

Nagindas Khandwala College (Autonomous)

Affiliated to University of Mumbai



**MKES's Nagindas Khandwala College (Autonomous),
Gate No 5, Bhavishya Bharat Campus, S. V. Road, Malad (West)
Mumbai-400 064**

Programme Code: UBSCIT

**Bachelor of Science in Information Technology (B.Sc.IT)
Three Year Integrated Programme -
Six Semesters
*Course Structure***

**Under Choice Based Credit, Grading and Semester System
*Implemented during Academic Year- 2022-23***

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1. Preamble

There is growing demand of IT Professionals to deal with increasing software development and automation jobs. IT graduates with logical and problem solving skills are a need of the time. This program is so created to make our graduates employable.

This Bachelor's Degree Program will provide students the right blend of knowledge and skills along with practical exposure.

2. Objectives

This program of B Sc IT is structured to provide graduates with practical skills required in the software development and testing field. The main objective of B Sc IT are:-

- To provide intensive theoretical & practical knowledge
- To provide an integrated perspective of IT functioning along with a good amount of exposure to real life cases / technical knowhow.
- To train students with knowledge in the field of logical thinking, problem solving, software engineering and programming.
- To develop students' programming skills to become employable or to start their own entrepreneurial journey.

3. Program Outcome

After completion of three years Bachelor of Science Information Technology (BSC IT) Programme, the learner will:

PO-1: Demonstrate a fundamental and systematic or coherent understanding of the academic field of Information Technology and its linkages with related disciplinary areas/subjects;

PO-2: Procedural knowledge that creates different types of professionals related to the disciplinary/subject area of Information Technology including software development and testing;

PO-3: Skills in areas related to one's specialisation within the disciplinary/subject area of Information Technology and current and emerging developments in the field.

PO-4: Demonstrate the ability to use the knowledge in formulating and tackling IT related problems and suggest software solution to them.

PO-5: Analyse and interpret data/information collected using appropriate methods, including the use of appropriate software such as programming languages and special-purpose packages, and report accurately the findings of the experiment/field investigations while relating the conclusions/findings to relevant theories.

PO-6: Demonstrate relevant global competencies such as problem solving skills that are required to solve different types of problems with well-defined solutions;

PO-7: Develop communication skills involving the ability to listen carefully, to read texts and research papers analytically and to present complex information in a concise manner to different groups/audiences;

PO-8: Develop (i) ICT skills such as presentation skills, documentation, etc; (ii) ^[IT]~~SEP~~ personal skills such as the ability to work both independently and in a group (iii) skills to manage IT infrastructure.

PO-9: Demonstrate professional behaviour such as (i) being objective, unbiased and truthful in all aspects of work and avoiding unethical behavior such as fabricating, falsifying or misrepresenting data or to committing plagiarism; (ii) the ability to identify the potential ethical issues in work-related situations;

PO-10: Inculcate the mentality for (i) the appreciation of intellectual property, environmental and sustainability issues; and (ii) promoting safe learning and working environment.

4. Program Specific Outcome

After completion of this program learners will be:

1. Enhanced with scientific thinking and problem solving skills
2. Able to design computer programs to solve real life problems
3. Capable of designing secure organizational IT structure
4. Capable of managing the security of organizational IT structure

PO – CO Mapping:

Semester	Subject	Course Code	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10
	Communication Skills	2111UISCS	*			*			*	*	*	*
Sem 1	Web Programming I	2112UISWP	*		*	*	*		*	*		*
	Introduction to Programming	2113UISIP	*	*		*	*	*			*	*
	Fundamentals of Computers and Electronics	2114UISCE	*	*	*	*		*				
	Operating Systems	2115UISOS	*	*	*	*			*	*		*
	Discrete Mathematics-I	2116UISDM	*	*				*				
	Practical of CC-1 + CC-2 Introduction to Programming + Fundamentals of Computers and Electronics	2117UISIPCE	*	*	*	*	*	*	*	*	*	*
	Practical of CC-2 + SEC-1 Operating Systems + Web Programming - I	2118UISOSWP	*	*	*	*		*	*	*		*
Sem 2	IT platforms, Tools and Practices	2121UISTP	*	*		*	*		*	*	*	*
	Web Programming II	2122UISWP	*				*			*	*	*
	Programming and Application Development in Python	2123UISDP	*	*	*		*		*	*		*
	Object Oriented Programming	2124UISOP	*	*		*			*	*	*	*
	Database Management Systems I	2125UISDM	*		*	*			*	*		*
	Discrete Mathematics II	2126UISDM	*	*				*		*		
	Practical of CC-4 + CC-5 Programming and Application Development in Python + Object Oriented Programming	2127UISDPOP	*	*	*	*	*		*	*	*	*
	Practical of CC-6 + SEC-2 Database Management Systems - I + Web Programming - II	2128UISDMWP	*	*	*		*		*	*	*	*

Sem 3	Core Java	2131UISCJ	*	*	*					*	*	*
	Data Structures	2132UISDS	*	*	*		*			*		*
	Computer Networks	2133UISCN	*	*	*				*	*		*
	Database Management Systems- II	2134UISDB	*	*	*					*	*	*
	Descriptive Statistics	2135UISST	*	*	*	*	*	*				
	Advanced Web Programming - I	2136UISAW	*	*	*					*		*
	Hybrid Mobile Application Development 1	2136UISMD	*	*	*	*				*	*	*
	Computer Graphics and Animation	2137UISCG	*	*	*	*	*	*		*		*
	Embedded Systems	2137UISES	*	*	*					*		*
	Principles of Management	2137UISPM	*			*			*	*	*	*
	Core Java Practical	2131UISPR	*	*	*					*	*	*
	Data Structures Practical	2132UISPR	*	*	*		*			*		*
	Computer Networks Practical	2133UISPR	*	*	*				*	*		*
	Database Management Systems- II Practical	2134UISPR	*	*	*					*	*	*
	Advanced Web Programming - I Practical	2136UISAWPR	*	*	*					*		*
	Hybrid Mobile Application Development 1 Practical	2136UISMDPR	*	*	*	*				*		*
	Computer Graphics and Animation Practical	2137UISCGPR	*	*	*	*	*	*		*		*
	Embedded Systems Practical	2137UISESPR	*	*	*					*		*
	Principles of Management Practical	2137UITPMPR	*			*			*	*	*	*
Sem 4	Design Patterns	2141UISDP	*	*	*	*		*		*		
	Design and Analysis of Algorithms	2142UISDA	*	*	*	*	*	*		*	*	*
	System Programming	2143UISSP	*	*	*	*				*		*
	Software Engineering	2144UISSE	*	*	*	*	*			*		*
	Probability Theory	2145UISPT	*	*	*	*	*	*		*		*
	Advanced Web Programming - II	2146UISAW	*	*	*	*						*

	Hybrid Mobile Application Development II	2146UISMD	*	*	*	*				*	*	*
	Advanced Java	2146UISAJ	*	*	*					*		*
	Multimedia Systems	2147UISMM	*	*	*	*			*	*		*
	Internet of Things	2147UISIT	*	*	*	*				*		*
	Principles of Marketing	2147UISPM	*		*	*			*	*		*
	Design Patterns Practical	2141UISPR	*	*	*	*		*		*		
	Design and Analysis of Algorithms Practical	2142UISPR	*	*	*	*	*	*		*	*	*
	System Programming Practical	2143UISPR	*	*	*	*				*		*
	Software Engineering Practical	2144UISPR	*	*	*	*	*			*		*
	Advanced Web Programming - II Practical	2146UISAWPR	*	*	*	*						*
	Hybrid Mobile Application Development II Practical	2146UISMDPR	*	*	*	*				*	*	*
	Advanced Java Practical	2146UISAJPR	*	*	*					*		*
	Multimedia Systems Practical	2147UISMSPR	*	*	*	*			*	*		*
	Internet of Things Practical	2147UISITPR	*	*	*	*				*		*
	Principles of Marketing Practical	2147UITPMPR	*		*	*			*	*		*
Sem 5	Principles of Artificial Intelligence	2151UITPA	*	*	*	*				*	*	*
	Data Mining and Warehousing	2152UITDW	*	*	*	*				*	*	*
	Geographic Information Systems	2153UITGS	*	*	*	*	*	*		*	*	*
	Personal Effectiveness Management	2153UITPM	*	*	*	*			*	*	*	*
	Foundations of Software Testing	2154UITST	*	*	*	*				*	*	*
	Cloud Computing	2154UITCC	*	*	*	*				*	*	*
	.Net Technologies	2154UITNT	*	*	*	*				*	*	*

	Principles of Artificial Intelligence Practical	2151UITPR	*	*	*	*				*	*	*
	Data Mining and Warehousing Practical	2152UITPR	*	*	*	*				*	*	*
	Geographic Information Systems Practical	2153UITGSPR	*	*	*	*	*	*		*	*	*
	Personal Effectiveness Management Practical	2153UITPMPR	*	*	*	*			*	*	*	*
	Foundations of Software Testing Practical	2154UITSTPR	*	*	*	*				*	*	*
	Cloud Computing Practical	2154UITCCPR	*	*	*	*				*	*	*
	.Net Technologies Practical	2154UITNTPR	*	*	*	*				*	*	*
	Project Implementation	2155UITPI	*	*	*	*	*	*	*	*	*	*
Sem 6	Information Security Management	2161UITIM	*	*	*	*				*	*	*
	Business Intelligence	2162UITBI	*	*	*	*				*	*	*
	Remote Sensing	2163UITRS	*	*	*	*	*	*		*	*	*
	Event Marketing	2163UITEM	*	*	*	*			*	*	*	*
	Project Management	2164UITPM	*	*	*	*	*	*	*	*	*	*
	Cyber Laws and Introduction to Blockchain	2164UITCLB	*	*	*	*				*	*	*
	Information Security Management Practical	2161UITPR	*	*	*	*				*	*	*
	Business Intelligence Practical	2162UITPR	*	*	*	*				*	*	*
	Remote Sensing Practical	2163UITRSPR	*	*	*	*	*	*		*	*	*
	Event Marketing Practical	2163UITEMPR	*	*	*	*			*	*	*	*
	Project Management Practical	2164UITPMPR	*	*	*	*	*	*	*	*	*	*
	Cyber Laws and Introduction to Blockchain Practical	2164UITLBPR	*	*	*	*				*	*	*
Project Implementation	2165UITPI	*	*	*	*	*	*	*	*	*	*	

5. Scheme of Examination

The scheme of Examination shall be divided into parts i.e. Continuous Internal Evaluation including Assignment, Projects, Seminars, Case Studies and Class Tests, Semester End Examinations and Practical Examination for some courses which will be of 50 marks. The semester wise Credit Points will be varied from course to course but the value of Credits for Under-Graduate Programme shall be of

(1) 120 Credits. Students will have to earn 8 extra credits under autonomy. This will be achieved by doing 1 Course on Environmental Science, 1 Short Term Course from an approved list of certifications and 4 IIT Online Spoken Tutorials. (Students admitted in First Year before 2021-2022)

(2) 132 credits for Students admitted in First Year before 2021-2022

The Credits are defined in terms of the learner's hours which are divided into two parts such as Actual and Notional. The value of a particular course can be measured in number of Credit Points. The value of One (01) Credit is equal to 15 Hours of learners' load

Scheme of Total Credits (Students admitted in First Year before 2021-2022)

Sr. No.	Year	Credits
1	Year 1	40
2	Year 2	40
3	Year 3	40
	Total Credits from Academics	120
	Additional Credits	8
	Total Credits for Award of Degree	128

5.1 Credit Based Evaluation System Scheme of Examination

For all 6 semesters, the performance of the learners shall be evaluated into two components.

For Semester 1 to 4: the first component shall carry 40% marks which will be a Continuous Internal Evaluation while the second component shall carry 60% marks at semester end examination

For Semesters 5 and 6: The first component shall carry 25% marks which will be a Continuous Internal Evaluation while the second component shall carry 75% marks at semester end examination.

The allocation of marks for the Continuous Internal Evaluation and Semester End Examination and Practical Examination are as shown below:

5.2 Structure of Continuous Internal Evaluation

Sr. No.	Particulars	Marks
1	Class test held in the given semester offline or online examinations	20 marks
2	Subject specific Term Work Module/assessment modes –as decided by the department in the beginning of the semester (like Extension/field/experimental work, Short Quiz; Objective test, lab practical, open book test etc. and written assignments, Case study, Projects, Posters and exhibits etc. for which the assessment is to be based on class presentations wherever applicable)	15 marks
3	Active participation in routine class instructional deliveries (and in practical work, tutorial, field work etc. as the case may be)	5 marks
	Total:	40 marks

Sr. No.	Particulars	Marks
1	Class test held in the given semester offline or online examinations.	10 marks
2	Subject specific Term Work Module/assessment modes –as decided by the department in the beginning of the semester (like Extension/field/experimental work, Short Quiz; Objective test, lab practical, open book test etc. and written assignments, Case study, Projects, Posters and exhibits etc. for which the assessment is to be based on class presentations wherever applicable)	10 marks
3	Active participation in routine class instructional deliveries (and in practical work, tutorial, field work etc. as the case may be)	5 marks
	Total:	25 marks

5.2.1 Structure of Practical Examination = 50 marks

Sr. No.	Particulars	Marks
1	Implementation Based	40
2	Viva Voce	05
3	Journal	05

Semester End Examination will be organized after all modules of the course are taught in the class. It will be a written examination / or as per the needs of the course a practical examination

or a combination of both. This examination will be for 75 marks, for Semesters III to VI and for 60 marks for Semesters I and II.

The assessment of Continuous Internal Evaluation and Semester End Examination as mentioned above for the Semesters I to VI shall be processed by the College – ‘Institutions of their Learners’ and issue the grade cards to them after the conversion of marks into grade as the procedure mentioned below.

The learners to pass a course shall have to obtain a minimum of 40% marks in aggregate for each course where the course consists of Continuous Internal Evaluation & Semester End Examination. The learner shall obtain minimum of 40% marks (i.e. 10 out of 25) in the Continuous Internal Evaluation, 40% marks in Semester End Examination (i.e. 30 Out of 75) 40% marks in Practical Examination (i.e. 20 out of 50) separately, to pass the course and minimum of Grade D in each program, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Continuous Internal Evaluation & Semester End Examination together.

5.3 Passing Standards

Grade	Marks (CIE + SEE)	Practical Marks	Grade Points
O	80 & Above	40 & Above	10
A+	70 to 79.99	35 to 39	9
A	60 to 69.99	30 to 34	8
B+	55 to 59.99	28 to 29	7
B	50 to 54.99	25 to 27	6
C	45 to 49.99	23 to 24	5
D	40 to 44.99	20 to 22	4
F	Less than 40	Less than 20	0

5.4 Approved Certifications for Additional Credits (Students admitted in First Year before 2021-2022)

Table for Additional Autonomy Credits

Table for Autonomy Credits					
Semester	Component	Duration	No. of Courses	Credit/ Course	Total Credits
A. Ability Enhancement Compulsory Course (AECC)					
3	AECC I Environment Science	1 Sem	1	2	2
2-5	AECC II Online IIT Spoken Tutorials	4 Sem	4	1	4
B. Skill Enhancement Course (SEC)					
1-5	SEC I (Short Term Courses)	30 hrs (Table – 1)	--	2	2
				Total	8

All B. Sc. IT students graduating from Nagindas Khandwala College will earn 8 (Eight) additional credits under autonomy. It is compulsory for every student to earn these credits for grant of a degree. The scheme of credits is explained below.

Course on Environmental Science (EVS)

This course is offered in Sem. III for 2 credits. It is compulsory for all students to complete this course. Lectures for this are arranged in college.

IIT Spoken Tutorial Programme

This is a compulsory course offered to all students of B.Sc IT and CS from Semester 2 to Semester 5. Students will choose the suitable course from the list of Spoken Tutorial courses offered by IITB. Students can download the lectures and learn at their pace. An online examination will be conducted by IITB and students will be appearing for the examination at the Computer Lab of the College under the invigilation of a faculty in-charge.

Short Term Courses (STC)
List of Short Term Courses Offered Semester Wise

Sr. No.	STC offered in Semester 1,3 & 5	STC offered in Semester 2,4 & 6
1	Basic Course in Brahmavidya	Add On Certificate course on Child Care & Child Development
2	Pranic Healing	Add On Certificate course on Travel & Tourism Management
3	Understanding Mental Health	Add On Certificate course on Computer Application
4	Leadership insights	Add On Certificate course on Functional English
5	Certificate in QGIS	Certificate Course in Gandhian Studies
6	Finding an 'Entrepreneur' in you	Certificate in GIS
7	Working with Vectors (COREL DRAW)	Tie and Dye
8	Certificate in Visual Merchandising	Jewellery Making
9	Certificate Course in Indian Embroidery	Working with Bitmap (Photoshop)
10	Certificate in Stylization	Grooming and Personality Development
11	CASI New York Global Student Associate Certification	Mind your Money
12	Certificate in Photography	Certificate Course in Banking
13	CASI New York Street Volunteering CASI	Understanding Pollution through Mobile Application
14	Certificate in Spanish Language	Digital Marketing
15	Fundamental of Capital Market and Derivatives	Certificate in Mandarin
16	Technical Analysis and trading on Stock Markets	Group Discussion Strategies
17	Financial Statement Analysis	Modelling
18	Certificate in Finance CASI	Certificate course on music
19	Certificate in Methods of Quantitative techniques	Certificate Course in Sports Management
20	Mastering Aptitude Skills	Mastering Analytical Skills
21	Enhancing Communication Skills	Certificate Course in Mobile Journalism
22	Gujrati Folk Dance	Certificate in Treasury Management CASI
23	Draping	CASI New York Retail Banking
24	Programme for Life Personal & Professional Insurance	Investment Banking Operations
25	Branding Yourself	Certificate in IFRS
26	COIST (Certificate Course In Online Sources , Tools and Techniques)	Making Effective PPT
27	Equity Share Boot Camp	Certificate in Beauty Treatments
28	Certificate in Hair Styling	

Khandwala College offers 55 Short Term Courses. These courses are divided in even and odd semesters and are organized in vacations. Students have to complete any **ONE** Short Term Course in any one of the semesters between 1 and 5. Courses offered in Sem. 1, 3 & 5 are

organized during the Diwali break and courses offered in Sem. 2 & 4 are organized in the month of April.

3.5 Exemptions from STC

Students satisfying any one of the criteria listed below will be granted exemption from registering for a short-term course. 2 credits under autonomy will be granted to students who have:-

1. Registered with NSS unit of Khandwala College, who have completed 120 hours with participation at the rural camp, and authorities in charge of NSS at college level have recommended their name for exemption.
2. Won prizes at University, State, National or International level in any sports activity- individual or team - and their name has been recommended by authorities in charge of Gymkhana at college level.
3. Enrolled for NCC unit of Khandwala College, have completed mandatory hours of training and have attended all programs of NCC at Khandwala College and their name has been recommended by authorities in charge of NCC at college level.
4. Represented Khandwala College at any University Cultural Festival and have won prize will be entitled to exemption on recommendation of their name by the Students Council in charge.

Bachelor of Science (Information Technology) Programme

Under Choice Based Credit, Grading and Semester System

Three Year Integrated Programme -

Six Semesters

Basic Structure: Distribution of Courses

1	Ability Enhancement Compulsory Course (AECC)	2 Paper of 2 Credits Hrs. each (Total Credits Hrs. $2*2=4$)	04
2	Skill Enhancement Compulsory Course (SEC)	8 Papers of 3 Credits Hrs. each (Total Credits Hrs. $8*3=24$) 2 Papers of 2 Credits Hrs. each (Total Credits Hrs. $2*2=4$) 10 Papers of 1 Credits Hrs. each (Total Credits Hrs. $10*1=10$)	38
3	Core Course (CC)	6 Papers of 3 Credits Hrs. each (Total Credits Hrs. $6*3=18$) 6 Papers of 2 Credits Hrs. each (Total Credits Hrs. $6*2=12$) 12 Papers of 1 Credits Hrs. each (Total Credits Hrs. $12*1=12$)	42
4	Discipline Specific Compulsory Course (DSC)	4 Papers of 2 Credits Hrs. each (Total Credits Hrs. $4*2=8$)	08
5	Discipline Specific Elective (DSE)	4 Papers of 3 Credits Hrs. each (Total Credits Hrs. $4*3=12$) 4 Papers of 2 Credits Hrs. each (Total Credits Hrs. $4*2=8$) 8 Papers of 1 Credits Hrs. each (Total Credits Hrs. $8*1=8$)	28
	Total Credits Hrs		120

Bachelor of Science in Information Technology (B.Sc. IT) Programme

Under Choice Based Credit, Grading and Semester System

Curriculum Framework

(Implemented during Academic Year 2022-2023)

FIRST YEAR

Semester I & II (2022-2023)

Sr No	Semester I	Subject code	Total Marks	Credits	Sr No	Semester II	Subject code	Marks	Credits
	Ability Enhancement Compulsory Course (AECC)					Ability Enhancement Practical Compulsory Course (AECC)			
1	AECC-1 Communication Skills	2111UISCS	60-40 100	3	1	AECC-2 IT platforms, Tools and Practices	2121UISTP	60-40 100	3
	Skill Enhancement Compulsory Course (SEC)					Skill Enhancement Compulsory Course (SEC)			
2	SEC-1 Web Programming-I	2112UISWP	60-40 100	2	2	SEC-2 Web Programming –II	2122UISWP	60-40 100	2
	Web Programming-I Practical	2112UISWP P	50	2		Web Programming – II Practical	2122UISWP P	50	2
	Core Course (CC)					Core Course (CC)			
3	CC-1 Introduction to Programming	2113UISIP	60-40 100	2	3	CC-4 Programming and Application Development in Python	2123UISDP	60-40 100	2
	Introduction to Programming Practical	2113UISIPP	50	2		Programming and Application Development in Python Practical	2123UISDP P	50	2

4	CC-2 Fundamentals of Computers and Electronics	2114UISCE	60-40 100	2	4	CC-5 Object Oriented Programming	2124UISOP	60-40 100	2
	Fundamentals of Computers and Electronics Practical	2114UISCE P	50	2		Object Oriented Programming Practical	2124UISOP P	50	2
5	CC-3 Operating Systems	2115UISOS	60-40 100	2	5	CC-6 Database Management Systems - I	2125UISDB	60-40 100	2
	Operating Systems Practical	2115UISOS P	50	2		Database Management Systems – I Practical	2125UISDB P	50	2
	<i>Discipline Specific Compulsory Course (DSC)</i>					<i>Discipline Specific Compulsory Course (DSC)</i>			
6	DSC-2 Discrete Mathematics-I	2116UISDM	60-40 100	3	6	DSC-2 Discrete Mathematics - II	2126UISDM	60-40 100	3
	Total			22		Total			22

SECOND YEAR-Information Technology
(Implemented during Academic year 2022-23)

Sr. No.	Semester III	Subject code	Total Marks	Cred its	Sr. No.	Semester IV	Subject code	Total marks	Cred its
	Discipline Specific Compulsory Course (DSC)					Discipline Specific Compulsory Course (DSC)			
1	DSC-3 Descriptive Statistics	2231UISST	60-40 100	3	1	DSC-4 Probability Theory	2241UISPT	60-40 100	3
	Skill Enhancement Compulsory Course (SEC)					Skill Enhancement Compulsory Course (SEC)			
2	SEC-3 Core Java	2232UISCJ	60-40 100	2	2	SEC-4 Design Patterns	2242UISDP	60-40 100	2
	Core Java Practical	2232UISCJP	50	2		Design Patterns Practical	2242UISDPP	50	2
	Core Course (CC)					Core Course (CC)			
3	CC-7 Data Structures	2233UISDS	60-40 100	2	3	CC-10 Design and Analysis of Algorithms	2243UISDA	60-40 100	2
	Data Structures Practical	2233UISDSP	50	2		Design and Analysis of Algorithms Practical	2243UISDAP	50	2
4	CC-8 Computer Networks	2234UISCN	60-40 100	2	4	CC-11 System Programming	2244UISSP	60-40 100	2
	Computer Networks Practical	2234UISCNP	50	2		System Programming Practical	2244UISSPP	50	2
5	CC-9 Database Management Systems- II	2235UISDB	60-40 100	2	5	CC-12 Software Engineering	2245UISSE	60-40 100	2
	Database Management Systems- Practical II	2235UISDBP	50	2		Software Engineering Practical	2245UISSEP	50	2

	<i>Discipline Specific Elective (DSE) CHOOSE ANY ONE</i>					<i>Discipline Specific Elective (DSE) CHOOSE ANY ONE</i>			
6	Advanced Web Programming – I	2236UISAW	60-40 100	2	6	Advanced Web Programming - II	2246UISAW	60-40 100	2
	Advanced Web Programming – I Practical	2236UISAWP	50	2		Advanced Web Programming – II Practical	2246UISAWP	50	2
	Hybrid Mobile Application Development – I	2236UISMD	60-40 100	2		Hybrid Mobile Application Development - II	2246UISMD	60-40 100	2
	Hybrid Mobile Application Development – I Practical	2236UISMDP	50	2		Hybrid Mobile Application Development – II Practical	2246UISMDP	50	2
						Advanced Java	2246UISAJ	60-40 100	2
						Advanced Java Practical	2246UISAJP	50	2
	Computer Graphics and Animation	2236UISCG	60-40 100	2		Multimedia Systems	2246UISMS	60-40 100	2
	Computer Graphics and Animation Practical	2236UISCGP	50	2		Multimedia Systems Practical	2246UISMSP	50	2
	Embedded Systems	2236UISES	60-40 100	2		Internet of Things	2246UISIT	60-40 100	2
	Embedded Systems Practical	2236UISESP	50	2		Internet of Things Practical	2246UISITP	50	2
	Principles of Management	2236UITPM	60-40 100	2		Principles of Marketing	2246UISPM	60-40 100	2
	Principles of Management Practical	2236UITPMP	50	2		Principles of Marketing Practical	2246UISPMP	50	2
	TOTAL			23		TOTAL			23

THIRD YEAR
(Implemented during Academic Year 2022-2023)

Sr No	Semester V	Subject code	Total Marks	Credits	Sr. No.	Semester VI	Subject code	Total Marks	Credits
	Core Course (CC)					Core Course (CC)			
1	CC 13: Principles of Artificial Intelligence	2251UITPA	60-40 100	3	1	CC 15: Information Security Management	2261UITIM	60-40 100	3
	CC 13: Principles of Artificial Intelligence Practical	2251UITPR	50	1		CC 15: Information Security Management Practical	2261UITPR	50	1
2	CC 14: Data Mining and Warehousing	2252UITDW	60-40 100	3	2	CC 16: Business Intelligence	2262UITBI	60-40 100	3
	CC 14: Data Mining and Warehousing Practical	2252UITPR	50	1		CC 16: Business Intelligence Practical	2262UITPR	50	1
	Discipline Specific Elective (DSE)					Discipline Specific Elective (DSE)			
3	Discipline Specific Elective (DSE-5) (Any one of group A)				3	Discipline Specific Elective (DSE-7) (Any one of group A)			
	Geographic Information Systems	2253UITGS	60-40 100	3		Remote Sensing	2263UITRS	60-40 100	3
	Geographic Information Systems Practical	2253UITGSPR	50	1		Remote Sensing Practical	2263UITRSPR	50	1
	Personal Effectiveness Management	2253UITPM	60-40 100	3		Event Marketing	2263UITEM	60-40 100	3
	Personal Effectiveness Management Project	2253UITPMPR	50	1		Event Marketing Project	2263UITEMPR	50	1
4	Discipline Specific Elective (DSE-6) (Any one of group B)				4	Discipline Specific Elective (DSE-8) (Any one of group B)			
	Foundations of Software Testing	2254UITST	60-40 100	3		Project Management	2264UITPM	60-40 100	3
	Foundations of Software Testing Practical	2254UITSTPR	50	1		Project Management Practical	2264UITPMPR	50	1
	Cloud Computing	2254UITCC	60-40 100	3		Cyber Laws and Introduction to Blockchain	2264UITLB	60-40 100	3
	Cloud Computing Practical	2254UITCCPR	50	1		Cyber Laws and Introduction to	2264UITLBPR	50	1

						Blockchain Practical			
	.Net Technologies	2254UITNT	60-40 100	3					
	.Net Technologies Practical	2254UITNTPR	50	1					
5	Project Implementation	2255UITPI	100	4	5	Project Implementation	2265UITPI	100	4
	TOTAL			20		TOTAL			20

Nagindas Khandwala College (Autonomous)

**Syllabus and Question Paper Pattern
of Courses of**

Bachelor of Science Information Technology Programme

First Year

Semester I and II

Under Choice Based Credit, Grading and Semester System

(Implemented during Academic Year 2022-2023)

Bachelor of Science Information Technology (B.Sc. IT) Programme

Under Choice Based Credit, Grading and Semester System

Curriculum Framework

(Implemented during Academic Year 2022-2023)

FIRST YEAR

Sr No	Semester I	Subject code	Total Marks	Credits	Sr No	Semester II	Subject code	Marks	Credits
	Ability Enhancement Compulsory Course (AECC)					Ability Enhancement Practical Compulsory Course (AECC)			
1	AECC-1 Communication Skills	2111UISCS	60-40 100	3	1	AECC-2 IT platforms, Tools and Practices	2121UISTP	60-40 100	3
	Skill Enhancement Compulsory Course (SEC)					Skill Enhancement Compulsory Course (SEC)			
2	SEC-1 Web Programming-I	2112UISWP	60-40 100	2	2	SEC-2 Web Programming –II	2122UISWP	60-40 100	2
	Web Programming-I Practical	2112UISWP P	50	2		Web Programming – II Practical	2122UISWP P	50	2
	Core Course (CC)					Core Course (CC)			
3	CC-1 Introduction to Programming	2113UISIP	60-40 100	2	3	CC-4 Programming and Application Development in Python	2123UISDP	60-40 100	2
	Introduction to Programming Practical	2113UISIPP	50	2		Programming and Application Development in Python Practical	2123UISDP P	50	2

