanities & Social Science (HSS)
Pre-requisite Subject: None
Contact hours/week: Lecture: 2, Tutorial: 1, Practical: 2
No of Credits: 4
Course Assessment Methods: Continuous assessment through tutorials, Attendance,

home assignments, quizzes, one minor Test and one Major Theory Exam.

Course Objective: The course aims:

To sensitize the students to understand the role & importance of communication for personal & professional success and enable learners to exhibit knowledge, skills, and judgment in and around human communication that facilitate their ability to work collaboratively with others in an interpersonal environment.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Use of various facets of communication skills, such as, Reading, Writing, Listening and speaking skills.
2. To identify, formulate and solve the real-life problems with positive attitude.
3. To inculcate the habit of learning and developing the communication and soft skills by practice.
4. To create an amicable ambience to make them learn the different part of English language with the correction of the language.
5. Enhancing word power by counselling scientific literature.
6. Focusing on effortless speaking and writing.

Unit I: - Spoken English

1. **Introduction**
   - ✓ Course Structure, Stress and Intonation in English Pronunciation
   - ✓ Phonetic Transcription and its role in pronouncing English words
   - ✓ Sounds of English Vowels and Consonants

Unit II: - Personality and Communication

1. **Introduction**
   - ✓ **Personality**

1. Definition
2. Elements
3. Determinants

   - ✓ **Personal Grooming**

1. Personal Hygiene
2. Social Effectiveness
3. Business Etiquettes (Power Dressing)

Unit III: - Presentation and its Strategies

1. Introduction
   - ✓ Warm up before Facing the Audience
   - ✓ Tips of Effortless Presentation
   - ✓ Role of Audio-Visual Aids in Presentation
   - ✓ Sign posting in Presentation

Unit IV: - Interview Preparation

1. Introduction
   - ✓ Resume Writing
   - ✓ Dress Code
   - ✓ Mock-Interview

- ✓ How to be Successful in an Interview

References:

1. Bansal, R.K. & Harrison J.B., (1972) *Spoken English*, Orient Longman, India.
2. Chauhan, Narender Kr. & Singh, Sudhir N., (2013) *Formal Letters*, Pankaj Publication International, New Delhi.
3. Chhabra T.N., (2019) *Business Communication*, Sun India Publication, New Delhi.
4. Dixon Robert J., (1986) *Complete Course in English*, Prentice Hall of India, New Delhi.
5. Jones, Daniel., (2012) *Cambridge English Pronouncing Dictionary*, 18th Edition, Paperback, CUP, India.
6. Lewis, Norman, (2015) *Word Power Made Easy*, Penguin India.
7. Sethi J. & Jindal, (1993) *Handbook of Pronunciation of English Words* - D.V.A, Prentice Hall of India, New Delhi.
8. Sharma R.C. & Mohan Krishna, (2017) *Business Correspondence and Report Writing*, Tata McGraw Hill.

Thomson, A. J. & and Martinet A. V., (1997) *A Practical English Grammar*, Paperback, Ed. IVth, Oxford.

BSM-156 Applied Probability and Statistics

Course category	:	PLBSE
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 3, Tutorial : 1 , Practical: 0
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Two Minor tests and One Major Theory Examination
Course Objectives	:	The course is aimed to develop the basic mathematical skills of engineering students that are imperative for effective understanding of engineering subjects.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To understand the basic concepts of probability and probability Distributions.
2. To understand the central tendency, correlation, and correlation coefficient and also regression.
3. To understand the fitting of various curves by method of least square
4. To apply the statistics for testing the significance of the given large and small sample data by using t- test, F- test and Chi-square test.
5. Application of probability and statistics in real life.
6. To inculcate the habit of statistical thinking and lifelong learning.

Topics Covered

UNIT-I 9

Basic Statistics: Frequency distribution, Mean, Median, Mode, Moments, Moment Generating function, Skewness, Types of Skewness, Measurement of Skewness, Kurtosis, and its types. Curve fitting: Method of Least Squares, Fitting of Straight lines, Fitting of Parabola of second degree.

UNIT-II 9

Applied Statistics: Correlation, Correlation coefficient, Spearman's rank correlation coefficient, Regression, Equation of regression lines, linear, and non-linear regression analysis. Relation between Regression Analysis and Correlation Analysis

UNIT-III 9

Probability: Random experiment, outcome, trial and event, Exhaustive events, favourable events, independent events, sample space, classical and empirical definition of probability, addition theorem of probability, multiplication theorem of probability, conditional probability, Baye's theorem.

UNIT-IV 9

Probability Distribution: Discrete and continuous random variable and their properties, distribution functions, Binomial, Poisson and Normal Distribution and evaluation of statistical parameter of these three distributions. **Test of significance:** sampling, large sample test for single proportion, difference of proportions, single mean, difference of means and difference of standard deviation, Chi-square test for goodness of fit.

Books & References

1. D. C. Montgomery and G. C. Runger, Applied Statistics and Probability for Engineers, Wiley.
2. J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning.
3. S.M. Ross, Introduction to Probability and Statistics for Engineers and Scientists, Academic Press; 5th edition
4. Robert V Hogg, Joseph McKean, Allen T Craig, Introduction to Mathematical Statistics, Pearson Edu.
5. Mood, Graybill and Boes, Introduction to the Theory of Statistics, Tata McGraw-Hill.

BSM-204 Applied Computational Methods

Course category	:	PLBSE
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	:	5
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record file, viva voce and two minor tests and One Major Theory & Practical Examination.
Course Objectives		The objective of this course is to introduce a broad range of numerical methods for solving mathematical problems that arise in science and engineering.
Course Outcomes	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To find the numerical solution of algebraic and transcendental equations
2. To interpolate a curve using Gauss, Newton's interpolation formula.
3. To solve a definite integral using numerical approach.
4. To develop numerical techniques for solving Initial value problems for ODE and difference equations.
5. To understand the meaning and importance of correlation and regression analysis.
6. To Apply numerical and statistical methods to obtain approximate solutions to engineering problems.

Topics Covered

UNIT-I 9

Solution of algebraic and Transcendental equations: Bisection method, Method of False position, Fixed point method, Secant method and Newton-Raphson method, Modified Newton Raphson Method for Multiple roots, derivation of rate of convergence, Aitkens Method

UNIT-II 9

Interpolation and Numerical Integration: Interpolation: Finite Differences, Difference operators, Newton's forward and backward interpolation formulae, Lagrange's formula for unequal intervals, Newton's divided difference formula for unequal intervals. Numerical Integration: Trapezoidal Rule, Simpson's one-third and three-eight rules.

UNIT-III 9

Numerical Solution of Ordinary Differential Equations and Difference Equations: Picard's method, Taylor's Series method, Euler's method, Modified Euler's method, Runge-Kutta method of order four. Difference equations and their solutions. Rules for finding the particular integral.

UNIT-IV 9

Statistical Methods and Probability Distributions: Frequency Distributions, mean, mode, median, standard deviation, Moments, Skewness, Kurtosis, Types and measurement of Skewness and Kurtosis. Correlation; Regression and regression lines. Binomial Distribution, Poisson's Distribution, Normal Distribution.

Experiments

1. To implement Regula-Falsi method to find root of algebraic equation.
2. To implement Newton-Raphson method to find root of algebraic equation.
3. To implement Newton's Divided Difference formula to find value of a function at a point.
4. To implement Numerical Integration by using Simpson's one-third rule.
5. To implement numerical solution by using Runge-Kutta method of order four to find solution of differential equation.
6. To implement numerical solution of differential equation by Picard's method.
7. To implement numerical solution of differential equation by using Euler's method.
8. To estimate regression equation from sampled data and evaluate values of standard deviation, regression coefficient.

Books & References

1. B.S. Grewal: Higher Engineering Mathematics; Khanna Publishers.
2. B.V. Ramana: Higher Engineering Mathematics, Tata Mc. Graw Hill Education Pvt. Ltd., New Delhi.
3. R. K. Jain and Iyenger: Numerical Methods, Narosa Publications.
4. A. Greenbaum & T. P. Chartier, Numerical methods, Princeton University Press, 2012.
5. Brian Bradie, A Friendly Introduction to Numerical Analysis, Pearson Education, Asia, New Delhi.

BIT-201 **SWITCHING THEORY AND LOGIC DESIGN**

Course category : Engineering Fundamental (EF)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4

Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests and one Major Theory Examination

Course Objectives : To study the basic philosophy underlying the various number systems, negative number representation, binary arithmetic, binary codes, and error-detecting and correcting binary codes.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Design a finite state machine and sequential logic design.
2. Synthesize a logic design from a natural language description of a problem.
3. Realize a complete arithmetic and logic unit.
4. Generate a realization of combinational logic in a programmable gate array.
5. Simulate a complete design to evaluate functional correctness and timing.
6. Design a suitable K-map.

Topics Covered

UNIT-I

Binary Codes - Weighted and Non-Weighted - Binary Arithmetic Conversion Algorithms - Error Detecting and Error Correcting Codes - Canonical and Standard Boolean Expressions - Truth Tables. 9

UNIT-II

K-Map Reduction - Don't Care Conditions - Adders / Subtractors- Carry Look-Ahead Adder - Code Conversion Algorithms - Design of Code Converters - Equivalence Functions. Binary/Decimal Parallel Adder/Subtractor for Signed Numbers - Magnitude Comparator - Decoders / Encoders - Multiplexers / Demultiplexers- Boolean Function Implementation using Multiplexers. 9

UNIT-III

Sequential Logic - Basic Latch - Flip-Flops (SR, D, JK, T and Master-Slave) - Triggering of Flip-Flops - Counters - Design Procedure - Ripple Counters - BCD and Binary - Synchronous Counters. 9

UNIT-IV

Registers - Shift Registers - Registers with Parallel Load - Memory Unit - Examples of RAM, ROM, PROM, EPROM - Reduction of State and Flow Tables - Race-Free State Assignment - Hazards. 9

Books & References

Textbooks

1. Morris Mano, Digital Design, Prentice Hall of India, 2001
2. Raj Kamal, Digital Systems Principles and Design, Pearson Education, First Edition, 2007

BIT-202	**Data Structure**
Course category	: Department Core (DC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	: 5
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests and one major theory & practical Examination

Course Objectives : To provide the knowledge of basic data structures and their implementations. Understand the importance of data structures in the context of writing efficient programs. As well as to gain the ability to use appropriate data structures in problem solving.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. To write programs for Array and will be able to calculate addresses for array implementation.
2. To develop algorithms for linked list and its applications
3. To develop algorithms for stacks, queues and their applications
4. To develop algorithms for tree and its applications
5. To develop algorithms for graph and its applications
6. To develop algorithms for searching, sorting, hashing and its applications

Topics Covered

UNIT-I

Introduction: Basic Terminology, Elementary Data Organization, Structure Operations, Complexity and Time-Space Tradeoff. 9

Arrays: Definition, Representation and Analysis, Single and Multi-Dimension Array, Address Calculation, Sparse Matrices.

Linked List: Representation and Implementation of Singly Linked Lists, Two-Way Header List, Traversing and Searching of Linked List, Insertion and Deletion to / from Linked Lists, Insertion and Deletion Algorithms, Doubly Linked List, Polynomial Representation and Addition, Garbage Collection

UNIT-II

Stacks: Array Representation and Implementation of Stack, Operations on Stacks: Push &Pop, Array Representation of Stack, Linked Representation of Stack, Operations Associated with Stacks, Application of Stack, Conversion of Infix to Prefix and Postfix Expressions, Evaluation of Postfix Expressions using Stack, Application of Recursion in Problem like Tower of Hanoi. 9

Queues: Array and Linked Representation and Implementation of Queues, Operations on Queue: Create, Add, Delete, Full and Empty, Circular Queues, D-Queues and Priority Queues.

UNIT-III

Trees: Basic Terminology, Binary Trees, Binary Tree Representation, Algebraic Expressions, Complete Binary Tree, Extended Binary Trees, Array and Linked Representation of Binary Trees, Traversing Binary Trees, Threaded Binary Trees, Traversing Threaded Binary Trees, Huffman Algorithm. Binary Search Trees: Binary Search Tree (BST), AVL Trees, B-Trees. 9

UNIT-IV

Graphs: Terminology & Representations, Directed Graphs, Sequential Representations of Graphs, Adjacency Matrices, Traversal, Connected Component and Spanning Trees, Minimum Cost Spanning Trees. 9

Searching and Hashing: Sequential Search, Binary Search, Hash Table, Hash Functions, Collision **Sorting:** Insertion Sort, Bubble Sorting, Quick Sort, Merge Sort, Heap Sort, Radix Sort

EXPERIMENTS

Write C/C++ Programs to illustrate the concept of the following:

1. Arrays
2. Linked List
3. Stack
4. Queues
5. Tree
6. Graph
7. Searching
8. Sorting
9. Hashing

Books & References

Textbooks

1. Horowitz and Sahani, Fundamentals of Data Structures, Galgotia Publication, New Delhi.
2. R. Kruseetal, Data Structure and Pragram Design in C, Pearson Education Asia Delhi.
3. A. M.Tenenbaum, Data Structures using C & C++, PHI, India.
4. K Loudon, Mastering Algorithms with C, Shroff Publication and Distributor Pvt. Ltd.
5. Bruno R Preiss, Data Structure and Algorithms with Object Oriented Design Pattern in C++, John Wiley & Sons.
6. Adam Drozdek, "Data Structures and Algorithms in C++", Thomson Asia Pvt. Ltd Singapore.

Reference books

1. Lewis, H.R., Denenberg, L., Data Structures and their Algorithms. Published by Addison-Wesley, UK, 1991.
2. Oluwadare, S.A., Agbonifo, O.C., Fundamentals of Data structures and Algorithms. Lecture Notes, 2013.

BIT-203 OBJECT ORIENTED PROGRAMMING

Course category :	Program Core (PC)
Pre-requisite Subject :	NIL
Contact hours/week :	Lecture : 3, Tutorial : 0 , Practical: 2
Number of Credits :	4
Course Assessment methods:	Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two minor test and one major theory and practical examination.

Course Objective: Students will gain an understanding of the fundamentals of C++ Programming, object-oriented concepts in C++, inheritance, polymorphism, exception handling and file handling.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Write code for Conditional statements, Loops, Array, Function, and Pointer.
2. Write object-oriented programming using classes and objects.
3. Write code for Inheritance, Exception handling and Templates.
4. Write code for Function Overloading and Operator Overloading
5. Write code for Dynamic or Run-time Polymorphism (Overriding)
6. Write code for constructors, destructors, file handling and various file operations.

Topics Covered

UNIT I **9L**

Tokens, Keywords, Identifiers and Constants, Basic Data Types, User-Defined and Derived Data Types, Type Casting, Implicit Conversion, Operators and Expressions, Operator Precedence, Simple statements, Conditional statements, Iterative statements, Array, Function, Pointer, Structure

UNIT II **9L**

Basic Concepts of Object Oriented Programming, Object Oriented Programming Paradigm, Benefits of OOP, Object Oriented Languages, Class and Objects, Scope Resolution Operator, Access specifiers, Data members, Accessing class members, Data hiding, Member function, Inline function, Friend function, Passing objects as arguments, Returning objects from functions

UNIT III
9L

Constructors and its types, Destructor, Constructor overloading, Order of construction and destruction, Inheritance, Single, Multilevel, Multiple, Hierarchical, Hybrid Inheritance, Base class, Derived class, Virtual function, Polymorphism: Function Overloading, Operator Overloading, Overloading Unary Operators, Overloading Binary Operators, Overriding

UNIT IV
9L

Exception Handling, Throwing and Catching Mechanism, Templates, File handling, Types of files, End of File, Basic file operations: creating, opening, closing, reading, writing and appending a file, copying a file to another, Object oriented system development

EXPERIMENTS:

Write programs to illustrate the following concepts:

1. Operators and expressions
2. Simple statements, Conditional statements and Iterative statements
3. Arrays
4. Functions
5. Pointers
6. Structures

7. Objects and Classes
8. Inline Function, Friend function and Virtual Functions
9. Scope Resolution Operator
10. Constructors and Destructors
11. Inheritance
12. Function Overloading
13. Operator Overloading
14. Dynamic or Run-time Polymorphism (Overriding)
15. Exception Handling
16. File operations

Books & References:

1. P. Deitel and H. Deitel, "C++ How to Program", Pearson.
2. E. Balagurusamy, "Object Oriented Programming with C++", TMH Publication.
3. Yashavant Kanetkar, "Let us C++", BPB Publications
4. Robert Lafore, "Object Oriented Programming in Turbo C++", Galgotia Publication.
5. B. Trivedi, "Programming with ANSI C++", Oxford University Press.
6. Ira Pohl, "Object Oriented Programming using C++", Pearson Education, Second Edition Reprint
7. B. Stroustrup, "The C++ Programming language", Pearson Education.
8. Timthy Budd, "An Introduction to Object Oriented Programming with C++," Addition-Wesley.
9. Kip R. Irvine, "C++ and Object-Oriented Programming," Prentice Hall.

BIT-204 SOFTWARE ENGINEERING

Course category : PLBSE
Pre-requisite Subject : Nil
Contact hours/week : Lecture: 3 Tutorial: 0, Practical: 2
Number of Credits : 4
Course Assessment methods : Continuous assessment through, attendance, home assignments, quizzes, two minor tests, and one major theory and practical examination.
Course Objectives : **Course objective of this subject is to-**

1. Requirement Analysis, Feasibility study, Software Development, Testing, Maintenance etc.
2. Enhance the Software Project development and Management skills.
3. Develop functioning software which benchmarks to the international standards.

Course Outcomes : **The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.**

1. Understand the fundamental concepts of Software Engineering and its applications.

2. Design and develop the DFD, E-R Diagram, Flow Chart, SRS for a project, ISO 9000 Models, SEI-CMM Model etc.
3. List and define the test cases, fundamental concepts of testing to be applied on various projects.
4. Implement and analyse the various model of software development for a project.
5. Design and define the cost estimations, size estimations using various techniques.
6. Understand the working concept of CASE tool, Reverse Engineering, Re-Engineering, Software Risk analysis and Management etc.

Topics Covered

UNIT-I

Introduction: Introduction to Software Engineering, Evolution and impact of Software engineering, Software Components, Software Characteristics, Software Crisis, Similarity and Differences from Conventional Engineering Processes, Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirement's analysis, Software Development Life Cycle (SDLC) Models: Waterfall Model, Prototype Model, Spiral Model, Evolutionary Development Models, Iterative Enhancement Models. 9

UNIT-II

Software Requirement Specifications (SRS): Requirement Engineering Process: Elicitation, Analysis, Documentation, Data Flow Diagrams, Entity Relationship Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS, Basic issues in software design: modularity, Top-Down and Bottom-Up Design, Cohesion and Coupling, Structure chart, Object-oriented software development, Software Quality Assurance (SQA): Verification and Validation, SQA Plans, Software Quality Frameworks, ISO 9000 Models, SEI-CMM Model. 9

UNIT-III

Software Testing: Fundamental of testing, Testing Objectives, Unit Testing, Integration Testing, Acceptance Testing, Regression Testing, Testing for Functionality and Testing for Performance, Top Down and Bottom-Up Testing Strategies: Test Drivers and Test Stubs, Structural Testing (White Box Testing), Functional Testing (Black Box Testing), Test Data Suit Preparation, Alpha, and Beta Testing of Products. Static Testing Strategies: Formal Technical Reviews (Peer Reviews), Walk Through, Code Inspection, Software Reliability Metrics. 9

UNIT-IV

Software Maintenance and Software Project Management: Need of Software Maintenance, Categories of Maintenance: Preventive, Corrective and Perfective Maintenance, Cost of Maintenance, Software Re- Engineering, Reverse Engineering. Software Configuration Management Activities, Change Control Process, Software Version Control, An Overview of CASE Tools, Estimation of Various Parameters such as Cost, Efforts, Schedule/Duration, Constructive Cost Models (COCOMO), Resource Allocation Models, Software Risk Analysis and Management. 9

List of Practical:

1. Problem Analysis and Project Planning -Thorough study of the problem–Identify Project scope, Objectives, and Infrastructure.
2. Software Requirement Analysis –Describe the individual Phases/modules of the project and Identify deliverables. Identify functional and non-functional requirements

3. Software Designing -Develop use case diagrams and activity diagrams, build and test class diagrams, sequence diagrams and add interface to class diagrams
4. Prototype model –Develop the prototype of the product.
5. Prepare SRS document for Library Management System, Hospital Management System, Hotel Management, University Management System, and similar projects with the IEEE recommended standards.
6. List the various test cases for above developed projects.
7. Perform the Alpha and Beta testing for the above developed projects.
8. Describe the various types of software testing and implement it on the project developed by your own.

Books & References:

9. RS Pressman, Software Engineering: A Practitioners Approach, McGraw Hill.
10. Pankaj Jalote, Software Engineering, Wiley
11. Rajib Mall, Fundamentals of Software Engineering, PHI Publication.
12. KK Aggarwal and Yogesh Singh, Software Engineering, New Age International Publishers.
13. Ghezzi, M. Jarayeri, D. Manodrioli, Fundamentals of Software Engineering, PHI Publication.
14. Ian Sommerville, Software Engineering, Addison Wesley.
15. Kassem Saleh, "Software Engineering", Cengage Learning.
16. P fleeger, Software Engineering, Macmillan Publication

BSM-255 Optimization Techniques

Course category : Basic Sciences & Maths (BSM)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits : 4
Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two Minor tests and one major theory & practical Examination.
Course Objectives The objective of this course is to introduce basic methods and algorithms of mathematical optimization and able to apply them to practical optimization problems in a computer science.
Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To solve L.P.P. with various methods.
2. To solve L.P.P. by interior method.
3. To solve N.L.P.P. by various methods.
4. To solve GPP by various methods.
5. To solve the transportation and assignment problems
6. To apply the analytical and numerical techniques of optimization theory to engineering problems.

Topics Covered

UNIT-I 9

Classical Optimization Techniques: Single variable optimization, Multi - variables with and without constraints. Non-linear programming: Fibonacci method, Golden Section method. Quadratic Programming.

UNIT-II 9

Linear Programming: Constrained Optimization Techniques: Graphical Methods**,** Simplex method, Big-M Method, Two-Phase Method, Revised Simplex method, Karmarkar's method, Duality Theorems, Dual Simplex method, Decomposition principle.

UNIT-III 9

Non-Linear Programming: Unconstrained Optimization Techniques: Direct search methods: Random jumping method, Univariate method, Rosenbrock's method. Indirect search methods: Steepest Descent method, Cauchy-Newton Methods, Newton's method, Transportation problems, Assignment problems.

UNIT-IV 9

Geometric Programming: Polynomial, Unconstrained minimization problem, Degree of difficulty. Solution of an unconstrained **Geometric** Programming problem. Constrained minimization complementary Geometric Programming, Application of Geometric Programming, Deterministic Dynamic Programming.

Experiments

1. To implement Fibonacci method to find optimal value.
2. To implement Golden Section method to find optimal value.
3. To implement Simplex Method to solve LPP.
4. To implement Revised Simplex Method to solve LPP.
5. To implement Dual Simplex method to solve LPP.
6. To implement Karmarkar's method to find the optimal value.

To implement Transportation problems by various methods.

Books & References

1. S.S. Rao; Engineering Optimization, New Age International.
2. E.J. Haug and J.S. Arora; Applied Optimal Design, Wiley New York.
3. Kalyanmoy Deb; Optimization for Engineering Design, Prentice Hall of India.
4. Er. P. K. Gupta; Operations Research, S. Chand.
5. G. Srinivasan, Operations Research, PHI Learning.

BIT-251 DATABASE MANAGEMENT SYSTEM

Course category	:	Programme Core (PC)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture: 3 Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through attendance, home assignments, quizzes, practical work, record file, viva voce, two minor tests, one major theory and practical examination.
Course Objectives	:	The objective of this course is to introduce the fundamental concepts of DBMS, terminologies of database management system, E-R Modelling, PL/SQL concept, database transactions and concurrency control techniques.
Course Outcomes	:	**The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.**

1. Understand the fundamental concepts, techniques, terminologies of database management system and E-R Modelling.
2. Understand the basic syntax, semantics, and pragmatics of SQL & PL/SQL and analyse the problems and apply DBMS concepts and techniques to develop appropriate programs/projects to solve the problems.
3. Evaluate the alternative database designs to determine which one is better according to selected criteria.
4. Understand the basic concepts/features of database transactions and concurrency control techniques.
5. Design large databases that are modular and have reusable components.
6. Implement the concept of DBMS and RDBMS during the development of various application packages.

