NEW HORIZON
COLLEGE OF ENGINEERING

Department of Information Science and Engineering

Academic Year 2025-26

7th and 8th Semester

Scheme & Syllabus

BATCH: 2022-26

CREDITS: 160

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NEW HORIZON COLLEGE OF ENGINEERING

VISION

To emerge as an institute of eminence in the fields of engineering, technology and management in serving the industry and the nation by empowering students with a high degree of technical, managerial and practical competence.

MISSION

• To strengthen the theoretical, practical and ethical dimensions of the learning process by fostering a culture of research and innovation among faculty members and students.

• To encourage long-term interaction between academia and industry through their involvement in the design of the curriculum and its hands-on implementation.

• To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

QUALITY POLICY

To provide educational services of the highest quality both curricular and co-curricular to enable students integrate skills and serve the industry and society equally well at global level.

VALUES

- ➢ Academic Freedom
- ➢ Integrity
- ➢ Inclusiveness
- ➢ Innovation
- ➢ Professionalism
- ➢ Social Responsibility

DEPARTMENT OF INFORMATION SCIENCE AND ENGINEERING

VISION

To emerge as a Department of Eminence in Information Science and Engineering in serving the Information Technology industry and the nation by empowering students with a high degree of technical and practical competence.

MISSION

• To strengthen the theoretical, practical and ethical dimensions of the learning process by continuous learning and establishing a culture of research and innovation among faculty members and students, in the field of information science and engineering.

• To build long-term interaction between the academia and Information Technology industry, through their involvement in the design of curriculum and its hands-on implementation.

• To strengthen and mould students in professional, ethical, social and environmental dimensions by encouraging participation in co-curricular and extracurricular activities.

Program Education objectives (PEOs)

PEO 1	Excel as Information Science Engineers with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments.
PEO 2	Pursue higher studies with profound knowledge enriched with academia and industrial skill sets.
PEO 3	Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges, which meet societal requirements.
PEO 4	Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society.

PEO to Mission Statement Mapping

PEO Statements	M1	M2	M3
PEO 1: Excel as an Information Science Engineer with the ability to solve a wide range of computational problems in the IT industry, Government or other work environments.	3	3	2
PEO 2: Pursue higher studies with profound knowledge enriched with academia and industrial skill sets.	3	3	2
PEO 3: Exhibit adaptive skills to develop computing systems using modern tools and technologies in multidisciplinary areas to meet technical and managerial challenges which meet societal requirements.	3	3	3
PEO 4: Possess the ability to collaborate as a team member and leader with professional ethics to make a positive impact on society.	2	2	3

Correlation: 3- High, 2-Medium, 1-Low

Program Specific Outcomes (PSO's)

PSO1: The ability to understand, analyze and develop computer programs in the areas of Information Science and Engineering related to System Software, Web Design, Big Data Analytics, Machine Learning, Internet of Things, Data Science, Networking and Security for efficient design of computer-based systems of varying complexity.

PSO2: The ability to apply standard practices and strategies in software project development using innovative ideas and open-ended programming environment with skills in teams and professional ethics to deliver a quality, sustainable product for business success in the field of Information Science.

Program Outcomes (PO) with Graduate Attributes

	Graduate Attributes	Program Outcomes (POs)
1.	Engineering Knowledge	**PO1:** Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
2.	Problem analysis	**PO2:** Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

3.	Design and Development of Solutions	**PO3:** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
4.	Investigation of Problem	**PO4:** Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
5.	Modern Tool usage	**PO5:** Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
6.	Engineer and society	**PO6:** Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
7.	Environment and sustainability	**PO7:** Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
8.	Ethics	**PO8:** Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
9.	Individual & team work	**PO9:** Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
10.	Communication	**PO10:** Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
11.	Lifelong learning	**PO11:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
12.	Project management and Finance	**PO12:** Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change learning for continued professional and career advancement.