4	CC-2 Fundamentals of Computers and Electronics	2114UISCE	60-40 100	2	4	CC-5 Object Oriented Programming	2124UISOP	60-40 100	2
	Fundamentals of Computers and Electronics Practical	2114UISCE P	50	2		Object Oriented Programming Practical	2124UISOP P	50	2
5	CC-3 Operating Systems	2115UISOS	60-40 100	2	5	CC-6 Database Management Systems - I	2125UISDB	60-40 100	2
	Operating Systems Practical	2115UISOS P	50	2		Database Management Systems – I Practical	2125UISDB P	50	2
	<i>Discipline Specific Compulsory Course (DSC)</i>					<i>Discipline Specific Compulsory Course (DSC)</i>			
6	DSC-2 Discrete Mathematics-I	2116UISDM	60-40 100	3	6	DSC-2 Discrete Mathematics - II	2126UISDM	60-40 100	3
	Total			22		Total			22

***Syllabus of Courses of
Bachelor of Science Information Technology Programme
at Semester I
(Implemented during Academic Year 2022-2023)***

1. COMMUNICATION SKILLS

(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Seven Cs of Effective Communication and Understanding Communication	9
2	Emotional Intelligence, Etiquette and Mannerism, Writing Business Messages and Documents	9
3	Academic Skills	9
4	Leadership and Team Building, Decision Making and Negotiation	9
5	Business ethics, Stress and Time Management	9
	Total	45

Objectives:

By the end of the course, learners will be able to:

1. Develop effective listening skills in learner so as to enable them to comprehend instructions and become a critical listener
2. Develop effective oral skills so as to enable learner to speak confidently interpersonally as well as in large groups
3. Develop effective writing skills so as to enable learner to write in clear, concise, persuasive and audience centred manner
4. Demonstrate effective use of communication technology

Course Outcome:

After completing this course, learners will be able to:

CO1: Understand the concept, channels, objectives, methods and modes of communication. (Understand)

CO2: Differentiate obstacles to communication in the business world. (Evaluate)

CO3: Sharpen the business correspondence, language and writing skills of the learner. (Remember)

CO4: Effectively use communication technology. (Apply)

CO5: Demonstrate effective presentation, visual communication and impress stage.(Analyse)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	The Seven Cs of Effective Communication: Completeness, Conciseness, Consideration, Concreteness, Clarity, Courtesy, Correctness Understanding Communication: Nature and Scope of Communication, Methods of communication, Cross-cultural communication, Technology-enabled Business Communication	9
2	Emotional Intelligence: Meaning and definition, Need for emotional intelligence, Intelligence Quotient versus Emotional Intelligence Quotient, Components of Emotional Intelligence, Competencies of Emotional Intelligence, and Skills to develop Emotional Intelligence. Etiquette and Mannerism: Introduction, Professional Etiquette, Technology Etiquette. Writing Business Messages and Documents: Business Correspondence: Letter of inquiry, letter of order, letter of complaints, sales letter, business reports, resume writing	9
3	Resume writing: Introduction, Resume, Curriculum Vitae, Job Application or Cover Letter Professional Presentation: Planning a Presentation, Preparing the Presentation, Delivering the Presentation Job Interviews: Types of job Interviews, Preparatory Steps for Job Interviews, Interview Skill Tips, FAQ During Interviews Group Discussion: Difference between Group Discussion, Panel Discussion and Debate, Importance of Group Discussions, Traits, Types of Group Discussions, Individual Traits	9
4	Leadership and Team Building: Leader and Leadership, Leadership Traits, Culture and Leadership, Leadership Styles and Trends, Team Building, Types of Teams, Decision Making and Negotiation: Introduction to Decision Making, Steps for Decision Making, Decision Making Techniques, Negotiation Fundamentals, Negotiation Styles, Major Negotiation Concepts	9
5	Business ethics: Importance of business ethics, personal integrity at work place, computer ethics, corporate social responsibility Stress and Time Management: Stress, Sources of Stress, Ways to Cope with Stress, time management, prioritizing and procrastination	9

Reference Books

1. Meenakshi Raman and Prakash Singh, Business Communication, Oxford University Press, 2nd Ed.
2. Aruna Koneru, Professional Communication, Tata McGraw Hill
3. M. S. Rao, Strategies for Improving Your Business Communication, Shroff Publishers and Distributors
 - i. Soft Skills: an Integrated Approach to Maximise Personality, Gajendra S. Chauhan, Sangeeta Sharma, Wiley India

2. DISCRETE MATHEMATICS I

(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Set Theory and Logic of Compound Statements	9
2	Relations and Functions	9
3	Sequences and Mathematical Induction	9
4	Recurrence Relations	9
5	Elementary Number Theory	9
	Total	45

Objectives:

By the end of the course learner will be able to:

1. Construct a truth table and test the validity of statements.
2. Determine the domain and range of a discrete or non-discrete function, graph functions, identify one-to-one functions, perform the composition of functions, find and/or graph the inverse of a function, and apply the properties of functions to application problems.
3. List the terms in a sequence, write a sequence in closed form, compute the sum of a finite sequence, compute the product of a finite sequence, and express sequences in terms of recursive or non-recursive forms.
4. Use elementary number theory including the divisibility properties of numbers to determine prime numbers and composites, the greatest common divisor, and the least common multiple; perform modulo arithmetic and computer arithmetic.
5. Recall sequences and mathematical induction.

Course Outcome:

After completing this course learner will be able to:

CO1: Remember theory of discrete objects, starting with relations and partially ordered sets. (Remember)

CO2: Understand recurrence relations, generating function and their applications. (Understand)

CO3: Apply well-ordering principle for integers and check correctness of algorithm. (Apply)

CO4: Recall types of functions and find their applications. (Analyze)

CO5: Locate maximum and minimum elements for Lattices. (Evaluate)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>Set Theory: Definitions and the Element Method of Proof, Properties of Sets, Disproof's, Algebraic Proofs, Boolean Algebras, Russell's Paradox and the Halting Problem.</p> <p>Logic of Compound Statements: Logical Form and Logical Equivalence, Conditional Statements, Valid and Invalid Arguments, Conditional Statements, CONVERSE, CONTRAPOSITIVE, AND INVERSE, Truth Tables of Compound Propositions.</p>	9
2	<p>Relations: Relations on Sets, Reflexivity, Symmetry, and Transitivity, Equivalence Relations, Partial Order Relations, Linear Ordering Hasse Diagrams, Maximum and Minimum elements, Lattices</p> <p>Functions: Definition of function. Domain, co domain and the range of a function. Direct and inverse images. Injective, surjective and bijective functions. Composite and inverse functions.</p>	9
3	<p>Sequences and Mathematical Induction: Sequences, Mathematical Induction, Strong Mathematical Induction and the Well-Ordering Principle for the Integers, Correctness of algorithms, defining sequences recursively</p>	9
4	<p>Recurrence Relations: Definition of recurrence relations, Formulating recurrence relations, solving recurrence relations- Back tracking method, Solving linear homogeneous recurrence relations with constant coefficients of degree two when characteristic equation has distinct roots and only one root, Applications- Formulate and solve recurrence relation for Fibonacci numbers, Tower of Hanoi</p>	9
5	<p>Elementary Number Theory: Introduction to Direct proofs, Rational Numbers, Divisibility, Quotient – Remainder theorem, Indirect Argument, Contradiction and Contraposition, Two Classical Theorems.</p>	9

Reference Books

1. Discrete Mathematics with Applications, Sussana S. Epp, Cengage Learning, 4th Edition, 2010.
2. Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz, Tata McGraw Hill, 2007.
3. Discrete Mathematics and its Applications, Kenneth H. Rosen, Tata McGraw Hill, 2015.
4. Discrete Mathematical Structures, 6th Ed., Kolmann R. C. Busby, S. Ross, PHI, 2009.
5. Elements of Discrete Mathematics, 4th Ed., C. L. Liu, D. P. Mohapatra, Tata McGraw Hill, 2012.

3. INTRODUCTION TO PROGRAMMING

(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Strategies for problem-solving	6
2	General problem-solving techniques and Algorithm complexity analysis	6
3	Pseudo Codes and Python	6
4	Pseudo Codes and Python (Conditional statements and Loops)	6
5	Searching and Sorting, Python, Project	6
	TOTAL	30

Course Objectives:

By the end of the course learner will be able to:

1. To enhance the logical thinking
2. To develop problem solving skills
3. To introduce the basic programming concepts
4. write programs in Python and Scratch

Course Outcome:

After successful completion of this course, learners will be able to:

CO1: Demonstrate the need of problem solving skills and demonstrate the solution to the standard problems (understand)

CO2: Analyse whether the given strategy is suitable for a given problem (evaluate)

CO3: Explain the basic programming structures in Python (understand)

CO4: Compare and suggest the suitable statements in Python for a given problem (analyze and apply)

CO5: Create animations in Scratch for a selected problem. (Create)

CO6: Write and demonstrate the working of basic programmes in Python (Apply)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>Strategies for problem-solving: Classic Puzzles: How to cross the river with fox, goose and corn, The sliding eight, sliding five, completing a Sudoku square, Quarrasi lock.</p> <p>Pseudo code, Algorithm and flow-chart creation for basic problems.</p>	6
2	<p>General problem solving techniques: Always have a plan, restate the problem, divide the problem, Start with What You Know, Reduce the problem, Look for analogies, experiment, Don't get frustrated Output method, Tracking down logical errors, Output patterns: Half of a square, count down by counting up, sideways triangle.</p> <p>Algorithm complexity analysis: Time and space complexity, asymptotic notations.</p>	6
3	<p>Pseudo Codes: convert character digits to integers, checksum validation, identification of positive or negative numbers, encode/decode a message, find mean/median/mode, tower of Hanoi.</p> <p>Python: Variables, Strings, Numeric Types, Typecasting, Python operators, Function: introduction, function definition, parameters, function call, recursions.</p>	6
4	<p>Pseudo Codes: finding the highest revenue customer, the iterative sum of list elements, Translator program, Hangman game, scientific calculator.</p> <p>Python: import statement, Branching (if, if-else, if-elif-else, switch-case structure), Looping (while, for, break and continue statement)</p>	6
5	<p>Searching and Sorting: Searching-Linear Search, Binary Search, Sorting- Bubble, Selection and Insertion Sort, Working with Sorted Lists- Maintaining Sorted Lists Exception handling: What is an exception, various keywords to handle exceptions such as try, catch, except, else, finally, raise.</p> <p>Python: List, slicing, Tuples, Dictionaries, Nested Elements, store, copy, search, append, sort operations.</p> <p>Project: Semester end project.</p>	6

Reference Books

1. Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014
2. Michael Dawson, Python Programming for the Absolute Beginner, Paperback, Second Edition, Published November 8th, 2005 by Course Technology PTR
3. James Payne, Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010

Practical:

1. Write a Scratch program for (any one):
 - a. How to cross the river with fox, goose, and corn
 - b. The sliding eight
 - c. The sliding five
2. Perform following
 - a. Python and Jupyter lab setup.
 - b. Write a Python program for printing the patterns.
3. Write a Python program to check:
 - a. Whether the given number is odd or even
 - b. Whether the given year is a leap year
4. Write a Python program to convert:
 - a. Character digit to an integer.
 - b. A decimal number to binary or hexadecimal.
5. Write a Python program to check:
 - a. Whether the given string is a palindrome or not.
 - b. Whether the given number is a prime number or not.
6. Write a Python program to find:
 - a. The nth Fibonacci number.
 - b. Factorial of a given number.
7. Write a Python program to convert read a line of text and count
 - a. The number of letters
 - b. Number of words
8. Write a Python program to read a list of values and determines the quartiles.
9. Write a Python function to calculate space and time complexity.
10. Write Python functions to encode and decode a message.
11. Write a python function to find the sum of positive integers in a list
 - a. Iteratively
 - b. recursively
12. Write a function to implement
 - a. Sorting with Exception handling.
 - b. Searching with Exception handling.

4. FUNDAMENTALS OF COMPUTERS AND ELECTRONICS

(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Computer Abstraction and Technology	6
2	Alphanumeric Codes and Binary Arithmetic	6
3	Boolean Algebra and Minimization	6
4	Combinational and Sequential Circuits	6
5	8085 Instruction Set Architecture	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Explain the concept of computer systems and get acquainted with number systems.
2. Understand Boolean Algebra and Minimization concepts.
3. Understand different types of logic gates.
4. Explain different types of digital circuits.
5. Code in 8085 Assembly Language.

Course Outcome:

After completing this course learner will be able to:

CO1: Understand and perform conversion between different number systems.(Apply)

CO2: Understand and analyse different Boolean theorems and laws and implement it in reduction of logic expression.(Apply)

CO3: Analyse different logic gates, minimize the given logical expression and create circuits from it.(Analyse)

CO4: Understand the Combinational and Sequential circuits and its application in designing circuits.(Evaluate)

CO5: Learners will also be able to create code using 8085 Assembly language. (Create)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>Computer Abstraction and Technology:</p> <p>Basic Structure of a Computer: Computer Types, Functional Units, Basic Operational Concepts, Performance, And Historical Perspective.</p> <p>Number System: Bits, bytes, analog system, digital system, binary number system, octal number system, hexadecimal number system. Number System Conversion: Conversion from one number system to another, floating point numbers, weighted codes, binary coded decimal, non-weighted codes, excess – 3 code, gray code</p>	6
2	<p>Alphanumeric Codes and Binary Arithmetic:</p> <p>Alphanumeric codes: ASCII Code, EBCDIC, ISCII Code, Hollerith Code, Morse Code, Teletypewriter (TTY), Error detection, and correction, Universal Product Code.</p> <p>Binary Arithmetic: Binary addition, Binary subtraction, Negative number representation, Subtraction using 1's complement and 2's complement, Binary multiplication and division, Arithmetic in octal number system, Arithmetic in hexadecimal number system, BCD and Excess – 3 arithmetic.</p>	6
3	<p>Boolean Algebra and Minimization:</p> <p>Boolean Algebra and Logic Gates: Introduction, Logic (AND OR NOT), Boolean theorems, Boolean Laws, De Morgan's Theorem, Perfect Induction, Reduction of Logic expression using Boolean Algebra, Deriving Boolean expression from given circuit, exclusive OR and Exclusive NOR gates, Universal Logic gates, Implementation of other gates using universal gates, Input bubbled logic, Assertion level. Min-term, Max-term and K-Maps: Introduction, min-terms and sum of min-term form, max-term and Product of max-term form, Reduction technique using k-maps – 2/3/4/5/6 variable K-maps, Grouping of variables in K-maps, K-maps for product of sum form, minimize Boolean expression using K-map and obtain K-map from Boolean expression.</p>	6
4	<p>Combinational and Sequential Circuits:</p> <p>Combinational circuit: Introduction, Multi-input and multi-output Combinational circuits, Introduction, Adder, BCD Adder, Excess – 3 Adder, Binary subtractor, BCD Subtractor, Multiplier, Comparator, Multiplexer, Demultiplexer, Decoder, Encoders. Sequential circuits: Flip- Flop(SR, JK), Shift Registers(serial– in serial–out, serial–in parallel–out , parallel–in parallel–out). Counters: Synchronous and Asynchronous</p>	6
5	<p>Instruction Set Architecture: Introduction: Microprocessor, Microprocessor Instruction Set and Computer Languages, From Large Computers to Single-Chip Microcontrollers, Applications</p> <p>Introduction to 8085 Assembly Language Programming: 8085 Programming Model, Instruction Classification, Data and Storage, Writing, assembling and Execution of a simple program, Writing and Assembling Program.</p>	6

Reference Books

1. Carl Hamacher et al., Computer Organization and Embedded Systems, 6 ed., McGraw-Hill 2012.
2. Patterson and Hennessy, Computer Organization and Design, Morgan Kaufmann, ARM Edition, 2011.
3. R P Jain, Modern Digital Electronics, Tata McGraw Hill Education Pvt. Ltd. , 4th Edition, 2010.
4. Ramesh Gaonkar, Microprocessor Architecture, programming and Applications with the 8085, PENRAM, 5th Ed., 2012.

Practical:

1. Study and verify the truth table of various logic gates.
2. Verify De-Morgan's Law
3. Simplify given Boolean expression and realize it.
4. Design and verify a half/full adder
5. Design and verify half/full subtractor
6. Design a 2 bit comparator using combinational circuits.
7. Perform the following Operations related to memory locations:
 - a. Store the data byte 32H into memory location 4000H.
 - b. Exchange the contents of memory locations 2000H and 4000H
8. Arithmetic operations:
 - a. Subtract the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.
 - b. Add the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.
 - c. Multiply the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.
9. Complement operations:
 - a. Find the 1's complement of the number stored at memory location 4400H and store the complemented number at memory location 4300H.
 - b. Find the 2's complement of the number stored at memory location 4200H and store the complemented number at memory location 4300H.
10. Logical operations:
 - a. AND the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.
 - b. OR the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H
 - c. X-OR the contents of memory location 4001H from the memory location 2000H and place the result in memory location 4002H.

5. OPERATING SYSTEMS

(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction and Overview of Operating System	6
2	Process Management-I	6
3	Process Management-II	6
4	Memory Management	6
5	Storage Management	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the services provided by and the design of an operating system.
2. Recognize what a process is and how processes are synchronized and scheduled.
3. Differentiate between different approaches to memory management.
4. Learn virtual memory and secondary memory management.
5. Learn different process scheduling algorithms and synchronization techniques to achieve better performance of a computer system

Course Outcome:

After completing this course, learners will be able to:

CO1: Understand the structure of OS and basic architectural components involved in OS design.

(Understand)

CO2: Analyze and design the applications to run in parallel either using process or thread models of different OS (Apply)

CO3: Differentiate various device and resource management techniques for time sharing and distributed systems. (Evaluate)

CO4: Understand the Mutual exclusion, Deadlock detection and agreement protocols of Distributed operating system (Understand)

CO5: Conceptualize the components involved in designing a contemporary OS (Create)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p><u>OverView</u> Introduction: Definition of Operating system, Operating System's role, Operating-System Operations, Functions of Operating System, Computing Environments Operating-System Structures: Operating-System Services, User and Operating-System Interface, System Calls, Types of System Calls, Operating-System Structure</p>	6
2	<p><u>Process Management-I</u> Processes: Process Concept, Process Scheduling, Operations on Processes, Interprocess Communication Threads: Overview, Multicore Programming, Multithreading Models Process Synchronization: General structure of a typical process, race condition, The Critical-Section Problem, Peterson's Solution, Synchronization Hardware, Mutex Locks, Semaphores, Classic Problems of Synchronization, Monitors</p>	6
3	<p><u>Process Management-II</u> CPU Scheduling: Basic Concepts, Scheduling Criteria, Scheduling Algorithms (FCFS, SJF, SRTF, Priority, RR, Multilevel Queue Scheduling, Multilevel Feedback Queue Scheduling), Thread Scheduling Deadlocks: System Model, Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Deadlock Avoidance, Deadlock Detection, Recovery from Deadlock</p>	6
4	<p><u>Memory Management</u> Main Memory: Background, Logical address space, Physical address space, MMU, Swapping, Contiguous Memory Allocation, Segmentation, Paging, Structure of the Page Table Virtual Memory: Background, Demand Paging, Copy-on-Write, Page Replacement, Allocation of Frames, Thrashing</p>	6
5	<p><u>Storage Management</u> Mass-Storage Structure: Overview, Disk Structure, Disk Scheduling, Disk Management File-System Interface: File Concept, Access Methods, Directory and Disk Structure, File-System Mounting, File Sharing</p>	6

Reference Books

1. Abraham Silberschatz, Peter Galvin, Greg Gagne, Operating System Concepts, Wiley, 9th Edition, 2012
2. Achyut S. Godbole, Atul Kahate, Operating Systems, 2nd Ed., Tata McGraw Hill, 2009
3. Andrew S Tanenbaum, Herbert Bos, Modern Operating Systems, 4e Fourth Edition, Pearson Education, 2016

4. Mastering Cloud Computing, Rajkumar Buyya, Christian Vecchiola, S Thamarai Selvi, Tata McGraw Hill Education Private Limited, 2013

Practical:

1. Installation of **Linux operating system (Red-Hat / Ubuntu) on virtual machine:** Configuring Linux system – creating user accounts – configuring networking.
2. Installation of **Windows operating system on virtual machine:** Configuring Windows - Service pack installation - OS updation - software installation – network configuration.
3. Linux commands: Linux commands: Working with Directories:
 - a) pwd, cd, absolute and relative paths, ls, mkdir, rmdir
 - b) file, touch, rm, cp, mv, rename, head, tail, cat, tac, more, less, strings, chmod Linux commands: Working with files:
 - a) ps, top, kill, pkill, bg, fg
 - b) grep, locate, find, locate
 - c) date, cal, uptime, w, whoami, finger, uname, man, df, du, free, whereis, which
 - d) Compression: tar, gzip
4. Working with Linux Desktop and utilities
 - a) The vi editor.
 - b) Graphics
 - c) Terminal
 - d) adjusting display resolution
 - e) Using the browsers
 - f) Configuring simple networking
 - g) Creating users and shares
5. Windows (DOS) Command-s
 - a) Date, time, prompt, md, cd, rd, path, color
 - b) Chkdsk, copy, xcopy, format, cls, defrag, del, move
 - c) Diskcomp, diskcopy, diskpart, doskey, echo
 - d) Edit, fc, find, rename, set, type, ver, attrib, deltree, tree
 - e) ipconfig, ping
6. Working with Windows Desktop and utilities
 - a) Notepad
 - b) Wordpad
 - c) Paint
 - d) Taskbar
 - e) adjusting display resolution
 - f) Using the browsers
 - g) Configuring simple networking
 - h) Creating users and shares
7. **Identification of Hardware components** - motherboard, processor, memory (DDR3,DDR4), HDD, DVD writer, SMPS - NIC– UPS – online & offline.
8. **Identification of connectors and slots in motherboard.** Ports - serial, parallel, USB, PS2, audio ports.
9. **Installing and connecting various Devices** - Printers, scanners, Ethernet, Blue tooth, wireless, mobile, modem, projector
10. Installation of ownCloud client and connecting with ownCloud server using demo.owncloud.org and Study of Google Drive

Self-Assessment Exercise

Exercise1

1. Use MS-DOS to create the above directory structure.
2. Create 3 files containing a list of songs for three of the artists. Save the files using no more than 8 letters for the filename.
3. Copy the files into the appropriate directory.
4. Ensure that you can navigate from the root to a given sub-directory and that you can copy a file to a given directory.
5. Remove the directory named Country.

Exercise2

1. Copy FILE1.TXT and make a file2.txt, file3.dat, file4.xyz, file5.txt. Pay attention to the names and extensions of the files.
2. List out the directory and see ALL the newly created files.
3. Now you just want to see a list of the files that have TXT as their extension.
4. Make a copy of file4.xyz and call it first.dat
5. Create a subdirectory under the directory you're currently in. Call this new directory TESTDIR
6. Copy all the files with an extension of DAT to the new subdirectory.
7. Change directories to the newly created directory and list all the files in there.
8. Delete file3.dat.
9. Go back up to the parent directory of the current directory you are in.
10. List all the file with an extension of DAT in the current directory and the one you just created. Use only one command to do so.
11. Change the name of file1.txt to file6.txt.
12. Delete the directory you created (TESTDIR). Are you able to do this ? Why or Why not ?
13. Change directories to the TESTDIR directory. Delete the remaining file. Change directories up to the parent directory (up one level) and now delete the directory.
14. List all the files that start with FI and have an extension of TXT.
15. List all the files that start with the word FILE, then a single digit an extension of TXT.

Exercise3

1. Create directory with your name.
2. Create two new subdirectories labelled: DIR1 and DIR2 in the YOUR directory. Create two subdirectories labelled dir11 and dir12 in the DIR1 directory. Create a subdirectory labeled dir21 in the DIR2 directory.
In the DIR1 directory, create a text file named myfile.txt, and write your firstname, lastname in this file.
3. Copy the file myfile.txt to the DIR2 directory.
4. Create a file myfile2.txt using notepad from MSDOS and mention today's date and time in the file.
5. Display the content of the myfile2.txt.
6. Copy the content of myfile2.txt into FILE.txt.
7. Move the file FILE.txt to dir21.
8. Change the prompt with \$.
9. Display the current path of the directory.
10. Display all the directories with their files.

Exercise 4

1. Create a directory with your name and rollno.
2. Change the current path to the created directory.
3. Create a file with 10 names in the directory.
4. Display the content of the file.
5. Display the content of the file in sorted order.
6. Open the file using vi editor and add more 5 names in the file.
7. Create 1 more directory and copy the above created file in the created directory.
8. Print the content of the file in reverse order.
9. Print the total words from a file.
10. Search the content with 'a' in file

6. WEB PROGRAMMING I

(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Internet and world wide web, HTML5	6
2	HTML5 Components, Style sheets	6
3	JavaScript	6
4	Document and its associated objects	6
5	JQuery and Bootstrap	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. Identify and learn the Internet World with working of a website using HTML.
2. Identify the creation of dynamic websites using different components of HTML.
3. Define and describe the javascript usage.
4. State and Explain the different document object models.
5. Explain jQuery and bootstrap components.

Course Outcome:

After completing this course learners will be able to:

CO1: Apply a structured approach to identifying needs, interests, and functionality of a website. (Apply)

CO2: Design dynamic websites that meet specified needs and interests.(Create)

CO3: Design appropriate HTML, CSS, and JavaScript code from public repositories of open-source and free scripts that enhances the experience of site visitors.(Create)

CO4: Analyze the existing HTML, CSS, and JavaScript code to extend and alter its functionality, and to correct errors and cases of poor practice. (Analyse)

CO5: Create a website which is functional with all the basics and advanced HTML,CSS, Javascript along with jQuery and Bootstrap.(Apply)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>Internet and world wide web: What is Internet? Introduction to internet and its applications, E-mail, telnet, FTP, e-commerce, video conferencing, e-business. Internet service providers, domain name server, internet address,</p> <p>World Wide Web (WWW): World Wide Web and its evolution, uniform resource locator (URL),</p> <p>Browsers – internet explorer, Netscape navigator, opera, Firefox, chrome, Mozilla. Search engine, HTTP protocol</p> <p>HTML5: Introduction, Why HTML5? Formatting text by using tags, using lists and backgrounds, Creating hyperlinks and anchors. Style sheets, CSS formatting text using style sheets, formatting paragraphs using style sheets</p>	6
2	<p>HTML5 Page layout and navigation: Creating navigational aids: planning site organization, creating text based navigation bar, creating graphics based navigation bar, creating graphical navigation bar, creating image map, redirecting to another URL, creating division based layouts: HTML5 semantic tags, creating divisions, creating HTML5 semantic layout, positioning and formatting divisions.</p> <p>HTML5 Tables, Forms and Media: Creating tables: creating simple table, specifying the size of the table, specifying the width of the column, merging table cells, using tables for page layout, formatting tables: applying table borders, applying background and foreground fills, changing cell padding, spacing and alignment, creating user forms: creating basic form, using check boxes and option buttons, creating lists, additional input types in HTML5, Incorporating sound and video: audio and video in HTML5, HTML multimedia basics, embedding video clips, incorporating audio on web page. HTML web storage.</p> <p>Style Sheets: What are style sheets?, Why are style sheets valuable?, Different approaches to style sheets, Using Multiple approaches, Linking to style information in separate file, ,Setting up style information, Using the tag, Embedded style information.</p>	6
3	<p>Java Script: Introduction, Client-Side JavaScript, Server-Side JavaScript, JavaScript Objects, JavaScript Security, Operators: Assignment Operators, Comparison Operators, Arithmetic Operators, % (Modulus), ++(Increment), --(Decrement), -(Unary Negation), Logical Operators, Short-Circuit Evaluation, String Operators, Special Operators, ?: (Conditional operator), , (Comma operator), delete, new, this, void Statements: Break, comment, continue, delete, do...while, export, for, for...in, function, if...else, import, labelled, return, switch, var, while, with. Core JavaScript (Properties and Methods of Each) : Array, Boolean, Date, Function, Math, Number, Object, String, regExp</p>	6

4	Document and its associated objects: document, Link, Area, Anchor, Image, Applet, Layer Events and Event Handlers : General Information about Events, Defining Event Handlers, event, onAbort, onBlur, onChange, onClick, onDbClick, onDragDrop, onError, onFocus, onKeyDown, onKeyPress, onKeyUp, onLoad, onMouseDown, onMouseMove, onMouseOut, onMouseOver, onMouseUp, onMove, onReset, onResize, onSelect, onSubmit, onUnload	6
5	JQUERY: Introduction of jquery, syntax, selectors, events, effects, jquery html and css methods. Bootstrap: Introduction of basic bootstrap, installation, using bootstrap grid, using base css	6

Reference Books

1. HTML5 Black Book: Covers CSS3, JAVASCRIPT, XML,XHTML, AJAX, PHP and JQUERY DreamTech Press.
2. Learning bootstrap : Aravind Shenoy,Ulrich Sossou, Packt publishing
3. Learning Jquery: Jonathan Chaffer, Karl Swedberg, Packt publishing
4. JavaScript 2.0: The Complete Reference, Thomas Powell and Fritz Schneider, Tata Mcgraw Hill
5. HTML5 Step by Step, Faithe Wempen, Microsoft Press

Practical:

1. Use of Basic Tag
 - a. Design a webpage using different text formatting tags.
 - b. Design a webpage using hyperlinks to different pages and allow navigation between webpages (atleast 3 web pages)
 - c. Design a webpage demonstrating all Style sheet type
2. Imagemaps, Tables, Forms and Media
 - a. Design a webpage with Imagemaps.
 - b. Design a webpage demonstrating different semantics
 - c. Design a webpage with different tables. Design a webpages using table so that the content appears well placed.
 - d. Design a webpage with a Registration / Feedback form that uses all types of controls.
 - e. Design a webpage embedding with multimedia features.
3. JavaScript
 - a. Using JavaScript design, a webpage that prints factorial / Fibonacci series / any given series.
 - b. Design a form and validate all the controls placed on the form using Java Script.
 - c. Write a JavaScript program to display all the prime numbers between 1 and 100.