Topics Covered

UNIT-I

Introduction: An Overview and motivation of Database Management System, Characteristics of database approach, Advantages of using DBMS approach, Database System vs File System, Database System Concept and Architecture, Data Model & its types, Schema and Instances, Data Independence, Database Language and Interfaces, Data Definitions Language, DML, Overall Database Structure. 9

Data Modelling using Entity Relationship Model: E-R Model Concepts, Notation for E-R Diagram, Mapping Constraints, Keys, Concepts of Super Key, Candidate Key, Primary Key, Generalization, Aggregation, Reduction of an ER Diagrams to Tables, Extended ER Model, Relationship of Higher Degree.

UNIT-II

Relational Data Model and Language: Relational Data Model Concepts, Consistency constraints, Integrity Constraints, Entity Integrity, Referential Integrity, Keys Constraints, Domain Constraints, Relational Algebra, Relational Calculus, Tuple and Domain Calculus. 9

Introduction on SQL: Characteristics of SQL, Advantage of SQL, SQL Data Type and Literals, Types of SQL Commands, SQL Operators and their Procedure, Tables, Views, and Indexes, Queries and Sub Queries, Aggregate Functions, Insert, Update and Delete Operations, Joins, Unions, Intersection, Minus, Cursors, Triggers, Procedures in SQL/PL SQL.

UNIT-III

Database Design & Normalization: Database Anomalies, Types of Anomalies, Functional Dependencies, Normalization, Normal Forms, First, Second, Third Normal Forms, BCNF, Fourth and Fifth Normal Forms, Closure of a set of FDs and MVDs, Armstrong's axioms, Minimal or Canonical cover of FDs, Inclusion Dependence, Loss Less Join Decompositions, Dependency Preserving Composition, Normalization using FD, MVD, and JDS, Examples on Normalization based on FDs and MVDs, Domain Key Normal Form (DKNF), Alternative Approaches to Database Design. 9

UNIT-IV

Transaction Processing Concept: Transaction System, Testing of Serializability, Serializability of Schedules, Conflict & View Serializable Schedule, Recoverability, Recovery from Transaction Failures, Log Based Recovery, Checkpoints, Deadlock Handling. 9

Distributed Database: Characteristics of Distributed Database, Advantages and disadvantages of distributed database, Distributed Data Storage.

Concurrency Control Techniques: Concurrency Control, Locking Techniques for Concurrency Control, Time Stamping Protocols for Concurrency Control, Validation Based Protocol, Multiple Granularity, Multi Version Schemes, Recovery with Concurrent Transaction.

List of Practical:

1. Exercises to be based on SQL/PLSQL/Oracle etc.
2. Applications involving vendor development systems, stores management system, finance Management, Library Management System etc.
3. Creation and querying of database tables for following cases.
   - ✓ Write SQL queries using logical operations (=, <,>, etc).
   - ✓ Write SQL queries using SQL operators.
   - ✓ Write SQL queries using character, number, date, and group functions.
   - ✓ Write SQL queries for extracting data from more than one table.
   - ✓ Write SQL queries for sub queries, nested queries.
   - ✓ Write program using PL/SQL.
   - ✓ Concepts for ROLL BACK, COMMIT & CHECK POINTS.
   - ✓ Create VIEWS, CURSORS and TRGGERS & write ASSERTIONS.
   - ✓ Create FORMS and REPORTS.
4. Design of tables by normalization and dependency analysis.
5. Writing application software with host language interface.

Books & References:

1. Date C J, An Introduction to Database Systems, Addison Wesley
2. Korth, Silbertz, Sudarshan, Database Concepts, McGraw Hill
3. Elmasri, Navathe, Fundamentals of Database Systems, Addison Wesley
4. Leon & Leon, Database Management Systems, Vikas Publishing House
5. Bipin C. Desai, An Introduction to Database Systems, Galgotia Publications
6. Majumdar & Bhattacharya, Database Management System, TMH
7. Ramkrishnan, Gehrke, Database Management System, McGraw Hill
8. Kroenke, Database Processing Fundamentals, Design and Implementation, Pearson Education.

Reference books

1. Ramon a. Mato-Toledo, Pauline K. Cushman, Database Management Systems, Schaums Outline series, TMH, New Delhi Special Indian Edition 2007
2. Ivan Bayross, Mastering Database Technologies, BPB Publications, New Delhi - First Indian Edition 2006, Reprinted 2011.

BIT-252 COMPUTER ORGANIZATION & ARCHITECTURE

Course category : Program Core (PC)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits : 4

Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce and two minor tests, one major theory & practical examination.

Course Objectives : To understand the structure, function, and characteristics of computer systems, the designing of various functional units and components of computers, and the identification of the elements of modern instructions sets and their impact on processor design, explain the function of each element of the memory hierarchy.

Course Outcomes : The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. To understand the basic structure and operation of digital computer.
2. To study the design of arithmetic and logic unit and implementation of fixed point and floating-point arithmetic operations.
3. To study the two types of control unit techniques and the concept of Pipelining.
4. To study the hierarchical memory system including cache memories and virtual memory.
5. To study the different ways of communicating with I/O devices.
6. To study the different ways of communicating with I/O interfaces.

Topics Covered

UNIT-I

Register Transfer Language, Bus and Memory Transfers, Bus Architecture, Bus Arbitration, Arithmetic Logic, Shift Micro-Operation, Arithmetic Logic Shift Unit, Design of Fast Address, IEEE Standard for Floating Point Numbers. 9

UNIT-II

Control Design: Hardwired &Micro Programmed Control Unit, Processor Design: Processor Organization: General Register Organization, Stack Organization, Addressing Mode, Instruction Format, Data Transfer & Manipulations, Program Control, Reduced Instruction Set Computer, Pipelining. 9

UNIT-III

Arithmetic - Addition & Subtraction of Signed Numbers - Multiplication - Integer Division - Floating Point Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations. 9

UNIT-IV

Input-Output Organization: I/O Interface, Modes of Transfer, Interrupts &Interrupt Handling, Direct Memory Access, Input-Output Processor, Serial Communication. 9

Memory Organization: Memory Hierarchy, Main Memory (RAM and ROM Chips), Auxiliary Memory, Cache Memory, Virtual Memory.

EXPERIMENTS

1. Implementing HALF ADDER, FULL ADDER using basic logic gates.
2. Implementing Binary -to -Gray, Gray -to -Binary code conversions.
3. Implementing 3–8-line DECODER.
4. Implementing 4x1 and 8x1 MULTIPLEXERS.
5. Verify the excitation tables of various FLIP-FLOPS.
6. Design of an 8-bit Input/ Output system with four 8-bit Internal Registers.
7. Design of an 8-bit ARITHMETIC LOGIC UNIT
8. Design the data path of a computer from its register transfer language description.
9. Design the control unit of a computer using either hardwiring or microprogramming based on its register transfer language description.

10. Implement a simple instruction set computer with a control unit and a data path.

Books & References

Textbooks

1. Computer System Architecture - M. Mano.
2. Carl Hamacher, Zvonko Vranesic, Safwat Zaky Computer Organization, McGraw-Hill, Fifth Edition, Reprint 2012.
3. John P. Hayes, Computer Architecture and Organization, Tata McGraw Hill, Third Edition, 1998.

Reference books

1. William Stallings, Computer Organization and Architecture-Designing for Performance, Pearson Education, Seventh edition, 2006.
2. Behrooz Parahami, "Computer Architecture", Oxford University Press, Eighth Impression, 2011.
3. David A. Patterson and John L. Hennessy, "Computer Architecture-A Quantitative Approach", Elsevier, a division of reed India Private Limited, Fifth edition, 2012.

BIT-253	**Computer Networks**
Course Category	Programme Core (PC)
Pre-requisite Subject	Nil
Contact Hours/Week	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	5
Course Assessment Methods	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests, one major theory & practical examination
Course Objectives:	1. To provide insight about networks, topologies, and the key concepts 2. To know the basic concepts of network security and its various security issues related with each layer 3. Illustrate different standards of Local Area Network in terms of technologies and hardware used 4. Illustrate network addressing and analysis techniques 5. Understand the Wide Area Network technologies and the internetworking concepts and architectures
Course Outcomes	1. To be exposed to the TCP/IP protocol suite. 2. To be able to design, calculate, and apply subnet masks and addresses to fulfill networking requirements. 3. Identify security and privacy issues that relate to computer networks.

4. Solve mathematical problems in such domains as: bandwidth & data rate, Hamming codes, cyclic redundancy check.
5. To be able to design and develop different types of multiplexing, data encoding, modulation, and switching techniques
6. To be able to design network routing concepts

Topics Covered

Unit – I

Introductory Concepts - Network Hardware - Network software, Networks Topologies. Layering and Protocols, Switching Methods, LAN Inter Connection Devices - Physical Layer - Different types of Transmission Media, Errors in Transmission: attenuation, noise.

Unit – II

MAC Layer: Channel Allocation Problem – Aloha, CSMA, CSMA/CD, CSMA/CA Protocols. Examples: Ethernet, including Gigabit, IEEE standards, FDDI. Data Link Layer: Framing, Error Detection (Parity, CRC), Sliding Window, Stop and Wait protocols.

Unit – III

Network Layer - Design issues, Routing Algorithms: Congestion Control Algorithms - Quality of Service, Distance Vector, Link State, Inter-domain Routing. Internet Protocol, IPv6, ARP, DHCP, ICMP, Subnetting, Classless Addressing, Network Address Translation.

Unit – IV

Transport Layer - Design issues, Elements of Transport Protocols - User Datagram Protocol -Transmission Control Protocol, Connection Establishment and Termination.

Session, Presentation, and Application Layers - Examples: DNS - Electronic mail - World Wide Web - Multimedia - Network Security.

EXPERIMENTS

1. To create scenario and study the performance of CSMA/CD protocol through simulation.
2. To create scenario and study the performance of token bus and token ring protocols through simulation.
3. Implementation of Error detection and correction algorithms.
4. Implementation and study of 1-bit sliding window viz., stop and wait protocol.
5. Implementation and study of Go-Back-N protocol.
6. Implementation and study of selective repeat protocol.
7. To get the MAC or Physical address of the system using Address Resolution Protocol.

8. Implementation of distance vector routing algorithm.
9. Implementation of link state routing algorithm.
10. To write a client-server application for chat using TCP.
11. To write a C program to develop a DNS client server to resolve the given hostname.

Textbooks

1. S. Tanenbaum, "Computer Networks", Pearson Education, Fourth Edition, 2003
2. Behrouz A. Foruzan, “Data Communication and Networking”, Tata McGraw Hill, 2004

Reference Books:

1. LL Peterson, BS Davie, Computer Networks: A Systems Approach, 5th Ed., Morgan-Kauffman, 2011.
2. Comer, Computer Networks & Internet with Internet Applications by Pearson Education
3. JF Kurose, KW Ross, Computer Networking: A Top-Down Approach, 5th Ed., Addison-Wesley, 2009.
4. W Stallings, Cryptography and Network Security, Principles and Practice, 5th Ed., Prentice-Hall, 2010
5. W. Stallings, "Data and Computer Communication", Pearson Education, Fifth Edition.

BIT-254 **Python Programming**

Course category : Program Core (PC)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits : 5
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests, one major theory and practical examination.

Course Objective: Students will gain an understanding of the fundamentals of Python programming, object-oriented concepts in Python, inheritance, polymorphism, exception handling, file handling and some advanced concepts in Python.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Write simple, conditional, and iterative statements in Python.
2. Create arrays and use array methods in Python.
3. Create functions and implement recursion in Python.
4. Create and use Python classes and objects.
5. Write code for Constructors, Destructors, Inheritance, Polymorphism, Exception handling, file handling and various file operations.
6. Solve various real time problems using Python such as problems of Data Science and Machine Learning using Python.

Topics Covered

UNIT I: Programming Basics and Decision Making

9

Fundamentals: Key features and applications of Python, Python Editors and Compilers (Interpreters), Using different offline and online Python IDE, Interacting with Python programs, **Data types:** Numeric, Boolean, Strings, Lists, Sets, Tuples, Dictionary; **Variables:** Declaration and initialization; **Other concepts:** Operators, Expressions, Indentation, Comments, Casting; **Simple Statements**: Taking inputs from user, Displaying outputs; **Conditional statements:** If…Else

UNIT II: Control Flow and Other Programming Concepts

9

Iterative statements: For Loops, While Loops, Break, Continue; **Array:** Looping Array elements, Array methods; **Functions:** Local and Global Variables, Built-in functions, User defined functions, Declaration of a function, Defining the function, Calling of the function, Functions with arguments, Recursion

UNIT III: OOP and File Handling

9

Object Oriented Programming: Classes and objects, attributes and methods, constructors and destructors, inheritance, polymorphism, **Exception Handling:** Try…Except; **Management of text files:** Type of files, various file operations on text files, creating a text file, opening a file, closing a file, reading a text file, writing into a text file, copying a file to another file

UNIT IV: Advance Concepts **9**

Problem solving: Use of Python to solve real time problems, How Python helps to research problems, Creating various types of graphs corresponding to any data to show different kinds of results and analysis; **Data Analysis:** Understanding problems of data science and machine learning, Creating codes in Python for various data analysis problems, Other advance programs

Books & References:

1. Alex Martelli, “Python in a Nutshell”
2. Allen Downey, “Think Python”
3. Ken Lambert, “Fundamentals of Python: First Programs”
4. Willi Richert, Luis Pedro Coelho, “Building Machine Learning Systems with Python”
5. Cody Jackson ,”Learning to Program Using Python”
6. Ljubomir Perkovic, “Introduction to Computing Using Python”
7. https://www.w3schools.com/python/default.asp
8. https://www.w3resource.com/python/python-tutorial.php
9. https://www.geeksforgeeks.org/python-tutorial/
10. https://www.geeksforgeeks.org/python-programming-language/

EXPERIMENTS:

1. Writing codes using simple statements, operators and expressions
2. Writing codes using conditional statements
3. Writing codes using iterative statements
4. Writing programs for creating arrays, looping array elements and using array methods
5. Writing programs to use various standard modules
6. Writing codes to create functions and implement recursion
7. Writing object oriented code for Constructors and Destructors
8. Writing object oriented code for implementing Inheritance
9. Writing object oriented code for implementing Polymorphism

10. Writing program for implementing Exception Handling
11. Write codes for various file operations
12. Developing codes for solving various real time problems
13. Developing codes for solving problems of Data Science and Machine Learning
14. Writing codes to create various types of graphs corresponding to any data
15. Writing other advance programs in Python

BHM-301/351 Engineering & Managerial Economics

Course category	:	Management (M)
Pre-requisite Subject	:	NIL
Contact hours/week	:	Lecture : 2, Tutorial : 0, Practical: 0
Number of Credits	:	2
Course Assessment methods	:	Continuous assessment through tutorials, attendance, home assignments, quizzes and Three Minor tests and One Major Theory Examination
Course Objective		Enable students to understand the fundamental economic concepts applicable to engineering.
Course Outcomes	:	1. Students will acquire basic knowledge in Engineering Economics, which allows students to gain theoretical and empirical skill of Economics. 16. To develop the basic understanding of Microeconomics and Macroeconomics and its application to decision making and Managerial Economics. 17. Become acquainted with basic economic concepts such as demand and supply and Elasticity of Demand. 18. To develop a significant understanding of various concepts of cost. 19. To develop the ability to understand the various kinds of market structure. 20. To develop the ability to acquire the knowledge of National Income and its measurement.

Topics Covered

UNIT-I

Introduction: Meaning, Nature and Scope of Microeconomics, Macro Economics and ManagerialEconomics, Decision making Process with reference to Managerial economics, Managerial Economics and its application in engineering perspective.

UNIT-II

Concepts of Demand and Supply: Demand Analysis, Law of Demand, Determinants of Demand,Elasticity of Demand: Price, Income and cross Elasticity. Uses of concept of elasticity of demand in managerial decision, Law of Supply.

UNIT-III

Production function, Overview of cost: fixed cost, variable cost, average cost, marginal cost, opportunity cost, An over-view of Short and long run cost curves.

UNIT-IV

Market Structure: Perfect Competition, Imperfect competition – Monopolistic, Oligopoly, Monopoly, National Income: Concept and Measurement of National Income.

Books & References

1. Mote, Paul and Gupta, Managerial Economics, T M H, New Delhi.
2. H L Ahuja, Managerial Economics, S Chand & Co. New Delhi
3. P.L. Mehta, Managerial Economics, Analysis, Problems and Cases, Sultan Chand Sons, New Delhi.
4. Prof. D.N. Kakkar , Managerial Economics for Engineering, PHI publication, New Delhi
5. Varshney

BIT-301 AI and Machine Learning

Course category : Program Core (PC)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits : 5

Course Assessment methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, record, viva voce, two minor test, one major theory and practical examination.

Course Objective: Students will gain an understanding of the fundamentals of machine learning, supervised learning, unsupervised learning, reinforcement learning and some applications of machine learning.

and Maheshwari, Managerial Economics, Sultan Chand and Sons, New Delhi.

Course Outcomes: Upon successful completion of the course, the student will be able to

1. understand the current trends and basics of data science.
2. understand the difference between data science and data analytics.
3. understand the relation between data science, machine learning and deep learning.
4. learn various machine learning techniques.
5. learn different algorithms of Supervised, Unsupervised and Reinforcement Learning
6. Understand and design various applications of Machine Learning.

Topics Covered:

UNIT-I

9

The Foundations of Artificial Intelligence: Monkey Banana Problem, Travelling Salesman Problem, Intelligent Agents, Agents and Environments, The Structure of Agents, Solving Problems by Searching, Problem-Solving Agents, Searching for Solutions, Infrastructure for search algorithms, Measuring problem-solving performance. Uninformed Search Strategies, Informed (Heuristic) Search strategies, Greedy best-first search, A* search, Heuristic Functions, **Expert Systems:** Introduction to expert system and its applications, various expert system shells, knowledge acquisition, case studies, MYCIN

UNIT-II

9

Some Basic Concepts: Big Data, Data Mining, Data Science, Data Analytics, Data Visualization, Difference Between Data Science and Data Analytics, Relation between Artificial Intelligence, Machine Learning, Neural Network, and Deep Learning, Machine Learning vs. Deep Learning, Characterization of Learning Problems, Mathematical Foundations of Data Science and Machine Learning, **Fundamentals of Machine Learning:** Definition, Pre-processing, Dimensionality Reduction, Normalization, Feature Extraction, Training, Testing, Confusion Matrix

UNIT-III

9

Types of Machine Learning Techniques: ***Supervised Learning:*** Classification, Regression, K Nearest Neighbour, Naive Bayes Classifiers, Decision Trees, Random Forest, Support Vector Machine (SVM), Linear Regression, ***Unsupervised Learning:*** Clustering, Association, Hierarchical Clustering, Principal Component Analysis (PCA), K-means Clustering, Density-Based Spatial Clustering of Applications with Noise (DBSCAN); ***Reinforcement Learning:*** Significance of Reinforcement, Feedback, Q learning, Markov Decision Process

UNIT-IV

9

Some Applications of Machine Learning: Fake News Detection, Sentiment Analysis, Disease Detection, Credit Card Fraud Detection, Bitcoin Price Predictor, Stock Price Prediction, Handwritten Digit Recognition, Chatbots, Human Face Detection, Speech Emotion Recognition, Iris Flowers Classification, Music Genre Classification, Automatic Music Generation, Language Translator, Gender and Age Detection

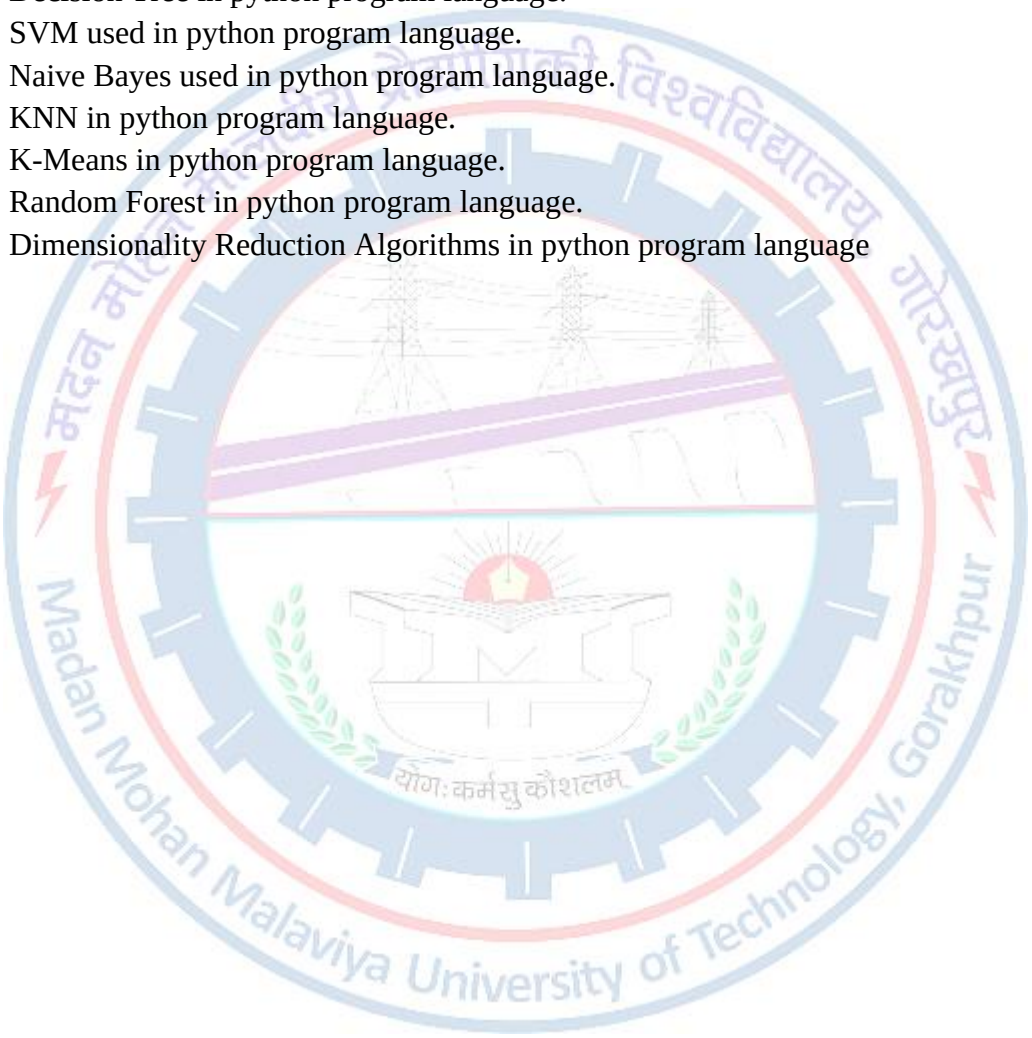
Books & References:

1. Artificial Intelligence, Rich and Knight, McGraw Hill
2. Machine Learning, Tom Mitchell, McGraw Hill
3. Deep Learning, John D. Kelleher, The MIT Press
4. Data Science From Scratch, Joel Grus, O'Reilly
5. Data Analytics, Anil Maheshwari, McGraw Hill
6. Research papers and internet resources

Experiments:

1. Complete any at any 10 experiments as per the direction given by the instructor.
2. Designing and Implementation of some of the uninformed search algorithms.

3. Designing and Implementation of some of the informed search algorithms.
4. Designing and Implementation of A* search algorithms.
5. Designing and Implementation of A* search algorithms with different heuristic functions.
6. Designing and Implementation of some types of intelligent agents.
7. A simple linear regression attempts to draw a straight line that will best minimize the residual sum of squares between the observations and the predictions in python program language.
8. Linear Regression Logistic Regression used in python program language
9. Decision Tree in python program language.
10. SVM used in python program language.
11. Naive Bayes used in python program language.
12. KNN in python program language.
13. K-Means in python program language.
14. Random Forest in python program language.
15. Dimensionality Reduction Algorithms in python program language



BIT-302 **Operating Systems**

Course Category : Program Core (PC)

Pre-requisites : Knowledge of Programming and its various techniques, Basic knowledge of Data Structures and Computer Organization.

Contact Hours/Week : Lecture: 3, Tutorial: 0, Practical:2

Number of Credits : 4

Course Assessment Methods : Continuous Assessment through assignments, quizzes, practical work, record file, viva voce, two minor tests, one major theory and practical examination.