Mapping of POs with PEOs

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**
PEO 1	3	3	3	2	3	-	-	-	3	-	3	-
PEO 2	3	3	3	2	3	-	-	-	3	-	3	-
PEO 3	3	3	3	2	3	-	-	-	3	-	3	-
PEO 4	3	3	3	2	3	-	-	-	3	-	3	-

Correlation: 3- High, 2-Medium, 1-Low

NEW HORIZON COLLEGE OF ENGINEERING

B. E. in Information Science and Engineering

Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

VII Semester													
S. No.	**Course and Course Code**		**Course Title**	**BoS**	**Credit Distribution**				**Overall Credits**	**Contact Hours**	**Marks**		
					L	**T**	**P**	**S**			**CIE**	**SEE**	**Total**
1	PCC	22ISE71	Mobile Application Development	IS	3	0	0	0	3	3	50	50	**100**
2	PCCL	22ISL71	Mobile Application Development Lab	IS	0	0	1	0	1	2	50	50	**100**
3	PCC	22ISE72	Software Testing and Automation	IS	3	0	0	0	3	3	50	50	**100**
4	PCCL	22ISL72	Software Testing and Automation Lab	IS	0	0	1	0	1	2	50	50	**100**
5	PCC	22ISE73	Object Oriented Modeling and Design	IS	3	0	0	0	3	3	50	50	**100**
6	PROJ	22ISE74	Project Phase - II	IS	0	0	10	0	10	20	100	100	**200**
7	OEC	23NHOP7XX	Industrial Open Elective Course-II	Offering Dept.	3	0	0	0	3	3	50	50	**100**
				Total					**24**	**36**	**400**	**400**	**800**

PCC: Professional Core Course, **PCCL**: Professional Core Course laboratory, **PEC**: Professional Elective Course, **OEC**: Open Elective Course, **PROJ**: Project work**, L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, C**IE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

Industrial Open Elective Courses-II:
Credit for OEC is 03 (L: T: P: S) can be considered as (3: 0: 0 : 0). The teaching and learning of these Courses will be based on hands-on. The Course Assessment will be based on CIE and SEE in practical mode. This Courses will be offered by Centre of Excellence to students of all the branches. Registration to Industrial open electives shall be documented and monitored on college level.

Project Phase-II:
The objective of the Project work is

(i) To encourage independent learning and the innovative attitude of the students.
(ii) To develop interactive attitude, communication skills, organization, time management, and presentation skills.
(iii) To impart flexibility and adaptability.
(iv) To inspire team working.
(v) To expand intellectual capacity, credibility, judgment and intuition.
(vi) To adhere to punctuality, setting and meeting deadlines.
(vii) To install responsibilities to oneself and others.
(viii) To train students to present the topic of project work in a seminar without any fear, face the audience confidently, enhance communication skills, involve in group discussion to present and exchange ideas.

CIE procedure for Project Work:

(1) Single discipline: The CIE marks shall be awarded by a committee consisting of the Head of the concerned Department and two senior faculty members of the Department, one of whom shall be the Guide.

The CIE marks awarded for the project work, shall be based on the evaluation of the project work Report, project presentation skill, and question and answer session in the percentage ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

(2) Interdisciplinary: Continuous Internal Evaluation shall be group-wise at the college level with the participation of all guides of the college. Participation of external guide/s, if any, is desirable. The CIE marks awarded for the project work, shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the percentage ratio of 50:25:25. The marks awarded for the project report shall be the same for all the batch mates.

SEE procedure for Project Work: SEE for project work will be conducted by the two examiners appointed by the University. The SEE marks awarded for the project work shall be based on the evaluation of project work Report, project presentation skill, and question and answer session in the percentage ratio of 50:25:25.