- d. Write a JavaScript program to accept a number from the user and display the sum of its digits.
- e. Write a program in JavaScript to accept a sentence from the user and display the number of words in it. (Do not use split () function).
- f. Write a java script program to design simple calculator.
- g. Write a java script program to validate the form.
- 4. Control and looping statements and Java Script references
 - a. Design a web page demonstrating different conditional statements
 - b. Design a web page demonstrating different looping statements.
- 5. Design a web page demonstrating different Core JavaScript references (Array, Boolean, Date, Function, Math, Number, Object, String, regExp).
- 6. Design a web page demonstrating key Events and mouse events
- 7. Design a web page demonstrating jquery events and effects.
- 8. Design a web page demonstrating jquery html and css methods
- 9. Design a web page demonstrating bootstrap
- 10. Demonstrate program on HTML web storage.

Evaluation Scheme

Test– 20 Marks

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform or a written test conducted in the classroom.

Assignments/Presentation: 15 marks

5 Marks - Active participation in routine class instructional deliveries:

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

Semester End Examination- 60 Marks

Duration - 2 Hours.

Theory question paper pattern:-

All questions are compulsory.		
Question	Based on	Marks
Q1	Unit 1, 2, 3, 4, 5	4 out of 5 questions (05 marks each)
Q2	Unit 1, 2, 3, 4, 5	2 out of 3 questions (07 marks each)
Q3	Unit 1, 2, 3, 4, 5	2 out of 3 questions (08 marks each)
Q4	Based on multiple Units	1 out of 2 questions (10 marks)

Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Examination)

***Syllabus of Courses of
Bachelor of Science Information Technology Programme
at Semester II
(Implemented during Academic Year 2022-23)***

**1. PROGRAMMING AND APPLICATION DEVELOPMENT IN
PYTHON**
(w.e.f. 20120-21)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1.	GUI Programming in Python (using Tkinter/wxPython/Qt)	6
2.	Database connectivity in Python	6
3.	Python File Input-Output	6
4.	Regular Expressions, Python and the Web	6
5	Network connectivity, Project	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Design UI and program python UI applications.
2. Connect database in a python program.
3. Read and write files and file operations.
4. Write a program on regular expressions.
5. Program web applications and implement web scraping in python.
6. Learn network connectivity.

Course Outcome:

After completing this course, learner will be able to:

CO1: Implement UI Applications using Python Tkinter.(Apply)

CO2: Apply the Knowledge of Database Connection in Python Application.(Apply)

CO3: Understand the working of different File Operations.(Understand)

CO4: Analyse the data obtained using Web Scraping and Develop Network Connectivity Applications.(Analyse)

CO5: Create a small application showing the implementation of topics learned.(Create)

Detailed Syllabus:

Module	Topics	No of Lectures
1	GUI Programming in Python (using Tkinter/wxPython/Qt): What is GUI, Advantages of GUI, Introduction to GUI library, Layout management, events, and bindings, fonts, colors, drawing on canvas (line, oval, rectangle, etc.). Widgets such as: frame, label, button, checkbutton, entry, listbox, message, radiobutton, text, spinbox etc.	6
2	Database connectivity in Python: Installing mysql connector, accessing connector module using connect, cursor, execute & close functions, reading single & multiple results of query execution, executing different types of statements, executing transactions, understanding exceptions in database connectivity.	6
3	Python File Input-Output: Opening and closing files, various types of file modes, reading and writing to files, manipulating directories. Iterables, iterators and their Problem solving applications. Python Modules and Packages, Lambda function.	6
4	Regular Expressions: Concept of regular expression, various types of regular expressions, using match function. Python and the Web: Screen scraping, Web Scraping (Using Scrapy/Selenium/BeautifulSoup etc.	6
5	Network connectivity: Socket module, creating server-client programs, sending Email, reading from URL Project: Semester end project.	6

Reference Books

1. Paul Gries, Jennifer Campbell, Jason Montojo, Practical Programming: An Introduction to Computer Science Using Python 3, Pragmatic Bookshelf, 2/E 2014
2. Python Programming for the Absolute Beginner by Michael Dawson Paperback, Second Edition, 472 pages Published November 8th, 2005 by Course Technology PTR
3. James Payne, Beginning Python: Using Python 2.6 and Python 3, Wiley India, 2010

Practical:

1. Programs to read and write files.
2. Programs with iterables and iterators.
3. Program to connect to a DB and execute various SQL queries.
4. Program to demonstrate the use of regular expressions.
5. Program to show draw shapes & GUI controls. (Mini project including database connectivity)
6. Program to create server-client and exchange basic information.
7. Use Scrapy/Selenium/Beautiful Soup for web mining.
8. Program to send email & read contents of URL.
9. Create a registration and login application using Python Tkinter. Registered data should be stored in the database and login data should be compared with the registered data to check if the user is registered or not.

2. OBJECT ORIENTED PROGRAMMING

at Semester II
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Object oriented paradigm	6
2	Creating class diagrams and Generate Blueprints using Classes	6
3	Encapsulation of Data	6
4	Inheritance and Specialization	6
5	Interfaces, Multiple Inheritance, and Composition, Visualization	6
	TOTAL	30

Course Objectives :

By the end of the course learner will be able to:

1. Study the principles of object-oriented paradigms.
2. Understand how real-world objects can become part of fundamental elements in the code.
3. Understand the difference between classes, prototypes, and instances.
4. Learn to organize data in the blueprints and create a hierarchy of blueprints that generate objects.
5. Develop basic object-oriented code using object-oriented languages.
6. Implement all concepts of OOP in Program development.

Course Outcome:

After completing this course learner will be able to:

CO1: Define various concepts of Object Oriented Programming. (Remember)

CO2: Identify real-world objects and design Class diagram to organize data.(Understand)

CO3: Generate blueprints to create objects. (Create)

CO4: Apply standards and principles to write truly readable code. (Apply)

CO5: Develop and test basic programs. (Understand)

CO6: Demonstrate the concepts of object-oriented design, polymorphism, information hiding, and inheritance. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1.	<p>Introduction: A look at Procedure-Oriented Programming, OOP Paradigm, Basic concepts of OOP, Benefits of OOP, OOP Languages, Applications of OOP.</p> <p>Objects Everywhere: Recognizing objects from nouns, Generating blueprints for objects, Recognizing attributes/behaviour, Recognizing actions from verbs – methods, Organizing the blueprints – classes using UML diagrams.</p>	6
2.	<p>Classes and Objects: Understanding classes and objects, Understanding constructors and destructors, Creating classes, Customizing constructors, Customizing destructors, Creating objects of classes</p>	6
3.	<p>Encapsulation of Data: Understanding the different members of a class, Protecting and hiding data, Adding attributes to a class, Adding properties to a constructor function, Hiding data using prefixes, Using access modifiers, Using property getters and setters, Using methods to add behavior to classes.</p>	6
4.	<p>Inheritance and Specialization: Using classes to abstract behavior, Understanding inheritance, Polymorphism, Understanding method overloading and overriding, Understanding operator overloading, Taking advantage of polymorphism.</p>	6
5.	<p>Interfaces, Multiple Inheritance, and Composition: Understanding the requirement to work with multiple base classes, working with multiple inheritance, Declaring base classes for multiple inheritance, Declaring classes that override methods, Declaring a class with multiple base classes, Working with objects of classes that use multiple inheritance, Working with abstract base classes.</p> <p>Data Visualization: Introduction, History, Importance, Benefits, Data visualization in today's world, Data Visualization Techniques.</p>	6

Reference Books

1. Learning Object-Oriented Programming, Gaston C. Hillar, Packt, 1st Edition, 2015.
2. Python 3 Object-oriented Programming, Dusty Phillips, Packt, 2nd Edition, 2015.
3. The Object-Oriented Thought Process, Matt Weisfeld, 3rd Edition, 2009
4. https://www.sas.com/en_in/insights/big-data/data-visualization.html
5. <https://realpython.com/python3-object-oriented-programming/#how-to-define-a-class-in-python>

Practicals:

1. Creating Class diagrams with the abstract, subclasses, their attributes and methods.
2. Defining and using a class.
3. Defining methods with and without attributes in a class.
4. Creating and using constructor and Destructor.
5. Using property getters and setters.
6. Implementing various forms of Inheritance.
7. Implementing Polymorphism by Overloading Overriding methods.
8. Implementing the concept of Operator Overloading.
9. Implementing abstract classes and interfaces.
10. Implementing the concept of Composition.

3. DATABASE MANAGEMENT SYSTEMS I
at Semester II
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Introduction and Data Models	6
2	ER Diagram, Relational Database Design, Relational Algebra	6
3	Joining Tables, Sub queries, Views	6
4	Transaction and Concurrency Control, Crash Recovery	6
5	Introduction to SQL, View, Functions	6
	TOTAL	30

Course Objective:

By the end of the course, learners will be able to:

1. Understand the basic concepts and the applications of database systems.
2. Master the basics of SQL and construct queries using SQL.
3. Familiar with the basic issues of transaction processing and concurrency control.
4. Understand the concept of Normalization, Transaction and Concurrency Control.
5. Understand the concept of PL/SQL procedures and construct.

Course Outcome:

After completing this course, learners will be able to:

- CO1: Explain the basic elements of a relational database management system(Understand)
- CO2: Design entity relationship and convert entity relationship diagrams into RDBMS and formulate SQL queries on the respect data into RDBMS and formulate SQL queries on the data. (Analyze, Create)
- CO3: Apply various Normalization techniques (Apply)
- CO4: Apply advanced SQL features like views, indexes, synonyms, etc. for database management. (Apply)
- CO5: Understand the principles of Transaction Processing & Locking using the concept of Concurrency control. (Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1.	<p>Introduction to DBMS: Definition, Overview of DBMS, Advantages of DBMS, Purpose of Database Systems, View of Data, Database Languages, Levels of abstraction, Data independence, DBMS Architecture, Limitation of DBMS, Introduction of NoSQL, Comparison between DBMS and RDBMS.</p> <p>Data Models: The importance of data models, Basic building blocks, Business rules, Client/Server Architecture, Object Based Logical Model, Record Based Logical Model (relational, hierarchical, network), Degrees of data abstraction.</p>	6
2.	<p>ER-Diagram : Database design and ER Model: Overview, ER-Model, Constraints, ER Diagrams, ERD Issues, weak entity sets, Codd's rules, Relational Schemas</p> <p>Relational Database design: Features of good relational database design, atomic domain and Normalization (1NF, 2NF, 3NF, BCNF).</p> <p>Relational Algebra: Operations - selection, projection, Set operations-union, intersection, difference, cross product, Joins –conditional, equi join and natural joins, division operator</p>	6
3.	<p>Joining tables: Inner, Equi , Outer , Cross and Self join</p> <p>Sub queries: Sub queries with IN, EXISTS, correlated sub queries, queries with modified comparison operations, SELECT INTO operation, UNION operation. Sub queries in the HAVING clause</p> <p>Views: Meaning of view, Data independence provided by views, creating, altering dropping, renaming and manipulating views using SQL.</p>	6
4.	<p>Transaction Management and Concurrency Control: Concept of a transaction, ACID properties, Serial and serializable schedules, Conflict and View Serializability, Precedence graphs and test for conflict serializability.</p> <p>Enforcing serializability by locks: Concept of locks, the locking scheduler, Two phase Locking, upgrading and down grading locks, Concept of dead locks, Concurrency control by time stamps, The Thomas Write rule.</p> <p>Crash Recovery: ARIES algorithm, The log based recovery, recovery related structures like transaction and dirty page table, check points, recovery from a system crash.</p>	6
5.	<p>Introduction to SQL : SQL commands - Data Definition Language Commands, Data Manipulation Language Commands, The Data types a cell can hold; insertion of data into the tables; Viewing of data into the tables; Deletion operations; updating the contents of the table; modifying the structure of the table; renaming table; destroying tables; Data Constraints; Type of Data Constraint; Column Level Constraint; Table Level Constraint; Null value Concepts; The UNIQUE Constraint; The</p>	6

	<p>PRIMARY constraint; The FOREIGN key constraint; The CHECK Constraint; Viewing the User Constraints.</p> <p>Viewing The Data : Computations on Table Data; Arithmetic Operators; Logical Operators; Comparison Operators; Range Searching; Pattern Searching.</p> <p>Functions: Aggregate function, Date function, String functions.</p>	
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Reference Books

1. Ramakrishnam, Gehrke, "Database Management Systems", McGraw- Hill.
2. Ivan Bayross, "SQL,PL/SQL -The Programming language of Oracle", B.P.B. Publications
3. Elmasri and Navathe, "Fundamentals of Database Systems", Pearson Education.

Practical:

1. Draw ER diagram for the given scenario and convert it into table.
2. Study of Data Definition Language Statement
3. Study of Data Manipulation Language Statement
4. Study of various type of JOINS.
5. Study of subqueries with all its clauses.
6. Study of various types of SET OPERATORS.
7. Study of various types of views.
8. Study of different functions.
9. Study of Transaction (Commit/ Rollback), Locks
10. Implementing deadlocks.

Case Study1

Railway Reservation

Aim: The railway reservation system facilitates the passengers to enquire about the trains available on the basis of source and destination, booking and cancellation of tickets, enquire about the status of the booked ticket, etc.

The aim of case study is to design and develop a database maintaining the records of different trains, train status, and passengers. The record of a train includes its number, name, source, destination, and days on which it is available, whereas record of train status includes dates for which tickets can be booked, total number of seats available, and number of seats already booked. The database has been developed and tested on Oracle.

Description:

Passengers can book their tickets for the train in which seats are available. For this, passengers have to provide the desired train number and the date for which ticket is to be booked. Before booking a ticket for a passenger, the validity of train number and booking date is checked.

Once the train number and booking date are validated, it is checked whether the seat is available. If yes, the ticket is booked with confirmed status and corresponding ticket ID is generated which is stored along with other details of the passenger. After all the available tickets are booked, certain numbers of tickets are booked with waiting status. If the waiting lot is also finished, then tickets are not booked and a message of non-availability of seats is displayed.

The ticket once booked can be canceled at any time. For this, the passenger has to provide the ticket ID (the unique key). The ticket ID is searched and the corresponding record is deleted.

With this, the first ticket with waiting status also gets confirmed.

List of Assumption

Since the reservation system is very large in reality, it is not feasible to develop the case study to that extent and prepare documentation at that level. Therefore, a small sample case study has been created to demonstrate the working of the reservation system. To implement this sample case study, some assumptions have been made, which are as follows:

1. The number of trains has been restricted to 5.
2. The booking is open only for next seven days from the current date.
3. Only two categories of tickets can be booked, namely, *AC* and *General*.
4. The total number of tickets that can be booked in each category (*AC* and *General*) is 10.
5. The total number of tickets that can be given the status of waiting is 2.
6. The in-between stoppage stations and their bookings are not considered.

Description of Tables and Procedures

Tables and procedures that will be created are as follows:

1. **TrainList:** This table consists of details about all the available trains. The information stored in this table includes train number, train name, source, destination, fair for AC ticket, fair for general ticket, and weekdays on which train is available.

Constraint: The train number is unique.

2. **Train_Status:** This table consists of details about the dates on which tickets can be booked for a train and the status of the availability of tickets. The information stored in this table includes train number, train date, total number of AC seats, total number of general seats, number of AC seats booked, and number of general seats booked.

Constraint: Train number should exist in TrainList table.

3. **Passenger:** This table consists of details about the booked tickets. The information stored in this table includes ticket ID, train number, date for which ticket is booked, name, age, sex and address of the passenger, status of reservation (either confirmed or waiting), and category for which ticket is booked.

Constraint: Ticket ID is unique and the train number should exist in the TrainList table.

4. **Booking:** In this procedure, the train number, train date, and category is read from the passenger. On the basis of the values provided by the passenger, the corresponding record is retrieved from the Train_Status table. If the desired category is AC, then the total number of AC seats and number of booked AC seats are compared in order to find whether a ticket can be booked or not. Similarly, it can be checked for the general category. If a ticket can be booked, then passenger details are read and stored in the Passenger table.

5. **Cancel:** In this procedure, ticket ID is read from the passenger and corresponding record is searched in the Passenger table. If the record exists, it is deleted from the table. After deleting the record (if it is confirmed), the first record with waiting status for the same train and the same category are searched from the Passenger table and its status is changed to confirm.

4. WEB PROGRAMMING II
at Semester II
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	XML	6
2	PHP Basics	6
3	PHP- Working with Files	6
4	Advanced PHP and MySQL	6
5	Networking and XML Parsing	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Analyze and evaluate the working of XML.
2. Apply how server-side programming works on the web.
3. Understand the working of web application with php as a server side scripting language.
4. Develop web applications using MySQL database
5. Apply the maintenance of MySQL database.

Course Outcome:

After completing this course learners will be able to:

- CO1: Design a structured approach to identify needs, interests, and functionality of a website. (Apply)
- CO2: Describe POST and GET in form submission using PHP(Understand)
- CO3: Design website with php sessions and cookies. (Create)
- CO4: Design and develop a full-fledged website using php with MySQL database. (Create)
- CO5: Apply and Analyze the working of website with Php and MySql. (Analyse)

Detailed Syllabus:

Module	Topics	No. of Lectures
1.	XML : Introduction to XML, Anatomy of an XML document, Creating XML Documents, Creating XML DTDs, XML Schemas, XSL	6
2.	PHP : Introduction of PHP, Server-side scripting. PHP BASICS :PHP syntax and variables, comments, types, constants, control structures, branching, looping, termination, functions, arrays, passing information with PHP, GET, POST	6
3.	PHP : formatting form variables, superglobal arrays, strings and string functions, regular expressions, arrays, number handling, basic PHP errors/problems, working with files and operating systems.	6
4.	Advanced PHP and MySQL : MYSQL basics, PHP/MySQL Functions, Integrating web forms and databases, authenticating your users, Displaying queries in tables.	6
5.	Building Forms from queries, String and Regular Expressions, Sessions, Cookies and HTTP, handling file uploads networking - E-Mail, securing your website, XML parsing	6

Reference Books

1. XML: The Complete Reference –Heather Williamson, Mcgrawhill India,2001
2. Beginning php and mysql from novice to professional 4th edition 2010
3. MySQL-PHP Database Applications-Jay Greenspan and Brad Bulger,M&T Books
4. Practical PHP and MySQL, Jono Bacon, Prentice Hall,2007

Practical:

1. XML
 - a. Design a DTD, corresponding XML document and display it in browser using CSS.
 - b. Design an XML document and display it in browser using XSLT.
 - c. Design XML Schema and corresponding XML document.
2. PHP Basics-II
 - a. Write a PHP Program to accept a number from the user and print it factorial.
 - b. Write a PHP program to accept a number from the user and print whether it is prime or not.

3. PHP Basics- II

- a. Write a PHP code to find the greater of 2 numbers. Accept the no. from the user.
- b. Write a PHP program to display the following Binary Pyramid:

```
1
0 1
1 0 1
0 1 0 1.
```

4. String Functions and arrays

- a. Write a PHP program to demonstrate different string functions.
- b. Write a PHP program to create one dimensional array.

5. PHP and Database

- a. Write a PHP code to create: (i) Create a database Student (ii) Create a table Marks (Sno,Sname,Marks)
 - b. Write a PHP program to create a database named “College”. Create a table named “Student” with following fields (sno, sname, percentage). Insert 3 records of your choice. Display the records with different suitable queries.
 - c. Design a PHP page for authenticating a user.
 - d. Write a program to send email with attachment
6. Write a program to demonstrate use of sessions and cookies.
7. Create a shopping cart using php and Mysql.
8. Write a program to demonstrate XML parsing with php.
9. Design a web page demonstrating Platform as a service (PAAS) with google cloud.
10. Demonstrate json with php.

5. DISCRETE MATHEMATICS II

at Semester II
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Matrices and Determinants	9
2	Linear Transformation of Matrices and Counting Principles	9
3	Permutations and Combinations	9
4	Graphs	9
5	Trees	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. Build a mathematical foundation for the computing applications
2. Lay a foundation for data structures
3. Recall matrices, properties, rank and understand its linear transformation.
4. Understand application of counting principle.
5. Define graphs and trees and their traversing.

Course Outcome:

After completing this course, learners will be able to:

CO1: Find a mathematical solution to the problems.(Apply)

CO2: Link the mathematical concepts with application in the computing domain.(Analyse)

CO3: Find Normal form of matrix, similarity and its applications.(Evaluate)

CO4: Solve problems on counting principle. (Remember)

CO5: Identify graphs and trees, their traversing and operations on binary search tree.(Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1.	<p>Matrices: Introduction, Matrix Arithmetic, Properties of matrices, Transposes and Powers of Matrices, Inverse of a matrix, Elementary transformation, Rank of matrix, Echelon or normal form, Linear equations, Linear dependence and independence of vectors.</p> <p>Determinants: General definition, determinants and inverses of 2×2 matrices, Properties of determinants.</p>	9
2.	<p>Linear Transformation of matrices: Characteristics roots and characteristics vectors, their properties, Cayley-Hamilton theorem, Similarity of matrices, Reduction of matrix to a diagonal matrix.</p> <p>Counting Principles: Sum and Product Rules, Two-way counting, Tree diagram for solving counting problems, Pigeonhole Principle (without proof); Simple examples, Inclusion Exclusion Principle (Sieve formula) (Without proof).</p>	9
3.	<p>Permutations and Combinations: Partition and Distribution of objects, Permutation with distinct and indistinct objects, Binomial numbers, Combination with identities: Pascal Identity, Vandermonde's Identity, Pascal triangle, Binomial theorem, Combination with indistinct objects.</p>	9
4.	<p>Graphs: Definition and elementary results, Adjacency matrix, path matrix, Representing relations using diagraphs, Warshall's algorithm- shortest path , Linked representation of a graph, Operations on graph with algorithms – searching in a graph; Insertion in a graph, Deleting from a graph, Traversing a graph- Breadth-First search and Depth-First search</p>	9
5.	<p>Trees: Definition and elementary results. Ordered rooted tree, Binary trees, Complete and extended binary trees, representing binary trees in memory, traversing binary trees, binary search tree, Algorithms for searching and inserting, traversing binary trees, binary search tree, Algorithms for searching and inserting, in binary search trees, Algorithms for deleting in a binary search tree</p>	9

Reference Books

1. Discrete Mathematics with Applications, Sussana S. Epp, Cengage Learning, 4th Edition, 2010.
2. Discrete Mathematics, Schaum's Outline Series, Seymour Lipschutz, Tata McGraw Hill, 2007.
3. Discrete Mathematics and its Applications, Kenneth H. Rosen, Tata McGraw Hill, 2015.
4. Discrete Mathematical Structures, 6th Ed., Kolmann R. C. Busby, S. Ross, PHI, 2009.
5. Elements of Discrete Mathematics, 4th Ed., C. L. Liu, D. P. Mohapatra, Tata McGraw Hill, 2012.

6. IT platforms, Tools and Practices

*at Semester II
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Free and Open Source Softwares	9
2	Coding Practices	9
3	Introduction to Semantic Web	9
4	The Multidisciplinary Nature of Environmental Studies	9
5	Green Computing	9
	Total	45

Course Objectives:

By the end of the course, learners will be able to:

1. To prepare students according to the industry standards.
2. To give an awareness on industry practices and ethics.
3. To encourage the use of IT Tools so as to enable students to improve their skills and knowledge
4. To impart skills that can enable students to approach business problems analytically.
5. To understand what Green IT is and How it can help improve environmental Sustainability.

Course Outcome:

After completing this course, learners will be able to:

CO1: Follow the industry standards and practices in coding. (Apply)

CO2: Illustrate various green IT services and its roles. (Understand)

CO3: Describe the importance of IT enabled services and challenges. (Understand)

CO4: Evaluate various IT tools and services for betterment of knowledge. (Evaluate)

CO5: Use and Examine different computing services. (Analyze)

Detailed Syllabus:

Module	Topics	No. of Lectures
1.	Free and Open Source Softwares Introduction: Introduction: Open Source, Free Software, Free Software vs. Open Source software, Public Domain Software, FOSS does not mean no cost. History: BSD, The Free Software Foundation and the GNU Project. GitHub: Introduction to GitHub, preparing the environment: Install Git on our machine, create a GitHub account, create a workspace on our machine GitHub workflow and the environment: Creating a repository, creating workspace, cloning the repository, creating a branch, committing the changes, merging the changes, Introduction to Wikipedia, contributing to Wikipedia	9
2.	Coding Practices: Variable Naming Conventions, Constant Naming Conventions, Indentations, General Practices, Commenting, Advantages of Coding guidelines, pair programming/code review, Refactoring, Reduction of Complexity, JavaScript best Practices, Java best Practices, Python best Practices, Python best practices (PEP 8), Code analysis tools (Pylint)	9
3.	Introduction to Semantic Web: Limitations of current Web – Development of Semantic Web – Emergence of the Social Web – Social Network analysis: Development of Social Network Analysis – Key concepts and measures in network analysis – Electronic sources for network analysis: Electronic discussion networks, Blogs and online communities – Web-based networks – Applications of Social Network Analysis.	9
4.	The Multidisciplinary Nature of Environmental Studies - Definition, Scope and Importance; Natural Resources – Introduction, Renewable and Non-renewable Resources; Ecosystems - Concept of an ecosystem, Structure and functions of an ecosystem, Producers, consumers and decomposers, Energy flow in the ecosystem, Types of ecosystem; Environmental Pollution – Definition, Causes, Effects and Control Measures; Human population and the environment.	9
5.	Green IT: Overview and Issues ; Minimizing Power Usage: Power Problems, Monitoring Power Usage, Servers, Low-Cost Options, Reducing Power Use, Low-Power Computers, PCs, Linux, Components, Servers, Computer Settings, Storage, Monitors, Power Supplies, Wireless Devices, Software; Going Paperless: Paper Problems, The Environment, Costs: Paper and Office, Practicality, Storage, Destruction, Going Paperless, Organizational Realities, Changing Over, Paperless Billing, Handheld Computers vs. the Clipboard, Unified Communications, Intranets, What to Include, Building an Intranet, Microsoft Office SharePoint Server 2007, Electronic Data Interchange (EDI), Nuts and Bolts, Value Added Networks, Advantages, Obstacles; Recycling; Green Data Storage: Introduction , Storage Media Power Characteristics, Energy Management Techniques for Hard Disks, System-Level Energy Management; Staying Green.	9

Reference Books

Unit1-

1. Open Source Initiative: <https://opensource.org/>
2. Github: <https://help.github.com/>
3. <https://medium.freecodecamp.org/how-you-can-learn-git-and-github-while-youre-learning-to-code-7a592ea287ba>
4. <https://medium.com/quick-code/top-tutorials-to-learn-git-for-beginners-622289ffdf5>
5. Wikipedia: <https://en.wikipedia.org/>

Unit 2:

1. https://developer.mozilla.org/en-US/docs/Mozilla/Developer_guide/Coding_Style
2. <https://www.castsoftware.com/glossary/coding-in-software-engineering-best-practices-good-standards>

Unit 3:

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

Unit 4:

1. TextBook for Environmental Studies, Erach Bharucha.

Unit 5 :

1. Toby Velte, Anthony Velte, Robert Elsenpeter, Green IT, McGraw Hill, 2008
2. Alvin Galea, Michael Schaefer, Mike Ebbers, Green Data Center: Steps for the Journey, Shroff Publishers and Distributers, 2011

Practical:

1. Create a project, repository and workspace in GitHub.
2. Clone the Repositories in GitHub.
3. Creating a branch in GitHub.
4. Committing the changes in GitHub.
5. Merging the changes in GitHub.
6. Working on Wikipedia.
7. Implementing coding practices in Python using Pylint.
8. Implementing coding practices in Python using PEP8.
9. Implementing coding practices in Java.
10. Implementing coding practices in JavaScript.

Evaluation Scheme

Test– 20 Marks

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform or a written test conducted in the class room.

Assignments/Presentation: 15 marks

5 Marks - Active participation in routine class instructional deliveries:

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

Semester End Examination- 60 Marks

Duration - 2 Hours.

Theory question paper pattern:-

All questions are compulsory.		
Question	Based on	Marks
Q1	Unit 1, 2, 3, 4, 5	4 out of 5 questions (05 marks each)
Q2	Unit 1, 2, 3, 4, 5	2 out of 3 questions (07 marks each)
Q3	Unit 1, 2, 3, 4, 5	2 out of 3 questions (08 marks each)
Q4	Based on multiple Units	1 out of 2 questions (10 marks)

Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Examination)

Nagindas Khandwala College (Autonomous)

**Syllabus and Question Paper Pattern
of Courses of**

Bachelor of Science Information Technology Programme

Second Year

Semester III and IV

Under Choice Based Credit, Grading and Semester System

(Implemented during Academic Year 2022-2023)

(Implemented during Academic year 2022-23)

Sr. No.	Semester III	Subject code	Total Marks	Cred its	Sr. No.	Semester IV	Subject code	Total marks	Cred its
	<i>Discipline Specific Compulsory Course (DSC)</i>					<i>Discipline Specific Compulsory Course (DSC)</i>			
1	DSC-3 Descriptive Statistics	2231UISST	60-40 100	3	1	DSC-4 Probability Theory	2241UISPT	60-40 100	3
	<i>Skill Enhancement Compulsory Course (SEC)</i>					<i>Skill Enhancement Compulsory Course (SEC)</i>			
2	SEC-3 Core Java	2232UISCJ	60-40 100	2	2	SEC-4 Design Patterns	2242UISDP	60-40 100	2
	Core Java Practical	2232UISCJP	50	2		Design Patterns Practical	2242UISDPP	50	2
	<i>Core Course (CC)</i>					<i>Core Course (CC)</i>			
3	CC-7 Data Structures	2233UISDS	60-40 100	2	3	CC-10 Design and Analysis of Algorithms	2243UISDA	60-40 100	2
	Data Structures Practical	2233UISDSP	50	2		Design and Analysis of Algorithms Practical	2243UISDAP	50	2
4	CC-8 Computer Networks	2234UISCN	60-40 100	2	4	CC-11 System Programming	2244UISSP	60-40 100	2
	Computer Networks Practical	2234UISCNP	50	2		System Programming Practical	2244UISSPP	50	2
5	CC-9 Database Management Systems- II	2235UISDB	60-40 100	2	5	CC-12 Software Engineering	2245UISSE	60-40 100	2
	Database Management Systems- II Practical	2235UISDBP	50	2		Software Engineering Practical	2245UISSEP	50	2
	<i>Discipline Specific Elective (DSE) CHOOSE ANY ONE</i>					<i>Discipline Specific Elective (DSE) CHOOSE ANY ONE</i>			

6	Advanced Web Programming – I	2236UISAW	60-40 100	2	6	Advanced Web Programming - II	2246UISAW	60-40 100	2
	Advanced Web Programming – I Practical	2236UISAWP	50	2		Advanced Web Programming – II Practical	2246UISAWP	50	2
	Hybrid Mobile Application Development – I	2236UISMD	60-40 100	2		Hybrid Mobile Application Development - II	2246UISMD	60-40 100	2
	Hybrid Mobile Application Development – I Practical	2236UISMDP	50	2		Hybrid Mobile Application Development – II Practical	2246UISMDP	50	2
						Advanced Java	2246UISAJ	60-40 100	2
						Advanced Java Practical	2246UISAJP	50	2
	Computer Graphics and Animation	2236UISCG	60-40 100	2		Multimedia Systems	2246UISMS	60-40 100	2
	Computer Graphics and Animation Practical	2236UISCGP	50	2		Multimedia Systems Practical	2246UISMSP	50	2
	Embedded Systems	2236UISES	60-40 100	2		Internet of Things	2246UISIT	60-40 100	2
	Embedded Systems Practical	2236UISESP	50	2		Internet of Things Practical	2246UISITP	50	2
	Principles of Management	2236UITPM	60-40 100	2		Principles of Marketing	2246UISPM	60-40 100	2
	Principles of Management Practical	2236UITPMP	50	2		Principles of Marketing Practical	2246UISPMP	50	2
	TOTAL		23		TOTAL		23		

1. CORE JAVA

at Semester III

*(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Java Basics and Datatypes	6
2	Control Flow Statements, Iterations, Classes and objects	6
3	Inheritance, Packages and Multithreading	6
4	Enumerations and Arrays, I/O Streams, Exceptions handling	6
5	GUI development using AWT	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the importance of Object Oriented paradigm in Application development.
2. Study Java language Basics.
3. Implement Object oriented concepts using Java.
4. Understand concepts of packages and Multithreading in Java.
5. Explore the importance of Exception handling in program design.
6. To develop GUI Applications using AWT.