Course Objective : The primary objective of this course is to introduce the basic principles, and techniques. Emphasis will be placed on the teaching of fundamentals of Operating System, not on providing a mastery of specific software tools or programming environments. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

1. Students will learn how Operating System is Important for Computer System.
2. To make aware of different types of Operating System and their services.
3. To make aware of different types of Operating System design structures and their advantages as well as disadvantages.
4. To learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system.
5. To know virtual memory concepts
6. To learn secondary memory management.
7. To learn different security methods used to make the computer system safe for use.
8. To learn about different file structure and storage techniques.

Course Outcomes : Upon successful completion of this course, the student shall be able to:

1. List and define the fundamental concepts of Operating System
2. Understand the structure and functions of OS and compare various memory management schemes.
3. Understand about Processes, Threads and Scheduling algorithms.
4. Understand the principles of concurrency and Deadlocks.
5. Understand I/O management and File systems.
6. Study various CPU scheduling, Disk scheduling algorithms and compare their performance and able to simulate the given problems.

Topics to be Covered

UNIT-I

Introduction: Basic architectural concepts, Operating System Services, interrupt handling, concepts of batch-processing, multiprogramming, time-sharing, real-time operations; Resource Manager view, process view and hierarchical view of an OS. 9

Memory management: Partitioning, paging, concepts of virtual memory demand paging, page replacement algorithms, segmentation, Segmentation and demand-paging, Cache memory management

UNIT-II

Processor and Process management: CPU scheduling – short-term, medium term and long-term scheduling, non-preemptive and preemptive algorithms, performance analysis of multiprogramming, multiprocessing and interactive systems, Concurrent processes, precedence graphs, critical section problem, semaphores; Classical process, co-ordination problems, Producer-consumer problem, Reader-writer problem, Dining philosophers' problem, Barber's shop problem, Inter-process communication. 9

UNIT-III

Concurrent Programming: Critical region, conditional critical region, monitors, Deadlocks: prevention, avoidance, detection and recovery. 9

Device Management: Scheduling algorithms – FCFS, shortest-seek-time-first, SCAN, C-SCAN, LOOK, C-LOOK and elevator algorithms, spooling, spool management algorithm.

UNIT-IV

Information Management: File concept, file support, directory structures, symbolic file directory, basic file directory, logical file system, physical file system, access methods, file protection, file allocation strategies. 9

Protection: Goals, policies and mechanisms, domain of protection, access matrix and its implementation, access lists, capability lists, Lock/Key mechanisms, passwords, dynamic protection scheme, security concepts and public and private keys, RSA encryption and decryption algorithms.

Case study: UNIX OS file system, shell, filters, shell programming, programming with the standard I/O, and UNIX system calls.

LAB EXPERIMENTS

Study of hardware and software requirements of different operating systems (UNIX, LINUX, WINDOWS XP, WINDOWS 10)

Write a shell program using UNIX system calls for

a. Process management

b. File management

c. Input/output Systems calls

Write a program to simulate following CPU Scheduling Policies:

a. SJ

b. Priority

c. FCFS

d. Multi-level Queue

Write a program to simulate following file storage allocation techniques:

a. Contiguous (using array)

b. Linked –list (using linked-list)

c. Indirect allocation (indexing)

Write a program to simulate following contiguous memory allocation techniques:

a. Worst-Fit

b. Best- Fit

c. First- Fit

Calculation of external and internal fragmentation

a. Free space list of blocks from system
b. List process file from the system
Write a program to simulate compaction for the continually changing memory layout and calculate total movement of data.
Write a program to create a resource allocation graph (RAG)
Write a program to simulate Banker's algorithm
Write a program for conversion of resource allocation graph (RAG) to wait for graph (WFG) for each type of
method used for storing graph.
Write a program for the solution of Bounded Buffer (producer-consumer) problem using inter process
communication techniques with Semaphores.

12. Write a program for the solutions for Readers-Writer's problem using inter process communication technique with Semaphore.

Textbooks

1. A. Silberschatz and P. B. Galvin: Operating Systems Concepts, 5th ed., John Wiley and Sons, New York, 1998.
2. J. L. Peterson and A. Silberschatz: Operating Systems Concepts, Addison-Wesley, Reading, Mass., 1987.

Reference Books

1. P. B. Hansen: Operating System Principles, Prentice Hall, Englewood Cliffs, 1980.
2. A. S. Tannenbaum: Modern Operating Systems, Prentice Hall, Englewood Cliffs, 1992.
3. S. E. Madnick and J. J. Donovan: Operating Systems, McGraw Hill, New York
4. H. M. Dietel, Operating Systems, Addison Wesley Longman.

BIT-303	**Design & Analysis of Algorithm**
Course Category	Programme Core (PC)
Pre-requisite Subject	NIL
Contact Hours/Week	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	5
Course Assessment Methods	Continuous assessment through tutorials, attendance, home assignments, quizzes, practical work, viva voce, two minor tests, one major theory and practical examination.
Objectives:	1. To understand the importance of algorithm and how to analyse the complexity of algorithms. 1. To analyse the complexity of an algorithm in terms of time and space complexities 2. To design and implement various programming paradigms and its complexity

3. To program brute force, divide and conquer, greedy, and dynamic and backtracking techniques.

Course Outcomes The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Argue the correctness of algorithms using inductive proofs and invariants and analyse worst-case running times of algorithms using asymptotic analysis.
2. Describe the divide-and-conquer paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize dynamic-programming algorithms and analyse them.
4. Describe the greedy paradigm and explain when an algorithmic design situation calls for it. Recite algorithms that employ this paradigm. Synthesize greedy algorithms and analyse them.
5. Explain the different ways to analyse randomized algorithms (expected running time, probability of error). Analyse randomized algorithms. Compare between different data structures. Pick an appropriate data structure for a design situation.
6. Understand the concept of sorting networks and explain what an approximation algorithm is, and the benefit of using approximation algorithms. Be familiar with some approximation algorithms.

Topics Covered

Unit-I

Introduction: Algorithms, Analyzing Algorithms, Asymptotic Notation, Complexity of Algorithms, Growth of Functions, Performance Measurements, Solving Recurrence Equations Sorting and Order Statistics - Shell Sort, Heap Sort, Comparison of Sorting Algorithms, Sorting in Linear Time.

Unit II

Divide and Conquer with examples such as Sorting- Quick Sort, Merge Sort, Matrix Multiplication, Convex hull and Searching, Advanced Data Structures*:* Red-Black trees, B – trees, 2-3 Trees, Binomial Heaps, and Fibonacci Heaps.

Unit - III

Greedy methods with examples such as Optimal Reliability Allocation, Knapsack, Minimum Spanning Trees – Prim's and Kruskal's algorithms, Single Source Shortest Paths - Dijkstra's and Bellman Ford algorithms. Dynamic programming with examples such as Fibonacci Numbers, Multistage Graphs, Resource Allocation, Kanpsack, All Pair Shortest Paths – Warshal's and Floyd's algorithms.

Unit - IV

Backtracking Algorithms- Graph Coloring, n-Queen Problem, Hamiltonian Cycles and Sum of Subsets.

Selected Topics: String Matching, Theory of NP-completeness, Polynomial Time, Polynomial time Verification and Reducibility, NP – Hard - NP-Complete problems with examples. Approximation Algorithms Randomized Algorithms, Algebraic Computation and Fast Fourier Transform.

Experiments

1. To analyze time complexity of Insertion Sort, Merge Sort and Quick Sort.
2. To Implement Strassen's Matrix Multiplication.
3. To implement Merge Sort using Divide and Conquer approach.
4. To implement Quick Sort using Divide and Conquer approach.
5. To implement Knapsack Problem.
6. To implement Activity Selection Problem
7. To implement Dijkstra's Algorithm
8. To implement Bellman Ford's Prim's
9. To implement Kruskal's Algorithms.
10. To implement Largest Common Subsequence.
11. To implement Matrix Chain Multiplication.
12. To implement Multistage Graph Algorithms
13. To implement n-Queen Algorithms.
14. To implement Naïve String Matching Algorithm.
15. To implement Rabin Karp String Matching Algorithm.

Textbooks

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. RCT Lee, SS Tseng, RC Chang and YT Tsai, "Introduction to the Design and Analysis of Algorithms", McGraw Hill, 2005.
3. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Computer Science Press, Maryland, 1978
4. Berman, Paul," Algorithms", Cengage Learning.
5. Aho, Hopcraft, Ullman, "The Design and Analysis of Computer Algorithms" Pearson Education, 2008.

Reference books

1. Berlion, P. Izard, P., Algorithms-The Construction, Proof and Analysis of Programs, 1986. Johan Wiley & Sons.
2. Bentley, J.L., Writing Efficient Programs, PHI
3. Ellis Horowitz, SartajSahni, and SanguthevarRajasekaran, Computer Algorithms, W. H. Freeman, NY, 1998
4. Goodman, S.E. &Hedetnien, introduction to Design and Analysis of Algorithm1997, MGH.
5. Knuth, D.E , Fundamentals of Algorithms: The Art of Computer Programming Vol,1985

BIT-304 JAVA PROGRAMMING
5 Credits (3-1-2)

Course Category	PLBSE
Pre-requisite Subject	NIL
Contact Hours/Week	Lecture: 3, Tutorial: 1, Practical: 2
Number of Credits	5
Course Assessment Methods	Continuous assessment through attendance, tutorial, home assignments, quizzes, practical work, viva voce, two minor tests, one major theory and practical examination.
Objectives:	To make students ready for industry in programming using object oriented concepts with Java.

Course Outcomes

The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Analyze and explain the behavior of programs involving the fundamental program constructs
2. Identify and correct syntax and logic errors in short programs
3. Design and implement a class based on attributes and behaviors of objects
4. Describe the parameter passing mechanisms in terms of formal parameters, actual parameters, non-object parameters and object parameters

Topics Covered

UNIT- I

Introduction-Java IDE-JRE-JVM-Object oriented programming concepts – objects – classes – methods and messages – abstraction and encapsulation –abstract classes – Objects and classes in Java – defining classes – methods - access specifiers – static members –finalize method, Arrays – Strings - Packages –- constructors –Inheritance and its types – class hierarchy – polymorphism- dynamic binding – final keyword – abstract classes

UNIT- II

Exception Handling-The Object class – Reflection – interfaces – object cloning – inner classes – proxies - I/O Streams - Graphics programming – Frame – Components – working with 2D shapes-Introduction to Applets- Java Libraries for Applets

UNIT- III

Event Handling – event handlers – adapter classes – actions – mouse events – AWT event hierarchy – introduction to Swing – Model-View-Controller design pattern – buttons – layout management– Swing Components – exception handling – exception hierarchy – throwing and catching exceptions.

UNIT- IV

Motivation for generic programming – generic classes – generic methods – generic code and virtual machine – inheritance and generics – reflection and generics - Multi-threaded programming – interrupting threads – thread states – thread properties – thread synchronization – Executors – synchronizers. JDBC: The connectivity Model, JDBC/ODBC Bridge, java.sql package, connectivity to remote database.

EXPERIMENTS

1. Basic programs of simple statements, conditional statements, iterative statements and arrays
2. Programs having object-oriented concepts like Inheritance and Interface
3. Programs for Exception Handling and Event Handling
4. Programs of Threads and Multithreading
5. Programs related to Applets and Swings
6. Programs including JAVA Beans and Servlets

Textbooks

1. Naughton, Schildt, The Complete Reference JAVA2, TMH.
2. Balaguruswamy E, Programming in JAVA, TMH
3. Cay S. Horstmann and Gary Cornell, “Core Java: Volume I – Fundamentals”, Eighth Edition, Sun Microsystems Press
4. K. Arnold and J. Gosling, “The JAVA programming language”, Third edition, Pearson Education, 2000.

Reference Books

1. Margaret Levine Young, The Complete Reference Internet, TMH.
2. Dustin R. Callway, Inside Servlets, Addison Wesley.
3. Mark Wutica, JAVA Enterprise Edition, QUE.
4. Steven Holzner, JAVA2 Black book, Dreamtech.
5. Timothy Budd, "Understanding Object-oriented programming with Java", Updated Edition, Pearson Education, 2000.
6. C. Thomas Wu, "An introduction to Object-oriented programming with Java", Fourth Edition, Tata McGraw-Hill Publishing company Ltd., 2006

BHM-354 **BUSINESS MANAGEMENT**

Course category : Management (M)

Pre-requisite Subject : NIL

Contact hours/week : Lecture: 2, Tutorial: 0, Practical: 0

Number of Credits : 2

Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, two minor tests, and one major theory examination.

Course Objectives: To help the students gain understanding of the functions and responsibilities of managers and provide them tools and techniques to be used in the performance of the managerial job so that they can be to analyze and understand the environment of the organization and importance of management principles.

Course Outcomes :

1. Students will comprehend and correlate all the fundamental Management functions and the concepts and principles of Management.
2. Demonstrate Engineering students, demonstrate the roles, skills, and functions of Management.
3. Students will develop Interdisciplinary skills which can help them to thrive in the life- long changing environment in various fields of business.
4. One can analyze the effective application of management knowledge principles and practices to diagnose and solve organizational problems and develop optimal managerial decisions.
5. Demonstrate the acumen in organizing and understanding the staffing process.

6. Understand the complexities associated with management in the organizations and integrate the learning in handling these complexities

Topics Covered

UNIT-I

Meaning and Definition, Need for business, Nature of Business, Scope, Objectives, Qualities of a Successful Businessman. Forms of Business Ownership, Public, Private, and Joint Sector Undertaking, Public-Private Partnership, NGO – only meaning.

UNIT-II

Meaning, Emergence of Management Thought, Characteristics of Management, Bureaucracy, Scientific Management, Administrative Theories of Management, Principles of Management, Social Responsibility of Management, and Business Ethics.

UNIT-III

Meaning & Definition, Characteristics of a Good Plan, Planning Process, Types of Plans, MBO &MBE, Decision making: Types of Decisions, Steps involved in Decision Making, Communication, Importance of Communication and Types of Communication.

UNIT-IV

Meaning, characteristics, the importance of organization, steps in organization, organization structure, departmentation–meaning and basis for departmentation. The span of management-Meaning Only, Centralization vs. Decentralization, Definition, Staffing-Meaning, Functions, Selection Procedure and Instruments used in the selection.

Books & References

1. Business Management, Dr. P. Subba Rao, Roopa Traisa, Himalaya Publishing.
2. Management, Michael A Hitt, J Stewart Black, Lyman W - Prentice-Hall publishing – 2nd Revised edition.
3. Essentials of management, Harold Koontz Heinz Weihrich - Tata Mc Graw hill publishing.
4. Business management, R. K Sharma, Shashi K. Gupta – Kalyani publishers – 2009.
5. Business management, Appanniah Reddy - Himalaya publishers.2008.

BIT-351 WIRELESS SENSOR NETWORK & IoT

Course category:	Program Core (PC)
Pre-requisite Subject:	NIL
Contact hours/week:	Lecture: 3, Tutorial: 0 , Practical: 2
Number of Credits:	4
Course Assessment methods:	Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce

and two minor tests, one major theory & practical examination.

Course Objective: Students will gain an understanding of the fundamentals of Wireless Sensor Networks, IoT, Some Protocols and Applications of these technologies.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand the concepts of wireless sensor networks and its application areas
2. Understand the concepts of Internet of Things and its application areas
3. Design WSN applications in different domains and be able to analyze their performance
4. Design IoT applications in different domains and be able to analyze their performance
5. Analyse the basic routing protocols in wireless sensor network
6. Understand some energy efficient protocols of WSN

Topics Covered

UNIT I:

9

Wireless Sensor Networks (WSN): Basic components of a sensor node, Types of sensors, Constraints on the sensor nodes, Characteristics of WSN, Nature of Data in Sensor Networks, Manual vs Randomized node deployment, Event aware topology management in WSN, Data Dissemination, Aggregation, Virtual Sensor Network, Operating Systems for WSN, Issues & challenges with WSN, Some applications of WSN

UNIT II:

9

Internet of Things (IoT): Physical Design of IoT, Logical Design of IoT, IoT Enabling Technologies, Machine-to-Machine Communications, Difference between IoT and M2M, Software Defined Networking, SDN for IoT, Network Function Virtualization, Interoperability in IoT, Issues & Challenges with IoT, Some applications of IoT

UNIT III:

9

Applications of WSN: Military Applications, Environmental monitoring applications, Traffic Monitoring, Weather Monitoring, Fire Detection, Underwater Monitoring, Underground Monitoring, Agricultural Applications, Habitat Monitoring; **Applications of IoT:** Smart Cities, Smart Homes, Surveillance applications, Vehicular IoT, Smart Lighting System, Weather Monitoring System, Smart Agriculture, Healthcare System, Industry applications

UNIT IV:

9

Routing Protocols in WSN: Classification of routing protocols, Proactive routing vs Reactive routing, QoS routing, **Flat Protocols:** SPIN (Sensor Protocols for Information via Negotiation), Directed Diffusion, **Hierarchical or Cluster Based Protocols:** LEACH (Low Energy Adaptive Clustering Hierarchy), PEGASIS (Power-Efficient Gathering in Sensor

Information Systems), **Location Based Protocols:** GEAR (Geographic and Energy Aware Routing)

EXPERIMENTS:

1. Installation of simulators of WSN & IoT
2. Creating basic programs of WSN & IoT
3. Creating any application of WSN & IoT

Books & References:

1. Waltenegus Dargie, Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley Publishers, 2010, ISBN: 978-0-470-99765-9
2. Carlos De Morais Cordeiro, Dharma Prakash Agrawal, "Ad Hoc and Sensor Networks: Theory and Applications", World Scientific Publishers, 2011, ISBN: 981-256-681-3
3. Dorothea Wagner and Roger Wattenhofer, "Algorithms for Sensor and Ad Hoc Networks", Advanced Lectures, Springer, Lecture Notes in Computer Science 4621, 2007, ISBN-13 978-3-540-74990-5
4. Pethuru Raj and Anupama C. Raman, "The Internet of Things: Enabling Technologies, Platforms, and Use Cases", CRC Press, Taylor & Francis Group, 2017, ISBN: 9781498761284
5. AdrianMcEwen, "Designing the Internet of Things", Wiley Publishers, 2013, ISBN: 978-1-118-43062-0
6. VijayMadisetti, Arshdeep Bahga, "Internet of Things: A Hands-On Approach",2014,ISBN:9780996025515
7. Daniel Kellmereit, "The Silent Intelligence: The Internet of Things", 2013, ISBN: 0989973700
8. Waltenegus Dargie,Christian Poellabauer, "Fundamentals of Wireless Sensor Networks: Theory and Practice", Wiley Publishers, 2010, ISBN 978-0-470-99765-9

BIT-352 CRYPTOGRAPHY AND CYBER SECURITY

Course category	:	Programme Core (PC)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture: 3 Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through attendance, home assignments, quizzes, two minor tests, and one major theory and practical examination.
Course Objectives	:	**Course objective of this subject is to-**

1. Explain the fundamental principles of access control models and techniques, authentication, and secure system design.
2. Explain the various security threats to the networks and how to deal with it.
3. Have a strong understanding of different symmetric and asymmetric cryptographic protocols/techniques and be able to use them.
1. Apply methods for authentication, access control, intrusion detection and prevention.

2. Aware with various cybersecurity threats and how to deal with it.
3. Identify and mitigate software security vulnerabilities in existing systems.

Course Outcomes : **At the end of the course the students will be able to do following:**

1. Understand cryptography, Network security and Cybersecurity concepts and its application.
2. Apply security principles to system design.
3. Implement DES, AES, IDEA, RSA and other symmetric and asymmetric key algorithm.
4. Identify and investigate network security threat.
5. Analyse and design network security protocols.
6. Conduct research in network security and Cyber Security field.

Topics Covered

UNIT-I

Introduction to Cryptography, Attacks, Conventional and Classical Encryption Techniques- Substitution Ciphers and Transposition Ciphers, Cryptanalysis, Steganography, Stream and Block Ciphers, Modern Block Ciphers: Block Cipher Modes of Operations, Symmetric Key Cryptography: Data Encryption Standard (DES), Strength of DES, Double DES, Triple DES, Differential and Linear Crypt Analysis, IDEA Encryption and Decryption, Strength of IDEA, Key Management, Diffie-Hellman Key Exchange Algorithm, Man- in- Middle Attack, Principals of Asymmetric Key Cryptography: RSA Algorithm, Security of RSA. 9

UNIT-II

Introduction to Graph, Ring and Field, Prime and Relative Prime Numbers, Modular Arithmetic, Fermat's and Euler's Theorem, Euclid's Algorithm, Chinese Remainder Theorem, Message Authentication and Hash Function: Authentication Requirements, Authentication Functions, Message Authentication Code, Hash Functions, Birthday Attacks, Security of Hash Functions, MD5 and SHA Message Digest Algorithm, Digital Signatures, Digital Envelope, Authentication Protocols, Digital Signature Standards (DSS), Authentication Applications: Kerberos. 9

UNIT-III

IP Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), System Security: Intruders, Viruses and Related Threads, Honeypots, Traffic flow security, Firewall Design Principals, Types of Firewalls, Personal Firewalls, Intrusion Detection System (IDS), Email Security-PGP, S/MIME, Trusted Systems. 9

UNIT-IV

Introduction to Cyber Security, Need for security, Concept of Cyber Space, Cyber Crimes and its various types, Cyber Attack and its various types, Fundamental security principles – threats, attacks and vulnerability, The key concept of Cyber Security, The CIA Triad – 9

Confidentiality, Integrity and Availability, Introduction to basic Security Management and Policies - Authentication, Authorization, Access control, Identification and Accounting, Cyber Security Challenges, Cyber Security Initiative: Generating Secure Password, Password Manager, Enabling two-step verification, Use of free Anti-Virus, Finding the best browser as per requirement of users, Safe Browsing, Tips of Buying Online, Clearing Cache from Browsers.

List of Practical:

7. Write a program to implement Ceaser Cipher technique.
8. Write a program to implement Playfair Cipher with key ldrp.
9. Write a program to implement polyalphabetic Cipher.
10. Write a program to implement Vernam Cipher.
11. Write a program to implement Hill Cipher. (Use any matrix but find the inverse yourself)
12. Write a program to implement Rail fence technique
13. Write a program to implement Simple Columner Transposition technique
14. Write a program to implement Advanced Columner Transposition technique
15. Write a program to implement Euclidean Algorithm.
16. Write a program to implement Advanced Euclidean Algorithm.
17. Write a program to implement Simple RSA Algorithm with small numbers.
18. Write a program to implement:

1. DES
2. Double DES
3. Triple DES
4. AES
5. IDEA

19. Study of different wireless network components and features of any one of the Mobile Security Apps.
20. Study of the features of firewall in providing network security and to set Firewall Security in windows.
21. Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome).
22. Study of different types of vulnerabilities for hacking a websites / Web Applications.
23. Analysis the Security Vulnerabilities of E-commerce services. 6 Analysis the security vulnerabilities of E-Mail Application

Books & References:

1. Atul Kahate, "Cryptography and Network Security" Tata McGraw Hill Publications.
1. Cryptography And Network Security Principles and Practice Fourth Edition, William Stallings, Pearson Education
2. Johannes A. Buchmann, Introduction to Cryptography, Springer-Verlag Publications.
3. Bruce Schiener, Applied Cryptography, John Wiley & Sons Publications.
4. Behrouz A. Frouzan, Cryptography & Network Security, Tata McGraw Hill
5. Modern Cryptography: Theory and Practice, by Wenbo Mao, Prentice Hall PTR
6. Network Security Essentials: Applications and Standards, by William Stallings, Prentice Hall Publication.
7. Cybersecurity: The Beginner's Guide: A comprehensive guide to getting started in cybersecurity Paperback – Import, 27 May 2019 by Dr. Erdal Ozkaya

BIT-353 CLOUD COMPUTING

Course category	:	Program Core (PC)
Pre-requisite Subject	:	-
Contact hours/week	:	Lecture :3, Tutorial :0 , Practical:2
Number of Credits	:	4
Course Assessment methods	:	Continuous assessment through attendance, home assignments, quizzes, two minor tests, and one major theory and practical examination.
Course Objectives	:	To learn the advanced concepts of cloud infrastructure and services and its implementation for assessment of understanding the course by the students.
Course Outcomes	:	After successful completion of the course, students will be able to:

1. Explain the basic concepts along with evolution and features of cloud computing.
2. Analyse the trade-offs between deploying applications in the cloud and over the local infrastructure
3. Demonstrate the concept of existing cloud paradigms and platforms.
4. Classify the issues of cloud computing in various cloud models.
5. Apply the knowledge of virtualization through different virtualization technologies.
6. Apply the concept of Map reduce framework using SQL and NO SQL databases.