Credit Definition:	03-Credits courses are to be designed for
1-hour Lecture (L) per week=1Credit	40 hours in Teaching-Learning Session
2-hoursTutorial(T) per week=1Credit	02- Credits courses are to be designed for
2-hours Practical / Drawing (P) per week=1Credit	25 hours of Teaching-Learning Session
2-hous Self Study for Skill Development (SDA) per	01-Credit courses are to be designed for
week = 1 Credit	15 hours of Teaching-Learning Sessions

NEW HORIZON COLLEGE OF ENGINEERING

B. E. in Information Science and Engineering

Scheme of Teaching and Examinations for 2022- 2026 BATCH (2022 Scheme)

VIII Semester

S. No.	Course and Course Code		Course Title	BoS	Credit Distribution				Overall Credits	Contact Hours	Marks		
					L	T	P	S			CIE	SEE	Total
1	PEC	22ISE81X	Professional Elective Courses-III	IS	3	0	0	0	3	3	50	50	**100**
2	PEC	22ISE82X	Professional Elective Courses -IV	IS	3	0	0	0	3	3	50	50	**100**
3	INT	22ISE83	Internship	IS	0	0	10	0	10	20	100	100	**200**
				Total					**16**	**26**	**200**	**200**	**400**

NCMC: Non-Credit Mandatory Course, **AEC**: Ability Enhancement Course, **SEM**: Seminar, **INT**: Industry Internship / Research Internship / Rural Internship, **L:** Lecture, **T**: Tutorial, **P**: Practical **S: SDA**: Self Study for Skill Development, , **CIE**: Continuous Internal Evaluation, **SEE**: Semester End Evaluation.

Professional Elective Course-III			
22ISE811	Software Architecture and Design Patterns	22ISE814	Quantum Computing
22ISE812	Management and Entrepreneurship	22ISE815	Prompt Engineering
22ISE813	Virtual Reality and Augmented Reality		

Professional Elective Course-IV			
22ISE821	Digital Marketing	22ISE824	Social Network Analysis
22ISE822	Service Oriented Architecture	22ISE825	Deep Learning
22ISE823	Parallel computing		

Elucidation:

At the beginning of IV years of the program i.e., after VI semester, VII semester classwork and VIII semester Internship shall be permitted to be operated simultaneously by the University so that students have ample opportunity for an internship. In other words, a good percentage of the class shall attend VII semester classwork and a similar percentage of others shall attend to Internship.

Internship: The mandatory Internship is for **14 to 20 weeks**. The internship shall be considered as a head of passing and shall be considered for the award of a degree. Those, who do not take up/complete the internship shall be declared to fail and shall have to complete it during the subsequent SEE examination after satisfying the internship requirements. If the students are opting for the 8th semester, the following internship options are available:

- Industry Internship
- Research Internship
- Skill Enhancement Courses
- Post-Placement Training as Internship
- Online Internship

Industry internship: It is an extended period of work experience undertaken by students to supplement their degree for professional development. It also helps them learn to overcome unexpected obstacles and successfully navigate organizations, perspectives, and cultures. Dealing with contingencies helps students recognize, appreciate, and adapt to organizational realities by tempering their knowledge with practical constraints. Students undertaking industry internships must ensure the organization is listed on the VTU Internship Portal. If not, request the organization to register on the portal.

Research internship: A research internship is intended to offer the flavor of current research going on in the research field. It helps students get familiarized with the field and imparts the skill required for carrying out research. Research internships must be carried out in recognized research centers. Ensure that these centers are registered on the portal.

Skill Enhancement Courses: Students can take Skill-based courses with credits totalling the same as those of the internship. Students must be taken from registered providers listed on the VTU Internship Portal.

Post-Placement Training as Internship: The post-placement training is also considered an internship. For students placed during their 6th/7th semester and willing to take the training during their final year, colleges must inform the recruiting companies in advance to register on the VTU Internship Portal.

Online Internship: Reputed online internship platforms, including those identified by NSDC, are already listed on the VTU Internship portal. If colleges come across other eligible organizations not yet listed, they are informed to ask the organization to register on the VTU Internship portal.

The faculty coordinator or mentor has to monitor the student's internship progress and interact with them to guide for the successful completion of the internship. The students are permitted to carry out the internship anywhere in India or abroad. University shall not bear any expenses incurred in respect of the internship. With the consent of the internal guide and Principal of the Institution, students shall be allowed to carry out the internship at their hometown (within or outside the state or abroad), provided favorable facilities are available for the internship and the student remains regularly in contact with the internal guide.