Course Outcome:

After successful completion of this course, learners will be able to:

- CO1: Acquire knowledge about Java language.(Understand)
CO2: Apply Object Oriented paradigm in Application development.(Apply)
CO3: Develop user defined packages.(Understand)
CO4: Implement Single threaded and Multithreaded programs in Java language.(Apply)
CO5: Create programs using Exception Handling.(Understand)
CO6: Integrate important concepts of OOP to develop GUI applications.(Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Java basics: History, Architecture and its components, Java Class File, Java Runtime Environment, The Java Virtual Machine, JVM Components, The Java API, Java platform, Java development kit, Lambda Expressions, Features of Java, Java program structure, main method of Java, Command line arguments, Wrapper classes, Java Tokens, Java Statements,</p> <p>Data Types: primitive and user defined types, Arrays, Typecasting, Autoboxing and Unboxing ,Operators in Java</p>	6
2	<p>Control Flow Statements: If...Else If...Else Statement, Switch...Case Statement Iterations: While Loop, Do ... While Loop, For Loop, For each Loop, Labeled Statements, Break and Continue statements, Return Statement</p> <p>Classes and objects : Scope of variables, Defining class ,instance variables and instance methods, Creating and initializing object from class, Method Overloading, Variable Arguments [Varargs], Constructors, this instance, super instance, static members of a class, Garbage collection</p>	6
3	<p>Inheritance: Inheritance and Access Specifiers, forms of inheritance, Constructors in inheritance, super keyword, Abstract Classes and Interfaces: Abstract Classes, Abstract Methods, Interfaces, What is an Interface? Difference between Interface and an Abstract Class, Multiple Inheritance implementation, Packages and Imports: benefits of packages, predefined packages Creating user defined Packages, Importing Packages, Using A Package.</p> <p>Multithreading: Thread concept, thread control methods, thread life cycle, the main thread, creating a thread, extending the thread class, Implementing Runnable interface.</p>	6
4	<p>Enumerations and Arrays: Creating and using enum type data, Two and Multi-Dimensional Arrays, Variable size arrays, , Creating and using Vectors, Annotations, Strings: String and String buffer class, String methods, manipulating Strings, Introduction to Collection framework.</p> <p>I/O Streams: Introduction, Byte-oriented streams, Character- oriented streams,</p> <p>File: Reading and writing files, Random access File, Exceptions handling: Introduction, Pre-Defined Exceptions, Try-Catch-Finally, Throws, throw, User Defined Exception examples.</p>	6
5	<p>GUI development using AWT: Introduction, Components, Event-Delegation-Model, Listeners, Layouts, Individual components Label, Button, Check Box, Radio Button, Choice, List, Menu, Text Field, Text Area</p>	6

Reference Books

1. A.Balaguruswamy, "Programming with JAVA", A Primer, TMH, 1999.
2. Core Java for Beginners by Sharanam Shah
3. Head First Java by Kathy Sierra and Bert Bates ,O Reilly ,2nd edition
4. Patrick Naughton & Herbert Schildt, JAVA 2: The Complete Reference, THM, 1999

Practical:

1. Java Data types:

- a) Write a program to accept length and breadth as command line arguments and calculate area and perimeter of rectangle.
- b) Write a program to accept integer values for a, b and c which are coefficients of quadratic equation and find the solution of quadratic equation.

2. Use of operators

- a) Demonstrate the use of various types of operators supported by Java.
- b) Write a program to reverse a string.

3. Use of Control statements and Iterators

- a) Write a program to find the smallest and largest element from an array.
- b) Write a program to count the letters, spaces, numbers, and other characters of an input string.

4. Using classes and objects

- a) Design a class in java which includes instance methods and instance variables and initialize them by creating object.
- b) Demonstrate the use of constructors in java.

5. Inheritance

- a) Write a java program to implement single level inheritance.
- b) Write a java program to implement multiple inheritance.

6. Polymorphism

- a) Write a java program to implement method overloading.
- b) Write a java program to implement method overriding.

7. Packages and Multithreading

- a) Create a package, add necessary classes and import the package in java class.
- b) Write a java program to implement multithreading.

8. Arrays

- a) Write a java program for multiplying two matrices and print the product for the same.
- b) Design a class which contains instance methods to sort data in ascending and descending order stored in an array.

9. String handling and Exception handling

- a) Demonstrate the use of various methods of String and StringBuffer class to manipulate strings.
- b) Demonstrate the use of try catch and finally block to create and handle your own exception.

10. I/O streams and File handling

- a) Demonstrate the use of BufferedReader and Scanner classes for taking user input from console.

b) Write a java program to read the student data from user and store it in the file.

11 AWT

a) Design an AWT application that contains the interface to add student information and display the same.

b) Design a calculator based on AWT application.

2. DATA STRUCTURES

*at Semester III
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Introduction and Array	6
2	Linked List	6
3	Stack, Queue, Recursion	6
4	Trees and Graphs	6
5	Sorting, Searching, Tree and Hashing	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. To introduce the fundamental concept of data structures.
2. To emphasize the importance of data structures in developing and implementing efficient algorithms.
3. To understand the implementation of different data structures
4. To gain knowledge with respect to complexities of different algorithms
5. To understand concept of Hashing

Course Outcomes:

After successful completion of this course, learners will be able to:

- CO1: Describe how arrays, records, linked structures, stacks, queues, trees, and graphs are represented in memory and used by algorithms (Understand)
- CO2: Write programs that use arrays, records, linked structures, stacks, queues, trees, and graphs. (Apply)
- CO3: Demonstrate different methods for traversing trees. (Apply)
- CO4: Discuss the computational efficiency of the principal algorithms for sorting, searching, and hashing. (Understand)
- CO5: Compare and contrast the benefits of dynamic and static data structures implementations. (Analyse)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction: Data and Information, Data Structure, Classification of Data Structures, Abstract Data Types, Operations on Data Structure, Algorithm, Importance of Algorithm Analysis, Complexity of an Algorithm, Asymptotic Analysis and Notations.</p> <p>Array: Introduction, One Dimensional Array, Memory Representation of One Dimensional Array, Operations, Multidimensional Arrays, Memory Representation of Two Dimensional Arrays, Sparse Matrix</p>	6
2	Introduction, Types of Linked List (one way, two way, circular, header), Operations on One way and Two way Linked List (Traversing, Searching, Insertion, Deletion, Copying, Merging), Applications of the Linked list- Representation of Polynomials, Storage of Sparse Arrays.	6
3	<p>Stacks: Stack ADT, Memory Representation, Operations, Applications - Evaluating arithmetic expressions- Conversion of Infix to postfix expression, Matching Parenthesis.</p> <p>Queue: Queue ADT, Memory Representation, Operations, Circular Queue, Priority Queue, deQueue, applications of queues.</p> <p>Recursion: Developing Recursive Definition of Simple Problems and their implementation; Advantages and Limitations of Recursion; Understanding what goes behind Recursion (Internal Stack Implementation)</p>	6
4	<p>Trees: Tree ADT, tree traversals, Binary Tree ADT, expression trees, applications of trees, binary search tree ADT, Red Black tree, AVL Trees, B-Tree, B+ Tree, Heap, Applications of heap.</p> <p>Graphs: Definition, Representation of Graph, Types of graph, Breadth-first traversal, Depth-first traversal, Application- shortest path, minimum spanning trees</p>	6
5	<p>Searching- Linear Search, Binary Search.</p> <p>Sorting - Bubble sort, Selection sort, Insertion sort, Shell sort, Radix sort.</p> <p>Hashing- Hash Functions, Separate Chaining, Open Addressing, Rehashing, Extendible Hashing.</p>	6

Reference Books

1. A Simplified Approach to Data Structures, Lalit Goyal, Vishal Goyal, Pawan Kumar, SPD 1st edition 2014.
2. Schaum's Outlines Data structure, Seymour Lipschutz TMH 2nd edition 2005.
3. Data Structure and algorithm Using Python, Rance D. Necaie, 2016 Wiley India Edition.
4. Data Structure and Algorithm in Python, Michael T. Goodrich, Robertom Tamassia, M. H. Goldwasser, 2016 Wiley India Edition.
5. Data structure – A Pseudocode Approach with C, AM Tanenbaum, Y Langsamand MJ Augustein, Prentice Hall India 2nd edition 2006.

Practical:

1. Implement the following for Array:
 - a. Write a program to store the elements in 1-D array and provide an option to perform the operations like searching, sorting, merging, reversing the elements.
 - b. Write a program to perform the Matrix addition, Multiplication and Transpose Operation.
2. Implement Linked List. Include options for insertion, deletion and search of a number, reverse the list and concatenate two linked lists
3. Implement the following for Stack:
 - a. Perform Stack operations using Array implementation.
 - b. Implement Tower of Hanoi
 - c. WAP to scan a polynomial using linked list and add two polynomial.
 - d. WAP to calculate factorial and to compute the factors of a given no. (i) using recursion, (ii) using iteration.
4. Perform Queues operations using Circular Array implementation.
5. Write a program to search an element from a list. Give user the option to perform Linear or Binary search.
6. WAP to sort a list of elements. Give user the option to perform sorting using Insertion sort, Bubble sort or Selection sort.
7. Implement the following for Hashing:
 - a. Write a program to implement the collision technique.
 - b. Write a program to implement the concept of linear probing.
8. Write a program for inorder, postorder and preorder traversal of tree.
9. Write a program to generate the adjacency matrix.
10. Write a program for shortest path diagram.

3. COMPUTER NETWORKS

*at Semester III
(Implemented during Academic Year 2022-23)
(wef. 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction and Network Models	6
2	Physical Layer and Analog and Digital signals	6
3	Data Link Layer	6
4	Network Layer	6
5	Transport and Application Layer	6
Total		30

Course Objectives:

By the end of the course learner will be able to:

1. Understand Networking Basics.
2. Explore Hardware and Software requirements for Communication Network.
3. Understand the framework of communication networks.
4. Do layer wise study of OSI Model and TCP/IP Model.
5. Compare OSI and TCP/IP Model.
6. Implement various protocols in communication.

Course Outcome:

After successful completion of this course learner will be able to:

CO1: Define Data communication and Networking concepts.(Remember)

CO2: Acquire knowledge about common equipment, standard hardware and software requirements and communication protocols.(Understand)

CO3: Study functions of all layers in OSI Model and their requirements.(Analyze)

CO4: Understand the importance of TCP/IP Model in Communication Networks. (Understand)

CO5: Compare various protocols and their requirements in communication. (Analyze)

CO6: Simulate Communications systems using various protocols and understands its real life applications. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Introduction: Data communications and networking concepts, network types, network topologies, categories of networks, Internet history, standards and administration. Network models: Protocol layering, OSI model and TCP/IP model, Layered Architecture, Introduction to functions of all layers, Addressing.	6
2	Physical Layer : Data and Signals, Analog and Digital signals, Periodic and non-periodic signals, properties, Composite signals, transmission impairment , Digital and analog conversions, Transmission modes, Transmission media, Multiplexing, Frequency-Division Multiplexing, Wavelength-Division Multiplexing, Time Division Multiplexing.	6
3	Data link layer: Flow and error control, Types of Errors, Redundancy, Detection versus Correction, Error detecting methods Forward error correction and error correction by retransmission, sliding window protocols, Multiple access protocols	6
4	Network layer: Connecting devices, Switched networks, Network layer protocols, IPV4 and IPV6, addressing, Packet format, Transition strategies from IPV4 to IPV6, Unicast routing protocols - RIP, OSPF, wireless technologies, Mobile IP	6
5	Transport and Application layer : Transport layer protocols, UDP -packet format, applications ,TCP - Circular buffers, segment format, Connection management and data transfer in TCP, Introduction to SCTP, SMTP, FTP, HTTP, DNS, DHCP	6

Reference Books

1. Data Communication and Networking , Behrouz A. Forouzan Tata McGraw Hill 5th edition, 2013.
2. TCP/IP Protocol Suite Behrouz A. Forouzan Tata McGraw Hill 4th edition, 2010.
3. Computer Networks , Andrew Tanenbaum pearson, 5th edition 2013.

Practical:

1. Configuring SSH protocol for secure communication.
2. Use of ping and tracet / traceroute, ipconfig / ifconfig, route and arp utilities.
3. Configure multiple layer 2 switches where every switch is connected to multiple computers to create a network. Verify their connectivity with each other.
4. Create a wireless network of multiple devices using appropriate access point.
5. Configure IP static routing.
6. Configure IP routing using RIP.
7. Configuring Simple OSPF.
8. Configuring DHCP server and client.
9. Configuring DNS, HTTP, DHCP Server and client.
10. Use of Wireshark to scan and check the packet information of following protocols: HTTP, ICMP, TCP, SMTP, POP3

4. DATABASE MANAGEMENT SYSTEM - II

*at Semester III
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Fundamentals of PL/SQL	6
2	Overview of PL/SQL Control Structures	6
3	Stored Procedures	6
4	PL/SQL Records and Collections	6
5	Exception Handling and Cursors	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. Develop efficient PL/SQL programming skills
2. Understanding Oracle database.
3. Designing modular applications using packages.
4. Creating triggers to solve business challenges and enforce business rules.
5. Stepping stone for RDBMS and PL/SQL structures.

Course Outcomes:

After successful completion of this course, learners will be able to:

CO1: Explain the fundamental concepts of PL/SQL. (Understand)

CO2: Develop PL/SQL queries in real-time applications. (Create)

CO3: Design modular applications using packages. (Create)

CO4: Perform PL/SQL programming using concept of Cursor Management, Error Handling, Package and Triggers (Create)

CO5: Analyze PL/SQL structures like functions, procedures, cursors and triggers for database applications. (Analyze)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Fundamentals of PL/SQL: Introduction, Overview and benefits of PL/SQL, Types of PL/SQL blocks, Simple Anonymous Block, Identifiers, types of identifiers, Declarative Section, variables, Scalar Data Types, The % Type attribute, bind variables, sequences in PL/SQL expressions, Executable statements, comment the code, deployment of SQL functions in PL/SQL, nested blocks, operators, Invoke SELECT Statements in PL/SQL, Data Manipulation in the Server using PL/SQL, Save and discard transactions.</p>	6
2	<p>Overview of PL/SQL Control Structures: Conditional Control: IF and CASE Statements, IF-THEN Statement, IF-THEN-ELSE Statement, IFTHEN-ELSIF Statement, CASE Statement, Iterative Control: LOOP and EXIT Statements, WHILE-LOOP, FOR-LOOP, Sequential Control: GOTO and NULL Statements.</p>	6
3	<p>Stored Procedures : Create a Modularized and Layered Subprogram Design, differences between Anonymous Blocks and Subprograms, Create, Call, and Remove Stored Procedures, Implement Procedures Parameters and Parameters Modes, View Procedure Information, Stored Functions and Debugging Subprograms, Create, Call, and Remove a Stored Function, advantages of using Stored Functions, Invoke User-Defined Functions in SQL Statements, Packages, advantages of Packages, components of a Package, Develop a Package, Create the Package Specification and Body, Invoke the Package constructs.</p> <p>Triggers: Concept of triggers, implementing triggers - Statement Level Triggers and Row Level Triggers, Compound Trigger to Resolve the Mutating Table Error, Comparison of Database Triggers and Stored Procedures, Create Triggers on DDL Statements.</p>	6
4	<p>PL/SQL Records: Table-based records, Cursor-based records and User-defined records.</p> <p>PL/SQL Collection: Index-by tables or Associative array, Nested table, Variable-size array or Varray.</p>	6
5	<p>Exception Handling: Concept of Exception Handling, Handle Exceptions with PL/SQL, Trap Predefined and non-predefined Oracle Server Errors, User-Defined Exceptions, Propagate Exceptions, RAISE_APPLICATION_ERROR Procedure.</p> <p>Cursors: Concept of a cursor, types of cursors: implicit cursors; explicit cursor, Cursor for loops, Cursor variables, parameterized cursors.</p>	6

Reference Books

1. Ivan Bayross, "SQL,PL/SQL -The Programming language of Oracle", 4th Ed., B.P.B. Publications, 2009.
2. Murach's Oracle SQL & PL/SQL Works with All Versions Through 11G.
 3. Satish Asnani, Oracle Database 12C Hands-On Sql and Pl/Sql.
 4. Oracle 11g: PL/SQL Reference Oracle Press.
 5. Dr. P.S.Deshpande SQL &PL/SQL for Oracle 10g Black Book

Practical:

Practical 1: PL/SQL basics

Practical 2: Control Structures

Practical 3: Creating and working with Sequence

Practical 4: Creating Procedures, Functions and Packages

Practical 5: Creating Database Triggers.

Practical 6: Working with Collections

Practical 7: Implementing Records

Practical 8: System and User-defined Exception

Practical 9: Implicit and Explicit Cursors

Practical 10: SQL Server Performance Tuning

Case Study : Car Rental Database

A car rental company has several car rental agencies across the country. The agencies rent several classes of vehicles: compact, midsize, full size, sport utility. Each vehicle is managed by one agency. Customers rent vehicles from different agencies. When a vehicle is rented, a new rental record is added to Rental table with Dateout as the current date and DateReturned is left Null. When the vehicle is returned, the record is updated filling in the DateReturned field. A portion of the car rental database schema is as follows:

Vehicle (Vehicleid, Vehicleclassid, Agencyid)

Rental(Rentalid, Vehicleid, Customerid, Dateout, DateReturned) Customer(Customerid, CustomerName, CustomerBalance) Agency(Agencyid, AgencyLocation)

VehicleClass(VehicleClassid, VehicleClassName, RentalRate)

- a) Create sequence for generating primary key value prefixed with entity starting variable. For example, to generate Vehicleid it must be in the format "V1" and so on.
- b) Implement trigger to store the record in Rental table whenever a vehicle is rented.
- c) Create a procedure to insert, update and delete records in individual table.
- d) Create a function to display total cars rented by the customer.

5. DESCRIPTIVE STATISTICS

at Semester III

(Implemented during Academic Year 2022-23)

(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Types, collection and scrutiny of Data	9
2	Analysis of Quantitative Data	9
3	Bivariate Data	9
4	Multivariate data	9
5	Analysis of Categorical data	9
	Total	45

Course Objective:

By the end of this course, learners will be able to:

- understand the basic terminologies
- differentiate the types of data
- use visualization tools and to analyze the underlying pattern in the data
- model the data using the suitable polynomials
- demonstrate the association between the variables
- work independently on a given data set.

Course Outcome:

After completing this course the learner will be able to:

CO1: Define the terms population, sample, univariate and multivariate data, correlation, regression and odds ratio.(Remember)

CO2: Differentiate the data into different categories.(Analyze)

CO3: Analyze a given dataset using statistical techniques.(Analyze)

CO4: Use suitable visualization tools to get a better insight into the underlying dataset.(Apply)

CO5: Device a strategy to identify the associations between the variable.(Evaluate)

CO6: Fitting lines and polynomials to model the given data.(Create)

CO7: Analyze and develop a statistical model of the data collected.(Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Types Of Data: Concept of a statistical population and sample from a population; Qualitative and quantitative data, nominal and ordinal data, cross sectional and time Series data, discrete and continuous data; frequency and non-frequency data. Different types of scales – nominal, ordinal ratio and interval. Collection and Scrutiny of Data: Primary data – designing a questionnaire and a schedule; checking their consistency. Secondary data- its major sources including some government publication. Complete enumeration, controlled experiments, observational studies and sample surveys, Scrutiny of data for internal consistency and detection of errors of recording ideas of cross- validation. Presenting of Data: Construction of tables with one or more factors of classification, Diagrammatic and graphical representation of grouped data. Frequency distributions, Cumulative frequency distributions and their graphical representation, histogram, frequency polygon and gives, Stem and leaf chart. Box plot.	9
2	Analysis of Quantitative Data: Univariate data-Concepts of central tendency or location, dispersion and relative dispersion, skewness and kurtosis, and their measures including those based on quantiles and moments. Sheppard's corrections for moments for grouped data (without derivation)	9
3	Bivariate Data: Scatter diagram , Product moment correlation coefficient and its properties, Coefficient of determination, Correlation ratio, Concepts of error in regression, Principle of least squares, Fitting of linear regression and related results, Fitting of curves reducible to polynomials by transformation, Rank correlation Spearman's and Kendall's measures.	9
4	Multivariate data: Multiple regression, multiple correlation and partial correlation in three variables. Their measures and related results.	9
5	Analysis of Categorical data: Consistency of categorical data, Independence and association of attributes, Various measures of association for two-way and three- way classified data, Odds ratio.	9

Reference Books

1. Bhat B.R, Srivenkatramana T and Rao Madhava K.S.; Statistics: A Beginner's Text, Vol 1, New Age International (P) Ltd.
2. Croxton F.E, Cowden D.J and Kelin S : Applied General Statistics, Prentice Hall of India.

Evaluation will be Continuous Internal Evaluation (25 Marks) and project presentation and viva-voce (75 Marks)

Discipline Specific Elective (DSE) (Any one of group A)

6A. ADVANCED WEB PROGRAMMING - I

at Semester III

*(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Object Oriented Javascript	6
2	Advanced bootstrap	6
3	AJAX	6
4	Advanced jQuery	6
5	Introduction to JSON	6
	Total	30

Course Objective:

By the end of the course, learners will be able to:

1. Recall the JavaScript, bootstrap, jquery and learn the advanced technologies.
2. Define and describe Ajax working with partial refreshes.
3. Study the concept of json to store data.
4. Learn designing with bootstrap and jQuery
5. Develop a website with the latest ajax,bootstrap and jQuery and store data in json.

Course Outcome:

After completing this course learners will be able to:

CO1: Discuss the concepts of object oriented concepts with JavaScript.(Understand)

CO2: Develop websites with bootstrap, Ajax technologies and jquery.(create)

CO3: Discuss json in web applications.(Understand)

CO4: Define and discuss major concepts, tools, techniques, and methods of web application development.(Create)

CO5: Apply the technologies learned in creation of websites.(Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Object Oriented Javascript: Javascript - Error Handling, Javascript – Validations, Javascript – Animation, Javascript – Multimedia, Javascript – Debugging, Javascript - Image Map, Javascript – Browsers, JS form validation, JS email validation, JavaScript OOPs, JS Class, JS Object, JS Prototype, JS constructor Method, JS static Method, JS Encapsulation, JS Inheritance, JS Polymorphism, JS Abstraction, JS Cookies, Cookie Attributes, Cookie with multiple Name, Deleting Cookies, JavaScript Events, JS this Keyword, JS Debugging, JS Hoisting, JS Strict Mode, JS TypedArray	6
2	Advanced bootstrap: Introduction, Grid Basic, Typography, Colors, Tables, Images, Jumbotron, Alerts, Buttons, Button Groups, Badges, Progress Bars, Spinners, Pagination, List Groups, Cards, Dropdowns, Collapse, Navs, Navbar, Forms, Inputs, Input Groups, Custom Forms, Carousel, Modal, Tooltip, Popover, Toast, Scrollspy, Utilities, Flex, Icons, Media Objects, Filters, Bootstrap 4 Grid: Grid System, Stacked/Horizontal, Grid XSmall, Grid Small, Grid Medium, Grid Large, Grid XLarge	6
3	What is AJAX? Asynchronous Ajax Technologies, AJAX - Browser Support, AJAX – Action XMLHttpRequest, How AJAX Works?, Java AJAX, AJAX with Database, Email Finder Comment Form, AJAX - Security, AJAX – Issues ,AJAX with PHP, AJAX Applications	6
4	Advanced jquery jQuery Introduction, jQuery Syntax, jQuery Selectors, jQuery Events, jQuery in HTML, jQuery Get, jQuery Set, jQuery Add, jQuery Remove ,jQuery CSS Classes, jQuery css(), jQuery Dimensions, jQuery Traversing, jQuery Ancestors, jQuery Descendants, jQuery Siblings, jQuery Filtering, jQuery AJAX, Intro jQuery, Load jQuery, Get/Post, jQuery Selectors, jQuery DOM	6
5	Introduction to JSON, What is JSON, JSON - Syntax, JSON - DataTypes, JSON - Objects, JSON - Schema, JSON vs XML, JSON Parse, JSON Stringify, JSON Object, JSON Array, JSON Comments, JSON with PHP, JSON with Python, JSON with Ajax, JSON with Java	6

Reference Books

Textbooks:

1. Javascript2.0: The Complete reference, Thomas Powell and Fritz Schneider, 2nd Edition
2. Learning Bootstrap: Aravind Shenoy, Ulrich Sossou, Packt Publishing, 2014
3. Learning JQuery: Jonathan Chaffer, Karl Swedberg, Packt Publishing, 2013
4. Ajax for dummies, Steve Holzner

Website: www.w3schools.com

Practical:

1. Write a program on basic object oriented javascript.
2. Write a program to
 - a) Demonstrate Form validation with all controls.
 - b) Demonstrate Encapsulation, Inheritance, polymorphism, abstraction.
3. Write a program to demonstrate cookies and events.
4. Write a program to demonstrate bootstrap components.
5. Write a program to demonstrate bootstrap grid
6. Write a program to demonstrate simple Ajax and Ajax with php
- 7 Write a program to demonstrate advanced jquery.
8. Write a program to demonstrate jquery with ajax, jquery DOM
9. Write a program to demonstrate JSON with XML.
10. Write a program to demonstrate JSON with PHP and JSON with Ajax

7A. HYBRID MOBILE APPLICATION DEVELOPMENT - I

at Semester III

(Implemented during Academic Year 2022-23)

(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	AngularJS Introduction	6
2	AngularJS Components	6
3	Introduction to Ionic Software setup	6
4	Ionic Components	6
5	JS Components	6
	Total	30

Course Objective:

By the end of the course, learners will be able to:

1. Focus in this course is on the basic understanding of web frameworks and
2. Develop API's for user interface design by Angular JS and Ionic Framework for Mobile Application Development.
3. On the completion of the course, students will be able to develop Hybrid mobile applications.