Topics Covered

UNIT-I 9

Introduction to Cloud: Cloud Computing at a Glance, The Vision of Cloud Computing, Defining a Cloud, A Closer Look, Cloud Computing Reference Model. Characteristics and Benefits, Challenges Ahead, Historical Developments.

Virtualization: Introduction, Characteristics of Virtualized Environment, Taxonomy of Virtualization Techniques, Virtualization and Cloud computing, Pros and Cons of Virtualization, Technology Examples- VMware and Microsoft Hyper-V

UNIT-II 9

Cloud Computing Architecture: Introduction, Cloud Reference Model, Architecture, Infrastructure / Hardware as a Service, Platform as a Service, Software as a Service, Types of Clouds, Public Clouds, Private Clouds, Hybrid Clouds, Community Clouds, Economics of the Cloud, Open Challenges, Cloud Interoperability and Standards, Scalability and Fault Tolerance.

UNIT-III 9

Aneka: Cloud Application Platform Framework Overview, Anatomy of the Aneka Container, From the Ground Up: Platform Abstraction Layer, Fabric Services, Foundation Services, Application Services, Building Aneka Clouds, Infrastructure Organization, Logical Organization, Private Cloud Deployment Mode, Public Cloud Deployment Mode, Hybrid Cloud Deployment Mode, Cloud Programming and Management, Aneka SDK, Management Tools.

UNIT-IV 9

Cloud Applications: Scientific Applications – Health care, Geoscience and Biology. Business and Consumer Applications- CRM and ERP, Social Networking, Media Applications and Multiplayer Online Gaming. Cloud Platforms in Industry: Amazon Web Services- Compute Services, Storage Services, Communication Services and Additional Services. Google AppEngine-Architecture and Core Concepts, Application Life-Cycle, cost model. Microsoft Azure- Azure Core Concepts, SQL Azure.

EXPERIMENTS

1. To implement Cloud, Apache and Hadoop framework and related services.
2. To understand various concepts practically about virtualization, data storage.
3. To implement few algorithms with the help of MapReduce and some high-level language.

Books & References

1. Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi, Mastering Cloud Computing, McGraw Hill
2. Arshdeep Bahga, Vijay Madisetti, Cloud Computing: A Hands-on Approach, Universities Press
3. Thomas Erl, Zaigham Mahmood and Ricardo Puttini, Cloud Computing: Concepts, Technology & Architecture
4. Raj Kumar Buyya, James Broberg, Andrezei M. Goscinski, Cloud Computing: Principles and Paradigms, , John Wiley and Sons 2011.

BIT-401 DATA SCIENCE AND ANALYTICS

Course category	: Program Core (PC)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	: 4
Course Assessment methods	: Continuous assessment through tutorials, attendance, home assignments, quizzes, two minor tests and one major theory examination.

Course Objective: Students will gain an understanding of the fundamentals of data science, data analytics, big data, machine learning and deep learning.

Course Outcomes: Upon successful completion of the course, the student will be able to

1. understand the current trends and basics of data science.
2. understand the difference between data science and data analytics.
3. understand the relation between data science, machine learning and deep learning.
4. learn various machine learning techniques.
5. learn various deep learning techniques.
6. understand and design various data science applications.

Topics Covered:

UNIT-I

9

Basic Concepts: Big Data, Data Science, Mathematical Foundations of Data Science, Data Analytics, Data Mining, Data Visualization, Difference Between Data Science and Data Analytics, **Some Concepts of Data Analytics:** Sampling and sampling distributions, Hypothesis testing, Two sample testing, Introduction to ANOVA, Two way ANOVA, **Types of Big Data Analytics:** Prescriptive Analytics, Diagnostic Analytics, Descriptive Analytics, Predictive Analytics, Cyber Analytics, **Data Science vs. Machine Learning vs. Deep Learning:** Definitions and Applications

UNIT-II

9

Machine Learning: Definition, Pre-processing, Dimensionality Reduction, Feature Extraction, Training, Testing, Confusion Matrix, Classification, Regression, Clustering, Association, Feedback, Types of Machine Learning Techniques; **Supervised Learning:** K Nearest Neighbour, Naive Bayes Classifiers, Decision Trees, Random Forest, Support Vector

Machine (SVM), Linear Regression; **Unsupervised Learning:** Hierarchical Clustering, K-means Clustering, Density-Based Spatial Clustering of Applications with Noise (DBSCAN), Principal Component Analysis (PCA); **Reinforcement Learning:** Q learning, Markov Decision Process

UNIT-III **9**

Deep Learning: Definition, Artificial Neural Networks, Learning Process in a Neural Network, Layers of a Neural Network, Loss Functions, Gradient Descent, **Deep Learning Algorithms:** Convolutional Neural Network (CNN), Long Short Term Memory Network (LSTM), Recurrent Neural Network (RNN), Generative Adversarial Network (GAN), Radial Basis Function Networks (RBFN), Multi-layer Perceptron (MLP), Self Organizing Map (SOM), Deep Belief Network (DBN), Restricted Boltzmann Machines(RBMs), Autoencoders

UNIT-IV **9**

Applications of Data Science and Case Studies: Fake News Detection, Sentiment Analysis, Disease Detection, Credit Card Fraud Detection, Bitcoin Price Predictor, Stock Price Prediction, Handwritten Digit Recognition, Chatbots, Human Face Detection, Speech Emotion Recognition, Iris Flowers Classification, Music Genre Classification, Automatic Music Generation, Language Translator, Gender and Age Detection

Books & References:

1. Data Science From Scratch, Joel Grus, O'Reilly
2. Machine Learning, Tom Mitchell, McGraw Hill
3. Deep Learning, John D. Kelleher, The MIT Press
4. Data Analytics, Anil Maheshwari, McGraw Hill
5. Research papers and internet resources

BIT-402 Distributed Systems

Course category : Program Core (PC)
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits : 4
Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests and one major theory and practical examination.

Course Objectives:

1. To study the characteristics of OS for Multiprocessor and Multicomputer.
2. To learn the issues related to designing DOS.
3. To have a broad and up-to-date coverage of the principles and practice in the area of Distributed Systems.
4. To understand the heterogeneous systems and their functionalities.

Course Outcomes

1. Knowledge about advanced concepts in OS.
2. Developing skill set in developing a distributed system.
3. Understand and implement the concept of distributed deadlock.

4. Understand the concept of distributed resource management.
5. Designing and evaluation of algorithms and protocols for various distributed systems.
6. Understand the failure recovery and fault tolerance.

TOPICS TO BE COVERED

UNIT-I **09**

Process Synchronization, Synchronization Mechanism, Process Deadlock, Architectural of Distributed system, Theoretical foundations: logical and vector clocks, causal ordering of messages, Chandy Lamport global state recording algorithms, cuts of distributed computation, termination detection. Distributed Mutual Exclusion: Classification of distributed mutual exclusion, requirement of mutual exclusion theorem, performance metric for distributed mutual exclusion algorithms

UNIT-II **09**

Distributed Deadlock Detection: deadlock handling strategies in distributed systems, Issues in deadlock detection & resolution, control organization for distributed dead lock detection, centralized dead lock detection algorithms, distributed dead lock detection algorithms, hierarchical dead lock detection algorithms.

Agreement Protocols: system model, classification of agreement problem, Solution to Byzantine Agreement problem, Application of Agreement algorithms.

UNIT-III **09**

Distributed Resource Management: distributed file system, mechanism for building distributed file systems, design issues, sun network file system, sprite file system, log-structured file system, disk space management, system, distributed shared memory: Algorithm for implementing DSM, Memory coherence, coherence protocols and design issues, Distributed Scheduling

UNIT-IV **09**

Failure recovery and Fault tolerance: backward and forward error recovery check pointing and recovery, recovery in concurrent systems, consistent set of checkpoints, synchronous check pointing and recovery, and asynchronous check pointing and recover. Fault tolerance: voting protocols, dynamic voting protocols, dynamic vote reassignment protocols.

EXPERIMENTS

1. Program to implement non token based algorithm for Mutual Exclusion.
2. Program to implement Lamport's Logical Clock.
3. Program to implement edge chasing distributed deadlock detection algorithm.
4. Program to implement locking algorithm.
5. Program to implement Remote Method Invocation.
6. Program to implement Remote Procedure Call.
7. Program to implement Chat Server.
8. Program to implement termination detection

Books:

1. Advanced Concept in Operating Systems-Singhal & Shivaratri (McGraw Hill)

References:

1. Distributed Operating Systems and Algorithm Analysis - Randy Chow & Theodore Johnson (Pearson Education)

2. Distributed System: Concepts and Design - Coulouris, Dollimore, Kindberg (Pearson Education)
3. Distributed Algorithms - Gerald Tel (Cambridge University Press)

BIT-403 **BLOCKCHAIN TECHNOLOGY AND ITS APPLICATIONS**

Course category : Program Core (PC)
Pre-requisite Subject : Nil
Contact hours/week : Lecture: 3 Tutorial: 0, Practical: 2
Number of Credits : 4
Course Assessment methods : Continuous assessment through attendance, Home Assignments, practical record, Viva Voce, Quizzes, two Minor Tests, One Major Theory and practical Examination.
Course Objectives : **Course objective of this subject is to-**

1. To understand the history, types, and applications of Blockchain.
2. To give students the understanding of emerging abstract models for Blockchain Technology.
3. To familiarize the students with the functional/operational aspects of cryptocurrency eco-system.
4. To acquire knowledge about cryptography and consensus algorithms.
5. Deploy projects using Web3j and design blockchain based applications.

Course Outcomes : **Upon completion of this course, the students will be able to** demonstrate:

1. an understanding of the design of non-permissioned / public blockchains such as the original Bitcoin system.
2. an understanding of how decentralized Internet application-layer services can be built using blockchain technologies and what advantages they have over traditional implementations.
3. an understanding of some of the open research problems pertaining to blockchain technology.
4. an understanding of what smart contract is and the ability to program smart contracts in software.
5. the ability to develop blockchain-based decentralized applications and understanding of how decentralized storage can be built using blockchain technologies.
6. an understanding of what permissioned blockchains are, and how they differ from non-permissioned/public blockchains.

Topics Covered
UNIT-I

Introduction to Blockchain: Distributed DBMS – Limitations of Distributed DBMS, Introduction to Block chain – History, Definition, Distributed Ledger, Blockchain Categories – Public, Private, Consortium, Blockchain Network and Nodes, Peer-to-Peer Network, Mining Mechanism, Generic elements of Blockchain, Features of Blockchain, and Types of Blockchain. 9

UNIT-II

Blockchain Architecture: Blockchain Architecture – Block, Hash, Distributer P2P, Bitcoin basics: Bitcoin blockchain, Operation of Bitcoin Blockchain, Challenges and solutions, Proof of Work (PoW), Proof of Stake (PoS), alternatives to Bitcoin consensus, Bitcoin scripting language and their use, Byzantine Fault Tolerance (BFT), Proof of Authority (PoA) and Proof of Elapsed Time (PoET), digital signatures, public key cryptography, verifiable random functions, Zero-knowledge systems. 9

UNIT-III

Blockchain-Based Futures System: Project presentation- Futures smart contract: Blockchain oracles- Web3j: Setting up the Web3J- Installing web3j- Wallet creation, Java client: The wrapper generator- Initializing web3j- Setting up Ethereum accounts- Deploying the contract, Privacy, Security issues in Blockchain: Pseudo-anonymity vs. anonymity, Zcash and Zk-SNARKS for anonymity preservation, attacks on Blockchains: Sybil attacks, selfish mining, 51% attacks advent of algorand; Sharding based consensus algorithms to prevent these attacks. 9

UNIT-IV

Blockchains In Business and Creating ICO: Public versus private and permissioned versus permission less blockchains- Privacy and anonymity in Ethereum- Why are privacy and anonymity important? - The Ethereum Enterprise Alliance, Ethereum Virtual Machine- Swarm and IPFS, Blockchains-a-Service- Initial Coin Offering (ICO): Project setup for ICO implementation- Token contracts- Token sale contracts-Contract security and testing the code, Applications and Case Studies: Block chain in Financial Service, Supply Chain Management and Government Services 9

List of Practical:

1. Create a Public Ledger vs. Private Ledger with the various attributes like Access, Network Actors, Native token, Security, Speed, and examples.
2. How would a blockchain help in processing insurance claims of the insurance industry, which suffers from several issues like fraud, contract complexity, human error, information flows in reinsurance and claims processing? Use various aspects to summarize the solution.
3. Prepare your build system and Building Bitcoin Core.
4. Write Hello World smart contract in a higher programming language (Solidity).
5. Solidity example using arrays and functions
6. create a Maven project using Web3j.
7. Construct and deploy your contract (Use deploy method)
8. Implement an ICO on Ethereum.
9. Install IPFS locally on our machine, initialize your node, view the nodes in network and add files and directories install Swarm and run any test file.

Books & References:

1. Imran Bashir, “Mastering Blockchain: Distributed Ledger Technology, decentralization, and smart contracts explained”, 2nd Edition, Packt Publishing Ltd, March 2018.

2. Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, "Blockchain by Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger", Packt Publishing Limited, 2018.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, "Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction", Princeton University Press, July 2016.
4. Narayanan, Bonneau, Felten, Miller and Goldfeder, "Bitcoin and Cryptocurrency Technologies– A Comprehensive Introduction", Princeton University Press.
5. Josh Thompson, 'Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technologyand Blockchain Programming', Create Space Independent Publishing Platform, 2017.
6. Merunas Grincalaitis, "Mastering Ethereum: Implement Advanced Blockchain Applications Using Ethereum-supported Tools, Services, and Protocols", Packt Publishing.
7. Prof. Sandip Chakraborty, Dr. Praveen Jayachandran, "Blockchain Architecture Design and Use Cases" [MOOC], NPTEL: https://nptel.ac.in/courses/106/105/106105184/

BIT-326 ANDROID PROGRAMMING

Course category : Program Elective-1

Pre-requisite Subject : -

Contact hours/week : Lecture :3, Tutorial :0, Practical:2

Number of Credits : 4

Course Assessment methods : Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests, one major theory and practical examination.

Course Objectives :
1. To gain knowledge of installing Android Studio and Cross Platform Integrated Development Environment.
2. To learn designing of User Interface and Layouts for Android App.
3. To learn how to use intents to broadcast data within and between Applications.
4. To use Content providers and Handle Databases using SQLite.
5. To introduce Android APIs for Camera and Location Based Service.
6. To discuss various security issues with Android Platform.

Course Outcomes : After successful completion of the course, students will be able to:
1. Experiment on Integrated Development Environment for Android Application Development.
2. Comprehend the basic features of Android Platform and Create Activities in Android.
3. Demonstrate the design concepts of user interface using components, views and menus in Android.
4. Create and use databases for Android Application.
5. Implement messaging services in Android.
6. Deploy mobile applications in various marketplaces for distribution.

Topics Covered

UNIT-I

INTRODUCTION TO ANDROID: The Android Platform, Android SDK, Eclipse Installation, Android Installation, Building you First Android application, Understanding Anatomy of Android Application, Android Manifest file.

UNIT-II

ANDROID APPLICATION DESIGN ESSENTIALS: Anatomy of an Android applications, Android terminologies, Application Context, Activities, Services, Intents, Receiving and Broadcasting Intents, Android Manifest File and its common settings, Using Intent Filter, Permissions.

UNIT - III

ANDROID USER INTERFACE DESIGN ESSENTIALS: User Interface Screen elements, Designing User Interfaces with Layouts, Drawing and Working with Animation. Testing Android applications, Publishing Android application, Using Android preferences, Managing Application resources in a hierarchy, working with different types of resources.

UNIT-IV

USING COMMON ANDROID APIs: Using Android Data and Storage APIs, Managing data using Sqlite, Sharing Data between Applications with Content Providers, Using Android Networking APIs, Using Android Web APIs, Using Android Telephony APIs, Deploying Android Application to the World.

EXPERIMENTS

1. Android application to demonstrate any five types of textboxes.
2. Android applications to demonstrate Checkboxes, radio buttons.
3. Android applications to demonstrate ImageView, ScrollView, ListView and GridView.
4. Android application to demonstrate page navigation.
5. Create an android application to demonstrate any three types of layouts.
6. Create a simple calculator application.
7. Android application to demonstrate MapView.
8. Create an android application to demonstrate registration form.
9. Create an android application to demonstrate login form by connecting to the database.

Create an android application to retrieve data from the database and display it.

Books & References

1. Wei – Meng Lee, Beginning Android Application Development, Wiley publications.
2. Reto Meier, Professional Android 4 Application Development, Wiley publications
3. Mark Murphy; Beginning Android 3; Apress Springer India Pvt Ltd. ;1st Edition; 2011;ISBN13: 978-1-4302-3297-1
4. Sayed Hashimi , Satya Komatineni, Dave MacLean; Pro Android 4; Apress Springer India Pvt Ltd; 1st Edition; 2012; ISBN: 978-1-4302-3930-7
5. The Android Developer's Cookbook: Building Applications with the Android SDK by James Steele, Nelson To, Addison-Wesley Professional

BIT-327 **Computer Vision**

Course Category	:	Programme Elective-1
Pre-requisites	:	Knowledge of Programming and its various techniques, Basic co-ordinate geometry, matrix algebra, linear algebra and random process.
Contact Hours/Week	:	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests, one major theory and practical examination.
Course Objective	:	The primary objective of this course is to introduce the basic notions in image processing and computer vision in such a way that a student will be able to use them for practical purposes and have an understanding of the theoretical (mathematical) basics.

Algorithms for image processing and computer vision are often the 'materialization' of mathematical formulas. Being able to make a program from a mathematical description using the Python programming language and Numpy/Scipy packages is an important objective of this course. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity.

1. Students will learn fundamental concepts/issues of Computer Vision and Image Processing, and major approaches that address them.
2. Students will be able to understand the fundamentals of computer vision including image acquisition and image formation models.
3. The students will learn about radiometric models of image formation, image formation in the camera, image processing concepts, concept of feature extraction and selection for pattern classification/recognition
4. The students will learn about advanced concepts like motion estimation and tracking, image classification, scene understanding, object classification and tracking, image fusion, and image registration
5. The students will learn about the use of various tools being utilized for computer vision and image processing through various practical exercises.

Course Outcomes : Upon successful completion of this course, the student shall be able to:

1. apply relatively simple methods to analyze images in practical settings.
2. design, implement, and evaluate a computer-based system, process, component, or program to meet desired needs.
3. analyze the local and global impact of computing on individuals, organizations, and society.
4. use current techniques, skills, and tools necessary for computing practice.
5. apply design and development principles in the construction of software systems of varying complexity.
6. recover the information, knowledge about the objects in the scene and projection geometry and understanding of 3D image.

Topics to be Covered

UNIT-I

Introduction: Brief History, Goals of Computer Vision and Image Processing, Image Formation Concepts. Fundamental Concepts of Image Formation: Radiometry, Geometric Transformations, 2-D Projective Geometry, homograph and its Properties, Camera Geometry, Geometric Camera Models, Camera Calibration, Stereo geometry, Image Formation in a Stereo Vision Setup, Image Reconstruction from a Series of Projections. 9

UNIT-II

Image Enhancement in the Spatial and Frequency Domain: Image Enhancement in the Spatial and Frequency Domain: Fundamentals of Image processing, Feature matching and model fitting, Colour processing, Image enhancement by point processing, Image enhancement by neighbourhood processing, Basic Gray Level, Transformations, Histogram Processing, Enhancement Using Arithmetic and Logic operations, Zooming, Basics of Spatial Filters, Smoothening and Sharpening Spatial Filters, Combining Spatial Enhancement Methods. introduction to Fourier Transform and the frequency Domain, Smoothing and Sharpening Frequency Domain Filters, Homomorphic Filtering 9

UNIT-III

Feature Detection and Matching: Points and Patches, Edges, Lines, Colour Image Processing Texture, Descriptors, Colour Features, Feature detection and description, Range image processing, Edges/Boundaries, Object Boundary and Shape Representations. Interest or Corner Point Detectors, Histogram of Oriented Gradients, Scale Invariant Feature Transform, Speeded up Robust Features, Saliency. Clustering and classification, Segmentation: Active Contours: Snakes, Dynamic Snake and Condensation, Scissor, Level Sets, Split and Merge, Mean Shift and Mode Finding, Feature Based Alignment: 2D and 3D Feature Based Alignment, Pose Estimation, Geometric Intrinsic Calibration. 9

UNIT-IV

Structure from Motion: Triangulation, Two Frame Structure from Motion, Factorization, Bundle Adjustment. Dense Motion Estimation: Translational Alignment, Parametric Motion, Spline Based Motion, Layered Motion. Image Stitching: Motion Models, Global Alignment, Composing. Artificial Neural Network for Pattern Classification, Convolutional Neural Networks, Autoencoders, Gesture Recognition, Motion Estimation and Object Tracking. Dimensionality reduction and sparse representation, Deep neural architecture, and applications. 9

List of Experiments: Practical will be based on the above syllabus. It is suggested at least 10 experiments should be conducted during practical hours.

1. Introduction to MATLAB Programming.
2. Write a Program to display the Negative of a digital Image.
3. Write a Program to perform thresholding on an input Image
4. Write a Program to perform gray level slicing without background
5. Write a Program to perform gray level slicing with background
6. Write a Program to perform bit-plane slicing
7. Write a Program to display Histogram of an image
8. Write a Program to perform Log Transformation of an image.
9. Write a Program to implement Ideal low pass filter.
10. Write a Program to implement Butterworth low pass filter.
11. Write a Program to implement Gaussian low pass filter.
12. Write a Program for generating noise PDFs for uniform, Rayleigh and exponential noise.
13. Write a Program to implement various edge detection operators
14. Open Ended program

Textbooks

1. Rafael C. Gonzalez & Richard E. Woods, “Digital Image Processing”, 2nd edition, Pearson Education.
2. R. Szeliski, Computer Vision: Algorithms and Applications, Springer
3. D. Forsyth and J. Ponce, Computer Vision- A Modern Approach, Prentice Hall
4. B. K. P. Horn, Robot Vision, McGraw Hill
5. David A. Forsyth, Jean Ponce, “Computer Vision: A Modern Approach”, Prentice Hal

Reference Books

7. E. Trucco and A. Verri, Introductory Techniques for 3D Computer Vision, Publisher: Prentice Hall. 23. 4.
8. R. Jain et. Al, Machine Vision, McGraw Hill, 1995.

9. E. Trucco, and A. Verri, Introductory Techniques for 3-D Computer Vision, Prentice Hall, 1998.
10. V. Nawla, A Guided Tour of Computer Vision, Addison-Wesley, 1993

BIT-328 Mobile Computing

Course Category	:	Programme Elective-1
Pre-requisites	:	Knowledge of Programming and its various techniques, Basic co-ordinate geometry, matrix algebra, linear algebra and random process.
Contact Hours/Week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through attendance, tutorial, home assignments, quizzes, two minor tests, one major theory examination.

Course Outcomes

The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. To study the working principles of wireless LAN and its standards.
2. Demonstrate the energy management in wireless mobile networks and outline knowledge on Mobile IP.
3. Be familiar with the network protocol stack and learn the basics of mobile telecommunication system.
4. Be exposed to Ad-Hoc networks.
5. Gain knowledge about different mobile platforms and application development
6. To build skills in working with Wireless application Protocols to develop mobile content applications

TOPICS TO BE COVERED

UNIT-I **09**

Introduction to Electromagnetic Spectrum, modulation techniques, Mobile telephone systems, Cellular systems development and GSM/CDMA Standards, handover scenarios, HSCSD and GPRS.

UNIT-II **09**

Satellite Systems-GEO, LEO, MEO, Broadcast Systems-Broadcast transmission, Digital Audio Broadcasting-Multimedia Object Transfer Protocol. Digital Video Broadcasting. Infrastructure and ad hoc networks, 802.11- Bluetooth- Architecture, Applications and Protocol, Layers, Frame structure, comparison between 802.11 and 802.16. Wireless ATM-Services, Reference Model, Functions, Radio Access Layer. Handover- Reference Model, Requirements, Types,

Location Management, Addressing, Access Point Control Protocol (APCP).

UNIT-III **09**

Mobile Network and Transport Layers: Mobile IP- Goals, Requirements, IP packet delivery, Advertisement, and discovery. Registration, Tunnelling and Encapsulation, Optimization,

Reverse Tunnelling, IPv6, Traditional TCP, Indirect TCP, Snooping TCP, Mobile TCP, Transmission.