SEVENTH SEMESTER

MOBILE APPLICATION DEVELOPMENT

Course Code	**22ISE71**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE71.1	Understand the components and structure of android OS and android applications.
22ISE71.2	Illustrate the working of various mobile application development frameworks.
22ISE71.3	Apply the basic and important design concepts and issues of development of mobile applications.
22ISE71.4	Analyze the capabilities and limitations of mobile devices.
22ISE71.5	Develop the skills in designing and building mobile applications using android platform.
22ISE71.6	Develop mobile applications using multimedia graphics and animations.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
21ISE71.1	3	3	3	2	2	-	-	-	1	-	3	3	3	3
21ISE71.2	3	3	3	2	3	-	-	-	1	-	3	3	3	3
21ISE71.3	3	3	3	2	3	-	-	-	1	-	3	3	3	3
21ISE71.4	3	3	3	2	3	-	-	-	1	-	3	3	3	3
21ISE71.5	3	3	3	2	3	-	-	-	1	-	3	3	3	3
21ISE71.6	3	3	3	2	3	-	-	-	1	-	3	3	3	3

MODULE 1	**INTRODUCTION OF ANDROID OPERATING SYSTEM**	**22ISE71.1**	**8 Hours**

Android OS design and Features – Android development framework, SDK features, Creating AVDs, Types of Android applications, Android tools, Android Application components – Android Manifest file, Android Application Lifecycle – Activities, Activity lifecycle, activity states, monitoring state changes.

Text Book	Text Book 1: CH 1.2.2.1, 1.2.2.2. Text Book 2: CH 5.1. 5.2

MODULE-2	**ANDROID UI ARCHITECTURE AND UI WIDGETS**	**22ISE71.2**	**8 Hours**

Fundamental Android UI design Layouts, Drawable resources, UIwidgets, Notification, Toasts, Menu, Dialogs, Building dynamic UI with fragments.

Text Book	Text Book 1: CH 1.2.1.2, 1.2.1.3, 1.2.1.4 Text Book 2: CH 6.1, 6.2

MODULE-3	**INTENTS AND BROADCASTS**	**22ISE71.3 22ISE71.4**	**8 Hours**

Intent, Native Actions, using Intent to dial a number or to send SMS. Broadcast Receivers - Using Intent filters to service implicit Intents, Resolving Intent filters, finding and using Intents received within an Activity. Notifications – Creating and Displaying notifications, Displaying Toasts.

Text Book	Text Book 1: CH 1.4.1.3, 1.4.2.1 Text Book 2: Ch 7.1,7.2

MODULE-4	**DATA STORAGE, SERVICES & CONTENT PROVIDERS**	**22ISE71.5**	**8 Hours**

Saving Data, Interacting with other Apps, Apps with content sharing, Shared Preferences, Preferences activity, Files access, SQLite database, Overview of services in Android, Implementing a Service, Service lifecycle, Inter Process Communication.

Text Book	Text Book 1: CH 1.5.1.1, 1.5.2.1,1.5.3.3, Text Book 2: Chapter 5, Chapter 6, Chapter 7		
MODULE-5	**ADVANCED APPLICATIONS**	**22ISE71.6**	**8 Hours**

Building apps with Multimedia, Building apps with Graphics & Animations, Building apps with Sensors, Bluetooth, Camera, Telephony Services, Building apps with Location Based Services and Google maps.