Course Outcome:

After completing this course learners will be able to:

- CO1: Create a fully functional HTML5 app for any of the three OSes (Create)
CO2: Use PhoneGap to package HTML5 apps into native apps. (Apply)
CO3: Understand mobile application development and deployment process. (Understand)
CO4: Understand jQuery and jQuery Mobile architecture. (Understand)
CO5: Learn how to build apps with the Ionic framework. (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	AngularJS Introduction, AngularJS Expressions, AngularJS Modules, AngularJS Directives, AngularJS Model, AngularJS Data Binding, AngularJS Controllers, AngularJS Scopes, AngularJS Filters, AngularJS Services, AngularJS Http, AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation	6
2	AngularJS Tables, AngularJS Select, AngularJS SQL, AngularJS API, AngularJS Includes, AngularJS Animations, AngularJS Routing, AngularJS Application, AngularJS AJAX, AngularJS Views, AngularJS Scopes, AngularJS Services, AngularJS Dependency Injection, AngularJS Custom Directives, AngularJS Internationalization	6
3	Introduction to Ionic: Mobile Hybrid Architecture, What is Apache Cordova?, What is Ionic?, Features of Framework, Framework Advantages, Framework Limitation, Software setup: Install Node.js, Install Git, Install Bower, Install Gulp, Install Sublime Text, Install Cordova and Ionic CLI, The platform guide, Creating First Ionic App, The browser developer tools setup, The Ionic project structure, The config.xml file, The www folder, Scaffolding the tabs template, Scaffolding the side menu template, generator-ionic, Installing generator-ionic	6
4	Ionic Colors, Content, Header, Footer, Buttons, Lists, Cards, Forms, Toggle, Checkbox, RadioButton, Range, Select, Tabs, Grid, Icons, Padding	6
5	JS ActionSheet, JS Backdrop, JS Content, JS Form, JS Events, JS Header, JS Footer, JS Keyboard, JS List, JS Loading, JS Modal, JS Navigation, JS Popover, JS Popup, JS Scroll, JS Side Menu, JS Slide Box, JS Tabs, Cordova Integration, Admob, Camera, Facebook, In App Browser, Native Audio, GeoLocation, Media, Splashscreen	6

Reference Books

1. Pro AngularJS – Adam Freeman
2. AngularJS Programming by example - AgusKurniawan
3. AngularJS UI Development – Amit Ghart, Matthias Nehlsen.
4. Learning Ionic - Build Hybrid Mobile Applications with HTML5 - Arvind Ravulavaru
5. Ionic Framework by Example - Sani Yusuf
6. Full Stack Mobile App with Ionic Framework - Hoc Phan
7. Ionic Framework - Building Mobile Apps with Ionic Framework - Michael Bohner

Practical:

1. Data Binding- Write the Script to get the name of the User
2. Angular Js- Using Scope
 - a. Cars in an Array
 - b. Colors in List
3. Controllers - Root Scope ,Scope Colours
4. Filters - Birthday Party Invite (Use Filters) Uppercase , Lowercase. Currency, Date Friend List
5. Design a Page - Fruit Shop that has a Click Event added to an Image and MouseOver Event
6. Create a Form with Validation for Booking a Football Turf
7. Write an AngularJS program to do the following:
 1. Http
 2. Calendar Table
 3. Animation
8. Angular Js Advanced Practicals
 1. Implement Date Range Picker
 2. Create Search Filter Pipe
 3. Drag Range Slider with NGX Slider
 4. Angular 12- Star Rating
 5. Angular Radio Button
9. Mini Project on Angular JS
10. Installation of Ionic Practical
11. Ionic 2/Ionic 4-Create, Generate and Add Pages
12. Theming and Styling Ionic 2 Apps

Discipline Specific Elective (DSE) (Any one of group B)

8B. COMPUTER GRAPHICS AND ANIMATION

at Semester III

(Implemented during Academic Year 2022-23)

(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction and Scan Conversions Algorithms	6
2	2D and 3D Transformation	6
3	Viewing in 3D and Object Rendering	6
4	Visible-Surface Determination and Curves	6
5	Animation	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. Introduce the different graphics systems and become familiar with the working of graphics system components.
2. Understand the working of different scan conversion algorithms.
3. Learn the basic principles of 2- dimensional and 3- dimensional computer graphics.
4. Transform the object using various transformation techniques.
5. Provide an understanding of mapping from world coordinates to device coordinates, clipping, and projections.
6. Understand the concept of illumination, shading and Visible Surface determination and different techniques involved in it.
7. Have a basic understanding of Animation and its principles.

Course Outcome :

After completing this course learner will be able to:

CO1: Understand different scan conversion algorithms, apply it using programming language and define their applications.(Apply)

CO2: Discuss 2D and 3D transformations and different transformation matrix used. (Understand)

CO3: Apply various 2D transformations on a 2D object. (Apply)

CO4: Discuss different shading models and Visible-Surface Determination techniques. (Understand)

CO5: Define Animations and apply the basic principles of animation. (Remember, Apply)

CO6: Create basic 2D animation using programming language. (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Introduction and Scan Conversions Algorithms Introduction to computer graphics: Introduction to computer Graphics, Computer Graphics Application, Description of some graphics devices, Hard Copy devices, display technologies, Raster-Scan Graphics Displays, CRT Raster Scan Basics, Random-Scan Display Processor, LCD displays. Scan conversion – Digital Differential Analyser (DDA) algorithm, Bresenham's Line drawing algorithm. Bresenham's method of Circle drawing, Problems of Aliasing, end-point ordering and clipping lines, Scan Converting Circles, Clipping Lines algorithms: Cohen-Sutherland, Clipping Polygons.	6
2	2D and 3D Transformation 2D Transformations: Basic transformation, Matrix representation and Homogeneous coordinates, Rotation, Reflection, Scaling, Transformation of Points, Transformation of The Unit Square, Combined transformation, Rotation About an Arbitrary Point, Reflection through an Arbitrary Line. 3D Transformations: translation, rotation, scaling, composite-shears and reflections, Three-dimensional viewing, Rotation about an Arbitrary Axis in Space, Reflection through an Arbitrary Plane, Matrix Representation of 3D Transformations, Composition of 3D Transformations, Projection and its types.	6
3	Viewing in 3D and Object Rendering Stages in 3D viewing, Canonical View Volume (CVV), specifying an Arbitrary 3D View, Examples of 3D Viewing, the Mathematics of Planar Geometric Projections, Combined transformation matrices for projections and viewing, Coordinate Systems and matrices, camera model and viewing pyramid. Object Rendering: Introduction Object-Rendering, Light Modelling Techniques, Illumination Model, Shading, Flat Shading, Polygon Mesh Shading, Gouraud Shading Model, Phong Shading, Transparency Effect, Shadows, Texture and Object Representation, Ray Tracing, Ray Casting, Radiosity, Color Models.	6
4	Visible-Surface Determination and Curves	6

	<p>Visible-Surface Determination: Techniques for efficient Visible-Surface Algorithms, Categories of algorithms, Back face removal, The z-Buffer Algorithm, Scan-line method, Painter's algorithms (depth sorting), Area subdivision method, BSP trees, Visible-Surface Ray Tracing, comparison of the methods.</p> <p>Plane Curves and Surfaces: Curve Representation, Nonparametric Curves, Parametric Curves, Parametric Representation of a Circle, Ellipse, Parabola, Hyperbola, Representation of Space Curves, Cubic Splines, Bezier Curves, B-spline Curves, Parametric Cubic Curves, Quadric Surfaces. Bezier Surfaces</p>	
5	<p>Animation Principles of Animation, about motion graphics, Principles of animation, Key framing, Deformations, Character Animation, Physics-Based Animation, Procedural Techniques, Groups of Objects, Animation by computer, Animation file formats, Display of animated content, Introduction to Morphing, Three-Dimensional Morphing, Motion Tweening and Motion Editor, Classic tweening and Shape tweening.</p>	6

Reference Books

1. Computer Graphics, R. K. Maurya, John Wiley.
2. Mathematical elements of Computer Graphics, David F. Rogers, J. Alan Adams, TataMcGraw-Hill.
3. Procedural eteinem« of Computer Graphics, David F. Rogers, Tata McGraw-Hill.
4. Multimedia BASICS by Suzanne (Suzanne Weixel) Weixel, Jennifer Fulton, Karl Barksdale and CherylBeck Morse (Mar 14, 2003)

Practical List

1. Solve the following:
 - a) Draw a coordinate axis at the center of the screen.
 - b) Divide your screen into four regions, draw a circle, rectangle, ellipse and half ellipse in each region with appropriate message.
2. Draw a simple hut on the screen.
3. Write a program to implement the DDA line drawing algorithm.
4. Write a program to implement Bresenham's line drawing algorithm.
5. Write a program to implement a midpoint circle drawing algorithm.
6. Write a program to clip a line using Cohen and Sutherland line clipping algorithm.
7. Write a program to clip a polygon using Sutherland Hodgeman algorithm.
8. Write a program to apply various 2D transformations on a 2D object (use homogeneous coordinates).
9. Write a program to demonstrate 2D animation such as clock simulation or rising sun.
10. Write a program to implement the bouncing ball inside a defined rectangular window.

9B. EMBEDDED SYSTEMS

*at Semester III
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction and Core Components	6
2	Embedded Hardware	6
3	Introduction to 8051 Microcontroller	6
4	Programming in C	6
5	RTOS and Trends	6
	Total	30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the meaning, components of a basic embedded systems
2. Study the characteristics and quality attribute of an embedded systems
3. Understand the memory structure of embedded systems and its peripheral devices
4. Differentiate aspects of programming for developing embedded systems
5. Understand the EDLC

Course Outcomes:

After completing this course, learners will be able to:

CO1: Define and describe the characteristics of an embedded system. (Remember)

CO2: Explain the internal architecture and interfacing of different peripheral devices with Microcontrollers. (Understand)

CO3: Identify the need and role of embedded systems in industry. (Understand)

CO4: Write the programs for 8051 microcontroller using C/Assembly Programming language. (Apply)

CO5: Breakdown the pinout connection of 8051 Microcontroller in different categories. (Analyse)

CO6: Demonstrate the usage of Embedded Systems in real life applications such as traffic signals, elevators, and so on. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction: Embedded Systems and general purpose computer systems, history, classifications, applications and purpose of embedded systems</p> <p>Core of embedded systems: microprocessors and microcontrollers, RISC and CISC controllers, Big endian and Little endian processors, Application specific ICs, Programmable logic devices, COTS, sensors and actuators, communication interface, embedded firmware, other system components.</p>	6
2	<p>Characteristics and quality attributes of embedded systems: Characteristics, operational and non-operational quality attributes.</p> <p>Embedded Hardware: Memory map, i/o map, interrupt map, processor family, external peripherals, memory – RAM, ROM, types of RAM and ROM, memory testing, CRC ,Flash memory.</p> <p>Peripherals: Control and Status Registers, Device Driver, Timer Driver - Watchdog Timers.</p>	6
3	<p>The 8051 Microcontrollers: Microcontrollers and Embedded processors, Overview of 8051 family.8051 Microcontroller hardware, Input/output pins, Ports, and Circuits, External Memory.</p> <p>Designing Embedded System with 8051 Microcontroller: Factors to be considered in selecting a controller, why 8051 Microcontroller, Designing with 8051.</p>	6
4	<p>8051 Programming in C: Variables, Declaring a variable, Data Types and time delay in 8051 C, I/O Programming, Logic operations, Data conversion Programs, structure of embedded program, infinite loop, compiling, linking and debugging, functions.</p>	6
5	<p>Real Time Operating System (RTOS): Operating system basics, types of operating systems, Real-Time Characteristics, Selection Process of an RTOS.</p> <p>Design and Development: Embedded system development Environment – IDE, types of file generated on cross compilation, disassembler/ decompiler, simulator, emulator and debugging, embedded product development life-cycle, trends in embedded industry.</p>	6

Reference Books

1. Shibu K.V, —Introduction to Embedded Systems, McGraw Hill.2014
2. Jonathan W.Valvano, —Embedded Microcomputer Systems Real Time Interfacing, Third Edition Cengage Learning, 2012
3. Raj Kamal, —Embedded Systems-Architecture, Programming and Design, 3 edition, TMH.2015
4. Lyla, —Embedded Systems, Pearson , 2013
5. David E. Simon, —An Embedded Software Primer, Pearson Education, 2000.

Practical:

1. A. To interface 8 LEDs at Input-output port and create different patterns.
- B. To demonstrate timer working in timer mode and blink LED without using any loop delay routine.
2. Configure timer control registers of 8051 and develop a program to generate given time delay.
3. To demonstrate use of general purpose port i.e. Input/ output port of two controllers for data transfer between them.
4. Serial I/ O: Configure 8051 serial port for asynchronous serial communication with serial port of PC exchange text messages to PC and display on PC screen.
5. To demonstrate interfacing of seven-segment LED displays and generate counting from 0 to 9 with fixed time delay.
6. A. Interface 8051 with D/A converter and generate a square wave of given frequency on an oscilloscope.
- B. Interface 8051 with a D/A converter and generate triangular waves of given frequency on the oscilloscope.
- C. Using a D/A converter generates sine wave on oscilloscope with the help of lookup table stored in data area of 8051.
7. Interface stepper motor with 8051 and write a program to move the motor through a given angle in clock wise or counter clock wise direction
8. Generate traffic signal
9. Implement Temperature controller
10. Implement Elevator control

10B. PRINCIPLES OF MANAGEMENT

*at Semester III
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Management and its Evolution	6
2	Planning, Decision Making and Controlling	6
3	Organizational Management	6
4	Understanding Business Ethics , CSR	6
5	Leadership	6
	Total	30

Course Objectives:

By the end of the course, learner will be able to :

1. To relate, discuss, understand the management principles, processes and procedures in consideration of their efforts on individual actions.
2. Knowledge and understanding of the subject will enable the student to gain valuable insights into the working of business and other organization.

Course Outcomes:

After completion of this course the learner will be able to:

CO1: Describe the concepts of management. (Understand)

CO2: Apply principles of planning, decision making and controlling in organizations. (Apply)

CO3: Discuss organizational management strategies. (Understand)

CO4: Demonstrate understanding of business ethics, CSR and leadership. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Concept of management – concept, significance, managerial grid.</p> <p>Management in new millennium</p> <ul style="list-style-type: none"> ○ Four management functions ○ Mintzberg Managerial roles ○ Management as a set of skills <p>Evolution of Management - Contribution of F.W Taylor, Bureaucratic Management and Hawthorne Studies</p>	6
2	<p>Planning: Meaning, importance, process, MBO, planning premises, pitfalls of planning, formal planning and opportunity planning.</p> <p>Decision Making: Meaning, importance, process, techniques, difference between planning and decision making, cognitive biases and decision making.</p> <p>Controlling: Meaning, process, techniques. Close relationship of planning and controlling.</p>	6
3	<p>Organizing: Meaning, importance, features</p> <p>Managing the structure (vertical dimensions of organizational structure)</p> <ul style="list-style-type: none"> ○ Unity of command ○ Authority, Responsibility & Accountability ○ Span of control ○ Centralization and Decentralization <p>Managing the structure (horizontal dimensions of organizational structure): Line structure, Funnel structure, Divisional structure and Matrix Structure</p> <p>Directing : Meaning and process</p>	6
4	<p>Business Ethics: Meaning, purpose and scope of Business Ethics towards society and stakeholders, 3 Cs of business Ethics, Myths about business ethics.</p> <p>Corporate Social Responsibility: Meaning, need, issues in CSR , ESG</p>	6
5	<p>Leadership: Meaning, style, quality of good leader</p> <ul style="list-style-type: none"> ○ Power: The key to leadership. ○ Models of leadership: Trait model, Behaviour model, Contingency model ○ Transformational leadership: Meaning, Transformational and Transactional Leadership. ○ Great leaders: their style, activities and skills (Dhirubhai Ambani, Ratan Tata, Anand Mahindra, Bill Gates, Satya Nadella, Mark Zuckerberg). 	6

Reference Books

1. Management: People, Performance, Change, 2nd Edition, Luis R. Gomez-Mejia, David B. Balkin, Robert L. Cardy , McGraw-Hill Companies (2005)
2. Contemporary Management, 3rd Edition, Gereth Jones and Jennifer George, McGraw-Hill; 3 edition (2002)
3. Essentials of Management: International and Leadership Perspective 9th Edition, Harold Koontz and Heinz Weihrich, Tata McGraw Hill Publishing (2012)
4. Principles of Management, Ramasamy , Himalya Publication (2012)
5. Principles of Management, Tripathi Reddy, Tata Mc Grew Hill (2017)
6. Management Text & Cases, VSP Rao , Excel Books, Delhi (2010)
7. Essentials of Management, Koontz II & W, Mc. Grew Hill, New York (2015)
8. Principles of Management-Text and Cases –Dr..M.Sakthivel Murugan, New Age Publications (2003)
9. Management Concepts and OB, P S Rao & N V Shah, Ajab Pustakalaya

Practical

- Preparation of power-point presentation, which include videos, animations, pictures, graphics for better understanding theory and practical work. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered. The power-point slides should be put up on the LMS, along with the names of the students of the group, the name of the faculty, Department and College on the first slide.

OR

- Mini-project based on the implementation aspects of the theory topics covered. Faculty in-charge will allocate chapters/ parts of chapters to groups of students so that the entire syllabus to be covered

Evaluation Scheme

Test– 20 Marks

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform or a written test conducted in the classroom.

Assignments/Presentation: 15 marks

5 Marks - Active participation in routine class instructional deliveries:

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

Semester End Examination- 60 Marks

Duration - 2 Hours.

Theory question paper pattern:-

All questions are compulsory.		
Question	Based on	Marks
Q1	Unit 1, 2, 3, 4, 5	4 out of 5 questions (05 marks each)
Q2	Unit 1, 2, 3, 4, 5	2 out of 3 questions (07 marks each)
Q3	Unit 1, 2, 3, 4, 5	2 out of 3 questions (08 marks each)
Q4	Based on multiple Units	1 out of 2 questions (10 marks)

Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Examination)

***Syllabus of Courses of
Bachelor of Science in Information Technology Programme
at Semester IV
(Implemented during Academic Year 2022-23)***

1. DESIGN PATTERNS

*at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction	6
2	Designing a Document Editor	6
3	Creational Patterns	6
4	Structural Pattern	6
5	Behavioral Patterns	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand design patterns.
2. Acquire basic understanding of commonly used to design patterns to solve problems.
3. Compare the object-oriented programming model with the standard structured programming.
4. Uses the basic design principles in solving real life problems.
5. Understand the necessity of dealing with change.
6. Learn to apply the pattern based analysis and design to the software to be developed.

Course Outcome:**After completing this course, learners will be able to:**

CO1: Learn the role of design patterns in software development.(Understand)

CO2: Understands the pattern based design principle.(Understand)

CO3: Apply a fundamental set of design patterns utilizing object-oriented principles to solve real-world software design problems.(Apply)

CO4: Able to work individually as well as in teams to create reusable and cohesive software components.(Apply)

CO5: Create Design Patterns to solve real world problems.(Create)

Detailed syllabus:

Module	Topics	No. of Lectures
1	What is a design pattern? design patterns in MVC, Describing Design Patterns, The Catalog of Design Patterns, Organizing the Catalog, How Design Patterns Solve Design Problems, How to Select a Design Pattern, How to Use a Design Pattern.	6
2	A Case Study: Designing a Document Editor: Design Problems, Document Structure, Formatting, Embellishing the User Interface, Supporting Multiple Look-and-Feel Standards, Supporting Multiple Window Systems, User Operations Spelling Checking and Hyphenation, Summary.	6
3	Creational Patterns: Abstract Factory, Builder, Factory Method, Prototype, Singleton, Discussion of Creational Patterns.	6
4	Structural Pattern Part-I : Adapter, Bridge, Composite. Structural Pattern Part-II : Decorator, açade, Flyweight, Proxy.	6
5	Behavioral Patterns Part-I : Chain of Responsibility, Command, Interpreter, Iterator.Behavioral Patterns Part-II : Mediator, Memento, Observer, State, Strategy, Template Method ,Visitor, Discussion of Behavioral Patterns.	6

Reference Books

1. Design Patterns By Erich Gamma, Pearson Education.
2. Head First Design Patterns By Eric Freeman-O'reilly-spd.

Practical:

Practical 1: Implement Abstract Factory and Factory Method patterns

Practical 2: Implement Builder and Singleton patterns

Practical 3: Implement Prototype pattern

Practical 4: Implement Adapter and Bridge patterns

Practical 5: Implement Composite and Decorator patterns

Practical 6: Implement Chain of Responsibility pattern

Practical 7: Implement Iterator pattern

Practical 8: Implement Template pattern

Practical 9: Implement Memento pattern

Practical 10. Implement Facade pattern

2. DESIGN AND ANALYSIS OF ALGORITHMS

*at Semester IV
(Implemented during Academic Year 2022-23)
(w.e.f. 2020-21)*

Modules at a Glance

Sr. No	Modules	No. of Lectures
1	Fundamentals of Algorithmic Problem Solving	6
2	Applications	6
3	Computing a Binomial Coefficient	6
4	The Simplex Method	6
5	Limitations of Algorithm Power	6
	Total	30

Course Objective:

By the end of the course, learner will be able to:

1. Understand algorithms
2. Design efficient solutions for real-world problems.
3. Analyze and compare various algorithms
4. understand and analyse the problems solvable in polynomial time and non-deterministic polynomial time.

Course Outcome:

After the completion of the course the learners will be able to:

CO1: Analyze the asymptotic performance of algorithms (Analyze)

CO2: Write rigorous correctness proofs for algorithms. (Apply)

CO3: Demonstrate familiarity with major algorithms and data structures and explain the NP completeness. (Understand)

CO4: Apply important algorithmic design paradigms and methods of analysis. (Apply)

CO5: Synthesize efficient algorithms in common design situations. (Analyze)

CO6: Develop suitable algorithms for a given problem. (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	The notion of an Algorithm – Fundamentals of Algorithmic Problem Solving – Important Problem Types – Fundamentals of the Analysis of Algorithm Efficiency – Analysis Framework – Asymptotic Notations and its properties – Mathematical analysis for Recursive and Non-recursive algorithms.	6
2	Brute Force – Closest-Pair and Convex-Hull Problems-Exhaustive Search – Traveling Salesman Problem – Knapsack Problem – Assignment problem. Divide and conquer methodology – Merge sort – Quick sort – Binary search – Multiplication of Large Integers – Strassen’s Matrix Multiplication-Closest-Pair and Convex-Hull Problems.	6
3	Computing a Binomial Coefficient – Warshall’s and Floyd’s algorithm – Optimal Binary Search Trees – Knapsack Problem and Memory functions. Greedy Technique– Prim’s algorithm- Kruskal’s Algorithm- Dijkstra’s Algorithm-Huffman Trees.	6
4	The Simplex Method-The Maximum-Flow Problem – Maximum Matching in Bipartite Graphs- The Stable marriage Problem.	6
5	Limitations of Algorithm Power-Lower-Bound Arguments-Decision Trees-P, NP and NP-Complete Problems–Coping with the Limitations – Backtracking – n-Queens problem – Hamiltonian Circuit Problem – Subset Sum Problem-Branch and Bound – Assignment problem – Knapsack Problem – Traveling Salesman Problem- Approximation Algorithms for NP-Hard Problems – Traveling Salesman problem – Knapsack problem.	6

Reference Books

1. Thomas H.Cormen, Charles E.Leiserson, Ronald L. Rivest and Clifford Stein, “Introduction to Algorithms”, Third Edition, PHI Learning Private Limited, 2012.
2. Alfred V. Aho, John E. Hopcroft and Jeffrey D. Ullman, “Data Structures and Algorithms”, Pearson Education, Reprint 2006.
3. Donald E. Knuth, “The Art of Computer Programming”, Volumes 1& 3 Pearson Education, 2009. Steven S. Skiena, “The Algorithm Design Manual”, Second Edition, Springer, 2008.

Practical:

1. Sort a given set of elements using different sorting methods and determine the time required to sort the elements. Repeat the experiment for different values of n, the number of elements in the list to be sorted and plot a graph of the time taken versus n. The elements can be read from a file or can be generated using the random number generator.

2. Implement Knapsack problem using Dynamic Programming
3. From a given vertex in a weighted connected graph, find shortest paths to other vertices using Dijkstra's algorithm.
4. Find Minimum Cost Spanning Tree of a given undirected graph using Kruskal's algorithm.
5. Perform various tree traversal algorithms for a given tree.
6. Print all the nodes reachable from a given starting node in a digraph using both BFS and DFS methods.
7. Implement any scheme to find the optimal solution for the Traveling Salesperson problem and then solve the same problem instance using any approximation algorithm and determine the error in the approximation.
8. Find Minimum Cost Spanning Tree of a given undirected graph using Prim's algorithm.
9. Implement N Queen's problem using Backtracking.
10. Find the longest palindromic subsequence using dynamic programming

3. SYSTEM PROGRAMMING

*at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Linux Utilities	6
2	Files and Directories	6
3	Process and signal	6
4	Inter Process Communications, message queues, semaphores	6
5	Shared Memory and sockets	6
Total		30

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the basics of OS concepts, efficient scripts and utilities are to be used.
2. Learn the concept of files and directories.
3. Describe the working of processes and signals.
4. Describe the concept of IPC, semaphores, memory and sockets.
5. Design and implement code generators using C and gdb

Course Outcome:

After the completion of the course, the students would be able to

CO1: Understand and make effective use of Linux utilities and Shell scripting language (bash) to solve problems.(Apply)

CO2: Develop the skills necessary for systems programming including file system programming, process and signal management and inter-process communication.(Analyse)

CO3: Develop the basic skills required to write network programs using sockets.(Apply)

CO4: Design and implement system utility programs.(Create)

CO5: Describe UNIX file systems and process control.(Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Linux Utilities: File handling utilities, Security by file permissions, Process utilities, Disk utilities, Networking commands, Filters, Text Processing utilities and backup utilities.</p> <p>sed- scripts, operation, address, commands, applications, awk- execution, fields and records, scripts, operations, patterns, actions, associative arrays, string and mathematical functions, system commands in awk, applications.</p> <p>Shell programming with the Bourne again shell(bash): Introduction, shell responsibilities, pipes and Redirection, Here documents, Running a shell scripts, The shell as a programming language, Shell meta characters, File name substitution, Shell variables, Command substitution, Shell commands, The environment, Quoting, Test command, control structures, arithmetic in shell, shell script examples, interrupt processing, functions, debugging shell scripts</p>	6
2	<p>Files and Directories: File Concept, File types, File system Structure, File meta data – Inodes, Kernel support for files, System calls for I/O operations – open, create, read, write, lseek, dup2. File status information – stat family, file and record locking, fcntl function, Links – Soft links & hard links – symlink, link, unlink.</p> <p>Directories – creating, removing, changing directories – mkdir, rmdir, chdir, obtaining current working directory – getcwd, directory contents, scanning directories – opendir, readdir, closedir, rewinddir functions.</p>	6
3	<p>Process: Process concepts, layout of C program image in main memory, process environment –environment list, environment variables, getenv, setenv, Kernel support for process, process identification, process control-process creation. Replacing a process image, Waiting for a process, process termination, zombie process, orphan process, system call interface for process management – fork, vfork, exit, wait, waitpid, exec family, process groups, session and controlling terminal, difference between threads and processes.</p> <p>Signal- Introduction to signals, Signal generation and handling, Kernel support for signal, Signal function, unreliable signals, reliable signals, Kill, raise, alarm, pause, abort, sleep functions.</p>	6
4	<p>Inter Process Communications: - Introduction to IPC, IPC between processes on a single computer, IPC between processes on different systems, pipes – creating, IPC between related processes using Unnamed Pipes, FIFOs – creation, IPC between unrelated processes using FIFO (named pipes), difference between named and unnamed pipes, popen and pclose library functions.</p> <p>Message Queues – kernel support for messages, APIs for Message Queues, client/server examples.</p> <p>Semaphores – Kernel support for semaphores, APIs for semaphores, FILE locking with semaphores.</p>	6
5	<p>Shared Memory:- Kernel support for Shared memory, APIs for shared memory, shared memory examples.</p>	6

	Sockets:- Introduction to Berkeley Sockets, IPC over a network, client/server model, Sockets Address Structure(UNIX Domain & Internet Domain), Socket System calls for connection oriented Protocol and connectionless protocol, Example client/server programs – single server-client connection, multiple simultaneous clients, socket options – setsockopt and fcntl system calls, comparison of IPC mechanisms.	
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Reference Books

1. Unix concepts and Applications, 4th Edition, Sumitabha Das, TMH.
2. Beginning Linux Programming, 4th Edition, N.Matthew, R.Stones, Wrox, Willey India Edition.

Practical:

1. Installation of Unix/Linux operating system
2. Basic Commands
3. Write a shell script program to display list of user currently logged in
4. Shell script program to check whether given file is a directory or not.
5. Write a program using sed command to print duplicated lines of Input.
6. Write a grep/egrep script to find the number of character, words and lines in a file.
7. Write an awk script to develop a Fibonacci series.
8. Write a shell script to change the priority of processes.
9. Write a shell script program to check variable attributes of file and processes.
10. To execute programs using gdb to utilize its various features like breakpoints, conditional breakpoints etc.
11. Program to run multiple child processes using fork().

4. SOFTWARE ENGINEERING

*at Semester IV
(Implemented during Academic Year 2020-21)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Introduction to Software Engineering and SDLC	6
2	Introduction to Software Requirements Specifications	6
3	System Design and Object-oriented design using UML	6
4	Software Measurement and Metrics and Testing	6
5	Project management and Software Maintenance and Risk Analysis	6
	Total	30

Course Objective:

By the end of the course, learners will be able to:

1. Understand the basic theory of software engineering.
2. Understand the software development life cycle.
3. Understand and apply the basic project management practices in real life projects.
4. Understanding of approaches to verification and validation including static analysis, and reviews.
5. Describe software measurement and software risks.

Course Outcome:

After completing this course, learners will be able to:

CO1: Decompose the given project in various phases of a lifecycle. (Analyse)

CO2: Choose appropriate process model depending on the user requirements. (Evaluate)

CO3: Perform various life cycle activities like Analysis, Design, Implementation, Testing and Maintenance.(Apply)

CO4: Know various processes used in all the phases of the product. (Understand)

CO5: Apply the knowledge, techniques, and skills in the development of a software product. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction to Software Engineering: Introduction to Software, Types of Software, Classes of Software, Introduction to Software Engineering, Software Components, Software Characteristics, Software Crisis, Software Myths, Software Applications, Software-Engineering Processes, Programs Versus Software Products.</p> <p>Software-Development Life-Cycle Models Software-Development Life-Cycle, Waterfall Model, Prototyping Model, Spiral Model, Evolutionary Development Model, Iterative-Enhancement Model, RAD Model, Agile Model.</p>	6
2	<p>Introduction to Software Requirements Specifications Requirement Engineering, Process of Requirements Engineering, Information Modeling, Data-Flow Diagrams, Decision Tables, SRS Document, IEEE Standards for SRS Documents, SRS Validation, Components of SRS, Characteristics of SRS.</p> <p>Software Reliability and Quality Assurance Verification and Validation, Software Quality Assurance, Software Quality, International Standard Organization (ISO), Comparison of ISO-9000 Certification and the SEI-CMM, Reliability Issues, Reliability Metrics, Reliability Growth Modeling, Reliability Assessment.</p>	6
3	<p>System Design: System/Software Design, Architectural Design, Low-Level Design Coupling and Cohesion, Functional-Oriented Versus, object-Oriented Approach, Design Specifications, Verification for Design, Monitoring and Control for Design.</p> <p>Object-oriented design using UML - Class diagram, Object diagram, Use case diagram, Sequence diagram, Collaboration diagram, State chart diagram, Activity diagram, Component diagram, Deployment diagram.</p>	6
4	<p>Software Measurement and Metrics: Software Metrics, Halstead's Software Science, Function-Point Based Measures, Cyclomatic Complexity</p> <p>Software Testing: Introduction to Testing, Testing Principles, Testing Objectives, Test Oracles, Levels of Testing, White-Box Testing/Structural Testing, Functional/Black-Box Testing, Test Plan, Test Case Design.</p>	6
5	<p>Project management: Revision of Project Management Process, Role of Project Manager, Project Management Knowledge Areas, Managing Changes in requirements, Software-Project Estimation, Constructive Cost Model (COCOMO).</p>	6

	Software Maintenance and Risk Analysis: Software as an Evolution Entity, Software-Configuration Management Activities, Change-Control Process, Software-Version Control, Software-Configuration Management, Need for Maintenance, Categories of Maintenance, Maintenance Costs, Software-Risk Analysis and Management.	
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Reference Books

1. R.S. Pressman, Software Engineering: A Practitioner's Approach (7th Edition), McGrawHill, 2009.
2. P. Jalote, An Integrated Approach to Software Engineering (2nd Edition), Narosa Publishing House, 2003.
3. K.K. Aggarwal and Y. Singh, Software Engineering (revised 2nd Edition), New Age International Publishers, 2008.
4. I. Sommerville, Software Engineering (8th edition), Addison Wesley, 2006.
5. Software Engineering & Testing , B.B.Agarwal, S.P.Tayal, M.Gupta.