UNIT-IV **09**

Dynamic Host configuring protocol, Ad-hoc networks – Routing, DSDV, Dynamic source routing. Hierarchical Algorithms. Wireless Application Protocol & World Wide Web: WAP- Architecture, Protocols-Datagram, Transaction, Session -Wireless Application Environment-WML- Features, Script- Wireless Telephony Application. WWW- HTTP, Usage of HTML, WWW system architecture.

Books:

1. Jochen Schiller, Mobile Communications, Preason Education Asia.
2. Hazyszt of Wesolowshi, "Mobile Communication Systems", John Wiley and Sons Ltd, 2002.

References:

1. Leon-Garcia & Indra Widjaja, Communication Networks -Fundamental Concepts and Key Architectures, Tata McGraw Hill.
2. Mobile Computing, ASOKE TALUKDER HASAN AHMED ROOPA R YAVAGAL, Second Edition .McGrawHill

BIT-376 Compiler Design

Course Category	:	Programme Elective-2
Pre-requisites	:	Knowledge of Programming and its various techniques, Basic co-ordinate geometry, matrix algebra, linear algebra and random process.
Contact Hours/Week	:	Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through attendance, tutorial, home assignments, quizzes, two minor tests, one major theory examination.

Course Objectives:

a. To teach concepts of language translation and phases of compiler design
b. To describe the common forms of parsers
c. To inculcate knowledge of parser by parsing LL parser and LR parser
d. To demonstrate intermediate code using technique of syntax directed translation
e. To Illustrate the various optimization techniques for designing various optimizing compilers

Course Outcomes

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

1. Use compiler construction tools and describes the Functionality of each stage of compilation process.

2. Construct Grammars for Natural Languages and find the Syntactical Errors/Semantic errors during the compilations using parsing techniques.
3. Analyse different representations of intermediate code.
4. Construct new compiler for new languages.
5. Generate Machine dependent code generation, object code forms, the target machine, a simple code generator.
6. Participate in GATE, PGECET and other competitive examinations

TOPICS TO BE COVERED

UNIT-I **09**

INTRODUCTION TO COMPILERS: Definition of compiler, interpreter and its differences, the phases of a compiler, role of lexical analyzer, regular expressions, finite automata, from regular expressions to finite automata, pass and phases of translation, bootstrapping, LEX-lexical analyzer generator. PARSING: Parsing, role of parser, context free grammar, derivations, parse trees, ambiguity, elimination of left recursion, left factoring, eliminating ambiguity from dangling-else grammar, classes of parsing, top down parsing - backtracking, recursive descent parsing, predictive parsers, LL(1) grammars.

UNIT-II **09**

BOTTOM UP PARSING: Definition of bottom up parsing, handles, handle pruning, stack implementation of shift-reduce parsing, conflicts during shift-reduce parsing, LR grammars, LR parsers-simple LR, canonical LR(CLR) and Look Ahead LR (LALR) parsers, error recovery in parsing, parsing ambiguous grammars, YACC-automatic parser generator.

UNIT-III **09**

SYNTAX DIRECTED TRANSLATION: Syntax directed definition, construction of syntax trees, attributed and L-attributed definitions, translation schemes, emitting a translation. INTERMEDIATE CODE GENERATION: intermediate forms of source programs– abstract syntax
tree, polish notation and three address code, types of three address statements and its implementation, syntax directed translation into three-address code, translation of simple statements, Boolean expressions and flow-of-control statements.

UNIT-IV **09**

Type Checking, Run Time Environments, Code Optimization: Organization of code optimizer, basic blocks and flow graphs, optimization of basic blocks, the principal sources of optimization, the directed acyclic graph (DAG) representation of basic block, global data flow analysis.

CODE GENERATION: Machine dependent code generation, object code forms, the target machine, a simple code generator, register allocation and assignment, peephole optimization.

Books:

1. Alfred V. Aho, Ravi Sethi, Jeffrey D. Ullman (2007), Compilers Principles, Techniques and Tools, 2nd edition, Pearson Education, New Delhi, India.

References:

1. Alfred V. Aho, Jeffrey D. Ullman (2001), Principles of compiler design, Indian student edition, Pearson Education, New Delhi, India.

2. Kenneth C. Louden (1997), Compiler Construction– Principles and Practice, 1st edition, PWS Publishing.
3. K. L. P Mishra, N. Chandrashekaran (2003), Theory of computer science- Automata Languages and computation, 2nd edition, Prentice Hall of India, New Delhi, India.
4. Andrew W. Appel (2004), Modern Compiler Implementation C, Cambridge University Press, UK.

BIT-377 DEEP LEARNING

Course category : Program Elective-2
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4
Course Assessment methods : Continuous Assessment through Tutorials, Assignments, Quizzes, two minor tests, one major theory examination.

Course Objective: Students will gain an understanding of the fundamentals of deep learning, unsupervised learning, supervised learning, some artificial neural networks and applications of deep learning.

Course Outcomes: Upon successful completion of the course, the student will be able to

1. understand the current trends and basics of deep learning.
2. understand the difference between data science and data analytics.
3. understand the relation between data science, machine learning and deep learning.
4. learn various machine learning techniques.
5. learn various deep learning techniques.
6. understand and design various applications of deep learning.

Topics Covered:

UNIT-I **9**

Basic Concepts: Big Data, Data Science, Data Analytics, Data Mining, Data Visualization, Difference Between Data Science and Data Analytics, Machine Learning vs. Deep Learning, Characterization of Learning Problems, Mathematical Foundations of Data Science and Deep Learning, Supervised Tasks with Deep Learning, Unsupervised Learning with Deep Network, Transfer Learning

UNIT-II **9**

Deep Learning: Definition, Pre-processing, Dimensionality Reduction, Normalization, Feature Extraction, Training, Testing, Artificial Neural Networks, Learning Process in a Neural Network, Layers of a Neural Network, Multi-layer Perceptron (MLP), Feed Forward Neural Networks, Backpropagation, Loss Functions, Gradient Descent, Principal Component Analysis (PCA), Autoencoders

UNIT-III **9**

Deep Learning Techniques: Convolutional Neural Network (CNN), Long Short-Term Memory Network (LSTM), Recurrent Neural Network (RNN), Generative Adversarial Network (GAN), Radial Basis Function Networks (RBFN), Deep Belief Network (DBN), Self-Organizing Map (SOM), Restricted Boltzmann Machines (RBMs), A study of LeNet, AlexNet, ZF-Net, VGGNet, GoogLeNet, and ResNet

UNIT-IV **9**

Some Applications of Deep Learning: Fake News Detection, Sentiment Analysis, Disease Detection, Credit Card Fraud Detection, Bitcoin Price Predictor, Stock Price Prediction, Handwritten Digit Recognition, Chatbots, Human Face Detection, Speech Emotion Recognition, Iris Flowers Classification, Music Genre Classification, Automatic Music Generation, Language Translator, Gender and Age Detection

Books & References:

1. Deep Learning, John D. Kelleher, The MIT Press
2. Machine Learning, Tom Mitchell, McGraw Hill
3. Data Science from Scratch, Joel Grus, O'Reilly
4. Data Analytics, Anil Maheshwari, McGraw Hill
5. Research papers and internet resources

BIT-378 Data Mining & Warehousing

Course category : Program Elective-2
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4

Course Assessment Method

Continuous assessment through attendance, tutorial, home assignments, quizzes, two minor tests, one major theory examination

Course Outcomes

The students are expected to be able to demonstrate the following knowledge, skills, and attitudes after completing this course.

1. Understand the basic concepts of Data Mining & Warehousing.
2. Understand the concept of Mining Frequent Patterns, Associations and Correlations.
3. Understand and implement the concepts of Cluster Analysis.
4. Understand the concept of Spatial Data, Text Mining and Data Mining for Business Applications.
5. Approach business problems data-analytically by identifying opportunities to derive business value from data.
6. know the basics of data mining techniques and how they can be applied to extract relevant business intelligence.

TOPICS TO BE COVERED

UNIT-I **09**

Introduction to Data Mining: Motivation for Data Mining, Data Mining Definition &Functionalities, Classification of DM Systems, DM Task Primitives, Integration of a Data Mining System with A Database or A Data Warehouse, Major Issues in Data Mining. Data Warehousing. Overview of Concepts Like Star Schema, Fact and Dimension Tables, OLAP

Operations, from OLAP to Data Mining. Data Pre-Processing: Why? Descriptive Data Summarization, Data Cleaning: Missing Values, Noisy Data, Data Integration and Transformation. Data Reduction: Data Cube Aggregation, Dimensionality Reduction, Data Compression, Numerosity Reduction, Data Discretization and Concept Hierarchy Generation for Numerical and Categorical Data.

UNIT-II **09**

Mining Frequent Patterns, Associations and Correlations: Market Basket Analysis, Frequent Item Sets, Closed Item Sets, and Association Rules, Frequent Pattern Mining, Efficient and Scalable Frequent Item Set Mining Methods, The Apriori Algorithm for Finding Frequent Item Sets Using Candidate Generation, Generating Association Rules from Frequent Item Sets, Improving the Efficiency of Apriori, Frequent Item sets without Candidate Generation using FP Tree, Mining Multilevel Association Rules, Mining Multidimensional Association Rules, from Association Mining to Correlation Analysis, Constraint-Based Association Mining. Issues Regarding Classification and Prediction: Classification Methods: Decision Tree, Bayesian Classification, Rule Based Prediction: Linear and Non-Linear Regression Accuracy and Error Measures, Evaluating the Accuracy of a Classifier or Predictor.

UNIT-III **09**

Cluster Analysis: Types of Data in Cluster Analysis, Categories of Clustering Methods, Partitioning Methods K-Means, K-Medoids Hierarchical Clustering Agglomerative and Divisive Clustering, BIRCH and ROCK Methods, DBSCAN, Outlier Analysis Stream Data Classification, Clustering Association Mining in Stream Data. Mining Sequence Patterns in Transactional Databases.

UNIT-IV **09**

Spatial Data and Text Mining: Spatial Data Cube Construction and Spatial OLAP, Mining Spatial Association and Co-Location Patterns, Spatial Clustering Methods, Spatial Classification and Spatial Trend Analysis. Text Data Analysis and Information Retrieval, Dimensionality Reduction for Text, Text Mining Approaches Web Mining Introduction, Web Content Mining, Web Structure Mining, Web Usage Mining, Automatic Classification of Web Documents. Data Mining for Business Applications like Balanced Scorecard, Fraud Detection, Click Stream Mining, Market Segmentation, Retail Industry, Telecommunications Industry, Banking & Finance and CRM etc.

Books:

1. Han, Kamber, "Data Mining Concepts and Techniques", Morgan Kaufmann 2nd Edition
2. P. N. Tan, M. Steinbach, Vipin Kumar, Introduction to Data Mining, Pearson Education

References:

1. MacLennan Jamie, Tang Zhao Hui and CrivatBogdan,Data Mining with Microsoft SQL Server 2008, Wiley India Edition.
2. G. Shmueli, N.R. Patel, P.C. Bruce, Data Mining for Business Intelligence: Concepts, Techniques, and Applications in Microsoft Office Excel with XL Miner, Wiley India.
3. Michael Berry and Gordon Linoff, Data Mining Techniques., 2nd Edition Wiley Publications
4. **Alex Berson and Smith, Data Mining and Data Warehousing and OLAP, McGraw Hill Publication.**
5. E. G. Mallach, Decision Support and Data Warehouse Systems", Tata McGraw Hill.

6. Michael Berry and Gordon Linoff, Mastering Data Mining- Art & science of CRM., Wiley Student Edition
Arijay Chaudhary & P. S. Deshpande, Multidimensional Data Analysis and Data Mining
7. Dreamtech Press 8. Vikram Pudi & Radha Krishna, Data Mining, Oxford Higher Education.

BIT-426 Social Networks

Course category : Program Electives-3
Pre-requisite Subject : NIL
Contact hours/week : Lecture: 3, Tutorial: 1, Practical: 0
Number of Credits : 4
Course Assessment methods : Continuous assessment through tutorials, attendance, home assignments, quizzes, two Minor Test, one Major Theory Examination.

Course Objective: Students will gain an understanding of the fundamentals of social networks analysis, ontology, semantic web, mining concepts and security in social networks.

Course Outcomes: The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course

1. Understand basics of Social Network Analysis and Electronic Sources for Network Analysis
2. Understand basics of Ontology and their Role in the Semantic Web
3. Understand Modelling and Aggregating Social Network Data
4. Understand Knowledge Representation, Extraction, Visualization and Predicting Human Behaviour for Social Communities
5. Understand Mining Communities in Web Social Networks
6. Implement Security and Privacy in Online Social Networks

Topics Covered

Unit 1 **9**

Basics of Social Networks: Handling Real-world Network Datasets, Link Analysis, Cascading Behavior in Networks, Pseudocore (How to go viral on web), **Introduction to Social Network Analysis:** 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 Social Network Analysis, Applications of Social Network Analysis; **Electronic Sources for Network Analysis:** Electronic discussion networks, Blogs and online communities, Web-based networks; **Ontology and their Role in the Semantic Web:** Ontology languages for the Semantic Web, Web Ontology Language (OWL), Resource Description Framework (RDF)

Unit 2

9

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; **Knowledge Representation and Extraction**: Advanced representations, Ontology-based knowledge

representation, Definition of community, Evaluating communities, Extracting evolution of web community from a series of web archives, Detecting communities in social networks

Unit 3

9

Mining Communities in Web Social Networks: 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; **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 4

9

Visualization: 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 of Social Networks:** Cover networks, Community welfare, Collaboration networks, Co-Citation networks; **Predicting Human Behavior for Social Communities:** User data management, Inference and predicting human behavior, Enabling new human experiences

Books & References:

1. Social Networks and the Semantic Web, Peter Mika, First Edition, Springer 2007.
2. Handbook of Social Network Technologies and Applications‖, Borko Furht, 1st Edition, Springer, 2010.
3. Social Network Analysis with applications, Ian McCulloh, Helen Armstrong, and Anthony Johnson, WILEY Publisher, 2013
4. Data Mining Concepts and Techniques, Jiawei Han, Micheline Kamber, second edition, Morgan Kaufmann Publishers (an imprint of Elsevier0, 2006

BIT-427 **Digital Forensics**

Course Category	:	Programme Elective-3
Pre-requisites	:	Knowledge of Programming and its various techniques, Algorithm design and Analysis
Contact Hours/Week	:	Lecture: 3, Tutorial: 0, Practical:2
Number of Credits	:	4
Course Assessment Methods	:	Continuous assessment through attendance, home assignments, quizzes, practical work, record, viva voce, two minor tests, one major theory and practical examination.
Course Objective	:	The primary objective of this course is to introduce the principles and practices of digital investigation. Emphasis will be placed on the teaching of these fundamentals and importance of digital forensics. Assigned projects promote a 'hands-on' approach for understanding, as well as a challenging avenue for exploration and creativity. 1. Students will learn how to conduct a digital investigation in an organized and systematic way.

2. Students will learn different techniques and procedures that enable them to perform a digital investigation.
3. The students will learn the analysis of physical storage media and volume analysis.
4. The students will learn how to examine digital evidence such as the data acquisition, identification analysis.
5. The students will learn about the use of various tools being utilized for digital forensics through various practical exercises.

Course Outcomes : Upon successful completion of this course, the student shall be able to:

1. discuss and describe Forensic science and Digital Forensic concepts.
2. determine various digital forensic Operandi and motive behind cyber-attacks.
3. interpret the digital pieces of evidence, digital forensic process model and their legal perspective.
4. choose and use different forensic tools to investigate the cybercrime.
5. identify the digital pieces of evidence.
6. analyse the digital evidence used to commit cyber offences.

Topics to be Covered

UNIT-I

Introduction: Understanding of forensic science, digital forensic, the digital forensic process, Locard's exchange principle, scientific models, legal concerns and private issues, roles of Forensics Investigator, Steps for Forensics. **Understanding of the technical concepts:** Basic computer organization, File system, Memory organization concept, Data storage concepts (with respect to Windows and Linux Operating System.)

UNIT-II

Digital Forensics Process Model: Digital Evidence and First Responder Procedure (Introduction to cybercrime scene, Documenting the scene and evidence), Digital Evidence, Digital Evidence Investigation Process-types of investigation, techniques in digital forensics, Live and dead system forensic, maintaining the chain of custody, hashing concepts to maintain the integrity of evidence , First Responders Toolkit, Report drafting. 9

UNIT-III

Computer Operating system Artifacts: Recovering deleted file and partition, hibernating files, examining window registry, recycle bin operation, understanding of metadata, Restore points and shadow copies. Report the Investigation, File carving and document analysis. Digital Forensics Tools: Overview of EnCase Forensics, Deep Information Gathering Tool - Dmitry Page. Computer Forensics Live Practical by using Autopsy and FTK Imager. 9

UNIT-IV

Logs and Event Analysis, Forensic Analysis using AUTOPSY- Linux and Windows, Forensics and Log analysis, Compare and AUDIT Evidences using Hashdeep Page, Data Carving using Bulk Extractor- Kali Linux and Windows, Recovering Evidence from Forensic Images using Foremost. **Password Cracking:** Introduction to Password Cracking, 9

Application Password Cracking, Password Cracking using John the Ripper, Password Cracking using Rainbow Tables, PDF File Analysis, Remote Imaging using E3 Digital Forensics. **Report Writing:** Introduction to Report Writing, Forensic Reports & Expert Witness.

List of Experiments: Practical will be based on the above syllabus. The instructor is advised to explore the following tools/e-resources during the practical sessions. It is suggested at least 10 experiments should be conducted during practical hours.

1. Wireshark
2. COFEE Tool
3. Magnet RAM Capture
4. Ram Capture
5. NFI Defragger
6. Toolsley
7. Volatility

Textbooks

1. Warren G. Kruse II and Jay G. Heiser**, "**Computer Forensics: Incident Response Essentials", Addison Wesley, 2002.
2. Cybersecurity – Understanding of cybercrimes, computer forensics and Legal perspectives by Nina Godbole and Sunit Belapure – Wiley India Publication
3. Nelson, B, Phillips, A, Enfinger, F, Stuart, C**.**, **"**Guide to Computer Forensics and Investigations, 2nd **e**d**.**, Thomson Course Technology, 2006, ISBN: 0-619-21706-5.
4. File System Forensic Analysis, by Brian Carrier, Addison-Wesley, ISBN 0321268172, 2005.
5. Handbook of Digital Forensics and Investigation, by Eoghan Casey, Academic Press, ISBN 0123742676, 2009

Reference Books

1. Vacca, J, *Computer Forensics, Computer Crime Scene Investigation*, 2nd Ed, Charles River Media, 2005, ISBN: 1-58450-389.

E-Learning Resources:

1. Ministry of Electronics and Information Technology (MeitY) – Govt of India – Information Security Project - https://www.infosecawareness.in
2. https://nptel.ac.in/
3. https://www.coursera.org/

BIT-428 **Reinforcement Learning**

Course Category : Programme Elective-3

Contact Hours/Week : Lecture: 3, Tutorial: 1, Practical: 0

Number of Credits : 4

Course Assessment Methods : Continuous Assessment through Tutorials, Assignments, Quizzes, Two Minor Test, One Major Theory Examination

Course Objective : The course should enable the students to:

1. Learn the concepts of reinforcement learning, Multi Armed Bandits problem, Finite Markov Decision Process.
2. Provide approximate solutions methods for Reinforcement learning.
3. Introduce Dynamic programming, Monte Carlo methods and Temporal-Difference Learning.

4. Excel with Tabular Methods and Prediction with Approximation.
5. Familiarize with applications and case studies of reinforcement learning

Course Outcomes : Upon successful completion of this course, the student shall be able to:

1. Understand the concepts of Reinforcement Learning to solve real world problems.
2. Solve problems using Finite Markov Decision process and dynamic program.
3. Apply Monte Carlo, Temporal Difference methods for policy evaluation and prediction.
4. Analyse the Tabular Methods and On-policy Prediction with Approximation.
5. Solve problems using deep reinforcement learning.
6. Recognize current advanced techniques and applications using RL

Topics to be Covered

UNIT-I

REINFORCEMENT LEARNING PRIMITIVES: 9

Introduction and Basics of RL, Defining RL Framework, Probability Basics: Probability Axioms, Random Variables, Probability Mass Function, Probability Density Function, Cumulative Distribution Function and Expectation. Introduction to Agents, Intelligent Agents – Problem Solving – Searching, Logical Agents.

UNIT-II

ELIGIBILITY TRACES AND REINFORCE: 9

Eligibility Traces and Reinforce: Planning and Learning with Tabular Methods, Models and Planning, Integrated Planning, acting and learning, Prioritized Sweeping, Expected vs Sample updates, Trajectory sampling, Real-time dynamic programming, Planning at decision time, Heuristic search, Rollout algorithms, Monte Carlo tree search,

UNIT-III

DYNAMIC PROGRAMMING AND FINITE MARKOV DECISION PROCESS 9

Dynamic Programming: Definition, Policy Evaluation (Prediction), Policy Improvement, Policy Iteration, Value Iteration, Asynchronous dynamic programming, Generalized Policy Iteration, Efficiency of dynamic programming, Finite Markov Decision Process: Basics, The Agent-Environment Interface, Goals and Rewards, Returns and Episodes, Unified Notation for Episodic and Continuing Tasks, Policies and Value Functions, Optimal Policies and optimal Value Functions, Optimality and Approximation.

UNIT-IV

MONTE CARLO METHODS FOR MODEL FREE PREDICTION AND CONTROL AND TD METHODS: 9

Monte Carlo Methods: Definition, Monte Carlo Prediction, Monte Carlo Estimation of Action values, Monte Carlo Control, Monte Carlo Control without Exploring Starts, Off-policy prediction via Importance Sampling, Incremental implementation, Temporal-Difference Learning: TD Prediction, Advantages of TD Prediction Methods, Optimality of TD (0), SARSA: On-policy TD control, Q-learning Off-policy TD control, Hierarchical RL.

Textbooks

1. Richard S. Sutton and Andrew G. Barto,"Reinforcement Learning: An Introduction", 2nd Edition

Reference Books

1. Daniel Jurafsky & James H Martin, Speech and Natural Language Processing - Pearson Publications.
2. Alberto Leon-Garcia, "Probability, Statistics, and Random Processes for Electrical Engineering", 3rd Edition
3. Kevin P. Murphy, "Machine Learning: A Probabilistic Perspective"

IIT-401 FULL STACK DEVELOPMENT 4 Credit (3-0-2)

Course category	: Industrial Elective (IE1)
Pre-requisite Subject	: NIL
Contact hours/week	: Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	: 4

Course Assessment methods: Continuous assessment through attendance, home assignments, quizzes, practical records, viva voce, Two Minor tests, One Major Theory and Practical Examination

Course Objective: Students will gain an understanding of the fundamentals of web development tools to become an industry-ready engineer who can be readily deployed in a project.

Course Outcomes: Upon successful completion of the course, the student will be able to

1. learn basics of HTTP, HTML, CSS, Web Sockets, JSON, DOM and AJAX.
2. learn basic concepts of JavaScript and jQuery.
3. implement frontend and backend scenarios to read, write and update data stored in MongoDB.
4. build strong expertise to develop front end application using Angular JS.
5. build strong expertise on Node.js core to develop web application
6. develop and deploy a complete web application

Topics Covered:

UNIT-I 9

Basic Concepts: Basics of Hyper Text Transfer Protocol (HTTP), Some Basics of Hyper Text Mark-up Language (HTML), Some Basics of Cascading Style Sheets (CSS), Introduction to Bootstrap, Bootstrap Basics, Bootstrap Grids, Bootstrap Themes, Bootstrap CSS, Basics of

Web Sockets, Opening Handshake, Sending and Receiving Data, Closing the Connections, Object Oriented Design, JSON, DOM, AJAX

UNIT-II **9**

JavaScript: JavaScript Objects, JavaScript Scope, JavaScript Events, JavaScript Strings, JavaScript Numbers, JavaScript Math, JavaScript Arrays, JavaScript Boolean, JavaScript Comparisons, JavaScript Conditions, JavaScript Switch, JavaScript Loops, JavaScript Type Conversion, JavaScript RegExp, JavaScript Errors, JavaScript Debugging, JavaScript Hoisting, JavaScript Strict Mode, JavaScript Functions, JavaScript Objects, JavaScript Forms, JavaScript HTML DOM, JavaScript BOM

UNIT-III **9**

Angular JS: Introduction to AngularJS, AngularJS Expressions, AngularJS Modules, AngularJS Data Binding, AngularJS Scopes, AngularJS Directives & Events, AngularJS Controllers, AngularJS Filters, AngularJS Services, AngularJS HTTP, AngularJS Tables, AngularJS Select, Fetching Data from MySQL, AngularJS Validation, AngularJS API, AngularJS Animations, AngularJS i18n and i10n; **Node.js:** Introduction to Express Framework, Node Core, Node Modules, File System, Debugger, Automation and Deployment; Introduction to **React.**

UNIT-IV **9**

MongoDB: Introduction to MongoDB, MongoDB Environment, MongoDB Create Database, MongoDB Drop Database, MongoDB Create Collection, MongoDB Drop Collection, MongoDB Read Operations, MongoDB Write Operations, MongoDB Data Modelling, MongoDB Administration, MongoDB Security, MongoDB Aggregation, MongoDB Indexes, MongoDB Storage, MongoDB Replication; **jQuery:** Syntax, jQuery Selectors, jQuery Events, jQuery Effects, jQuery HTML, jQuery Traversing, jQuery AJAX, Introduction to jQuery Mobile

EXPERIMENTS:

1. Create basic programs of HTML, CSS, Web Sockets, JSON, DOM and AJAX.
2. Create basic programs using JavaScript and jQuery.
3. Implement frontend and backend scenarios to read, write and update data stored in MongoDB.
4. Develop a front-end application using Angular JS and Node.js
5. Develop and deploy a complete web application.