Text Book	Text Book 2: Chapter 8, Chapter 11, Chapter 12, Chapter 13

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		**Marks Distribution**		
		Test (s)	**AAT1**	**AAT2**
		25	**17.5**	**7.5**
L1	**Remember**	5	-	-
L2	**Understand**	10	2.5	-
L3	**Apply**	5	5	2.5
L4	**Analyze**	5	10	5
L5	**Evaluate**	-	-	-
L6	**Create**	**-**	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		**Exam Marks Distribution (50)**
L1	**Remember**	10
L2	**Understand**	20
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	-
L6	**Create**	**-**

Suggested Learning Resources:

Text Books:

1. Google Developer Training, "Android Developer Fundamentals Course – Concept Reference", Google Developer Training Team, 2017. https://www.gitbook.com/book/google-developer-training/ android developer fundamentals course-concepts/details (Download pdf file from the above link).
2. Reto Meier; Professional Android 2 Application Development; Wiley India Pvt. ltd; 1stEdition;2012; ISBN-13:9788126525898.

Reference Books:

1. Mark Murphy; Beginning Android3; A press Springer India Pvt Ltd.; 1st Edition; 2011; ISBN-13: 978-1-4302-3297-1.
2. Eric Hellman; Android Programming– Pushing the limits by Hellman; Wiley; 2013; ISBN 13:978 1118717370.
3. Beginning Android 4 Application Development, Wei-Meng Lee, Wiley India (Wrox), 2013.

Web links and Video Lectures (e-Resources):
● https://developer.android.com ● https://www.geeksforgeeks.org/introduction-to-android-development/
Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning ● Project Based Learning – Hands on demonstration in class room with small prototypes. ● Case based learning – Student teams' formation to solve various use cases using learnt concepts and demonstration in class.

MOBILE APPLICATION DEVELOPMENT LABORATORY			
Course Code	**22ISL71**	**CIE Marks**	**50**
L:T:P:S	**0:0:1:0**	**SEE Marks**	**50**
Hrs / Week	**2**	**Total Marks**	**100**
Credits	**1**	**Exam Hours**	**03**

Course outcomes:

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

22ISL71 .1	Create, test and debug Android application by setting up Android development environment.
22ISL71 .2	Design User Interface and develop activity for Android App.
22ISL71 .3	Design and implement Database Application and Content providers.
22ISL71 .4	Implement adaptive, responsive user interfaces that work across a wide range of devices.

Mapping of Course Outcomes to Program Outcomes and Program-Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISL71 .1	3	3	3	2	3	-	1	1	-	1	-	1	3	3
22ISL71 .2	3	3	3	2	3	-	1	1	-	1	-	1	3	3
22ISL71 .3	3	3	3	2	3	-	1	1	-	1	-	1	3	3
22ISL71 .4	3	3	3	2	3	-	2	1	-	1	-	1	3	3

Pgm. No.	**List of Programs**	**Hours**	**COs**
	Prerequisite Programs		
	Knowledge of Programming languages like Kotlin or Java for Android is essential. For cross-platform development languages like Java script or C# are commonly used. Understanding OOP concepts and API is also important across all platforms.	2	NA
	PART-A		
1	Using Android SDK design and implement a single screen app that displays information about a small business.eg. Restaurant, Book shop etc. Your design must include: ● Business name ● Photo of business ● Contact information	2	22ISL71.1
2	Create an application to design a Visiting Card. The Visiting card should have a company logo at the top right corner. The company name should be displayed in Capital letters, aligned to the center. Information like the name of the employee, job title, phone number, address, email, fax and the website address is to be displayed. Insert a horizontal line between the job title and the phone number.	2	22ISL71.1