Practical:

1. Problem Statement on Case Study/Mini Project
2. ER Diagram
3. Use Case Diagram
4. Class Diagram
5. Activity Diagram
6. Sequence Diagram
7. State Machine Diagram
8. Component Diagram
9. Project Management
 - Computing FP
 - Gantt chart
 - Estimation Effort and schedule
10. Creating Test Cases using following testing types
 - Black Box Testing
 - White Box Testing

5. PROBABILITY THEORY

at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Topics	No. of Lectures
1	Important Concept in Probability	9
2	Random variables	9
3	Standard univariate discrete distributions	9
4	Continuous univariate distributions	9
5	Chebyshev's inequality and applications	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. Understand the fundamentals of probability theory
2. Explain the random variable and the underlying distribution
3. Apply the chebychev's inequality and central limit theorem

Course Outcome:

After the completion of the course the learners will be able to:

- CO1: Analyze a given dataset using statistical techniques. (Analyse)
- CO2: Demonstrate the probability distributions (Understand)
- CO3: Model the given data using a suitable distribution (Apply)
- CO4: Demonstrate the properties of the data in terms of the distribution. (Analyse)
- CO5: Apply chebychev's inequality and central limit theorem (Apply)
- CO6: work on a real data set and make a statistical model for analysis and prediction (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Important Concept in Probability: Definition of probability – classical and relative frequency approach to probability, Richard Von Mises, Cramer and Kolmogorov’s approaches to probability, merits and demerits of these approaches (only general ideas to be given) Random Experiment : Trial, sample point and sample space, definition of an event, Operation of events, mutually exclusive and exhaustive events. Discrete sample space, properties of probability based on axiomatic approach , conditional probability independence of events, Baye’s theorem and its applications.	9
2	Random variables: Definition of discrete random variables, probability mass function , idea of continuous random variable, probability density function , illustrations of random variables and its properties, expectation of a random variable and its properties moments, measures of location, dispersion, skewness and kurtosis, probability generating function (if it exists), their properties and uses.	9
3	Standard univariate discrete distributions and their properties, Discrete uniform, Binomial, Poisson , Hypergeometric, and Negative Binomial distributions .	9
4	Continuous univariate distributions – uniform, normal, Cauchy, Laplace , Exponential, ChiSquare, Gamma and Beta distributions ,Bivariate distribution (including marginal and conditional distributions).	9
5	Chebyshev’s inequality and applications, statements and application of weak law of large numbers and central limit theorems. De moivre’s central limit theorem, Lindberg Levy form of central limit.	9

Reference Books

1. Bhat B.R, Srivenkatramana T and Rao Madhava K.S.; Statistics: A Beginner’s Text, Vol 1, New Age International (P) Ltd.
2. Edward P.J. Ford J.S. and Lin : Probability for Statistical Decision – Making , Prentice Hall.

Evaluation will be Continuous Internal Evaluation (25 Marks) and project presentation and viva-voce (75 Marks)

DISCIPLINE SPECIFIC ELECTIVE (Any ONE from GROUP A)

6A. ADVANCED WEB PROGRAMMING - II

at Semester IV

(Implemented during Academic Year 2022-23)

(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	AngularJS Introduction	6
2	AngularJS Components	6
3	Node.js Introduction	6
4	Node.js Components	6
5	Node.js with MongoDB	6
Total		30

Pre-requisite: Student must have completed ADVANCED WEB PROGRAMMING – I course in Semester III.

Course Objectives:

By the end of the course, learners will be able to:

1. Understand and learn Angular JS concepts and develop web applications with its components.
2. Understand and learn Node JS environment and develop web applications with MongoDB database.
3. Explain and implement the components of AngularJS.
4. Develop web applications with Node JS
5. Implement MongoDB with Node JS

Course Outcome:

After completing this course learners will be able to:

CO1: Understand the concept of Angular JS (Understand)

CO2: Describe the working of Angular JS with its components.(Understand)

CO3: Recognize the concept of Node JS usage in web application.(Analyse)

CO4: Ability to develop web application with Angular JS and Node JS.(Apply)

CO5: Create and develop node JS applications with MongoDB.(Create)

Detailed syllabus:

Module	Topics	No. of Lectures
1	AngularJS Introduction, AngularJS - MVC Architecture, AngularJS Expressions, AngularJS Modules, AngularJS Directives, AngularJS Model, AngularJS Data Binding, AngularJS Controllers, AngularJS Scopes, AngularJS Filters, AngularJS Services, AngularJS Http, AngularJS DOM, AngularJS Events, AngularJS Forms, AngularJS Validation	6
2	AngularJS Tables, AngularJS Select, AngularJS SQL, AngularJS API, AngularJS Includes, AngularJS Animations, AngularJS Routing, AngularJS Application, AngularJS AJAX, AngularJS Views, AngularJS Scopes, AngularJS Services, AngularJS Dependency Injection, AngularJS Custom Directives, AngularJS Internationalization	6
3	Node.js Introduction, Node.js - Introduction, Node.js - Environment Setup, Node.js Modules, Node.js HTTP Module, Node.js File System, Node.js URL Module, Node.js REPL Terminal, Node.js Package Manager (NPM), Node.js Callbacks Concept, Node.js NPM, Node.js Event Loop, Node.js Event Emitter	6
4	Node.js Buffers, Node.js Streams, Node.js File System, Node.js Global Objects, Node.js Utility Modules, Node.js Upload Files, Node.js Email, Node.js Web Module, Node.js Express Framework, Node.js RESTful API, Node.js Scaling Application, Node.js Packaging	6
5	Node.js with MongoDB: MongoDB introduction, MongoDB Create Database, MongoDB Create Collection, MongoDB Insert, MongoDB Find, MongoDB Query, MongoDB Sort, MongoDB Delete, MongoDB Drop Collection, MongoDB Update, MongoDB Limit, MongoDB Join	6

Reference Books

1. Pro AngularJS – Adam Freeman,APress,2014
2. AngularJS Programming by example - AgusKurniawan,PE Press
3. AngularJS UI Development – Amit Ghart, Matthias Nehlsen,Packt Publishing
4. Beginning Node.js – Basarat Ali Syed,APress, 2014
5. Node.js Web Development – David Herron,Packt Publishing,2018
6. Getting MEAN with Mongo, Express, Angular and Node – Simon Holmes,Manning Publications,2018.

Practical:

1. Write a program on basic Angular JS
2. Write a program to demonstrate AngularJS form and validation.
3. Write a program to demonstrate AngularJS Ajax and AngularJS views
4. Write a program to demonstrate Node.js Package Manager.
5. Write a program to demonstrate Node.js Event Emitter.
6. Write a program to demonstrate Node.js Buffer
- 7 Write a program to demonstrate Node.js email
8. Write a program to demonstrate Node.js with json
9. Write a program to demonstrate Node.js with MongoDB with its operations.
10. Write a program to demonstrate Node.js with MongoDB Limit and MongoDB Join

7A. HYBRID MOBILE APPLICATION DEVELOPMENT – II

*at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction to React	6
2	Templating using JSX	6
3	Working with state and Props	6
4	React Components	6
5	React Modules	6
Total		30

Pre-requisite: Student must have completed HYBRID MOBILE APPLICATION DEVELOPMENT - I course in Semester III.

Course Objective:

By the end of the course learner will be able to:

1. Focus in this course is on the basic understanding of web frameworks and API's for user interface design by Angular JS and Ionic Framework for Mobile Application Development.
2. On the completion of the course, students will be able to develop Hybrid mobile applications.

Course Outcome:

After completing this course learners will be able to:

CO1: Learn how to build single page applications with React JS (Understand)

CO2: Use and Install React-Native dependencies for MAC and Windows Run Android and IOS simulator (Apply)

CO3: Understand and Learn the key concepts of the NodeJS (Understand)

CO4: Understand Nodejs, learn rapidly growing web server technology, Nodejs & understand how NodeJS works with Node course! (Understand)

CO5: Learn how to Style with React-Native and flex-box rules (Analyse)

Detailed syllabus:

Module	Topics	No. of Lecture
1	Introduction to React: What is React?, Why React?, React version history, React 16 vs React 15, Just React - Hello World, Using create-react-app, Anatomy of react project, Running the app, Debugging first react app	6
2	Templating using JSX: Working with React. createElement, Expressions, Using logical operators, Specifying attributes, Specifying children, Fragments, Component: Significance of component architecture, Types of components, Functional, Class based, Pure, Component Composition	6
3	Working with state and Props: What is state and its significance, Read state and set state, Passing data to component using props, Validating props using propTypes, Supplying default values to props using default-Props	6
4	Rendering Lists, Event Handling, Understanding component lifecycle and handling errors. Working with Forms, Context, Code Splitting, Hooks, Routing with react route, Redux, Immutable.js, React Redux, Redux Middleware	6
5	Unit Testing, Webpack Primer, Isomorphic React	6

References Books

1. Learning React: Functional Web Development with React and Redux - Book by Alex Banks and Eve Porcello
2. The Road to Learn React: Your Journey to Master Plain Yet Pragmatic React. Js - Book by Robin Wieruch
3. ReactJS by Example - Building Modern Web Applications with React - Book by Prathamesh Sonpatki

Practical:

1. Install create-react-app and create a new react project.
2. Create a Todo List with different JSX expression, apply CSS via className and styles.
3. Create multi-step form in React JS
4. Create Fragments with Flexbox
5. Create a Card Component for the Author written with Multiple Books
6. Create a shopping cart using different props types.
7. Create drop down menu using react bootstrap.
8. Create a functional component that uses the ability of state and life cycle features
 1. Create counter increment and decrement.
 2. Create song playlist
9. Create a conditional rendering for a shoe store (logging in) / subscribing to the email and map function for discount.
10. Create a component lifecycle with football points and chats
11. Create a program to handle error boundaries
12. Create a library Subscription Form using maps and navigation
13. Create an Online Bidding or auction website with routing rules and components (Code Splitting and Lazy loading)
14. To create a project using Synthetic Events.

7A. ADVANCED JAVA

*at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Networking and Servlets	6
2	JDBC and Cookies	6
3	JSP and MVC	6
4	Enterprise JavaBeans	6
5	Java Persistence API and Web Services	6
Total		30

Pre-Requisite:

To study Advanced Java basic knowledge of core java is needed..

Course Objective:

By the end of the course, learners will be able to:

- Learn to perform socket programming in java.
- Get an understanding on Enterprise Java and the servlet technology.
- Explain the database connection using JDBC.
- Understand the concept of cookies and session tracking in java.
- Work with JSP, EJB and implement it.

Course Outcome:

After completing this course learner will be able to:

CO1: Develop networking concept using Socket Programming. (Create)

CO2: Understand Enterprise Application and Java EE architecture. (Understand)

CO3: Explain the concept of servlet, JDBC and apply it through coding. (Understand, Apply)

CO4: Learn and analyse the concept of cookies and session tracking in Java. (Analyse)

CO5: Create applications using servlet, JSP, EJB along with implementation of database. (Create)

CO6: Basic understanding of JavaBean, Web services and their applications. (Understand)

Detailed syllabus:

Module	Topics	No.of Lectures
1	<p>Networking (Socket Programming): The java.net package, Connection oriented transmission – Stream Socket Class. Creating a Socket to a remote host on a port (creating TCP client and server) Simple Socket Program Example.</p> <p>Introduction to Java EE: What is an Enterprise Application? What is java enterprise edition? Java EE Technologies, Java EE evolution, Glassfish server.</p> <p>Java EE Architecture, Server and Containers: Types of System Architecture, Java EE Server, Java EE Containers.</p> <p>Server side programming with Java Servlet: Introduction, The need for Dynamic content, Java Servlet Technology, Lifecycle of a Servlet, a simple welcome servlet, Servlet API, Handling get and post request (HTTP), Handling data from HTML to servlet, Retrieving data from database to servlet(Servlet-JDBC).</p>	6
2	<p>Database Programming with JDBC: Introduction, JDBC Architecture, Types of Drivers, Basic JDBC program Concept, Making database Connection, Standard Statement, PreparedStatement, Callable statement ResultSet, Executing SQL commands, Executing queries, Metadata and Transaction.</p> <p>Cookies: Kinds Of Cookies, Where Cookies Are Used? Creating Cookies Using Servlet, Dynamically Changing The Colors Of A Page.</p> <p>Session tracking: Introduction, Lifecycle of HTTP Session, Methods of session tracking- User Authorization, URL rewriting, Hidden form fields.</p>	6
3	<p>JSP: Why use Java Server Pages? JSP v\s Servlets, Life Cycle of a JSP Page, How does a JSP function? How does JSP execute? Simple first JSP program, JSP architecture.Implicit Objects,Scripting elements – Declarations, Expressions, and Scriplets, Comments, JSP Directives, Action elements-forward, include, use bean, get and set property. JSP with database.</p> <p>Java Beans: Introduction, Components of JavaBean, JavaBeans Properties. Examples.</p> <p>MVC: What is MVC? History of MVC, Features of MVC, MVC architecture, Components of MVC, Examples- A simple implementation of MVC using Java, Advantages and Disadvantages.</p>	6

4	<p>Introduction To Enterprise JavaBeans: What is EJB? Benefits of EJB, When to use EJB? Enterprise bean architecture, types of enterprise bean.</p> <p>Working With Session Beans: Introduction, When to use Session Beans? Types of Session Beans, Remote and Local Interfaces, Accessing Interfaces, Lifecycle of Enterprise Beans, Packaging Enterprise Beans, Example of Stateful Session Bean, Example of Stateless Session Bean, Example of Singleton Session Beans.</p> <p>Working with Message Driven Beans: Lifecycle of a Message Driven Bean, Uses of Message Driven Beans, The Message Driven Beans Example.</p> <p>Java Naming and Directory Interface: Introduction to naming and directory services, What is JNDI? Basic lookup.</p>	6
5	<p>Persistence, Object/Relational Mapping And JPA: What is Persistence? Persistence in Java, Object/Relational Mapping,</p> <p>Introduction to Java Persistence API: The Java Persistence API, JPA, ORM, Database and Application, Architecture of JPA, How JPA Works and its specification.</p> <p>Introduction to Hibernate: What is Hibernate? Why Hibernate? Hibernate, Database and the application, Component of hibernate application, Architecture of hibernate</p> <p>Writing Hibernate Application: Creating Hibernate Configuration File, Adding a Mapping Class, Creating JSPs, Running the hibernate Application</p> <p>Web services: Introduction, Web service components, SOAP, RESTful, SOAP v/s REST, Java Web services API. Building a web services using JAX-WS.</p>	6

Reference Books

1. The Complete Reference Java- Herbert Schildt 7th edition, McGraw Hill.
2. Java EE 7 For Beginners :Sharanam Shah, Vaishali Shah : SPD : First : 2017
3. Java EE 8 Cookbook : Build reliable applications with the most or robust and mature technology for enterprise development : Elder Moraes : Packt : First : 2018
4. Advanced Java Programming :Uttam Kumar Roy : Oxford Press : 2015
5. Core Java for Beginners by Sharanam Shah

Practical:

1. Implement a program on Socket Programming.
2. Implement the following Simple Servlet applications.
 - a. Create a simple calculator application using servlet.
 - b. Create a servlet for a login page. If the username and password are correct then it says message “Hello <username>” else a message “login failed”.
 - c. Create a registration servlet in Java using JDBC. Accept the details such as Username, Password, Email, and Country from the user using HTML Form and store the registration details in the database.
3. Implement the following Servlet applications.
 - a. Design database for student administration. Develop servlet(s) to perform CRUD operations. The program should do the following:-
 - i. Insert details for a new student.
 - ii. View all the details of the students.
 - iii. Update details of existing student.
 - iv. Delete details of a student.
 - b. Develop Simple Servlet Question Answer Application using Database.
4. Programs on cookies and session in servlet.
 - a. Create a servlet that uses Cookies to store the number of times a user has visited servlet.
 - b. Create a servlet demonstrating the use of session creation and destruction. Also check whether the user has visited this page first time or has visited earlier also using sessions.
5. Demonstrate following JSP programs.
 - a. Create Customer table in CUST database. Perform select, insert and delete operations on Customer table using JSP.
 - b. Create a registration and login JSP application to register and authenticate the user based on username and password using JDBC.
 - c. Develop a simple JSP application to display values obtained from the use of intrinsic objects of various types.
6. Implement following JSP applications
 - a. Develop a simple JSP application to pass values from one page to another with validations. (Name-txt, age-txt, hobbies-checkbox, email-txt, gender-radio button).
 - b. Create an html page with fields, eno, name, age, desg, salary. Now on submit this data to a JSP page which will update the employee table of database with matching eno.
7. Javabeen program
 - a. Write a Student class with three properties. The useBean action declares a JavaBean for use in a JSP. Write Java application to access JavaBeans Properties.

8. Demonstrate following EJB applications.

- a. Create a Currency Converter application using EJB.
- b. Develop a Simple Room Reservation System Application Using EJB.
- c. Develop simple shopping cart application using EJB [Stateful Session Bean].

9. Implement the following EJB applications with different types of Beans.

- a. Develop simple EJB application to demonstrate Servlet Hit count using Singleton Session Beans.
- b. Develop simple visitor Statistics application using Message Driven Bean [Stateless Session Bean].
- c. Develop simple Marks Entry Application to demonstrate accessing Database using EJB.

10. Implement following Hibernate applications.

- a. Develop a Hibernate application to store Feedback of Website Visitor in MySQL Database.
- b. Develop a Hibernate application to store and retrieve employee details in MySQL Database.

11. Programs on web services.

- a. Develop a simple “Hello World” Web Service with SOAP in Java.
- b. Develop a Simple Web Service and Client with JAX-WS.

DISCIPLINE SPECIFIC ELECTIVE (Any ONE from GROUP B)

8B. MULTIMEDIA SYSTEMS

*at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)*

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction, Hardware and Software	6
2	Compression and Multimedia Objects	6
3	Audio and Video Compression	6
4	Multimedia with Internet and Animation	6
5	Multimedia-looking towards Future	6
Total		30

Pre-requisite: Students must have completed COMPUTER GRAPHICS AND ANIMATION course in Semester III.

Course Objectives:

By the end of the course, learners will be able to:

1. Become multimedia/graphics designers and engineers in their areas of expertise.
2. Understand the basic components of multimedia and different compression techniques used.
3. Get an understanding of Animation and Virtual Reality.
4. Implement different techniques for creating animated videos and edit different images using softwares.
5. Apply different effects and color coding on various objects.

Course Outcome:

After completing this course learner will be able to:

CO1: Use different compression techniques of text, audio, video and apply basics of animation.

(Apply)

CO2: Understand different file formats used for text, image, audio and video and compare between them. (Understand, Analyze)

CO3: Apply different animation on character, object, etc. Apply text effects, color variations on objects. (Apply)

CO4: Use different software for animation purposes and create a small animation clip and enhance graphics images using different software's. (Create)

CO5: Create different logos, cards and websites using multimedia software. (Create)

CO6: Discuss the concept of Virtual reality and its applications. (Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction, Hardware and Software</p> <p>Introduction to Multimedia: Definition, History of Multimedia, characteristics of multimedia, multimedia building blocks/components, Multimedia elements, Multimedia architecture, analog and digital representations, evolving technologies for multimedia, Multimedia applications.</p> <p>Multimedia-Hardware and Software: Multimedia Hardware – Macintosh and Windows production, Platforms, Hardware peripherals – Connections, Memory and storage devices, Media software – Basic tools, making instant multimedia, Multimedia software and Authoring tools, Production Standards.</p>	6
2	<p>Compression and Multimedia Objects</p> <p>Compression and coding: Definitions, need of data compression, types of compression, basic compression techniques- run length, Huffman's coding. Text, Graphics and Image data representation: Text, using text in multimedia, text file formats(txt,doc, rtf, pdf), text compression techniques. Basic Image fundamentals, image File formats - (BMP, TIFF, JPEG, GIF), image acquisition, graphics/image data types, color models in images, image processing and software, Image enhancement, image compression techniques.</p>	6
3	<p>Audio and Video Compression</p> <p>Audio and Audio compression: Introduction, Acoustics, Sound Waves, Types and Properties of Sounds, Psycho-Acoustics, Components of an Audio Systems, Digitization of audio, synthesizers, MIDI, digital audio processing, Quantization and Transmission of audio, Audio File Formats, audio compression techniques, audio processing software. Video and video compression: Introduction, types of video signal, television system, video color spaces, digital video, digital video processing, video file formats, video compression techniques, video recording and storage formats, video processing software</p>	6
4	<p>Multimedia with Internet and Animation:</p> <p>Multimedia and the Internet: History, Internet working, Connections, Internet Services, The World Wide Web, Tools for the WWW – Web Servers, Web Browsers, Web page makers and editors, Plug-Ins and Delivery Vehicles, HTML, VRML, Designing for the WWW – Working on the Web, Multimedia Applications – Media Communication, Media Consumption, Media Entertainment, Media games.</p>	6

	Animation: Basics of animation, types of animation, principles of animation, use of animation, traditional animation, computer based animation, OpenGL overview	
5	Multimedia-looking towards Future Multimedia-looking towards Future: Digital Communication and New Media, Interactive Television, Digital Broadcasting, Digital Radio, Multimedia Conferencing, Assembling and delivering a project-planning and costing, Designing and Producing, content and talent, Delivering, CD-ROM technology. Virtual Reality: Concept, Forms of VR, VR applications, VR devices: Hand Gloves, Head mounted tracking system, VR chair, VCR, 3D Sound system, Head mounted display.	6

Reference Books

1. Ranjan Parekh, "Principles of Multimedia", 2/E, Tata McGraw-Hill, ISBN: 1259006506
2. Ze-Nian Li, Marks S. Drew, "Fundamentals of Multimedia", Pearson Education
3. Keyes, "Multimedia Handbook", TMH, 2000.
4. R. Steinmetz and K. Nahrstedt, 2001, Multimedia: Computing, Communications & Applications, Pearson, Delhi.
5. S. Rimmer, 2000, Advanced Multimedia Programming, PHI, New Delhi..

Practical:

(Any open source/proprietary animation software (1-5), Photoshop (6-8), Dreamviewer (9-10))

1. To Move an object, to move an object in the path
2. Text flip, Text color change,
3. Creating a link using texts and objects, change the color of the object.
4. Shape Tweening and Using shape hints, Motion tweening, hybrid tweening.
5. Character Animation, Object Animation, Drawing Images
6. To create a greeting card, Create background picture
7. Text and Photo effects, editing images.
8. Designing Logos
9. Creating menu bar
10. Creating Pages and sites

Case Study

Create a project/ case study to demonstrate a small animation clip / create greeting card, logo or business card.

9B. INTERNET OF THINGS

at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	SoC and Raspberry Pi.	6
2	ARM 8 Architecture and Programming Raspberry Pi	6
3	Programing interfaces	6
4	Useful Implementations and Introduction to IoT	6
5	IoT Security and IoT Service as a Platform	6
Total		30

Prerequisite:

Students must have completed the EMBEDDED SYSTEMS course in Semester III.

Course Objectives:

By the end of the course, learners will be able to:

1. Understand the concept of System on Chip technology
2. Understand and implement basic concepts of Raspberry Pi
3. Understand the concept of Internet of Things
4. To configure the Raspberry Pi with the help of Linux Commands

Course Outcome:

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

CO1: Explain the System on Chip along with its structure and few products. (Level: Understand)

CO2: Explain the basic components of Raspberry Pi. (Level: Understand)

CO3: Write different commands of Linux programming for configuration of Raspberry Pi.
(Level: Apply)

CO4: Describe the different communication interface used by Raspberry Pi. (Level: Understand)

CO5: Designing IoT based Project. (Level: Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	SoC and Raspberry Pi. System on Chip: What is System on chip? Structure of SoC. SoC products: FPGA, GPU, APU, Compute Units.	6
2	ARM 8 Architecture: SoC on ARM 8. ARM 8 Architecture Introduction Introduction to Raspberry Pi: Introduction to Raspberry Pi, Raspberry Pi Hardware, Preparing your raspberry Pi. Raspberry Pi Boot: Learn how this small SoC boots without BIOS. Configuring boot sequences and hardware. Programming Raspberry Pi Raspberry Pi and Linux: About Raspbian, Linux Commands, Configuring Raspberry Pi with Linux Commands	6
3	Programing interfaces: Introduction to Node.js, Python, NodeRed Raspberry Pi Interfaces: UART, GPIO, I2C, SPI	6
4	Useful Implementations: Cross Compilation, Pulse Width Modulation, SPI for Camera. Introduction to IoT: What is IoT? IoT examples, Simple IoT LED Program. IoT and Protocols	6
5	IoT Security: HTTP, UPnp, CoAP, MQTT, XMPP. IoT Service as a Platform: Clayster, Thinger.io, SenseIoT, carriers and Node RED. IoT Security and Interoperability: Risks, Modes of Attacks, Tools for Security and Interoperability.	6

Reference Books

1. Learning Internet of Things, Peter Waher, Packt Publishing(2015) 2) Mastering the Raspberry Pi, Warren Gay, Apress(2014)

Additional Reference(s):

1) Abusing the Internet of Things, Nitesh Dhanjani, O'Reilly

Practical:

1. Preparing Raspberry Pi: Hardware preparation and Installation
2. Linux Commands: Exploring the Raspbian
3. GPIO: Light the LED with Python
4. GPIO: LED Grid Module: Program the 8X8 Grid with Different Formulas
5. SPI: Camera Connection and capturing Images using SPI
6. Real Time Clock display using PWM.
7. Stepper Motor Control: PWM to manage stepper motor speed.
8. Node RED: Connect LED to Internet of Things
9. Stack of Raspberry Pi for better Computing and analysis
10. Create a simple Web server using Raspberry Pi

10B. PRINCIPLES OF MARKETING

at Semester IV
(Implemented during Academic Year 2022-23)
(wef 2020-21)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction to Marketing	6
2	Segmentation, Targeting, Positioning, MIS and Consumer Behaviour	6
3	Marketing Mix	6
4	Advertising, Sales Promotion, Public Relations	6
5	Personal Selling, Direct Marketing and Marketing Strategies in the Digital Age	6
Total		30

Pre-requisite: Student must have completed PRINCIPLES OF MANAGEMENT course in Semester III.

Course Objectives:

By the end of the course, learner will be able to:

1. Introduce the marketing concept and how we identify, understand and satisfy the needs of customers and markets.
2. Analyze companies and competitors and to introduce marketing strategy to increase awareness of the strategic and tactical decisions behind today's top performing brands.

Course Outcomes:

After completion of this course the learner will be able to:

CO1: Explain the core concepts of marketing. (Understand)

CO2: Apply concepts of segmentation, targeting, positioning and consumer behaviour. (Apply)

CO3: Analyse the elements of the marketing mix. (Analyse)

CO4: Compare and contrast the different strategies for promotion. (Analyse)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Importance of marketing: Definition, Importance of marketing, The 4P's and 4C's of marketing. Marketing v/s Selling.</p> <p>Core Marketing Concepts Needs want and demand, Target markets, positioning & segmentation, Offering and Brands, Value and Satisfaction, Marketing Channels, Supply Chain, Competition, Marketing Environment.</p> <p>Company Orientation towards the Marketplace The Production Concept, The Product Concept, The selling Concept, The Marketing Concept, The Holistic Marketing Concept.</p> <p>Changes in the Marketing Place The new digital age ,Rapid Globalization, Ethics and Responsibility Growth for Not for Profit Marketing.</p>	6
2	<p>Segmentation – Meaning, importance, basis.</p> <p>Targeting – Meaning, evaluating market segments and selecting market segments, concentrated marketing, micromarketing, choosing a target marketing strategy.</p> <p>Positioning – Meaning, strategies, developing a positioning statement.</p> <p>MIS and Consumer Behaviour Meaning, features and Importance, Consumer Behaviour meaning, Importance, Factors affecting consumer behaviour.</p>	6
3	<p>Marketing mix: Meaning – elements of Marketing Mix.</p> <p>Product - Product Services and experience, Levels of Products, Product line decisions, Product mix decisions, New product development – failure of new product, Product life cycle strategies.</p> <p>Branding Strategy – Building strong brands, Brand equity and Managing Brands.</p> <p>Pricing – Objective, Factors influencing pricing policy and pricing strategy.</p> <p>Physical distribution – meaning, Factor affecting channel selection, types of marketing channels.</p>	6
4	<p>Advertising - Setting advertising objectives, Setting the advertising budget, Developing advertising strategy.</p> <p>Sales Promotion – Objectives, Major sales promotion tools.</p> <p>Public-Relations – Role and Impact of Public Relations, Major Public Relations tools.</p>	6
5	<p>Personal Selling – Nature of Personal Selling, The role of sales force.</p> <p>Direct Marketing – The new direct marketing model, benefits and growth of direct marketing.</p> <p>Marketing Strategies in the Digital Age – E-Business, E-Commerce and E-Marketing, Benefits to buyer, Benefits to seller, E-Market domains (B2C, B2B, C2C, C2B), Click only versus Click and Mortar E-Marketers, Opportunities and Challenges to E-Marketing.</p>	6

Reference Books

1. Marketing Management, A South Asia Perspective 13th edition, Philip Kotler, Kevin Lane Keller, Abraham Koshy, Mithileshwar Jha
2. Principles of Marketing 13th edition: Pearsons, Philip Kotler, Gary Armstrong, Prafulla Y. Agnihotri, Ehsan ul Haque
3. Kotler, Philip, Marketing Management, Prentice Hall, New Delhi.
4. Stanton, Etzel, Walker, Fundamentals of Marketing, Tata-McGraw Hill, New Delhi.
5. Saxena, Rajan, Marketing Management, Tata-McGraw Hill, New Delhi.
6. McCarthy, E.J., Basic Marketing: A managerial approach, Irwin, New York.