Books & References:

1. The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Chris Northwood
2. Modern Full-Stack Development: Using TypeScript, React, Node.js, Webpack, and Docker, Frank Zammetti

IIT-402 Getting Started with Competitive Programming

Course Category	Industrial Elective (IE1)
Pre-requisite Subject	Data Structure and Algorithms
Contact Hours/Week	Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	4
Course Assessment Methods	Continuous assessment through attendance, home assignments, quizzes, practical records, viva voce, Two Minor tests, One Major Theory and Practical Examination
Objectives:	Students' getups a natural follow up. This course is intended for students to deepen their appreciation for algorithmic techniques that they have learned in a foundational course and/or would like to take a first step towards preparing for coding competitions such as the ICPC.

Course Outcomes The students are expected to be able to demonstrate the following knowledge, skills and attitudes after completing this course.

1. Argue the correctness of algorithms using inductive proofs and invariants.
2. Do the coding using divide-and-conquer techniques. Recite algorithms that employ this paradigm. Synthesize divide-and-conquer algorithms. Derive and solve recurrences describing the performance of divide-and-conquer algorithms.
3. Do the coding to solve the problems using the greedy paradigm.
4. Do the coding to solve the problems using the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
5. Do the coding to find the shortest paths for different network types of Networks.
6. Do the coding to solve the problems using the concept of sorting networks

Topics Covered

Unit-I

Introduction to Analysis of Algorithms: Asymptotic Analysis: Worst, Average and Best Cases, Asymptotic Notations, Little o and little omega notations, Lower and Upper Bound Theory, Sorting and Searching Algorithms: Minimum adjacent swaps to move maximum and minimum to corners, Insertion Sort for Singly Linked List, K'th Smallest/Largest Element in Unsorted Array, Merge Sort for Doubly Linked List, QuickSort on Singly Linked List, QuickSort on Doubly Linked List, Why Quick Sort preferred for Arrays and Merge Sort for Linked Lists?

Divide and Conquer : Strassen's Matrix Multiplication, Quick Sort vs Merge Sort

Unit II

Greedy Algorithms: Activity Selection Problem, Knapsack Problem, Kruskal's Minimum Spanning Tree Algorithm, Huffman Coding, Prim's Minimum Spanning Tree Algorithm, Prim's MST for Adjacency List Representation, Job Sequencing Problem, Greedy Algorithm to find Minimum number of Coins, K Centers Problem, Minimum Number of Platforms Required for a Railway/Bus Station.

Unit – III

Disjoint Set Union with Path Compression, Minimum Spanning Tree, Shortest Paths: Dijkstra and Beyond

Network Flows: Ford-Fulkerson Algorithm for Maximum Flow Problem, Find maximum number of edge disjoint paths between two vertices, Find minimum s-t cut in a flow network, Maximum Bipartite Matching, Channel Assignment Problem

Unit - IV

Dynamic programming: Overlapping Subproblems Property, Optimal Substructure Property, Longest Increasing Subsequence, Longest Common Subsequence.

Min Cost Path- Multistage Graphs, Matrix Chain Multiplication, 0-1 Knapsack Problem, Egg Dropping Puzzle, Floyd Warshall Algorithm, Maximum Length Chain of Pairs, Bellman–Ford Algorithm for Shortest Paths, Optimal Binary Search Tree, Find the minimum cost to reach destination using a train, Vertex Cover Problem | Set 2 (Dynamic Programming Solution for Tree), Count number of ways to reach a given score in a game, Weighted Job Scheduling

Experiments

1. To implement Insertion Sort for Singly Linked List, K'th Smallest/Largest Element in Unsorted Array, Merge Sort for Doubly Linked List, QuickSort on Singly Linked List, QuickSort on Doubly Linked List.
2. To Implement Strassen's Matrix Multiplication.
3. To implement Merge Sort using Divide and Conquer approach.
4. To implement Quick Sort using Divide and Conquer approach.
5. To implement Knapsack Problem using Greedy Approach
6. To implement Activity Selection Problem using Greedy Approach
7. To implement Dijkstra's Algorithm using Greedy Approach
8. To implement the Minimum Number of Platforms Required for a Railway/Bus Station using Greedy Approach.
9. To implement the K Centers Problem using Greedy Approach.
10. To implement for the Greedy Algorithm to find Minimum number of Coins using Greedy Approach
11. To implement Bellman Ford's using Greedy Approach
12. To implement Kruskal's Algorithms using Greedy Approach
13. To implement Largest Common Subsequence using dynamic programming concepts.
14. To implement Matrix Chain Multiplication using dynamic programming concepts.
15. To implement Multistage Graph Algorithms using dynamic programming concepts
16. To implement for the finding minimum s-t cut in a flow network.
17. To implement the Ford-Fulkerson Algorithm for Maximum Flow Problem
18. To implement for solving the Channel Assignment Problem.
19. To implement the Weighted Job Scheduling algorithm.
20. To implement the concept to count number of ways to reach a given score in a game

Reference books

1. Thomas H. Coreman, Charles E. Leiserson and Ronald L. Rivest, Introduction to Algorithms, PHI.
2. Ellis Horowitz and SartajSahni, Fundamentals of Computer Algorithms, Computer Science Press, Maryland, 1978
3. Algorithms by Jeff Erickson (freely available online)
4. Algorithms Illuminated by Tim Roughgarden
5. Algorithm Design, Jon Kleinberg and Éva Tardos
6. Berman, Paul," Algorithms", Cengage Learning.

7. Aho, Hopcraft, Ullman, “The Design and Analysis of Computer Algorithms” Pearson Education, 2008.
8. RCT Lee, SS Tseng, RC Chang and YT Tsai, “Introduction to the Design and Analysis of Algorithms”, McGraw Hill, 2005.
9. Bentley, J.L., Writing Efficient Programs, PHI
10. Knuth, D. E , Fundamentals of Algorithms: The Art of Computer Programming Vol,1985

IIT-405 ARDUINO PROGRAMMING 4 Credit (3-0-2)

Course category : Industrial Elective (IE2)

Pre-requisite Subject : NIL

Contact hours/week : Lecture: 3, Tutorial: 0, Practical: 2

Number of Credits : 4

Course Assessment methods: Continuous assessment through attendance, home assignments, quizzes, practical records, viva voce, Two Minor tests, One Major Theory and Practical Examination

Course Objective: Students will gain an understanding of the fundamentals of Arduino programming language and will learn to develop programs for basic Arduino examples.

Course Outcomes: Upon successful completion of the course, the student will be able to

7. learn prototype circuits and connect them to the Arduino
8. learn the Arduino programming language and IDE
9. learn basic programming concepts like operators, statements, arrays and functions
10. connect the Arduino microcontroller to a serial terminal to understand the communication
11. develop programs for basic Arduino examples
12. extend knowledge about the capabilities of the Arduino microcontroller

Topics Covered:

UNIT-I 9

Basic Concepts: Introduction to Arduino, Pin configuration and architecture, Device and platform features, Concept of digital and analog ports, Familiarizing with Arduino Interfacing Board; Arduino Sensors: Humidity Sensor, Temperature Sensor, Water Detector / Sensor, PIR Sensor, Ultrasonic Sensor, Connecting Switch (Magnetic relay switches)

UNIT-II **9**

Arduino Programming I: Introduction to Embedded C and Arduino platform, Arduino Sketch Structure, Arduino data types, Variables and constants, Operators, Simple Statements, Conditional Statements, Iterative Statements

UNIT-III **9**

Arduino Programming II: Arduino Arrays, Arduino Strings, Arduino Functions: I/O Functions, Time Functions, Arduino Serial Input: getting data into an Arduino sketch from the serial port, how the sketch works, sketch limitations

UNIT-IV **9**

Basic Arduino Examples: Intelligent home locking system, Intelligent water level management system, Home automation using RFID, Real time clock-based home automation, Intelligent Automatic Irrigation System

EXPERIMENTS:

Developing Arduino Projects including following but not limited to these:

6. Intelligent home locking system.
7. Intelligent water level management system.
8. Home automation using RFID.
9. Real time clock-based home automation.
10. Intelligent Automatic Irrigation System

Books & References:

1. Arduino Uno Hardware Manual, Warwick A. Smith
2. C Programming with Arduino, Warwick A. Smith

IIT-406 **Simulation and Modelling**

Course Category	: Industrial Elective (IE2)
Contact Hours/Week	: Lecture: 3, Tutorial: 0, Practical: 2
Number of Credits	: 4
Course Assessment Methods	: Continuous assessment through attendance, home assignments, quizzes, practical records, viva voce, Two Minor tests, One Major Theory and Practical Examination

Course Objective : This course is proposed as an industrial elective with the aim of imparting basic understanding of Simulation and Modelling so that the students will find it easy to use this knowledge in profession for applying to various engineering systems and design.

Course Outcomes : Upon successful completion of this course, the student shall be able to:

1. Understand the concepts of Simulation and Modelling to solve real world problems.
2. Understand the techniques of modelling in the context of hierarchy of knowledge about a system.
3. Develop the capability to apply the same to study systems through available software.
3. Learn different types of simulation techniques.
4. To simulate the models for the purpose of optimum control by using software.
5. Develop the Simulators for Live systems.
6. Simulate the inventory control systems, PERT network and hypothetical computers.

Topics to be Covered

UNIT-I

Simulation: Introduction, Basic nature of simulation, when to simulate, Advantages, disadvantages, and limitations of simulation, Concepts of simulation of continuous and discrete system with the help of an example. 9

Modelling: System Concepts, system boundaries, and environment, continuous and discrete systems, system modelling, types of Models, Model validation, Principles & Nature of Computer modelling.

UNIT-II

Continuous System Simulation: Analog vs. digital simulation, continuous simulation vs. numerical integration, simulation of a chemical reactor, simulation of a water reservoir system. 9

Discrete system simulation: Fixed time-step vs. event-to-event model, Monte-Carlo computation vs. stochastic simulation, generation of random numbers, and generation of non-uniformly distributed random numbers.

UNIT-III

Simulators for the Live systems: Simulation of Queuing Systems: basic concepts of queuing theory, simulation of a single server, two servers, s and more general queuing system. 9

Simulation of PERT network: Network model of a project, analysis of an activity network, critical path computation, uncertainties in activity durations, simulation of an activity network.

UNIT-IV

Simulation of inventory control systems: Elements of inventory theory, inventory models, generation of Poisson and Erlang variates, simulator for complex inventory systems, Simulation of hypothetical computers, Design and Evaluation of Simulation Experiments: **V**ariance reduction techniques. Experiment layout and Validation. 9
Case Study: SciLab, Octave.

List of Experiments:

1. Introductions to programming with MATLAB.
2. Find the response of a lumped variable model expressed in terms of transfer function using MATLAB for input of (i) unit step function (ii) unit impact function and (iii) unit ramp function.
3. Use of Neural Network in MATLAB for engineering problems.
4. Use of Simulink in MATLAB for engineering problems.
5. Use of FIS and ANFIS in MATLAB for engineering problems.

Textbooks

1. Gordon G.: System simulation, Prentice-Hall of India Pvt. Ltd. New Delhi 1993
2. Narsingh Deo: System Simulation with Digital Computer, PHI New Delhi, 1993

Reference Books

1. Neelankavil Frances: Computer Simulation and Modelling, John Wiley & Sons, New York, 1987.
2. Payne, James A.: Introduction to simulation: Programming Techniques and Methods of Analysis, McGraw-Hill International Editions, Computer Science services, New York (1998).
3. Reitman Julian: Computer Simulation Experiments, Wiley Interscience 1971.

OIT-401 NETWORK AND CYBER SECURITY

Course category	:	Open Elective (OE)
Pre-requisite Subject	:	Nil
Contact hours/week	:	Lecture: 2 Tutorial: 1, Practical: 0
Number of Credits	:	3
Course Assessment methods	:	Continuous assessment through attendance, tutorial, home assignments, quizzes, two minor tests, and one major theory examination.
Course Objectives	:	**Course objective of this subject is to-**

4. Explain the fundamental principles of access control models and techniques, authentication, and secure system design.

5. Explain the various security threats to the networks and how to deal with it.
6. Have a strong understanding of different symmetric and asymmetric cryptographic protocols/techniques and be able to use them.
7. Apply methods for authentication, access control, intrusion detection and prevention.
8. Aware with various cybersecurity threats and how to deal with it.
9. Identify and mitigate software security vulnerabilities in existing systems.

Course Outcomes : **At the end of the course the students will be able to do following:**

10. Understand cryptography, Network security and Cybersecurity concepts and its application.
11. Apply security principles to system design.
12. Implement DES, AES, IDEA, RSA and other symmetric and asymmetric key algorithm.
13. Identify and investigate network security threat.
14. Analyse and design network security protocols.

24. Conduct research in network security and Cyber Security field.

Topics Covered

UNIT-I

Introduction to Cryptography, Attacks, Substitution Ciphers and Transposition Ciphers, Cryptanalysis, Steganography, Stream and Block Ciphers, Modern Block Ciphers: Block Cipher Modes of Operations, Symmetric Key Cryptography: Data Encryption Standard (DES), Strength of DES, Double DES, Triple DES, Differential and Linear Crypt Analysis, Diffie-Hellman Key Exchange Algorithm, Man- in- Middle Attack, Principals of Asymmetric Key Cryptography: RSA Algorithm, Security of RSA. 9

UNIT-II

Message Authentication and Hash Function: Authentication Requirements, Authentication Functions, Message Authentication Code, Hash Functions, Birthday Attacks, Security of Hash Functions, MD5 and SHA Message Digest Algorithm, Digital Signatures, Digital Envelope, Authentication Protocols, Digital Signature Standards (DSS), Authentication Applications: Kerberos. 9

UNIT-III

IP Security: Architecture, Authentication Header, Encapsulating Security Payloads, Combining Security Associations, Key Management, Web Security: Secure Socket Layer and Transport Layer Security, Secure Electronic Transaction (SET), System Security: Intruders, Viruses and Related Threads, Honeypots, Traffic flow security, Firewall Design Principals, Types of Firewalls, Personal Firewalls, Intrusion Detection System (IDS), Email Security-PGP 9

UNIT-IV

Introduction to Cyber Security, Need for security, Concept of Cyber Space, Cyber Crimes and its various types, Cyber Attack and its various types, Fundamental security principles – threats, attacks and vulnerability, The key concept of Cyber Security, Integrity and Availability, Introduction to basic Security Management and Policies - Authentication, Authorization, Access control, Identification and Accounting, Cyber Security Challenges, Cyber Security Initiative: Generating Secure Password, Password Manager, Enabling two-step verification, Use of free Anti-Virus, Finding the best browser as per requirement of users, Safe Browsing, Tips of Buying Online, Clearing Cache from Browsers. 9

Books & References:

1. Atul Kahate, "Cryptography and Network Security" Tata McGraw Hill Publications.
2. Cryptography And Network Security Principles and Practice Fourth Edition, William Stallings, Pearson Education
3. Johannes A. Buchmann, Introduction to Cryptography, Springer-Verlag Publications.
4. Behrouz A. Frouzan, Cryptography & Network Security, Tata McGraw Hill
5. Network Security Essentials: Applications and Standards, by William Stallings, Prentice Hall Publication.
6. Cybersecurity: The Beginner's Guide: A comprehensive guide to getting started in cybersecurity Paperback – Import, 27 May 2019 by Dr. Erdal Ozkaya

Annexure-01

Syllabus of Audit Courses

CONSTITUTION OF INDIA

Course Code: : **AUC 01** **Credits (0-0-0)**
Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : 1/2 Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

COURSE OUTCOME:
At the end of the course, learners should be able to
CO1- Student will Identify and explore the basic features and modalities about Indian constitution
CO2- Students will be able to differentiate and relate the functioning of Indian parliamentary system at the center and state level.
CO3- Student will be able to differentiate different aspects of Indian Legal System and its related bodies.

UNIT 1--Introduction and Basic Information about Indian Constitution: Historical Background of the Constituent Assembly, The Preamble of the Constitution, Fundamental Rights, Fundamental Duties, Directive Principles of State Policy, Parliamentary System, Federal System.

UNIT 2-Union Executive and State Executive: Powers of Indian Parliament Functions of Rajya Sabha, Functions of Lok Sabha, Powers and Functions of the President, Powers and Functions of the Prime Minister, Judiciary.

UNIT 3- Introduction and Basic Information about Legal System: The Court System in India and Foreign Courtiers (District Court, District Consumer Forum, Tribunals, High Courts, Supreme Court).

UNIT 4- Intellectual Property Laws and Regulation to Information: Introduction, Legal Aspects of Patents, Filing of Patent Applications, Rights from Patents, Infringement of Patents, Copyright, Information Technology Act, 2000. The Company's Act:

Reference:

1) G. Austin (2004) Working of a Democratic Constitution of India, New Delhi: Oxford University Press.
2) Basu, D.D (2005), An Introduction to the Constitution of India, New Delhi, Prentice Hall.
3) N. Chandhoke & Priyadarshini (eds) (2009) Contemporary India: Economy, Society, Politics, New Delhi: Oxford University Press.
4) N.G Jayal and P.B. Maheta, (eds) (2010) Oxford Companion to Indian Politics, New Delhi: Oxford University Press.

Indian Culture and Heritage

Course Code:	**:**	**AUC 02**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Unit-I

Indian Culture: An Introduction, Characteristics of Indian culture, Significance of Geography on Indian Culture, Society in India, Religion and Philosophy in India.

Unit-II

Indian Languages and Literature, Evolution of script and languages in India, Harappan Script and Brahmi Script, History of Buddhist and Jain Literature.

Unit-III

A Brief History of Indian Arts and Architecture, Indian Art & Architecture: Gandhara School and Mathura School of Art; Hindu Temple Architecture, Buddhist Architecture, Medieval Architecture and Colonial Architecture. Indian Painting Tradition: ancient, medieval, modern Performing Arts: Divisions of Indian classical music: Hindustani and Carnatic, Dances of India: Various Dance forms: Classical and Regional, Rise of modern theatre and Indian cinema.

Unit-IV

Spread of Indian Culture Abroad, Causes Significance and Modes of Cultural Exchange - Through Traders, Teachers, Emissaries, Missionaries and Gypsies, Indian Culture in South East Asia, India, Central Asia and Western World.

Recommended Readings:

1. Barua, B. 1934-37. Barhut Vol. I-III. Calcutta: Indian Research Institute.
2. Cunningham, Alexander 1966. The Bhilsa Topes. Varanasi: Indological Book Corporation.
3. Cunningham, Alexander 1965. The Stupa of Bharhut. Varanasi: Indological Book Corporation.
4. Dallapiccola, L.S.Z. Lallemant. 1980. The Stupa : Its Religious, Historical, and Architectural Significance. Wiesbaden: Franz Steiner Verlag.
5. Dehejia, Vidya 1972. Early Buddhist Rock Temples A Chronological Study. London: Thames and Hudson

Indian Architecture

Course Code:	**:**	**AUC 03**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course outcome

CO1- This course will help student learn about the development of Indian architecture and its contextual and traditional aspects.

CO2- The learner will gain knowledge of the development of architectural forms with reference to technology, style and character in various aspects of Hindu architecture.

CO3- The students will comprehend and relate to the theoretical basis of Budhdhist and Jain Architectures.

UNIT 1; Indus Valley Civilization: Town planning principles, cultural ethos, economy exemplified. The Aryan civilization: With its emphasis on the Vedic town plan.

UNIT 2: Buddhist Architecture Typology of lats, eddicts, stupas, viharas, and chaityas, both in rock-cut or other wise. The Buddhist philosophy and its imprint

UNIT3; Hindu Architecture, Indo Aryan: The evolution of the temple form, evolution of the shikhara in north India. The three schools of architecture - the Gujarat, the Khajuraho, and the Orrisan styles, Introduction to Dravidian Hindu Architecture.

UNIT 4: Jain Architecture : The temple cities of Palitana, Mount Abu and Girnar. Jain Theory The Jain philosophy and its imprint in built form.

REFERNCE BOOKS

1. Stella Kramrisch, The Hindu temple, Volume 1 & 2, Motilal Banarsidass Publications, 1996.
2. Percy Brown, Indian Architecture (Buddhist and Hindu period), D.B.Taraporewala Sons & co Pvt. Ltd. 1965
3. Volwahsen, Andreas, Living Architecture
4. Satish Grover, The Architecture of India- Volume 2, Vikas, 1980.
5. Henri Stierlin, Anne Stierlin, Hindu India: from Khajuraho to the temple city of Madurai, Taschen, 1998.
6. James Fergusson, History of Indian & Eastern Architecture, 2007
7. C. Batley, Design Development of Indian Architecture, John murray, London, 1934.

Indian Festivals

Course Code:	**:**	**AUC 04**	**Credits (0-0-0)**

Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : ½ Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course Outcomes:

CO1-Students will learn about rich cultural aspects associated with Indian religions

CO2-The course will give deep insight in to understand the importance of festivals.

UNIT 1; Indian Festivals: Introduction to major Indian festivals Bihu, Raksha Bandhan , Onam, Pongal, Holi, Dipawali, Dushehra, Easter, Good Friday, Christmas , Eid-ul-fitr and Eid-ul-Azha , Cultural aspects of festivals .

UNIT 2 ; **Characteristics of Indian festivals** ; Seasonal in nature, seasonal festival are Agro based, worships of animals.

UNIT 3; festivals observed at same time but with different names in different parts of country.

UNIT3 : Artificial or non religious festivals- like Jaisalmer desert festivals, Mango festivals in Delhi, Elephant festivals in India. Etc.

REFERENCE BOOKS

1) Discover India; Festival of India by Sonia Mehta

2) Hindu Festival : Origin, sentiments and Rituals by Mukuncharan Das.

VAIDIC MATHEMEATICS

Course Code: : **AUC 05** **Credits (0-0-0)**
Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : 1/2 Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course outcomes:

● Vedic mathematics methods are used in coding and VLSI implementation of encryption.
● Vedic mathematics method of division, exponentiation and multiplication are used in internet security and cryptographic algorithms for making these calculations faster than before.

● Arithmetic and logic unit (ALU) is responsible for all mathematical and logical calculations in computers. Some sutras like udharvtriyakbhyam and nikhilam are used for implementing multiplication methods.
● Digital Signal Processing (DSP) includes face recognition, text speech conversion, image processing and audio -video processing and also filtering of noise. In this area VM methods are very useful to improve the performance of DSP algorithms.

UNIT-I

Introduction & history of Vedic mathematics, Arithmetic and number, Vedic Maths Formulae, Addition and Subtraction: Addition - Completing the whole , Addition from left to right , Addition of list of numbers - Shudh method , Subtraction - Base method , Subtraction - Completing the whole, Subtraction from left to right

UNIT-II

Multiplication: Ekadhikenpurven method (multiplication of two numbers of two digits), Eknunenpurven method (multiplication of two numbers of three digits), Urdhvatiragbhyam method (multiplication of two numbers of three digits), Nikhilam Navtashchramam Dashtaha (multiplication of two numbers of three digits), Combined Operations

Division and Divisibility: Division, Nikhilam Navtashchramam Dashtaha (two digits divisor), Paravartya Yojyet method (three digits divisor)

Divisibility: Ekadhikenpurven method (two digits divisor), Eknunenpurven method (two digits divisor)

UNIT-III

Least Common Multiple **(LCM)** and Highest Common Factor **(HCF)**

Power and Root Power: Square (two digit numbers), Cube (two digit numbers).