3	Develop a simple application with one Edit text so that the user can write some text in it. Create a button called “Convert Text to Speech” that converts user input text into voice.	2	22ISL71.2
4	Develop an application that makes use of the clipboard framework for copying and pasting of the text. The activity consists of two EditText controls and two Buttons to trigger the copy and paste functionality.	2	22ISL71.2
5	Design an app for Tourist spot: With three activities, Welcome page, Display attractions of tourist spot and Webpage of the tourist spot.	2	22ISL71.2
6	Develop an Android application using controls like Button, TextView, EditText for designing a Calculator having basic functionality like Addition, Subtraction, Multiplication and Division.	2	22ISL71.2
PART-B			
7	Develop an android application Student Database App. The app should store USN, Student name and Semester of the student in SQLite database.	2	22ISL71.3
8	Create an Android application with two screens where the user enters his information on the first screen, when a button is clicked, the entered data should be passed to the second screen and displayed there.	2	22ISL71.4
9	Develop an application to set an image as wallpaper. On click of a button, the wallpaper image should start to change randomly every 30 seconds.	2	22ISL71.4
10	Design and develop Health Monitoring App using Android. The app will store the blood pressure, blood group and glucose level of patient in SQLite database.	2	22ISL71.3
11	Create a Sign-Up activity where the user enters a username and password, with password validation based on the following rules: It must be at least 8 characters long, contain both uppercase and lowercase letters, include letters and numbers, and have at least one special character. On successful sign-up, use a Bundle to pass the username and password to the Login activity. In the Login activity, allow the user to sign in using the credentials created during sign-up. If the credentials match, navigate to a new activity displaying "Successful Login"; otherwise, show a toast message "Login Failed".	2	22ISL71.4
12	Write a program to create an activity with two buttons START and STOP. On Pressing of the START button, the activity must start the counter by displaying the numbers from One and the counter must keep on counting until the STOP button is pressed. Display the counter value in a TextViewcontrol.	2	22ISL71.4
PART-C **Beyond Syllabus Virtual Lab Content** **(To be done during Lab but not to be included for CIE or SEE)** ● Develop an Android application to display Map of your college locality. ● Develop an Android application to alert SMS to one given phone number **.**			

CIE Assessment Pattern (50 Marks – Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	5	5
L3	Apply	5	10
L4	Analyze	5	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	10
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books

1. Reto Meier; Professional Android 4 Application Development; Wiley India Pvt.ltd; 1st Edition; 2012; ISBN-13: 9788126525898.
2. Phillips, Stewart, Hardy and Marsicano; Android Programming, 2nd edition - Big Nerd Ranch Guide;2015; ISBN-13 978-0134171494.
3. Mark Murphy; Beginning Android 3; Apress Springer India Pvt Ltd. ;1st Edition; 2011; ISBN-13: 978-1- 4302- 3297-1.
4. Eric Hellman; Android Programming – Pushing the limits by Hellman; Wiley; 2013; ISBN 13: 978- 1118717370.

SOFTWARE TESTING AND AUTOMATION			
Course Code	**22ISE72**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE72.1	Explain the fundamental concepts in software testing.
22ISE72.2	Analyze the types of structural testing techniques.
22ISE72.3	Analyze the importance of GUI Testing and software metrics in Software Testing.
22ISE72.4	Describe the Defect Management Process.
22ISE72.5	Evaluate the Automation process and related tools.
22ISE72.6	Analyze the Testing Tools related to web automation and mobile automation.

Mapping of Course Outcomes to Program Outcomes and Program-Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE72.1	3	2	2	2	2	-	-	-	-	-	-	2	3	3
22ISE72.2	3	3	3	3	2	-	-	-	-	-	-	3	3	3

22ISE72.3	3	3	3	3	2	-	-	-	-	2	-	3	3	3
22ISE72.4	3	2	3	2	2	-	-	-	-	2	-	3	3	3
22ISE72.5	3	3	3	3	3	-	-	-	-	-	-	3	3	3
22ISE72.6	3	3	3	3	3	-	-	-	-	-	-	3	3	3

MODULE-1	**INTRODUCTION TO SOFTWARE TESTING**	**22ISE72.1**	**8 Hours**

Fundamentals: Verification and Validation Techniques – V-Model of Testing – Software Testing - Purpose of Testing - Taxonomy of Bugs - Defect and Failure Analysis – Types of Testing Techniques – Black Box – White Box – Gray Box Testing Test Adequacy and Coverage. Functional Testing Functional testing - Boundary Value Testing - Equivalence class testing - Decision table-based testing.