Practical: PROJECT

Evaluation Scheme

Test– 20 Marks

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular object-oriented dynamic learning environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform or a written test conducted in the classroom.

Assignments/Presentation: 15 marks

5 Marks - Active participation in routine class instructional deliveries:

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

Semester End Examination- 60 Marks

Duration - 2 Hours.

Theory question paper pattern:-

All questions are compulsory.		
Question	Based on	Marks
Q1	Unit 1, 2, 3, 4, 5	4 out of 5 questions (05 marks each)
Q2	Unit 1, 2, 3, 4, 5	2 out of 3 questions (07 marks each)
Q3	Unit 1, 2, 3, 4, 5	2 out of 3 questions (08 marks each)
Q4	Based on multiple Units	1 out of 2 questions (10 marks)

Practical Examination – 50 marks (Duration: 2 Hours)

- Each practical course carries 50 Marks : 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Examination)

Nagindas Khandwala College (Autonomous)

**Syllabus and Question Paper Pattern
of Courses of**

Bachelor of Science Information Technology Programme

Third Year

Semester V and VI

Under Choice Based Credit, Grading and Semester System

(Implemented during Academic Year 2022-2023)

THIRD YEAR

(Implemented during Academic Year 2022-2023) **60:40 128 credits**

Sr No	Semester V	Subject code	Total Marks	Credits	Sr. No.	Semester VI	Subject code	Total Marks	Credits
	Core Course (CC)					Core Course (CC)			
1	CC 13: Principles of Artificial Intelligence	2251UITPA	60-40 100	3	1	CC 15: Information Security Management	2261UITIM	60-40 100	3
	CC 13: Principles of Artificial Intelligence Practical	2251UITPR	50	1		CC 15: Information Security Management Practical	2261UITPR	50	1
2	CC 14: Data Mining and Warehousing	2252UITDW	60-40 100	3	2	CC 16: Business Intelligence	2262UITBI	60-40 100	3
	CC 14: Data Mining and Warehousing Practical	2252UITPR	50	1		CC 16: Business Intelligence Practical	2262UITPR	50	1
	Discipline Specific Elective (DSE)					Discipline Specific Elective (DSE)			
3	Discipline Specific Elective (DSE-5) (Any one of group A)				3	Discipline Specific Elective (DSE-7) (Any one of group A)			
	Geographic Information Systems	2253UITGS	60-40 100	3		Remote Sensing	2263UITRS	60-40 100	3
	Geographic Information Systems Practical	2253UITGSPR	50	1		Remote Sensing Practical	2263UITRSPR	50	1
	Personal Effectiveness Management	2253UITPM	60-40 100	3		Event Marketing	2263UITEM	60-40 100	3
	Personal Effectiveness Management Project	2253UITPMPR	50	1		Event Marketing Project	2263UITEMPR	50	1
4	Discipline Specific Elective (DSE-6) (Any one of group B)				4	Discipline Specific Elective (DSE-8) (Any one of group B)			
	Foundations of Software Testing	2254UITST	60-40 100	3		Project Management	2264UITPM	60-40 100	3
	Foundations of Software Testing Practical	2254UITSTPR	50	1		Project Management Practical	2264UITPMPR	50	1
	Cloud Computing	2254UITCC	60-40 100	3		Cyber Laws and Introduction to Blockchain	2264UITLB	60-40 100	3

	Cloud Computing Practical	2254UITCCPR	50	1		Cyber Laws and Introduction to Blockchain Practical	2264UITLBPR	50	1
	.Net Technologies	2254UITNT	60-40 100	3					
	.Net Technologies Practical	2254UITNTPR	50	1					
5	Project Implementation	2255UITPI	100	4	5	Project Implementation	2265UITPI	100	4
	TOTAL			20		TOTAL			20

1. Principles of Artificial Intelligence

at Semester V

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Problem solving Search Methods	9
2	Data mining	9
3	Machine Learning	9
4	Introduction to Deep Learning Models	9
5	Case study with MNIST database	9
	Total	45

Course Objectives:

By the end of the course, learner will be able to:

1. To study the foundations for AI problem solving techniques and knowledge representation formalisms
2. To introduce students through some of the latest techniques in deep learning.
3. To explore the adaption of artificial intelligence techniques in real-time scenarios.
4. To provide Hands-on to the students to design intelligent deep learning systems for solving the problems in the area of their interests

Course Outcome:

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

CO1: Discuss appropriate AI methods for solving a problem. (Remember)

CO2: Discuss the search techniques to AI algorithms (Understand)

CO3: Analyse different AI algorithms in terms of design issues, computational complexity, and assumptions(Analyse)

CO4: Choose appropriate search algorithms for any AI problem(Apply)

CO5: Identify the apt agent strategy to solve a given problem(Evaluate)

CO6:Analyse various applications solved through the use of deep learning models(Analyse)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Problem solving Methods - Search Strategies- Uninformed - Informed - Heuristics - Local Search Algorithms and Optimization Problems - Searching with Partial Observations - Constraint Satisfaction Problems – Constraint Propagation - Backtracking Search - Game Playing - Optimal Decisions in Games – Alpha - Beta Pruning - Stochastic Games	9
2	Data mining: fundamentals – data reduction - Decision tree algorithms - Association rules, Clustering: K-means, fuzzy c-means, hierarchical, probabilistic clustering methods - Rough set theory: definition – rule induction – feature selection - rough sets in data mining	9
3	Machine Learning: Probability basics - Bayes Rule and its Applications - Bayesian Networks – Exact and Approximate Inference in Bayesian Networks - Hidden Markov Models - Forms of Learning - Supervised Learning - Learning Decision Trees - Regression and Classification with Linear Models - Artificial Neural Networks - Nonparametric Models - Support Vector Machines - Statistical Learning - Learning with Complete Data - Learning with Hidden Variables- The EM Algorithm – Reinforcement Learning	9
4	Introduction to Deep Learning Models: Autoencoder, Convolutional Neural Networks, Recurrent Neural Networks, LSTM, Network Architecture Search (NAS)	9
5	Case Study: Introduction to TensorFlow, Experiment: Training a CNN based hand-written digit recognition model with TensorFlow Dataset: MNIST hand-written digit dataset Lab Handwritten letter recognition Description: learn to recognize handwritten letters with CNN.	9

Reference Books

1. S. Russell and P. Norvig, Artificial Intelligence: A Modern Approach, Prentice Hall, 3rd Edition, 2009
2. Ethem Alpaydin, Introduction to Machine Learning (Adaptive Computation and Machine Learning series), The MIT Press; second edition, 2009
3. Nils J. Nilsson, the Quest for Artificial Intelligence, Cambridge University Press, 2009.
4. A. ZHANG, Z. LIPTON, M. LI, A. SMOLA (2020) Dive into Deep Learning (Release 0.7.1), <https://d21.ai/d21-en.pdf>.

Self-learning Material

1. Practical Machine Learning with Tensorflow, NPTEL Course Material, Department Computer Science and Engineering, IIT Madras: <https://nptel.ac.in/courses/106106213/>
2. Stanford CS class (CS231n), Convolutional Neural Networks for Visual Recognition: <http://cs231n.github.io/>

Practical:

1. Implement Search Strategies: Breadth first and Depth First search algorithm , Iterative deepening search , A* search algorithm
2. Implementation of basic neural network model with 4 activation functions on Pima Indians onset of diabetes dataset.
3. Performing AND & OR Operations in the Neural Network
4. Prediction Algorithm - Use of different packages on dataset of Cat and Non-Cat images
5. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.
6. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set. You can use Java/Python ML library classes/API.
7. Apply EM algorithm to cluster a set of data stored in a .CSV file. Use the same data set for clustering using k-Means algorithm. Compare the results of these two algorithms and comment on the quality of clustering. You can add Java/Python ML library classes/API in the program.
8. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set. Print both correct and wrong predictions. Java/Python ML library classes can be used for this problem.
9. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.
10. Case Study a CNN based hand-written digit recognition model with TensorFlow.

2. Data Mining and Warehousing

at Semester V

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Modules	No. of lectures
1	Introduction to Data Mining and Warehousing	9
2	Data Warehouse and OLAP Technology for Data Mining	9
3	Mining Frequent Patterns	9
4	Classification and Prediction	9
5	Cluster Analysis Introduction and Application and Trends	9
	Total	45

Course Objectives:

By the end of the course, learner will be able to:

1. To identify the scope and essentiality of Data Warehousing and Mining.
2. To analyze data, choose relevant models and algorithms for respective applications.
3. To develop research interest towards advances in data mining

Course Outcome:

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

CO1: To Understand Data Warehouse fundamentals, Data Mining Principles. (Understand)

CO2: To Compare different data mining techniques like classification, prediction, clustering and association rule mining. (Analyze)

CO3: To Evaluate the performance of different data mining techniques like classification, prediction, clustering and association rule mining etc. (Apply)

CO4: To Design data warehouse with dimensional modelling and apply OLAP operations. (Create)

CO5: To Create the designs/algorithms to solve a given data mining problem. (Create)

Detailed Syllabus:

Module	Topics	No of Lectures
1	Introduction: Fundamentals of data mining, Data Mining Functionalities, Classification of Data Mining systems, Data Mining Task Primitives, Integration of a Data Mining System with a Database or a Data Warehouse System, Major issues in Data Mining. Data Preprocessing: Need for Preprocessing the Data, Data Cleaning, Data Integration and Transformation, Data Reduction, Discretization and Concept Hierarchy Generation.	9
2	Data Warehouse and OLAP Technology for Data Mining: Data Warehouse, Multidimensional Data Model, Data Warehouse Architecture, Data Warehouse Implementation, Further Development of Data Cube Technology, From Data Warehousing to Data Mining Data Cube Computation and Data Generalization: Efficient Methods for Data Cube Computation, Further Development of Data Cube and OLAP Technology, Attribute-Oriented Induction.	9
3	Mining Frequent Patterns: Associations and Correlations, Basic Concepts, Efficient and Scalable Frequent Itemset Mining Methods, Mining various kinds of Association Rules, From Association Mining to Correlation Analysis, Constraint-Based Association Mining	9
4	Classification and Prediction: Issues Regarding Classification and Prediction, Classification by Decision Tree Induction, Bayesian Classification, Rule-Based Classification, Classification by Backpropagation, Support Vector Machines, Associative Classification, Lazy Learners, Other Classification Methods, Prediction, Accuracy and Error measures, Evaluating the accuracy of a Classifier or a Predictor, Ensemble Methods	9
5	Cluster Analysis Introduction :Types of Data in Cluster Analysis, A Categorization of Major Clustering Methods, Partitioning Methods, Hierarchical Methods, Density-Based Methods, Grid-Based Methods, Model-Based Clustering Methods, Clustering High-Dimensional Data, Constraint-Based Cluster Analysis, Outlier Analysis. Applications and Trends in Data Mining: Data Mining Applications, Data Mining System Products and Research Prototypes, Additional Themes on Data Mining and Social Impacts of Data Mining.	9

Reference Books:

1. Data Mining – Concepts and Techniques - Jiawei Han & Micheline Kamber, Morgan Kaufmann Publishers, Elsevier, 2nd Edition, 2006.
2. Introduction to Data Mining – Pang-Ning Tan, Michael Steinbach and Vipin Kumar, Pearson education

Practical:

1. Perform data preprocessing tasks and Demonstrate performing association rule mining on data sets
2. Write ETL scripts and implement using data warehouse tools.
3. Perform Various OLAP operations such slice, dice, roll up, drill up and pivot.
4. Demonstrate performing KNN classification on data sets
5. Demonstrate performing clustering on data sets
6. Demonstrate performing Regression on data sets
7. Implement a decision tree classifier.
8. Implement a Naive Bayes classifier.
9. Utilise data visualisation techniques to analyse the given dataset.

Geographic Information Systems

at Semester V

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Spatial Data Concepts	9
2	Data Input and its representation	9
3	Geometric transformation and Attribute data input	9
4	Data exploration, query and vector data analysis	9
5	Raster Data Analysis and data display	9
	Total	45

Course Objectives:

By the end of the course, learner will be able to:

1. To gain a basic, practical understanding of GIS concepts, techniques and real world applications
2. To develop a mapping project based on the assumptions and interpretations of data selected by the student.
3. To perform various operations on the data set provided.

Course Outcome:

After completion of the course, learners will be able to:

CO1: Understand practically few GIS concepts, techniques and real world applications.

(Understand)

CO2: Understand how GIS is applied in the larger context of business needs and IT strategies.

(Understand)

CO3: Apply the understanding to perform basic GIS analysis of concepts for decision making.

(Apply)

CO4: Demonstrate a practical application using basic GIS tools.(Apply)

CO5: Create Maps and perform different operations on it. (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Introduction to GIS, geographically referenced data, geographic projected and planer coordinate system, Map projections, Plane coordinate systems, data model. GIS Systems, GIS Science and GIS Applications. The real world and representations of it: Models and modelling, Maps, Databases, Spatial databases and spatial analysis	9
2	Models and Representations of the real world, Geographic Phenomena: Defining geographic phenomena, types of geographic phenomena, Boundaries, Computer Representations of Geographic Information: Regular tessellations, irregular tessellations, Vector representations, Topology and Spatial relationships, Organizing and Managing Spatial Data	9
3	Geometric transformation, RMS error and its interpretation, Resampling of pixel values, Attribute data in GIS, Relational model, Data entry, Manipulation of fields and attribute data	9
4	Exploration, attribute data query, spatial data query, raster data query, geographic visualization. Vector data analysis: Introduction, buffering, map overlay, Distance measurement and map manipulation.	9
5	Raster data analysis: Data analysis environment, local operations, neighborhood operations, zonal operations, Distance measure operations. Cartographic symbolization, types of maps, typography, map design, map production	9

Reference Books

1. Introduction to Geographic Information Systems by Kang-tsung Chang, 5th Edition, Tata McGraw Hill.
2. Principles of Geographic information Systems- An Introductory Text Book, Editors, Otto Huisman and Rofl A., The International institute of Geoinformation Science and Earth Observation, 4th edition, 2009

Practical:

1. Creating and Managing Vector Data: Adding vector layers, setting properties, formatting by Digitizing Map Data, Creating attribute tables.
2. Working with Attributes, Attribute Data Query on the map created in Practical 1.
3. Performing Spatial Queries on the map created in Practical 1.
4. Raster mosaicking and clipping
5. A. Importing Spreadsheets or CSV files Using Plugins,
B. Searching and Downloading OpenStreetMap Data
6. Working with attributes, Terrain Data
7. Georeferencing TopoSheets and Scanned Maps
8. Managing Data Tables and Spatial data Sets: Table joins: spatial joins, points in polygon analysis
9. Creating a Map using Print Compose

Personal Effectiveness Management

at Semester V

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Self-Esteem	9
2	Positive Attitudes	9
3	Working with others	9
4	Valuing Diversity	9
5	Workplace Success	9
	Total	45

Course Objective:

By the end of the course, learner will be able to:

1. Learners learn to manage their time, emotions and priorities effectively.
2. Build their confidence in dealing with difficult people and conflicts at workplace
3. How to persuade and influence others to achieve results.
4. Develop an action plan to enhance personal effectiveness at work.

Course Outcome:

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

CO1: Recognize the importance of Self – Esteem and Positive attitudes in enhancing Personal Effectiveness. (Understand)

CO2: Interpret the positive and negative traits in people and learn to work with others in a team effectively by managing those traits. (Apply)

CO3: Interpret the Diversity at workplace in terms of Culture, Values and apply this knowledge for managing conflicts at workplace ,work effectively .(Apply)

CO4: Demonstrate the ability to plan out their Career via Goal Planning (Apply)

Detailed Syllabus:

Module	Topics	No of Lectures
1	Self-Esteem – What is self-esteem? Self-concept and self-esteem, how self-esteem is formed, causes of low self-esteem, depression and self-esteem, techniques to increase self-esteem- behavioural methods, cognitive methods, humanistic methods, assertiveness, and physical appearance as a source of self-esteem, improving body image.	9
2	Positive Attitudes – Definition, how attitudes develop, how attitudes are learned, attitudes and their influence on others, ways of improving attitudes, coping with other people’s negative attitudes.	9
3	Value-added qualities – Cheerfulness, sense of humour, tactfulness, empathy and sympathy, willingness to participate. Negative traits to avoid – Resentment, irritating habits, envy or jealousy, self-pity. Being a team player – Keys to getting along with others, being a good team player, understanding your role in the team. Understanding your work group – Helping your colleagues, identify colleagues with special characteristics – complainers, tattletale, bossy, favorite, arguer.	9
4	Diversity at the workplace – Understanding the workforce today, taking pride in one’s culture and understanding other’s perspective. Cultural Conflicts – Understanding other cultures, managing language barriers, making cultural adjustments. Discrimination – Prejudice and stereotyping, avoiding, resisting or fighting discrimination.	9
5	First day on the job – Preparing a resume, employment forms, job description, rules of the job, safety rules Keeping your job – Work environment, workplace politics, integrity and ethics at the workplace, understanding employer expectations, keeping high standards – honesty, petty theft, expense account abuses, and alcohol abuse. Planning your career – Visualize success in your career, career goal, goal planning, how to leave a job.	9

Reference Books

Essential Reading:

1. Masters, W. &. (2001). *Personal Development for Life and Work*. Singapore: Thomson Learning.

Further Reading:

1. Melgosa, D. J. (2014). *Discover your worth-The importance of self-esteem and how to develop it*. Spain: New Lifestyle.

2. Onkar, R. (2009). *Personality Development and Career Management*. New Delhi: S. Chand & Company Ltd.

3. Schustack, H. S. (2004). *Personality - Classic Theories and Modern Research*. Delhi: Pearson Education.

5. Foundations of Software Testing

at Semester V

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Fundamentals of Testing, Testing Throughout the Software Development Lifecycle	9
2	Static Testing	9
3	Test Techniques	9
4	Test Management	9
5	Tool Support for Testing	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. To study fundamental concepts in software testing
2. To discuss various software testing issues and solutions in software unit test, integration and system testing
3. To learn how to plan a test project, design test cases and data, conduct testing operations, manage software problems and defects, and generate a testing report.
4. To gain the techniques and skills on how to use software testing tools to support software testing projects.

Course Outcome:

After completing this course, learners will be able to:

- CO1: Design and conduct a software test process for a software testing project. (Create)
- CO2: Discuss about the functional and system testing methods. (Understand)
- CO3: Understand the process of various testing techniques and strategies by applying tests to software and the fundamental components of a test case. (Understand, Apply)
- CO4: Distinguish various testing tools and test management approaches. (Analyze)
- CO5: Evaluate the testing requirements for a particular application. (Evaluate)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Fundamentals of Testing: What is Testing? Why is Testing Necessary? Seven Testing Principles, Test Process and The Psychology of Testing. Testing Throughout the Software Development Lifecycle: Software Development Lifecycle Models, Test Levels, Test Types and Maintenance Testing	9
2	Static Testing: Static Testing Basics and Review Process	9
3	Test Techniques: Categories of Test Techniques, Black-box Test Techniques, White-box Test Techniques, Experience-based Test Techniques	9
4	Test Management: Test Organization, Test Planning and Estimation, Test Monitoring and Control, Configuration Management, Risks and Testing, Defect Management	9
5	Tool Support for Testing: Test tool considerations, Effective use of tools	9

Reference Books

1. Dorothy Graham, Erik van Veenendaal, Isabel Evans, Rex Black, FOUNDATIONS OF SOFTWARE TESTING,ISTQB Certification.
2. Srinivasan Desikan and Gopalaswamy Ramesh, “Software Testing – Principles and Practices”, Pearson Education, 2006.
3. Ron Patton, “Software Testing”, Second Edition, Sams Publishing, Pearson Education, 2007.

Practical:

1. Design test cases for simple calculator application (BB Testing)
2. Design test cases for e-commerce application login form.(BB Testing)
3. Create a test plan document for any application.
4. Study of web testing tool (e.g. selenium)
5. Study of bug tracking tool (e.g. bugzilla)
6. Study of Jira Tool for test management and bug reporting.
7. Study of Jenkins Tool for automation tool.
8. Consider the following program segment:

```
int max (int i, int j, int k)
{
    int max;
```

```
if (i>j) then
if (i>k) then
max=i;
else max=k;
else if (j > k)
max=j
else max=k
return (max);
}
```

- a) Draw the control flow graph for this program segment
- b) Determine the cyclomatic complexity for this program
- c) Determine the independent paths

9. Study of load/performance testing tool.

10. Perform manual testing on any application.

6. Cloud Computing
at Semester V
(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction	9
2	Infrastructure as a Services	9
3	Software as a Service	9
4	Platform as a Service	9
5	Cloud Storage and Deployment Tools	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. To understand the concept of cloud and utility computing.
2. To understand the various issues in cloud computing.
3. To understand the various services in cloud computing.
4. To describe the emergence of cloud as the next generation computing paradigm.

Course Outcome:

At the end of the course the learner should be able to

CO1: Describe the need of various services in the cloud computing environment. (Understand)

CO2: Practice various open-source tools in cloud computing. (Apply)

CO3: Compare the need and usage of public, private and hybrid cloud. (Analyse)

CO4: Explain the concept of cloud storage. (Understanding)

CO5: Explain the need of next generation computing resources. (Understanding)

CO6: Create Type 0 and Type 1 hypervisors (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Evolution of cloud computing, Need for cloud computing, Benefits, Limitations, Migration into Cloud, Basics of virtualization, Desktop virtualization, Server virtualization, Case study: VMware-Basics of web services, Key concepts, Federation in cloud, Four levels of federation, Privacy in cloud	9
2	Three-layer cloud computing architecture, On-demand provisioning, Elasticity in cloud. Cloud Computing Services: Infrastructure-as-a-Service, Apache Cloud Stack, Cloud providers. Cloud deployment models, Security in cloud, Software-as-a-Service security. Case study: Aneka - Service level agreements.	9
3	Software-as-a-Service: Background, Computing today, Benefits of SaaS, Drawbacks of SaaS – Service Oriented Architecture (SOA). Case Studies: Amazon Web Services (AWS), Google App Engine	9
4	Platform-as-a-Service: PaaS defined, Requirements of an ideal PaaS Platform, Custom PaaS – Reference Architecture for Applications in custom PaaS, COTS implementation of PaaS, IBM Bluemix	9
5	Overview of cloud storage, Cloud storage providers, Case studies: Walrus - Amazon S3 - Cloud file system, Map Reduce, Case study: Hadoop - Study of open-source cloud platforms: Nimbus, Open Nebula, Eucalyptus	9

Reference Books

1. Danielle Ruest and Nelson Ruest, *Virtualization: A Beginner's Guide*, McGraw Hill, 2009.
2. Tom White, —*Hadoop: The Definitive Guide*], O'REILLY Media, 2009.
3. James E. Smith, Ravi Nair, —*Virtual Machines: Versatile Platforms for Systems and Processes*”, Elsevier/Morgan Kaufmann, 2005.
4. John W. Rittinghous, James F.Ransome, *Cloud Computing: Implementation, Management and Security*, CRC Press, 2010
5. Katarina Stanoevska-Slabeva, Thomas Wozniak, Santi Ristol, —*Grid and Cloud Computing - A Business Perspective on Technology and Applications*], Springer, 2009

Practical:

1. Creating and running virtual machines on Hosted Hypervisors Type 1 - KVM
2. Creating and running virtual machines on Hypervisors Type 0 – Xen.
3. Creating and running virtual machines on Hypervisors Type 0 - ESXI.
4. To demonstrate SaaS with Amazon Web Service
5. To demonstrate PaaS with Google App Engine
6. Implement OpenNebula
7. Implement Eucalyptus

Any other practical covering syllabus can be implemented.

7. .Net Technologies
at Semester V
(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introducing .NET	9
2	Web Form Fundamentals	9
3	Error Handling, Logging, and Tracing, State Management, Styles, Themes, and Master Pages	9
4	ADO.NET Fundamentals	9
5	XML, Security Fundamentals, ASP.NET Ajax	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. Understand basic building blocks of Dot Net.
2. Assimilate C# Fundamentals, Exception handling, Design Interfaces and Collections in C#.
3. Defines and discuss major concepts, tool, techniques, and methods of web application development.
4. Create web application using ASP.NET.
5. Implement the the database connectivity with ASP.NET.

Course outcome:

After completing this course learners will be able to:

CO1: Understand code solutions and compile C# projects within the .NET framework.

(Understand)

CO2: Develop simple file test assembly.(Create)

CO3: Apply and Create GUI components in C#. Design and Implement Web Applications, Control Library, Advanced UI Programming & Data Binding concepts.(Create,Apply)

CO4: Design and Implement database connectivity using ADO.NET, XML in C#.NET specifically ADO.NET.(Create)

CO5: Develop partial refreshes of web pages using ajax(Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introducing .NET: The .NET Framework, C#, VB, and the .NET Languages, The Common Language Runtime, The .NET Class Library. The C# Language, C# Language Basics, Variables and Data Types, Variable Operations, Object-Based Manipulation, Conditional Logic, Loops, Methods. Types, Objects, and Namespaces: The Basics About Classes, Building a Basic Class, Value Types and Reference Types, Understanding Namespaces and Assemblies</p>	9
2	<p>Web Form Fundamentals: Writing Code, Using the Code-Behind Class, Adding Event Handlers, Understanding the Anatomy of an ASP.NET Application, Introducing Server Controls, Using the Page Class, Using Application Events, Configuring an ASP.NET Application. Form Controls, Stepping Up to Web Controls, Web Control Classes, List Controls, Table Controls, Web Control Events and AutoPostBack, Validation, Understanding Validation, Using the Validation Controls, Rich Controls, The Calendar, The AdRotator, Pages with Multiple Views, User Controls and Graphics, User Controls, Dynamic Graphics, The Chart Control, Website Navigation, Site Maps, URL Mapping and Routing, The SiteMapPath Control, The TreeView Control, The Menu Control.</p>	9
3	<p>Error Handling, Logging, and Tracing : Avoiding Common Errors, Understanding Exception Handling, Handling Exceptions, Throwing Your Own Exceptions, Using Page Tracing</p> <p>State Management, Understanding the Problem of State, Using View State, Transferring Information Between Pages, Using Cookies, Managing Session State, Configuring Session State, Using Application State, Comparing State Management Options</p> <p>Styles, Themes, and Master Pages: Styles, Themes, Master Page Basics, Advanced Master Pages.</p>	9
4	<p>ADO.NET Fundamentals: Understanding Databases, Configuring Your Database, Understanding SQL Basics, Understanding the Data Provider Model, Using Direct Data Access, Using Disconnected Data Access. Data Binding: Introducing DataBinding, Using Single-Value Data Binding, Using Repeated-Value Data Binding, Working with Data Source Controls. The Data Controls: The GridView, Formatting the GridView, Selecting a</p>	9

	GridView Row, Editing with the GridView, Sorting and Paging the GridView, Using GridView Templates, The DetailsView and FormView	
5	<p>XML: The XML Classes, XML Validation, XML Display and Transforms.</p> <p>Security Fundamentals: Understanding Security Requirements, Authentication and Authorization, Forms Authentication, Windows Authentication.</p> <p>ASP.NET AJAX: Understanding Ajax, Using Partial Refreshes, Using Progress Notification, Implementing Timed Refreshes, Working with the ASP.NET AJAX Control Toolkit.</p>	9

Reference Books

1. Beginning ASP.NET 4.5 in C#, Matthew MacDonald , Apress , 2012
2. C# 2015, Anne Bohem and Joel Murach , Murach , Third , 2016
3. Murach's ASP.NET 4.6 Web Programming in C#2015 , Mary Delamater and Anne Bohem , SPD , Sixth , 2016
4. ASP.NET 4.0 Programming, J.Kanjilal , Tata McGraw-Hill , 2011
5. Programming ASP.NET, D.Esposito , Micosoft Press (Dreamtech) , 2011
6. Beginning Visual C# 2010 , K. Watson , C. Nagel, J.H Padderson, J.D. Ried, M Skinner, Wrox (Wiley) ,2010

Practical:

1. Working with basic C# and ASP.NET

a) Create an application that obtains four int values from the user and displays the product.

b) Create an application to demonstrate string operations.

c) Create an application that receives the (Student Id, Student Name, Course Name, Date of Birth) information from a set of students. The application should also display the information of all the students once the data entered.

d) Create an application to demonstrate following operations

i. Generate Fibonacci series. ii. Test for prime numbers. iii. Test for vowels. iv. Use of foreach loop with arrays v. Reverse a number and find sum of digits of a number.

2. Working with Object Oriented C# and ASP .NET

a) Create a simple application to perform following operations i. Finding factorial Value ii. Money Conversion iii. Quadratic Equation iv. Temperature Conversion

b) Create a simple application to demonstrate use of following concepts i. Function Overloading

ii. Inheritance (all types) iii. Constructor overloading iv. Interfaces

c) Create a simple application to demonstrate use of following concepts i. Using Delegates and events ii. Exception handling

3. Working with Web Forms and Controls

a) Create a simple web page with various server controls to demonstrate setting and use of their properties.(Example,AutoPostBack)

b) Demonstrate the use of Calendar control to perform following operations.

i) Display messages in a calendar control

ii) Display vacation in a calendar control

iii) Selected day in a calendar control using style

iv) Difference between two calendar date

c) Demonstrate the use of Treeview control and perform following operations. i) Treeview Control and datalist ii) Exception handling

4. Working with Form Controls

a) Create a Registration form to demonstrate use of various Validation controls.

b) Create Web Form to Demonstrate use of Adrotator Control.

c) Create Web Form to demonstrate use User Controls

5. Working with Navigation , Beautification and Master page.

a) Create Web Form to demonstrate use of Website Navigation controls and Site map.

b) Create a web application to demonstrate use of Master Page with applying Styles and Themes for page beautification

c) Create a web application to demonstrate various states of ASP.NET Pages.