Root: Square root (four digit number), Cube root (six digit numbers)

UNIT-IV

Contribution of Indian Mathematicians (In light of Arithmetic) , Aryabhatt , Brahmagupt , Mahaveeracharya , Bharti Krishna Tirtha

Reference Books:

1. Vedic Mathematics, Motilal Banarsi Das, New Delhi.

2. Vedic Ganita: Vihangama Drishti-1, Siksha Sanskriti Uthana Nyasa, New Delhi.

3. Vedic Ganita Praneta, Siksha Sanskriti Uthana Nyasa, New Delhi.

4. Vedic Mathematics: Past, Present and Future, Siksha Sanskriti Uthana Nyasa, New Delhi.

5. Leelavati, Chokhambba Vidya Bhavan, Varanasi.

6. Bharatiya Mathematicians, Sharda Sanskrit Sansthan, Varanasi.

ASTRONOMY

Course Code:	**:**	**AUC 06**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

UNIT-I

Historical introduction: Old Indian and western – astronomy – Aryabhatta, Tycho Brahe, Copernicus, Galileo – Olbers paradox – solar system – satellites, planets, comets, meteorites, asteroids.

Practical astronomy – telescopes and observations & techniques – constellations, celestial coordinates, ephemeris.

Celestial mechanics – Kepler's laws – and derivations from Newton's laws.

Sun: Structure and various layers, sunspots, flares, faculae, granules, limb darkening, solar wind and climate.

UNIT-II

Stellar astronomy: H-R diagram, color-magnitude diagram – main sequence – stellar evolution – red giants, white dwarfs, neutron stars, black holes – accretion disc – Schwartzchild radius – stellar masses Saha–Boltzman equation – derivation and interpretation.

Variable stars: Cepheid, RR Lyrae and Mira type variables – Novae and Super novae. Binary and multiple star system – measurement of relative masses and velocities. Interstellar clouds – Nebulae.

UNIT-III

Transformations Generalized Coordinates, Canonical transformations, Conditions for canonical transformation and problem, Poisson brackets, invariance of PB under canonical transformation, Rotating frames of reference, inertial forces in rotating frames.

UNIT-IV

Relativity and Application Concept of Special Theory of Relativity, Lorentz Transformation, Length Contraction and time dilation, Relativistic addition of velocities, conservation of mass and momentum, Concept of General Theory of Relativity, Equivalence of mass and energy, Relativistic Doppler shift and aberration of light. Lagrangian and Hamiltonian of relativistic particles, Relativistic degenerate electron gas.

Reference Books:

- "Textbook of Astronomy and Astrophysics with elements of Cosmology", V. B. Bhatia, Narosa publishing 2001.
- William Marshall Smart, Robin Michael Green "On Spherical Astronomy", (Editor) Carroll, Bradley W Cambridge University Press ,1977
- Bradley W.Carroll and Dale A. Ostlie. "Introduction to modern Astrophysics" Addison-Wesley, 1996.
- Bradley W.Carroll and Dale A. Ostlie, "An Introduction to Modern Astrophysics" Addison Wesley Publishing Company,1996
- 'Stellar Astronomy' by K. D Abhayankar.
- 'Solar Physics' by K. D Abhayankar.

ARTS OF INDIA

Course Code: **:** **AUC 07** **Credits (0-0-0)**
Course Category **:** **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : 1/2 Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course Outcomes:

CO1- Students will be introduced to emergence and development of art traditions upto 6th century C.E. Monuments will be studied in their cultural context.

CO2-Students will able to understand the monuments in their religious, regional and stylistic context. Students will be able to prepare plans of the monuments.

Unit 1:

Introduction to traditions of Art and Architecture in India . Introduction to Art and Architecture and prelude to historical art. ii. Art of the pre-Mauryan period. iii. Art and Architecture of Mauryan Period iv. Sources of Inspiration of Mauryan Art and Architecture: Foreign and Indigenous.

Unit 2:

Emergence and Development of Structural Stupa Architecture . Origin of Stupa Architecture. ii. Stupa Architecture - Pre-Mauryan and Mauryan periods. iii. North India, Central India, Deccan and Gandhara iv. Structural monasteries and Chaityas.

Emergence and Development of Rock-cut Architecture. Origin of Rock-cut Architecture. ii. Eastern India, Western Deccan, Eastern Deccan, Central India.

Unit 3:

Unit 4: Emergence and Development of Temple Architecture (08 hrs) i. Origin of Temple Architecture- Theoretical aspects. ii. Concept and symbolism of Temple. iii. Archaeological remains of structural temples. iv. Temple Architecture during the Gupta period. v. Temple Architecture during the Vakataka period.

Unit 4:

Sculptural Art and Paintings - Emergence and Development (10 hrs) i. Sculptural Art and Paintings -Concept and Symbolism. ii. Terracottas, Ivories and Bronzes iii. Paintings iv. Stone sculptures-Gandhara, Mathura, Sarnath and Andhra schools of Art. v. Art during the Gupta-Vakataka period.

Recommended Readings:

1. Barua, B. 1934-37. Barhut Vol. I-III. Calcutta: Indian Research Institute.
2. Cunningham, Alexander 1966. The Bhilsa Topes. Varanasi: Indological Book Corporation.
3. Cunningham, Alexander 1965. The Stupa of Bharhut. Varanasi: Indological Book Corporation.
4. Dallapiccola, L.S.Z. Lallemant. 1980. The Stupa : Its Religious, Historical, and Architectural Significance. Wiesbaden: Franz Steiner Verlag.
5. Dehejia, Vidya 1972. Early Buddhist Rock Temples A Chronological Study. London: Thames and Hudson

INTELLECTUAL PROPERTY RIGHTS

Course Code:	**:**	**AUC 08**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course Outcomes: After the completion of the course the student will be able to

CO1: Create an understanding on Intellectual Properties and the importance of it.

CO2: Understand Trademarks and Trade secrets. To create awareness of unfair completion and methods of it.

CO3: Create awareness on the protection copyrights and patents. Understand the Ownership rights and transfer.

CO4: Create awareness of Cyber laws, Cyber Crime and get understanding of Privacy of Data.

CO5: To create awareness international aspects of IPR and the Emerging Trends in IPR.

Course Content

UNIT – I: Introduction to Intellectual property: Introduction, types of intellectual property—Patent, Trademarks, Copy rights, IPR and World Trade Organization, other international organizations, agencies and treaties, importance of intellectual property rights. Creating Intellectual Property. Intellectual Property Management. Emerging Issues in IPR. Research and Development in India.

UNIT – II: Fundamentals of Patent: Historical Overview of Patent Law; Concept of Patent; Patentable Inventions; Procedure for Obtaining Patent; Rights and Obligations of Patent Holder; Transfer and Infringement of Patent Rights, Geographical Indications, Case Study: Apple versus Samsung Patent Dispute.

UNIT – III: Trademarks: Purpose and function of trademarks, acquisition of trademark rights, protectable matter, selecting, and evaluating trademark, trade mark registration processes.

UNIT – IV: Copy rights: Fundamental of copy right law, originality of material, rights of reproduction, rights to perform the work publicly, copy right ownership issues, copy right registration, notice of copy right, international copy right law. Law of patents: Foundation of patent law, patent searching process, ownership rights and transfer.

Textbooks

- Textbook of Intellectual Property Rights, N.K. Acharya. Asia Law House, ed. 2021.
- Intellectual property right, Deborah. E. Bouchoux, Cengage learning.
- Intellectual Property Rights–Pandey Neeraj, Dharni Khushdeep. PHI.
- Intellectual Property Rights: Text and Cases R. Radhakrishnan, S. Balasubramanian. Excel Books.

Reference Books

1) Intellectual property right – Unleashing the knowledge economy, Prabuddha Ganguli, Tate McGraw Hill ltd.

2) A short course in International Intellectual Property Rights – Karla C. Shippey, World Trade Press.

3) Intellectual Property Rights – Heritage, Science, & Society under international treaties – A. Subbian, - Deep & Deep Publications – New Delhi.

HUMAN RIGHTS

Course Code:	**:**	**AUC 09**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course Outcomes:

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

1. Simply put, human rights education is all learning that develops the knowledge, skills, and values of human rights.
2. Strengthen the respect for human rights and fundamental freedoms.
3. Enable all persons to participate effectively in a free society.
4. Learn about human rights principles, such as the universality, indivisibility, and interdependence of human rights.

UNIT-I

The Basic Concepts: Individual, Group, Civil Society, State, Equality, Justice, Human Values: Humanity, Virtues, Compassion.

UNIT-II

Human Rights and Human Duties:

i) Philosophical and historical foundation of human rights and duties
ii) Theories of rights
iii) Concept and classifications of human rights and duties
iv) Human rights and duties

1. Correlation of rights and duties/responsibilities
2. Tensions between rights inter se, duties inter se, and rights and duties

UNIT-III

Society, Religion, Culture, and their Inter-Relationship: Impact of Social Structure on Human behavior, Roll of Socialization in Human Values, Science and Technology, Modernization, Globalization, and Dehumanization.

UNIT-IV

Social Structure and Social Problems: Social and Communal Conflicts and Social Harmony, Rural Poverty, Unemployment, Bonded Labour, Migrant workers and Human Rights Violations, Human Rights of mentally and physically challenged.

Books & References:

1. Shastry, T. S. N., India and Human rights: Reflections, Concept Publishing Company India (P Ltd), 2005.
2. Nirmal, C.J., Human Rights in India: Historical, Social and Political Perspectives (Law in India), Oxford India.

LOGICAL RESEARCH

Course Code:	**:**	**AUC 10**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination

Course outcome: In this course you should develop the following competencies:

CO1: To understand about research methodology with its different aspects, about logical reasoning, and types of research.

CO2: It will also result in knowledge appraisal from data collection to data interpretation.

CO3: Mathematical reasoning will also help them to acquire several skills required for the placement.

Course Content

UNIT1- Research Methodology: meaning, characteristics, Types of research; Process of research; Research methods and Ethical issues in research.

UNIT2- Logical Reasoning: arguments, deductive and inductive research, quantitative and qualitative research, scientific research; logical approach in research - Venn diagram; Inferences; analogies.

UNIT3- Data collection, Organization of data, Data analysis and mapping, Parametric and non-parametric; Data Interpretation.

UNIT4- Mathematical Reasoning, number series, letter series, codes; relationships, classification.

References:

1. Business Research Methods – Donald Cooper & Pamela Schindler, TMGH, 9th edition
2. Business Research Methods – Alan Bryman & Emma Bell, Oxford University Press.
3. Research Methodology – C.R.Kothari
4. Marketing Research- G C Beri
5. Logical reasoning- R S Agarwal

PROFESSIONAL ETHICS

Course Code: : **AUC 11** **Credits (0-0-0)**
Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : 1/2 Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

Course Outcomes

Course Outcomes: After the completion of the course the student will be able to-
CO1: Understand the core values that shape the ethical behaviour of a professional.
CO2: Identify the multiple ethical interests at stake in a real-world situation or practice.
CO3: Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.
CO4: Solve moral and ethical problems through exploration and assessment by established experiments.
CO5: Apply the knowledge of human values and social values to contemporary ethical values and global issues.

Course Content

Unit I:
Understanding Professional Ethics and Human Values: Morals, values and Ethics – Integrity- Academic integrity-Work Ethics- Service Learning- Civic Virtue Respect for others- Living peacefully- Caring and Sharing- Honestly- courage-Cooperation commitment Empathy- Self Confidence -Social Expectations.

Unit II:
Ethics for Engineers: Ethics – its importance – code of ethics – person and virtues – habits and morals – 4 main virtues – ethical theories – Kohlberg's theory – Gilligan's theory – towards a comprehensive approach to moral behaviour – truth – approach to knowledge in technology.

Unit III:
Environmental Ethics and Sustainability: Problems of environmental ethics in engineering – engineering as profession serving people – engineer's responsibility to environment – principles of sustainability – industrial, economic, environmental, agricultural, and urban sustainability – Sustainable development. - Global Ethical Issues.

Unit IV:
Social Experimentation, Responsibility and Rights: Engineers and responsible experiments – safety and risk – confidentiality – knowledge gained confidentiality – experimental nature of engineering – Intellectual Property Rights – professional rights – employee rights – occupational crime.

Textbooks

- Mike W Martin, Roland Schinzinger, " Ethics in Engineering", Tata McGraw –Hill.

- Govindarajan M, Natarajan S, Senthil Kumar V S, "Engineering Ethics" PHI India.
- R.R Gaur, R Sangal, G P Bagaria, A foundation course in Human Values and professional Ethics, Excel books, New Delhi.

Reference Books

- Aarne Vesblind, Alastair S Gunn, "Engineering Ethics and the Enviornment".
- Edmund G Seebauer, Robert L Barry, "Fundamentals of Ethics for scientists and engineers" Oxford University Press.
- B L Bajpai, 2004, Indian Ethos and Modern Management, New Royal Book Co., Lucknow. Reprinted 2008.

ENVIRONMENTAL LAWS

Course Code: : **AUC 12** **Credits (0-0-0)**
Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : 1/2 Lecture : , Tutorial : , Practical:
Number of Credits :
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.
Course Outcomes:

The course gives students the opportunity to grapple with contemporary legal debates in environment law. Therefore, the learning outcomes of this course can be encapsulated as follows:

1) The primary learning outcome is to sensitize the students towards human activities that adversely affect the environment and the need for regulation of such activities.
2) Students will develop a thorough understanding of practice and procedure followed by various environmental law enforcing agencies/bodies.
3) Students will be able to pursue environmental litigation before the National Green Tribunal and assist the Tribunal as a researcher or in any other capacity.
4) Students will be able to assist industries and projects in obtaining environmental clearance and compliances with other environmental laws.

UNIT-I

Development of Environmental Laws and Policies in India:

I. Concept of 'environment' and understanding scope of environmental law.
II. Two approaches towards environmental protection- 'Eco-centric approach' and 'Anthropocentric' approach.
III. Impact of IEL on environmental law in India.
IV. Significance of Environmental Protection in Five Year Plans.

V. Development of the 'Right to Environment' as a Fundamental Right and challenges.

UNIT-II

Judicial remedies and the role of National Green Tribunal:

I. Civil Remedies i.e. Tortious remedy and Class Action
II. Criminal Law Remedies under relevant provisions of Indian Penal Code, 1860 and Criminal Procedure Code, 1973
III. Constitutional Law Remedies i.e. Writ Jurisdiction & Public Interest Litigation
IV. Statutory Remedies i.e. Remedies under Public Liability Insurance Act 1991, National Environment Tribunal Act, 1995, National Green Tribunal Act, 2010

UNIT-III

Statutory framework for Prevention of Environmental, Air and Water Pollution:

I. Water (Prevention and Control of Pollution) Act 1974 [Framework of the Act, Criminal Liability and Judicial relief under the Act, Constitutional Challenges of Restraining Orders under Section 33]
II. The Air (Prevention and Control of Pollution) Act 1981 [Framework of the Act, Criminal Liability and Judicial relief under the Act, Noise Pollution]
III. Environment (Protection) Act, 1986 [Framework of the Act, Enforcement mechanisms and Role of Pollution Control Boards, Environment Impact Assessment, Coastal zone regulations Notifications]
IV. Law on Waste Management and Handling
V. Procedural environmental rights under various environmental laws
   - Right to Information
   - Right to public consultation
   - Right of access to justice

UNIT-IV

Statutory framework governing Forest, Wildlife and Biodiversity:

II. Statutory Framework on Forest Preservation [The Indian Forest Act, 1927; Forest (Conservation) Act, 1980; National Forest Policy, 1988; The Scheduled Tribe and other Traditional Forest Dwellers (Recognition of Forest Rights) Act, 2006]
III. Statutory Framework on Wildlife & Biodiversity Protection [The Wildlife (Protection) Act, 1972; Implementation and gaps and Judicial Perspective; Biological Diversity Act, 2002]

Books & References:

1) Shyam Divan & Armin Rosencranz, Environmental Law & Policy in India (2 nded, Oxford University Press, 2014)
2) P. Leelakrishnan, Environmental law in India (4th ed, LexisNexis, 2016)
3) Lavanya Rajamani and Shibani Ghosh, Indian Environmental Law: Key Concepts and Principles (Orient Blackswan, 2019)
4) Gitanjali Nain Gill, Environmental Justice in India: The National Green Tribunal (Routledge,

2017)
5) Patricia Birnie, Alan Boyle and Catherine Redgwell, International Law and the Environment (3rd ed., Oxford University Press, 2009)
6) Philippe Sands, Principles of International Environmental Law (2nd ed, Cambridge University Press, 2003)

HEALTH LAW

Course Code: : **AUC 13** **Credits (0-0-0)**
Course Category : **Audit**
Pre-requisite Subject : NIL
Contact Hours/Week : ½ Lecture : , Tutorial : , Practical:
Number of Credits : 0 Credit
Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination
Course Outcome: In this course you should develop the following competencies:
CO1: Knowledge and understanding of the values and policies underlying Health Law.
CO2: Knowledge and understanding of substantive law related to health care, health care insurance markets as well as related procedural law.
CO3: Written and oral communication in the legal context.

Course Content

UNIT-1 BASICS OF HEALTH LAW- Basic of Health and its provider, Origin & Evaluation, All Council Acts.

UNIT-2 NEED FOR HEALTH LAW -Fraudulence, Negligence and Abuse, Human Rights, Rights & Duties of Health Care Provider (Public & Private Activities).

UNIT-3 LEGAL ASPECTS OF HEALTH LAW- Role of Health Policy & Health Care Delivery, General Laws on Health Law (Medical Allied Agencies), Specific Laws on Health Law (NDT, PWD/etc.).

UNIT-4 MEDICAL INSURANCE –Introduction-Various types, Significance and Kind of Medical Insurance/Policies, Insurance & Assurance, General Principles of Law and Contract, Medical Insurance Regulations.

REFERENCES:
1)Jonathan Herring- Medical Law and Ethics
2)Mason and Mc Call Smith- Law and Medical Ethics
3)S. V. Jogarao- Current Issues in Criminal Justice and Medical Law

National Cadet Corps (NCC)

Course Code:	**:**	**AUC 14**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	½ Lecture : , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Outcome: In this course you should develop the following competencies:
CO1: Imbibe the conduct of NCC cadets.
CO2: Respect the diversity of different Indian culture.
CO3: Perform his/her role in Nation Building
CO4: Do the social services on different occasions.
CO5: Practice togetherness and empathy in all walks of their life.
CO6: Do the asana and gain the physical& mental fitness

Course Content

UNIT 1
NCC General

History, Aims, Objective of NCC, NCC as Organization. Incentives of NCC, Duties of NCC Cadet, NCC Camps: Types & Conduct.

UNIT 2
National Integration & Awareness

National Integration: Importance & Necessity, Factors Affecting National Integration, Unity in Diversity & Role of NCC in Nation Building, Threats to National Security

UNIT 3
Social Service and Community Development

Celebration of Days of National & International Importance, Social Service and Community Development Activities to be conducted.

UNIT 4
Health & Hygiene:

Yoga- Introduction, Definition, Purpose, Benefits.
Asanas-Padamsana, Siddhasana, Gyan Mudra, Surya Namaskar, Shavasana, Vajrasana, Dhanurasana, Chakrasana, Sarvaangasana, Halasana etc.

Textbooks:

1. R. Gupta, "NCC: Handbook of NCC Cadets for 'A', 'B' and 'C' Certificate Examinations" 1st Edition (English, Paperback, RPH Editorial Board)

Basics of Human Health and Preventive Medicines

Course Code:	**:**	**AUC 15**	**Credits (0-0-0)**
Course Category	**:**	**Audit**	
Pre-requisite Subject	:	NIL	
Contact Hours/Week	:	1/2 Lecture: , Tutorial : , Practical:	
Number of Credits	:	0 Credit	

Course Assessment Methods: Continuous assessment through tutorials, attendance, home assignments, quizzes, practical, Tutorial class, viva voce and Minor tests and One Major Theory Examination.

UNIT- 1

Health- Definition, dimensions, concept of wellbeing, Physical quality of life index, Spectrum of health, Determinants of health.

Concept of disease- Epidemiological triad, Natural history of disease, Risk factors, risk group, Iceberg of disease, Disease control, Disease elimination, Disease eradication, **Monitoring and surveillance-** Concept of prevention, Primary, Secondary and Tertiary, Modes of Intervention.

UNIT- 2

Communicable diseases- Type of microorganisms, Mode of transmission, Prevention of infectious diseases, Vaccination/immunization**.**

Diarrheal diseases and dehydration- Prevention and role of ORS**.**

Fever- cause and how to deal with.

Respiratory problems and cough

UNIT - 3

Non communicable diseases/ Lifestyle related disorder- Risk factors, CAD, risk and prevention, Hypertension, Diabetes mellitus, Obesity, Cancer, Accidents.

UNIT – 4

Nutrition and health- Classification of food, Balance diet.

Occupational hazards

Mental health and substance abuse

Medical Emergencies- BLS and ALS.

Reference Textbook

1) K. Park – "Park's Textbook of Preventive and Social Medicine"
2) Yash Pal Bedi & Pragya Sharma– "Handbook of Preventive and Social Medicine, Seventeenth Edition, CBS Publication".
3) Sunder Lal, Adarsh, Pankaj – "Update on Textbook of Community Medicine Preventive and Social Medicine with Recent Advances" 5th Edition, Publication 2018.
4) Dr. B. Saha- "Preventive and Social Medicine Communicable Disease Hygiene".
5) Rabindra Nath Roy, Indernil Saha- "Mahajan and Gupta Textbook of Preventive and Social Medicine" 4th Edition, Japee

Annexure-02

Detail Syllabus of Extra Curricular Activities (ECA) Courses under Council of Student Activities

Skill Development- I (ECA-151)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and IEEE:** An introduction to technical sub-council and IEEE. An overview of IEEE and the events conducted by them.

UNIT- 2

- **Robotics Classes:** Informative classes conducted on by the students of IEEE about Bot modelling and electronics as well as embedded. It is conducted for both Wired and Wireless Robotics.

UNIT- 3

- **Introduction to Workshops by IEEE:** *Workshop* is a brief intensive course for a small group which emphasizes problem solving. A number of workshops are conducted by IEEE like Ethical hacking, Soft skills, Artificial Intelligence etc.

UNIT- 4

- **Events under TechSrijan:** Techsrijan is the annual techno-management fest held every year like Enigma, Robotics, Incognito, Quizzes, World Parliament, etc.

Skill Development- II (ECA-201)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and SAE:** An introduction to technical sub-Council and SAE. An overview of SAE and the events conducted by them.

UNIT- 2

- **Aeromodelling Classes:** Informative classes and workshop conducted on by the students of SAE about Drone and remote-controlled modeling and electronics as well as embedded.

UNIT -3

- **Introduction to Workshops by SAE:** *Workshop* is a brief intensive course for a small group which emphasizes problem solving. A no. of workshops is conducted by SAE like Aeromodelling workshop, Bridge modeling etc.

UNIT- 4

- **Events under TechSrijan by SAE:** Techsrijan is the annual techno-management fest held every year. SAE conducts a number of events in TechSrijan like Junkyard Wars, Bride Kriti, El Tiro etc.

Skill Development- III (ECA-251)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and UIC:** The University Innovation Cell supports and provides opportunity for Innovation works. You will get to learn about the things they do and promote.

UNIT -2

- **Introduction to Innowizion:** Every year University Innovation Cell organizes a national level

event that provides opportunities for students across all disciplines to team up and use their creativity, passion, and knowledge of technology. Events like I-Expo and I-Quiz.

UNIT- 3

- **Introduction to Spectra:** It is a special event organized by University Innovation Cell which foster an opportunity for students to showcase their creativity and talent. It comprises of three events InQUIZitive, Replica and MindBuzz**.**

UNIT- 4

- **Learnings and Innovation:** Innovation increases your chances to react to changes and discover new opportunities. It can also help foster competitive advantage as it allows you to build better products and services for your customers in the industry.

Skill Development- IV (ECA-301)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and SEB:** The Social Engineers Board (SEB) tries to achieve its goals by series of various events conducted throughout the academic year, both inside and outside the university.The members of the board are highly motivated individuals striving for noble cause, and voluntarily take initiatives which ensure betterment of the people and society in

any way possible.

UNIT- 2

- **Introduction to Drishya:** A career counselling event by college final year, and an event designed to crave out the creativity inside the students and their ability to make something novel out of normality in situation

UNIT- 3

- **Introduction to Dhishan:** Bringing out the oration skill and leadership personality among the students by providing them chance to stand and represent themselves by this event.

UNIT -4

- **Introduction to Paravartan and NGOs:** Paravartan consists of a audio visual round and the second round is a skit presentation developing character of a student. They also collab with NGOs for social works.

Skill Development- Vth (ECA-351)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and E CELL:** E-Cell of Madan Mohan Malaviya University of Technology promotes entrepreneurship abilities among the students of the university and conducts events to promote these ideas.

UNIT- 2

- **Introduction to Fresher's Talk:** A creative talk with the freshers of our university in which the fresher students provide some insights of what and how are they feeling about the college and its environment.

UNIT- 3

- **Introduction to Start Up Week:** Understanding the aspects of and entrepreneurial background and train to become one, through various personality developing as well as professionally balanced events.

UNIT- 4

- **Entrepreneurship Development:** It is the process of enhancing the skillset and knowledge of entrepreneurs regarding the development, management and organization of a business venture while keeping in mind the risks associated with it. Students will learn and cultivate skills which will promote entrepreneurship.

Skill Development-VIth (ECA-401)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Participation and Training
Course Outcome	:	Students are expected to learn and develop their skill and their personality through the activities and trainings under the council and should be well versed with the listed activities and events.

UNIT- 1

- **Introduction to TSC and Robotics Club:** Robotics Club speaks a name for itself in this domain with a sheen of itself that has been set by the high standards of the club members and strict adherence to the tagline Transforming ideas into reality, Events Details

UNIT- 2

- **Introduction to Web D Classes:** Classes on web development helps students to develop skills like Front-end and Back-end development which they can use to make websites.

UNIT -3

- **Introduction to Engineers Week:** a seven-day event paying tribute to all the engineers across the globe by conducting a no. of exciting events for technical development of students.

UNIT- 4

- **Robomania:** Develop the knowledge of robotics and circuitry in the students through training of students on circuits and the conduction of Robo Wars, Electronic chess, diffusion of a bomb

in a set up made by students, demonstration of live game of the virtual events of NFS and

Tekken, Lazer strike, Designing of Lazer maze.

Unity and Discipline (NCC)-I (ECA-171)

Course Category	:	NCC
Pre Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Lecture & Practical
Course Outcome	:	After completing this course, the students will be able to:

- Imbibe the conduct of NCC cadets.
- Do the social services on different occasions.

UNIT -1
Introduction of NCC: History, Aims, Objective of NCC.

UNIT -2
NCC as Organization. Incentives of NCC, Duties of NCC Cadet.
UNIT -3
Celebration of Days of National & International Importance, Social Service and Community Development Activities
UNIT- 4
NCC Parade on Independence Day.

Unity and Discipline (NCC)-II – (ECA- 221)

Course Category	:	NCC
Pre Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Lecture & Practical
Course Outcome	:	After completing this course, the students will be able to: -

- Respect the diversity of different Indian culture.
- Do the social services on different occasions.

UNIT- 1
National Integration & Awareness, Importance & Necessity

UNIT- 2
Factors Affecting National Integration, Unity in Diversity

UNIT -3
Celebration of Days of National & International Importance, Social Service and Community Development Activities
UNIT- 4
NCC Parade on Republic Day.

Unity and Discipline (NCC)-III – (ECA-271)

Course Category	:	NCC
Pre Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Lecture & Practical
Course Outcome	:	After completing this course, the students will be able to: - • Perform his/her role in Nation Building. • Do the social services on different occasions.

UNIT- 1
Role of NCC in Nation Building.

UNIT- 2
Threats to National Security.

UNIT -3
Celebration of Days of National & International Importance, Social Service and Community Development Activities
UNIT- 4
NCC Parade on Independence Day.

Unity and Discipline (NCC)-IV- (ECA-321)

Course Category	:	NCC
Pre Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Lecture & Practical
Course Outcome	:	After completing this course, the students will be able to: - • Contribute to environmental awareness and conservation activities. • Develop Leadership Qualities. • Do the social services on different occasions.

UNIT -1
Environmental Awareness and Conservation.

UNIT -2
Leadership Development: Important Leadership traits, Indicators of leadership.

UNIT- 3
Celebration of Days of National & International Importance, Social Service and Community Development Activities

UNIT -4
NCC Parade on Republic Day.

National Service Scheme-I (ECA-172)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Continuous assessment through National Service Scheme related tasks, participation in different events organized, attendance, home assignments.
Course Outcome	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes in achieving NSS motto after completing this course:

- The Motto of NSS "Not Me but You", reflects the essence of democratic living and upholds the need for self-less service.
- NSS helps the students' development & appreciation to other person's point of view and also show consideration towards other living beings.
- The philosophy of the NSS is a good doctrine in this motto, which underlines on the belief that the welfare of an individual is ultimately dependent on the welfare of the society as a whole and therefore, the NSS volunteers shall

strive for the well-being of the society.

Introduction to National Service Scheme:

UINIT-I: History and its Objectives
UNIT-II: Organizational structure of N.S.S. at National, State, University and College Levels

UNIT-III: Advisory committee and their functions with special reference to University CSA, Program officer, N.S.S. group leader and N.S.S. volunteers in the implementation**.**

UNIT-IV: Organization/ Participation in "Tree-Plantation Drive"

National Service Scheme- II (ECA-222)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Continuous assessment through National Service Scheme related tasks, participation in different events organized, attendance, home assignments.
Course Outcome	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes in achieving NSS motto after completing this course:

- The Motto of NSS "Not Me but You", reflects the essence of democratic living and upholds the need for self-less service.
- NSS helps the students' development & appreciation to other person's point of view and also show consideration towards other living beings.
- The philosophy of the NSS is a good doctrine in this motto, which underlines on the belief that the welfare of an individual is ultimately dependent on the welfare of the society as a whole and therefore, the NSS volunteers shall strive for the well-being of the society.

UNIT-I: National Integration, Need and importance of National integration

UNIT-II: Various obstacles in the way of National Integration, such as caste, religion, language and provisional problems etc.

UNIT-III: NSS related Activities: Awareness to various activities under NSS.

UNIT-IV: Organization/Participation in "Cleanliness Drive" at home, hostel, Department and University

UNIT-V: Organization/Participation in "Winter cloth collection and distribution to needy people"

National Service Scheme- III (ECA-272)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Continuous assessment through National Service Scheme related tasks, participation in different events organized, attendance, home assignments.
Course Outcome	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes in achieving NSS motto after completing this course:

- The Motto of NSS "Not Me but You", reflects the essence of democratic living and upholds the need for self-less service.
- NSS helps the students' development & appreciation to other person's point of view and also show consideration towards other living beings.
- The philosophy of the NSS is a good doctrine in this motto, which underlines on the belief that the welfare of an individual is ultimately dependent on the welfare of the society as a whole and therefore, the NSS volunteers

shall strive for the well-being of the society.

UNIT-I: Special Programme in NSS-I

A) Legal awareness
B) Health awareness
C) First-aid

UNIT-II: Special Programme in NSS-II

A) Career guidance
B) Leadership training-cum-Cultural Programme
C) Globalization and its Economic Social Political and Cultural impacts.

UNIT-III: Special Camping programme in NSS-I

A) Nature and its objectives
B) Selection of campsite and physical arrangement
C) Organization of N.S.S. camp through various committees and discipline in the camp.

UNIT-IV: Special Camping programme in NSS-I

A) Activities to be undertaken during the N.S.S. camp.
B) Use of the mass media in the N.S.S. activities.

National Service Scheme- IV (ECA-322)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	NIL
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Continuous assessment through National Service Scheme related tasks, participation in different events organized, attendance, home assignments.
Course Outcome	:	The students are expected to be able to demonstrate the following knowledge, skills and attitudes in achieving NSS motto after completing this course:

- The Motto of NSS "Not Me but You", reflects the essence of democratic living and upholds the need for self-less service.
- NSS helps the students' development & appreciation to other person's point of view and also show consideration towards other living beings.
- The philosophy of the NSS is a good doctrine in this motto, which underlines on the belief that the welfare of an individual is ultimately dependent on the welfare of the society as a whole and therefore, the NSS volunteers shall strive for the well-being of the society.

UNIT-I: N.S.S. Regular Activities-I

A) Traffic regulation
B) Working with Police Commissioner's Office
C) Working with Corporation of Gorakhpur District

UNIT-II: N.S.S. Regular Activities-II

A) Working with Health Department
B) Blind assistance
C) Garments collection and distribution

UNIT-III: N.S.S. Regular Activities-III

A) Non-formal Education
B) Environmental Education Awareness and Training (EEAT)'
C) Blood donation

UNIT-IV: N.S.S. Regular Activities-IV

A) Adopted Village related works
B) Disaster/Pandemic management

GAMES & SPORTS-I (ECA-181)

Course Category : Extra-Curricular Activities

Pre-Requisite	:	Physical Education at 12th standard
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Training and Practices.
Course Outcome	:	The students are expected to be able to perform the following Knowledge, skills, and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track.

Track & Field- UNIT- 1

- **INTRODUCTION:**

Historical development

- National
- International

Structure and functions of Controlling Bodies

- National
- International

UNIT- 2

- **FUNDAMENTAL SKILLS:**

- Starting techniques: Standing start, Crouch start and its variations, Proper use of blocks.
- Finishing Techniques: Run, Through, Forward lunging, Shoulder Shrug.

UNIT- 3

- **FUNDAMENTAL SKILLS-II:**

- Various patterns of Baton Exchange.
- Understanding of Relay Zones.
- Rules & their interpretation.

UNIT- 4

- **FUNDAMENTAL SKILLS-III:**

- Drills and Lead-up Games.
- Marking and Layout of Track & Field

Books & References

1. Latest Official Rule Books of International Federation
2. Coaching Manuals of International Federation
3. Official Website

GAMES & SPORTS-II (ECA-231)

Course Category	:	Extra-Curricular Activities

Pre-Requisite	:	Physical Education at 12th standard
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Training and Practices.
Course Outcome	:	The students are expected to be able to perform the following Knowledge, skills and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track.

Basketball- UNIT- 1

- **INTRODUCTION:**

Historical development

- National
- International

Structure and functions of Controlling Bodies

- National
- International

UNIT- 2

- **FUNDAMENTAL SKILLS- I:**

- Player stance and ball handling.
- Passing-Two Hand chest pass, Two hand Bounce Pass, One Hand Baseball pass, Side Arm Pass, Over Head pass, Hook Pass.
- Receiving-Two Hand receiving, One hand receiving, Receiving in stationary position, Receiving while jumping, Receiving while running.

UNIT- 3

- **FUNDAMENTAL SKILLS- II:**

- Dribbling-How to start dribble, how to drop dribble, High dribble, Low dribble, Reverse dribble, Rolling dribble.
- Shooting-Lay-up shot and its variations, one hand set shot, one hand jump shot, Hook shot, and Free throw.
- Individual Defensive-Guarding the man with and without the ball, pivoting.

UNIT- 4

- **FUNDAMENTAL SKILLS-III:**

- Drills and Lead-up Games.
- Marking and Layout of Court.

Books & References

1. Latest Official Rule Books of International Federation
2. Coaching Manuals of International Federation
3. Official Website

GAMES & SPORTS-III (ECA-281)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	Physical Education at 12th standard

Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Training and Practices.
Course Outcome	:	The students are expected to be able to perform the following Knowledge, skills and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track

Volleyball- UNIT- 1

- **INTRODUCTION:**

Historical development

- National
- International

Structure and functions of Controlling Bodies

- National
- International

UNIT- 2

- **FUNDAMENTAL SKILLS-I:**

- Service-Under Arm Service, Tennis Service, Floating Service.
- Overhead finger pass.
- The Dig (Under Arm pass).

UNIT- 3

- **FUNDAMENTAL SKILLS –II:**

- Back court defense.
- Defensive and Offensive strategies.
- Smash
- Block–individual and team.

UNIT- 4

- **FUNDAMENTAL SKILLS-III:**

- Drills and Lead-up Games.
- Marking and Layout of Field.

Books & References

1. Latest Official Rule Books of International Federation
2. Coaching Manuals of International Federation
3. Official Website

GAMES & SPORTS-IV (ECA-331)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	Physical Education at 12th standard
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Training and Practices.

Course Outcome : The students are expected to be able to perform the following Knowledge, skills and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track for running events.

Hockey- UNIT-1

- **INTRODUCTION:**

Historical development

- National
- International

Structure and functions of Controlling Bodies

- National
- International

UNIT- 2

- **FUNDAMENTAL SKILLS-I:**

- Player stance & Grip,
- Rolling the ball, Dribbling.
- Push, Stopping.
- Hit, Flick, Scoop.
- Reverse hit.

UNIT- 3

- **FUNDAMENTAL SKILLS-II:**

- Passing–Forward pass, square pass, triangular pass, diagonal pass, return Pass.
- Goalkeeping–Hand defense, foot defense.
- Positional play in attack and defense.

UNIT- 4

- **FUNDAMENTAL SKILLS-III:**

- Drills and Lead-up Games.
- Marking and Layout of Court.

Books & References

1. Latest Official Rule Books of International Federation
2. Coaching Manuals of International Federation
3. Official Website

GAMES & SPORTS- V (ECA- 381)

Course Category	:	Extra-Curricular Activities
Pre-Requisite	:	Physical Education at 12th standard
Contact/Hours of Work	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Method	:	Practical Training and Practices.

Course Outcome : The students are expected to be able to perform the following Knowledge, skills and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track for running events.

UNIT 1

- **YOGA- HOLISTIC HEALTH:**

 Health- Concept of Health, its importance in human life.
 Components of health.

UNIT-II

- **YOGA AND ITS IMPORTANCE:**

- Definition of Yoga.
- Importance of Yoga in daily life.
- Aims and Objective of yoga.
- Misconception of yoga.

UNIT-III

- **SURYA NAMASKAR:**

- Benefits of Surya Namaskar
- Practices of Surya Namaskar

Unit- IV

- **YOGA PRACTICES:**

 Asana- Meditative
  i) Sukhasana
  ii) Padmasana
  iii) Swastikasana
 Cultural- Trikonasana, Makarasana, Bhujangasana, Sarpasana, Dhanurasana.
 Pranayama- Yogic Breathing, Anulom-Vilom.

Books & References

1. Indra Devi, "Yoga For You", Gibbs, Smith publishers, Salt Lake City, 2002 Domen& Publishers, New Delhi-2001.
2. Yoga se Arogya, Indian Yoga Society, Sagar.

Games & Sports -VI (ECA- 431)

Course Category : Extra-Curricular Activities
Pre-Requisite : Physical Education at 12th standard
Contact/Hours of Work : 2 Hours/Week
Number of Credits : 0
Course Assessment Method : Practical Training and Practices.

Course Outcome : The students are expected to be able to perform the following Knowledge, skills and attitudes after completing this course.

- Understand the concept of skill.
- Acquire the required motor skills.
- Demonstrate and assess various techniques of starts and finish.
- Interpret the rules & regulations.
- Acquire skill of marking track for running events.

UNIT- 1

- **Badminton**

INTRODUCTION:

Historical development

- National
- International

Structure and functions of Controlling Bodies

- National
- International.

UNIT-II

- **FUNDAMENTAL SKILLS-I:**

 Racket parts, Racket grips, Shuttle (dimensions).
 The basics stances.
 Basic foot movements.

UNIT-III

- **FUNDAMENTAL SKILLS-II:**
- The basic strokes-Serves.
- Forehand-overhead and underarm.
- Backhand-overhead and underarm.
- Types of games-Singles, doubles, including mixed doubles.

Unit- IV

- **FUNDAMENTAL SKILLS-III:**

 Drills and Lead-up Games.
 Marking and Layout of Court.

Books & References

1. Latest Official Rule Books of International Federation
2. Coaching Manuals of International Federation
3. Official Website

Culture, Art & Literary-I (ECA-182)

Course category : Cultural, Art &Literary
Pre-requisite Subject : NIL
Contact hours/week : 2 Hours/Week
Number of Credits : 0
Course Assessment Methods : Practical Participation
Course Outcomes : Students are expected to develop their soft skills and their Personality through cultural and literary activities.

UNIT-1

Workout, Warm up, Stretching, Introduction to various dance forms, Dance form – Bollywood, Footwork, Body Movement, Theatre History, Literature and Aesthetics, Introduction to Acting, Yoga(Breathing, Exercise, Voice Control and Sound Modulation).

UNIT-2

Introduction to music, Basic Terminologies related to music, Origin of sound, Historical study of musical terms, Basic Introduction to Fine Arts, Roll of FAC in cultural sub-council, Basics of Fine Arts and Types, File extension, Editing software, Resources for stock images and video.

UNIT-3

MALVIKA: Basic knowledge of designing software (I) : Adobe In Design ,Photoshop ,Notice Making, Article writing.

UNIT-4

TIRESIA: Basic knowledge of designing software (I): Adobe In Design, Photoshop, Interview skills, Vocabulary development, Knowledge about technical advancements, knowledge of campus activities.

Culture, Art & Literary-II (ECA-232)

Course category	: Cultural, Art &Literary
Pre-requisite Subject	: NIL
Contact hours/week	: 2 Hours/Week
Number of Credits	: 0
Course Assessment Methods	: Practical Participation
Course Outcomes	: Students are expected to develop their soft skills and their personality through cultural and literary activities.

UNIT-1

Intro to basics of sketching, Painting, Craft, Sculpturing.

Sketch-Tools of sketching, Types of Sketching- Pencil/ Pen/ Color Pencil/ Charcoal/ Graphite/Ink/ Chalk / Digital Sketch. History of Indian Music, About life and contributions of Indian Musician sand Musicologists.

Two forms of Indian Classical Music (Hindustani/Karnataka).

UNIT-2

Introduction to Theatre Technique and Design, Character Analysis and practical on principle of Stanislavski Method (relaxations, concentration of attention and emotion memory), Workout, Warm up, Stretching, Dance Form- Hip-Hop, Footwork, Body movement, Choreography, Equipment, Types of lenses, building web site using template.

UNIT-3

ARUNODAY: Development of thinking ability with JAM (Just a Minute), Word Building, Letter rearrangement, Knowledge of spellings, Syllables, Critical thinking skill development, Vocabulary development, Thought expressing skill development, public speaking skill development.

UNIT-4

SPELLCZAR: Word building, Vocabulary development, Decision making ability development, Coordination capabilities.

Culture, Art & Literary-III (ECA-282)

Course category	:	Cultural, Art &Literary
Pre-requisite Subject	:	NIL
Contact hours/week	:	2 Hours/Week
Number of Credits	:	0
Course Assessment Methods	:	Practical Participation
Course Outcomes	:	Students are expected to develop their soft skills and their personality through cultural and literary activities.

UNIT-1

Photo editing (Photoshop)

Ras- (Sringar Ras, Hasya Ras, Rodra Ras, Karun Ras, Vir Ras, Adbhut Ras, Vibath Ras, Bhayanak Ras, Shaant Ras)

UNIT-2

Workout, Warmup, Stretching, Pranam, Types of classical dance forms and their outfits, Dance form- Kathak, Hand movements, Choreography, Basic knowledge of Talas for Instance Teental, Dadra and Kherwa, Practice of AUM and vocal exercises of sargam (sa, re, ga, ma, pa, dha, ni) of 45. Alankaras, Styles of Sketching-Line/ Hatching/Blending/Scribbles/Tattoo/Doodling/Cartoon/Graffiti/Typography/Calligraphy/Cari cat Ure

UNIT-3

ANNUAL DEBATE COMPETITION: General Knowledge & Current Affairs, Public speaking skill development, Oratory skill development, Sense of Team spirit, Knowledge of language, Social Study, Development of presentation skills.

UNIT-4

TWIST AND TWAIN: Development of imaginative power and creativity, Development of vocabulary, Development of writing skills, Thinking skill development.

Culture, Art & Literary-IV (ECA-332)

Course category	:	Cultural, Art &Literary
Pre-requisite Subject	:	NIL
Contact hours/week	:	2 Hours/Week
Number of Credits	:	0
Course Assessment methods	:	Practical Participation

Course Outcomes : Students are expected to develop their soft skills and their Personality through cultural and literary activities.

UNIT-1

Video editing, Basic knowledge about musical instruments (Tabla, flute, guitar etc.) about Swarmalika and two bragas-Bhupaliand Yaman.

UNIT-2

Monologue, reciting a poem, reading short stories, developing speech skill, Mime, Working on scene with partner and in a group, Painting-Tools of painting, Styles of painting-Abstract/Imagination/Expression/Cubism/Indian/Chinese/Japanese, All the theory covered upto Praveshi ka Purna, define and explain Kataaksha,Primalu, Nartan Bhedas- Nritta Nrutya and Natya, define Tandav and Lasya, Fourty pesof neck movements according to Abhinaya Darpan, Eight types of eye movements according to Abhinaya Darpan, Define and differentiate "FolkDance" and "Modern Dance" (Uday Shankar style), Life story of: Bindadin Maharaj, Kalka Prasadji, Harihar Prasadji& Hanuman Prasadji, Specialty of Jaipur and Lucknow Gharana,Definition and uses of the following Asanyukta Hasta Mudras: Sarpsheersha, Murga-sheersha, Simha-Mukha, Kangula, Alapadma, Chatura, Bhrama, Hansasya, Hansa-paksha, Sandausha, Mukula, Tamrachuda, Vyagraha, Trishula, Sanyukta HastaMudra: Anjali, Kapota, Karkata, Swastik, Dola, Pushpaputa, Utsanga, Shivalinga, Katakawardhan, Kartari-swastk, Shakata, Shankha.

UNIT-3

VAGMITA1: Development of oratory skill, Development of poetry writing skill, Alankar, Ras, Creative thinking ability development.

UNIT-4

VAGMITA 2: How to overcome camera consciousness, enhancement of the expression and presentation of the participants, development of the public speaking skill, Knowledge of tone adjustment while presenting.

Culture, Art & Literary-V (ECA-382)

Course category	:	Cultural, Art &Literary
Pre-requisite Subject	:	NIL
Contact hours/week	:	2 Hours/Week
Number of Credits	:	0
Course Assessment methods	:	Practical Participation
Course Outcomes	:	Students are expected to develop their soft skills and their personality

UNIT-1

Types of painting-Oil painting/ Watercolor painting/ Pastel painting/ Acrylic painting/ Digital painting/Spray Painting, Basic of Contemporary Dance, Foot Position and Transference, Center Technique, Travelling Technique, Dance, Dance (A) Peter Pan, dance (B) Emergence of a Butterfly.

UNIT-2

Improvisation, Elementary knowledge of Acting, Body language, Rhythm, Clarity and fluency in dialogue delivery, Understanding the depth of character, about terms related to Hindustani music like Naad, Shuruti, Saptak, Thaat, Vaadi, Samvadi, Photography Skill.

UNIT-3

MALAVIYAN THINKER: Creative thinking, how to pen down thoughts of our mind, Development of writing skill, Development of Expression, Public Speaking skill development.

UNIT-4

ABHYUDAYA: Multidimensional skill development: Technical skill development with software like Adobe Photoshop, MS word, MS PowerPoint, MS Excel, Content Writing skill development, public addressing, public engagement, Team work Mechanism, Leadership qualities, Time management, art and craft, Pottery, Oratory skill development, Presentation skill, Event management.

Culture, Art & Literary-VI (ECA-432)

Course category	:	Cultural, Art &Literary
Pre-requisite Subject	:	NIL
Contact hours/week	:	2 Hours/Week
Number of Credits	:	0
Course Assessment methods	:	Practical Participation
Course Outcomes	:	Students are expected to develop their soft skills and their personality

UNIT-1

Cinematography, Basic knowledge of Thaat system, Raga formation rules, 5 Ragas- Bhupali, Yaman, Bihag, Kafi, Deskar.

UNIT-2

Introduction to Nukkad, Mono Act, Skit, Introduction to Comedy, Tragic Comedy, Tragedy, Melodrama, Craft- Tools of craft, Types of Craft- paperwork/ Wood work/ foam work/ Cloth work, Popping/ Introto music theory, Angles and Movement/Music Theory, Direction and Levels/Rhythms for Grooves, Twists and isolated movements/8 Count Phrasing, Footwork/Floats and Glides, Waves/Movements Dynamics, Waves 2/Musical Phrasing, Putting it all together.

UNIT-3

WRITING SKILLS: Invitation making, Notice making, Article writing.

SKILL FOR INTEVIEWER: How to take formal interview, approaching the personality, Questions preparation, management, platform selection, public engagement.

UNIT-4

INTERVIEW SKILLS FOR INTERVIEWEE: Body language, Attire, Hand gestures, voice tone, Language, General Interview Questions- How to introduce yourself.