6. Working with Database

a) Create a web application bind data in a multiline textbox by querying in another textbox

b) Create a web application to display records by using a database.

c) Demonstrate the use of Datalist link control.

7. Working with Database

a) Create a web application to display Data Binding using dropdownlist control.

b) Create a web application to display the phone no of an author using a database.

c) Create a web application for inserting and deleting records from a database. (Using Execute-

Non Query).

8. Working with data controls

- a) Create a web application to demonstrate various uses and properties of SqlDataSource
- b) Create a web application to demonstrate data binding using DetailsView and FormView Controls.
- c) Create a web application to display Using Disconnected Data Access and Data Binding using GridView.

9. Working with GridView control

- a) Create a web application to demonstrate use of GridView control template and GridView hyperlink.
- b) Create a web application to demonstrate use of GridView button column and GridView Events.
- c) Create a web application to demonstrate GridView paging and Creating own table format using GridView

10. Working with AJAX and XML

- a) Create a web application to demonstrate reading and writing operations with XML.
- b) Create a web application to demonstrate Form Security and Windows Security with proper Authentication and Authorization Properties.
- c) Create a web application to demonstrate use of various Ajax controls.

Evaluation Scheme

Internal Exam-25 Marks

- **Test– 20 Marks which will be converted out of 10 Marks-** Duration 40 mins

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular Object-Oriented Dynamic Learning Environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform.

- **Assignments/Presentation/Projects – 10 Marks**

Subject specific Term Work Module/assessment modes –as decided by the department in the beginning of the semester (like Extension/field/experimental work, Short Quiz; Objective test, lab practical, open book test etc. and written assignments, Case study, Projects, Posters and exhibits etc. for which the assessment is to be based on class presentations wherever applicable)

- **Active participation in routine class instructional deliveries - 5 Marks**

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

External Examination- 75 Marks

Duration - 2.5 Hours.

Theory question paper pattern,-

All questions are compulsory.		
Question	Based on	Marks
Q.1	Unit 1	15
Q.2	Unit 2	15
Q.3	Unit 3	15
Q.4	Unit 4	15
Q.5	Unit 5	15

All questions shall be compulsory with internal choice within the questions.

Each Question may be sub-divided into sub questions as a, b, c, d & e, etc& the allocation of Marks depends on the weightage of the topic.

Practical Examination – 50 marks (Duration: 2 Hours)

Each practical course carries 50 Marks, 40 marks + 05 marks (journal)+ 05 marks(viva)

Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)

***Syllabus of Courses of
Bachelor of Science in Information Technology Programme
at Semester VI
(Implemented during Academic Year 2022-23)***

1. Information Security Management

at Semester VI

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Information Security Overview	9
2	Design of Security Architecture	9
3	Security Technology and Tools	9
4	Cryptographic Algorithms	9
5	Protocols for Secure Communications and Physical security	9
	Total	45

Course Objectives:

By the end of the course, learners will be able to:

1. Define key terms and critical concepts of information
2. Define risk management, risk identification and risk controls
3. Describe a security blueprint and identify its major components.
4. Recognize the important role of access control in computerized information systems,
5. Describe security technology and Identify Security tools
6. Describe cryptographic tools and techniques and identify the major protocols used for secure communications.
7. Discuss the relationship between information security and physical security.

Course Outcome:

After completing this course learners will be able to:

- CO1: Discuss the basics of information security.(Understand)
CO2: Demonstrate the aspects of risk management.(Apply)
CO3: Implement various security tools.(Apply)
CO4: Design and implementation of Security Techniques.(Create)
CO5: Correlate information security and physical security.(Analyze)
CO6: Understand the methods of security maintenance.(Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Information Security Overview: Components of Information Security, Key Information Security Concepts, Critical Characteristics of Information, CNSS Security Model, The McCumbers Cube, Approaches to Information Security Implementation, Information security functions, Threats to Information Security, Types of attacks, Risk Management: Components of Risk Management- Risk Identification, Risk Assessment, Risk Control Strategies, Quantitative Versus Qualitative Risk Control Practices	9
2	Planning for Security: Defining Information Security Policy, Standards, and Practices, The Information Security Blueprint, Design of Security Architecture Security Technology: Access control, Firewalls, Firewall Processing Modes, Generations of Firewall, Firewall Architecture, Protecting Remote Connections, Virtual private networks	9
3	Security tools: intrusion detection and prevention systems, Types of IDPS, Strengths and Limitations of IDPSs, introduction to Honeypots, Honeynets, and Padded Cell Systems, Biometric Access control, Intelligent System for Information Security Management	9
4	Cryptography: Terminology, Cipher Methods, Cryptographic Algorithms, Symmetric Encryption, Asymmetric Encryption, Cryptographic Tools, Public-key Infrastructure, Digital signatures, Digital Certificates,	9
5	Protocols for Secure Communications: Securing Internet Communication with S-HTTP and SSL, Securing Email with S/MIME, PEM, and PGP, Securing Web Transactions with SET, SSL, and S-HTTP, Securing Wireless Networks with WEP and WPA Wireless, Securing TCP/IP with IPsec and PGP Physical security: Physical Security Controls, Fire Security and Safety, Failure of Supporting Utilities, Interception of Data, Mobile and Portable Systems, Remote Computing Security. Information security maintenance: Security maintenance model, Digital Forensics concept.	9

Reference Books

1. Michael E. Whitman and Herbert J. Mattord(2012), Principles of Information Security, Fourth Edition Course Technology, Cengage Learning
2. Mark Rhodes-Ousley (2013), Information Security- The Complete reference, Second Edition , by The McGraw-Hill
3. “Cryptography and Network Security”, Behrouz A. Forouzan, Tata McGraw-Hill Edition

Practical:

1. Configure Routers

- a) With OSPF MD5 authentication.
- b) Using NTP.
- c) To log messages to the syslog server.
- d) To support SSH connections.

2. Configure AAA Authentication

- a) Configure a local user account on Router and configure authenticate on the console
- b) Verify lines using local AAA
- c) Verify local AAA authentication from the Router console and the PC-A client

3. Configuring Extended ACLs

- a) Configure, Apply and Verify an Extended Numbered ACL
- b) Configure, Apply and Verify an Extended Named ACL

4. Configure IP ACLs to Mitigate Attacks

- a) Verify connectivity among devices before firewall configuration.
- b) Use ACLs to ensure remote access to the routers is available only from management station PC-C.
- c) Configure ACLs on to mitigate attacks.

5. Configuring a Zone-Based Policy Firewall

6. Configure IOS Intrusion Prevention System (IPS) Using the CLI

- a) Enable IOS IPS.

7. Layer 2 Security

- a) Assign the Central switch as the root bridge.
- b) Secure spanning-tree parameters to prevent STP manipulation attacks.

8. Layer 2 VLAN Security

9. Configure and Verify a Site-to-Site IPsec VPN Using CLI

10. Configuring ASA Basic Settings and Firewall Using CLI

- a) Configure basic ASA settings and interface security levels using CLI
- b) Configure routing, address translation, and inspection policy using CLI
- c) Configure DHCP, AAA, and SSH
- d) Configure a DMZ, Static NAT, and ACLs

2. Business Intelligence

at Semester VI

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Business Intelligence, Decision Support system	9
2	Mathematical models for decision making, Data Mining, Data Preparation	9
3	Classification, Clustering	9
4	Business intelligence applications, Logistic and production models, Data envelopment analysis	9
5	Knowledge Management, Artificial Intelligence and Expert Systems	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. To understand the concept of Decision Support System
2. To understand the process of data mining.
3. Study different classification and clustering techniques.
4. Understand knowledge management and its approaches

Course Outcome:

After successful completion of the course, students will be able:

CO1: To create an understanding of Decision support systems, Mathematical models for decision making, Data envelopment analysis, Knowledge Management and AI and Expert systems. (Understand)

CO2: To Analyze and describe Business intelligence application models. (Analyze)

CO3: To assess and identify the best model to solve a given business problem. (Evaluate)

CO4: To apply different data mining algorithms to solve the given business problem. (Apply)

CO5: To create designs/solutions/algorithms to solve the given business problem. (Create)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction to Business intelligence: Effective and timely decisions, Data, information and knowledge, The role of mathematical models, Business intelligence architectures, Ethics and business intelligence.</p> <p>Decision support systems: Definition of system, Representation of the decision-making process, Evolution of information systems, Definition of decision support system, Development of a decision support system.</p>	9
2	<p>Mathematical models for decision making: Structure of mathematical models, Development of a model, Classes of models</p> <p>Data mining: Definition of data mining, Representation of input data, Data mining process, Analysis methodologies.</p> <p>Data preparation: Data validation, Data transformation, Data reduction</p>	9
3	<p>Classification: Classification problems, Evaluation of Classification models, Bayesian methods, Logistic regression, Neural networks, Support vector machines</p> <p>Clustering: Clustering methods, Partition methods, Hierarchical methods, Evaluation of clustering models</p>	9
4	<p>Business intelligence applications: Marketing models: Relational marketing, Sales force management.</p> <p>Logistic and production models: Supply chain optimization, Optimization models for logistics planning, Revenue management systems.</p> <p>Data envelopment analysis: Efficiency measures, Efficient frontier, The CCR model, Identification of good operating practices.</p>	9
5	<p>Knowledge Management: Introduction to Knowledge Management, Organizational Learning and Transformation, Knowledge Management Activities, Approaches to Knowledge Management, Information Technology (IT) In Knowledge Management, Knowledge Management Systems Implementation, Roles of People in Knowledge Management</p> <p>Artificial Intelligence and Expert Systems: Concepts and Definitions of Artificial Intelligence, Artificial Intelligence versus Natural Intelligence, Basic Concepts of Expert Systems, Applications of Expert Systems, Structure of Expert Systems, Knowledge Engineering, Development of Expert Systems</p>	9

Reference Books

1. Business Intelligence ,Data Mining and Optimization for Decision Making , Carlo Vercellis , Wiley , First edition , 2009
2. Decision support and Business Intelligence System, Efraim Turban, Ramesh Sharda, Dursun Delen , Pearson , 9th edition , 2011
3. Fundamental of Business Intelligence, Grossmann W, Rinderle-Ma, Springer, First Edition ,2015

Practical: (Power BI, SQL Server, MS Excel, R/Python)

1. Import the legacy data from different sources such as (Excel, SqlServer, Oracle etc.) and load in the target system using Power BI (You can download sample databases such as Adventureworks, Northwind, foodmart, Financial etc.)
2. Perform the Extraction Transformation and Loading (ETL) process to construct the database in the Sqlserver/ Power BI.
3.
 - a. Create the Data staging area for the selected database.
 - b. Create the cube with suitable dimension and fact tables based on ROLAP, MOLAP and the HOLAP model.
4.
 - a. Create the ETL map and set up the schedule for execution.
 - b. Execute the MDX queries to extract the data from the data warehouse.
5.
 - a. Import the data warehouse data in Microsoft Excel and create the Pivot table and Pivot Chart.
 - b. Import the cube in Microsoft Excel and create the Pivot table and Pivot Chart to perform data analysis.
6. Apply the what – if Analysis for data visualization. Design and generate necessary reports based on the data warehouse data.
7. Perform the data classification using classification algorithms.
8. Perform the data clustering using clustering algorithm.
9. Perform the Linear regression on the given data warehouse data.
10. Perform the Logistic regression on the given data warehouse data.

3. Remote Sensing

at Semester VI

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Remote Sensing – Basic Principles	9
2	Microwave Remote Sensing	9
3	Remotes Sensing Platforms and Sensors	9
4	Image Analysis	9
5	Global Positioning System	9
	Total	45

Course Objective:

1. Disseminate basic concepts and applications of Remote Sensing, Energy Balance and Data acquisition platforms, sensors and their characteristics.
2. Enhance student's knowledge about microwaves based Remote Sensing and GPS as Applications.
3. Introduce students to digital image processing tools and techniques.

Course Outcome:

On completion of this course, students should be able to:

CO1: Explain physical principles and sensing process in remote sensing (Understand)

CO2: Explain microwave sensors and their characteristics. (Understand)

CO3: Describe pre-processing requirements.(Understand)

CO4: Analyse various Digital Image Processing techniques. (Analyse)

CO5: Perform filtering on Satellite Images, and analyse the change. (Analyse)

CO6: Apply different clustering algorithms on Satellite Images. (Apply)

CO7: Apply compression and decompression algorithm on Satellite Image. (Apply)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Introduction, Electromagnetic remote sensing process, Physics of radiant energy, Energy source and its characteristics, Atmospheric interactions with electromagnetic radiation, Energy interaction with Earth's surface materials	9
2	Introduction, The Radar principle, Factors affecting microwave measurements, Radar wavebands, Side looking airborne (SLAR) systems, Synthetic Aperture Radar (SAR), Polarimetric SAR (PolSAR), Interaction between microwaves and Earth's surface, Interpreting SAR images, Geometric characteristics	9
3	Introduction, Satellite system parameters, Spatial Resolution, Spectral Resolution, Radiometric Resolution, Temporal resolution, Imaging sensor systems (thermal, multispectral and microwave imaging), Earth resources satellites, Meteorological satellites, Satellites carrying microwave sensors, OCEASAT-1, IKONOS, Latest trends in remote sensing platforms and sensors	9
4	Introduction, Visual interpretation, Elements of visual interpretation, Digital processing, Pre-processing, Enhancement, Transformations, Classification, Integration, Classification accuracy assessment	9
5	Introduction, System Design Considerations, GPS System Elements, GPS Satellite Constellation and Signals, GPS Measurements, GPS Instrumentation	9

Reference Books

1. Text Book of Remote Sensing and Geographical Information Systems M. Anji Reddy 4th Edition BS publication
2. Remote Sensing and Image Interpretation Lillesand, T.M. and Kiefer, R.W. 6th edition. John Wiley and Sons Inc.
3. Medical Image Processing Concepts and Applications Sinha, G.R., Patel, Bhagwati Charan PHI
4. Digital Image Processing Gonzalez and Woods 3rd Edition Pearson
5. Digital Image Processing and Analysis Bhabatosh Chanda, Dwijesh Dutta Majumder 2nd Edition PHI

Practical:

Satellite images can be downloaded from

- a. <http://bhuvan3.nrsc.gov.in/bhuvan/bhuvannew/bhuvan2d.php>
 - b. [http://landsat.usgs.gov/Landsat Search and Download.php](http://landsat.usgs.gov/Landsat_Search_and_Download.php)
 - c. <http://uavsar.jpl.nasa.gov/>
 - d. <http://airsar.jpl.nasa.gov/>
1. WAP for implementing LPF: Ideal LPF on square image, Butterworth filter, Gaussian filter
 2. WAP for implementing HPF: Ideal HPF on square image, Butterworth filter, Gaussian filter
 3. WAP for high boost filtering on square image
 4. WAP for homomorphic filtering on square image
 5. Apply different image enhancement techniques (to improve contrast, brightness, sharpness) on satellite image
 6. Apply different supervised classification techniques to classify the satellite image (minimum distance, maximum likelihood, decision tree, ANN)
 7. Apply different clustering algorithms (K-means, ISODATA)
 8. Apply compression and decompression algorithm on image (Huffman coding, Arithmetic encoding, LZW encoding)

4. Event Marketing
at Semester VI
(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Events	9
2	Segmentation, Targeting, and Positioning of Events and Concept of Product in Event	9
3	Concept of Pricing	9
4	Promotion in Events	9
5	Trends and Challenges in Event Marketing	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

- To understand basic concepts of Event Marketing.
- To impart knowledge to learners about categories of Events.
- To understand segmenting, targeting and positioning in the context of Event Marketing.
- To familiarize learners with trends and challenges in Event Marketing.

Course Outcome:

CO1: Describe the Process of Events, Event Marketing and the Components involved in it. (Understand)

CO2: To discuss the trends and challenges in Event Marketing .(Understand)

CO3: Develop critical understanding of segmenting, targeting and positioning in the context of Event Marketing and apply this knowledge (Apply)

CO4: Demonstrate a comprehensive knowledge of the details involved in planning and designing of an Event including the management of resources, budgets, Pricing and Promotion. (Apply)

CO5 : To conceptualize and design an event .(Create)

Detailed Syllabus:

Module	Topics	No of Lectures
1	<p>Definition and meaning of event marketing ; the evolution of event marketing, advantages of event marketing, 5 C's of events- conceptualization, costing, canvassing, customization, carrying-out; Event designing; reach; interaction-interaction points, direct interaction, indirect interaction, interaction catalysts or enablers.</p> <p>Importance of events as a marketing communication tool; events as a marketing tool: the varied marketing needs addressed by events: brand building, focus on target market, implementation of marketing plan, marketing research, relationship building, creating opportunities for better deals with different media, events and their economic implications.</p> <p>Concept of event creativity, key elements of events: event infrastructure; customer groups; clients; event organizers; venue; media.</p>	9
2	<p>Concept of market in events; segmentation and targeting of the market for events; positioning of events-event property.</p> <p>Concept of product in events: benefit levels-core, generic, expected, augmented; categories of events: competitive events, artistic expression, cultural celebrations, exhibition events, charitable events, special business events, retail events.</p> <p>Event Variations- Time frame based, concept based, artist based, client industry based.</p>	9
3	<p>Risk rating, setting pricing objectives, understanding local legislations and tax laws, feedback about events from the market, skills required for negotiating the best price, validation against pricing objectives, pricing decisions, event charges: percentage of the total event cost, flat fee, package price, hourly rate.</p>	9
4	<p>Networking components: print media, radio, television, internet, outdoor media, direct marketing, sales promotion, public relations, merchandising, and in-venue publicity.</p> <p>Event sponsorship: concept of sponsorship, sponsorship in a communication context, synergy between sponsor and event,</p>	9

	identifying potential sponsors, impact measurement, practical sponsor incentivization, in-kind sponsorship.	
5	E-event marketing, virtual events, societal event marketing, green event, cause-related event marketing, sports event marketing. Safety and security of event. Event crisis management. Growth of event industry in India. Career in event marketing.	9

Reference Books

1. Preston C.A., "Event Marketing: How to successfully promote Events, Festivals, Conventions, and Expositions", Wiley, Second Edition, 2015
2. Gaur Sanjaya Singh and Sanjay V Saggere, "Event Marketing and Management", Vikas Publishing House Pvt. Ltd. , 2003
3. Sharma Diwakar, "Event Planning & Management", Deep and Deep Publications Pvt. Ltd., 2005
4. Hoyle Leonard H., "Event Marketing-How to successfully Promote Events, Festivals, Conventions and Expositions", Wiley, 2009
5. Genadinik Alex, "Event Planning-Management and Marketing for Successful Events", CreateSpace Independent Publishing Platform, 2015
6. Harichandan C.P., "Event Management", Global Vision Publishing House, 2010
7. Goyal K. Swarup, "Event Management", Adhyayan Publishers, 2013

5. Project Management

*at Semester VI
(Implemented during Academic Year 2022-23)
(wef 2018-19)*

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to PMP and Project Management Terminologies Organizational Influences and the Project Life Cycle Project Management Processes	9
2	Project Integration Management Project Scope Management Project Time Management	9
3	Project Cost Management Project Quality Management Project Human Resource Management	9
4	Project Communications Management Project Risk Management	9
5	Project Procurement Management Project Stakeholder Management	9
	Total	45

Course Objective:

By the end of the course, learners will be able to:

1. Describe fundamental project management concepts for planning and execution of projects.
2. Define scope using a work breakdown structure (WBS)
3. Evaluate the risk factors involved in a project and manage them effectively.
4. Establish a structure to manage change and project baselines
5. Describe how to monitor and manage project status and quality.
6. Handling stakeholders and understanding procurements.

Course Outcome:

After completing this course, learners will be able to:

CO1: Understand project characteristics and various stages of a project. (Understand)

CO2: Analyze the learning and understand techniques for Project planning, scheduling and Execution Control. (Analyze)

CO3: Apply the risk management plan and analyse the role of stakeholders. (Apply)

CO4: Understand the Project Procurement, Service level Agreements and productivity. (Understand)

CO5: Understand How Human Resource Control is practiced in the Industry. (Understand)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	<p>Introduction: What is a Project? What is Project Management? Relationships Among Portfolio Management, Program Management, Project Management, and Organizational Project Management; Project Management, Operations Management, and Organizational Strategy; Business Value; Role of a Project Manager; Project Management Body of Knowledge</p> <p>Organizational Influences and Project Life Cycle: Organizational Influences on Project Management; Project Stakeholders and Governance; Project Team; Project Life Cycle</p> <p>Project Management Processes: Common Project Management Process Interactions; Project Management Process Groups; Initiating Process Group; Planning Process Group; Executing Process Group; Monitoring and Controlling Process Group; Closing Process Group; Project Information; Role of the Knowledge Areas</p>	9
2	<p>Project Integration Management: Develop Project Charter; Develop Project Management Plan; Direct and Manage Project Work; Monitor and Control Project Work; Perform Integrated Change Control; Close Project or Phase</p> <p>Project Scope Management: Plan Scope Management; Collect Requirements; Define Scope; Create WBS; Validate Scope; Control Scope</p> <p>Project Time Management: Plan Schedule Management; Define Activities; Sequence Activities; Estimate Activity Resources; Estimate Activity Durations; Develop Schedule; Control Schedule</p>	9
3	<p>Project Cost Management: Plan Cost Management; Estimate Costs; Determine Budget; Control Costs</p> <p>Project Quality Management: Plan Quality; Perform Quality Assurance; Quality Control</p> <p>Project Human Resource Management: Plan Human Resource Management; Acquire Project Team; Develop Project Team; Manage Project Team</p>	9
4	<p>Project Communications Management: Plan Communications Management; Manage Communications; Control Communications</p> <p>Project Risk Management: Plan Risk Management; Identify Risks; Perform Qualitative Risk Analysis; Perform Quantitative Risk Analysis; Plan Risk Responses; Control Risks</p>	9
5	<p>Project Procurement Management: Plan Procurements; Conduct Procurements; Control Procurements; Close Procurements</p> <p>Project Stakeholder Management: Identify Stakeholders; Plan Stakeholder Management; Manage Stakeholder Engagement; Control Stakeholder Engagement</p>	9

Reference Books

1. Project Management Institute, A Guide to the Project Management Body of Knowledge (PMBOK® Guide), Fifth Edition, Project Management Institute.
2. Harold Kerzner, *A Systems Approach to Planning, Scheduling, and Controlling*, Wiley
3. Colleen Garton with Erika McCulloch, *Fundamentals of Technology Project Management*, 2nd Edition, MC Press.
4. Kathy Schwalbe, *Information Technology Project Management*, 7th Edition, Cengage Learning

Practical: CASE STUDY implementing concepts of PROJECT PLANNING.

6. Cyber Laws and Introduction to Blockchain

at Semester VI

(Implemented during Academic Year 2022-23)

Modules at a Glance

Sr. No.	Topics	No. of lectures
1	Introduction to Cybercrime	9
2	Cyber offenses & Cybercrime	9
3	Tools and Methods Used in Cyberline	9
4	Overview of blockchain technology	9
5	Smart Contracts History	9
	Total	45

Course Objective:

- To understand and identify different types of cybercrime and cyber law.
- To recognize Indian IT Act 2008 and its latest amendments.
- To learn various types of security standards compliances.
- Evaluate the working and the underlying technology of transactions, blocks, proof-of-work, and consensus building using blockchain.

Course Outcome:

CO1: Plan and understand the concept of cybercrime and its effect on outside world(Understand)

CO2: Interpret and apply IT law in various legal issues(Apply)

CO3: Apply Information Security Standards compliance during software design and development.(Apply)

CO4: Develop applications on blockchain using platforms such as Ethereum(Create)

CO5: Illustrate the methods for data recovery, evidence collection and data seizure.(Evaluate)

Detailed Syllabus:

Module	Topics	No. of Lectures
1	Introduction to Cybercrime: Cybercrime definition and origins of the world, Cybercrime and information security, Classifications of cybercrime, Cybercrime and the Indian ITA 2000, A global Perspective on cybercrimes. Indian IT Act: Cyber Crime and Criminal Justice: Penalties, Adjudication and Appeals Under the IT Act, 2000, IT Act. 2008 and its Amendments. Information Security Standard compliances: SOX, GLBA, HIPAA, ISO, FISMA, NERC, PCI.	9
2	Cyber offenses & Cybercrime: How criminal plan the attacks, Social Engineering, Cyber stalking, Cybercafé and Cybercrimes, Botnets, Attack vector, Cloud computing, Proliferation of Mobile and Wireless Devices, Trends in Mobility, Credit Card Frauds in Mobile and Wireless Computing Era, Security Challenges Posed by Mobile Devices, Registry Settings for Mobile Devices, Authentication Service Security, Attacks on Mobile/Cell Phones, Mobile Devices: Security Implications for Organizations, Organizational Measures for Handling Mobile, Devices-	9
3	Tools and Methods Used in Cyberline: Phishing, Password Cracking, Key loggers and Spywares, Virus and Worms, Steganography, DoS and DDoS Attacks, SQL Injection, Buffer OverFlow, Attacks on Wireless Networks, Phishing, Identity Theft (ID Theft).	9
4	Overview of blockchain technology; History of blockchain: how and when blockchain/bitcoin started, milestones on the development of bitcoin, Introduction: Transactions, blocks, hashes, consensus, verify and confirm blocks, peer to peer networks, blocks of data in a chain, decentralisation of networks, processes & workflows, cryptocurrencies, nodes, assets, consensus, dapps; types of blockchain; chain policy; working of blockchain; life of blockchain application; privacy anonymity and security of blockchain.	9
5	Smart Contracts History; Distributed ledger; Smart contracts; Cryptocurrency; Bitcoin protocols; Mining strategy and rewards; Ethereum – construction; DAO; GHOST; Vulnerability; Attacks; Sidechain; Namecoin	9

Reference Books

1. N. Godbole, S. Belapure, Cyber Security, Wiley India, New Delhi.
2. S. Vishwanathan, The Indian Cyber Law; Bharat Law House New Delhi.
3. Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Princeton University Press (July 19, 2016).

4. The Information Technology Act, 2000; Bare Act- Professional Book Publishers, New Delhi.
5. P. Mali, Cyber Law & Cyber Crimes; Snow White Publications, Mumbai.
6. K. Knapp, Cyber Security & Global Information Assurance, Information Science Publishing.
7. Websites for more information: The Information Technology ACT, 2008- TIFR:
<https://www.tifrh.res.in>
8. Website for more information: A Compliance Primer for IT professional:
https://www.sans.org/reading-room/whitepapers/compliance/compliance-primer-professionals_-33538

Practical:

1. Survey of forensics tools such as WinHex, EnCase, FTK, or ProDiscover.
2. Experiments with USB disk and hard disk using FTK or other tool.
3. Familiarizing with port redirection tools: Quick 'n Easy FTP Server, FPIPE and FPORT.
4. AVISPA Tool for the Automated Validation of Internet Security Protocols and Applications
5. Problem solving with sample cyber crime reports
6. BlockSim: An Extensible Simulation Tool for Blockchain Systems
7. Create your own cryptocurrency , Creating wallets and sending cryptocurrency
8. Naive Blockchain construction,
9. Toy application using Blockchain, Mining puzzles
10. Exploring Ethereum tools like Ganache and GO , Setup the Ethereum development environment.

PROJECT

Semester V & VI

(Implemented during Academic Year 2022-23)

Course Objective:

- To provide an opportunity to apply the knowledge gained through various courses in solving a real life problem.
- To provide an opportunity to practice different phases of software/system development life cycle.
- To introduce the student to a professional environment and/or style typical of a global IT industry.
- To provide an opportunity for structured team work and project management.
- To provide an opportunity for effective, real-life, technical documentation.
- To provide an opportunity to practice time, resource and person management.

Course Outcome:

- Student will have exposure to understand industry-standard project practices, through a real-life project work under time and deliverable constraints, applying the knowledge acquired through various courses.

The project dissertation/document is expected to be created and it should have the following contents.

- a. SRS – Problem Statement, BRD- Business Requirement Document
- b. General Requirement
- c. System design (RED/Class Diagrams, DFD/Activity diagrams/Circuit diagram)
- d. User screen design and client side validation
- e. Database Design
- f. User interface design /user manual
- g. Test cases
- h. Future Scope and limitation
- i. Conclusion
- j. Bibliography

Evaluation Scheme

Internal Exam-25 Marks

- **Test– 20 Marks which will be converted out of 10 Marks-** Duration 40 mins

It will be conducted either as a written test or using any open source learning management system such as Moodle (Modular Object-Oriented Dynamic Learning Environment) or a test based on an equivalent online course on the contents of the concerned course (subject) offered by or build using MOOC (Massive Open Online Course) platform.

- **Assignments/Presentation/Projects – 10 Marks**

Subject specific Term Work Module/assessment modes –as decided by the department in the beginning of the semester (like Extension/field/experimental work, Short Quiz; Objective test, lab practical, open book test etc. and written assignments, Case study, Projects, Posters and exhibits etc. for which the assessment is to be based on class presentations wherever applicable)

- **Active participation in routine class instructional deliveries - 5 Marks**

Overall conduct as a responsible student, manners, skill in articulation, leadership qualities demonstrated through organizing co-curricular activities, etc.

External Examination- 75 Marks

Duration - 2.5 Hours.

All questions are compulsory.		
Question	Based on	Marks
Q.1	Unit 1	15
Q.2	Unit 2	15
Q.3	Unit 3	15
Q.4	Unit 4	15
Q.5	Unit 5	15

Theory question paper pattern, All questions shall be compulsory with internal choice within the questions.

Each Question may be sub-divided into sub questions as a, b, c, d & e, etc & the allocation of Marks depends on the weightage of the topic.

Practical Examination – 50 marks (Duration, 2 Hours)

- Each practical course carries 50 Marks , 40 marks + 05 marks (journal)+ 05 marks(viva)
- Minimum 75% practical from each core/allied course are required to be completed and written in the journal.

(Certified Journal is compulsory for appearing at the time of Practical Exam)