Text Book	Text Book 1: Ch1, 2, 3,4, 5,6

MODULE-2	**STRUCTURAL TESTING**	**21ISE72.2**	**8 Hours**

Structural Testing: Path testing - Data and Control Flow Testing – Graph Based Testing - Evaluation of the testing and summary Regression Testing: Need for Regression Testing–Impact Analysis – Regression Test Selection Techniques – Code and Model Based Techniques – Test Case Optimization Techniques.

Text Book	Text Book 1: Ch 6,8

MODULE-3	**NON-FUNCTIONAL TESTING**	**22ISE72.3** **22ISE72.4**	**8 Hours**

Nonfunctional testing GUI Testing – Domain Based Testing – Performance Testing – Stress Testing – Load Testing – Acceptance Testing – Alpha, Beta, Gamma Testing – Software Acceptance Plan.
Metrics: Importance of Metrics in Testing - Effectiveness of Testing – Defect Density – Defect Leakage Ratio – Residual Defect Density – Test Team Efficiency – Test Case Efficiency–Various Test Reports.

Text Book	Text Book 1:Ch 7, 8,9

MODULE-4	**AUTOMATION TESTING**	**22ISE72.5**	**8 Hours**

Automation testing: Basics, Significance, Testing using automated tools, Components, Process of Test Automation, Strategies, Automated tests, Examples of test automation, Test Automation maintenance, Automation test frameworks-types, tools.

Text Book	Text Book 1: Ch 10,11

MODULE-5	**WEB AUTOMATION**	**22ISE72.6**	**8 Hours**

Web Automation: Client- Server testing, Selenium Automation Framework, Selenium IDE, Selenium Web Driver, Data driven, Keyword driven, Hybrid. Selenium basics, waits, Web Component concept, Junit4 basics, Selenium in Java, Page Object Concept, Data transfer Object Concept. Database Testing using Selenium, Cross Browser Testing. Mobile Automation: Mobile application framework, APPIUM basics.

Text Book	Text Book 1: Ch 12, 13, 14

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		**Marks Distribution**	
		Test (s)	**AAT1**
		25	**25**
L1	**Remember**	5	-
L2	**Understand**	5	10
L3	**Apply**	5	10
L4	**Analyze**	5	5
L5	**Evaluate**	5	-
L6	**Create**	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	10
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	-

Suggested Learning Resources:

Text Books:

1. Matthew Heusser, Michael Larsen, "Software Testing Strategies", 2023.
2. Dorothy Graham, Rex Black, "Foundations of Software Testing: ISTQB Certification, 2020.
3. "Introduction to Software Testing" by Paul Ammann & Jeff Offutt 2nd edition, 2016.

Reference Books:

1. "Continuous Testing for DevOps Professionals" by Eran Kinsbruner (2020).
2. "Agile Testing" by Lisa Crispin and Janet Gregory (latest print 2019).

Web links and Video Lectures (e-Resources):

1. "Automation Testing Tutorial", https://artoftesting.com/automation-testing
2. Tools QA, Selenium Tutorial, https://www.toolsqa.com/selenium-tutorial/
3. "Appium Tutorials", https://appium.io/tutorial.html

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Case Study on software tool usage.
- NPTEL.

SOFTWARE TESTING AND AUTOMATION LAB			
Course Code	**22ISL72**	**CIE Marks**	**50**
L:T:P:S	**0:0:1:0**	**SEE Marks**	**50**
Hrs / Week	**2**	**Total Marks**	**100**
Credits	**1**	**Exam Hours**	**03**

Course outcomes:

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

22ISL72 .1	Derive the test cases for a given problem using testing approaches such as decision table approach, Equivalence class testing and Boundary Value Analysis method.
22ISL72 .2	Derive test cases for UI of web applications.
22ISL72 .3	Illustrate automated testing of web applications using selenium and Junit automation framework.
22ISL72 .4	Illustrate Working on web objects and excel file updated using Selenium.

Mapping of Course Outcomes to Program Outcomes and Program-Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

22ISL72 .1	3	3	3	3	-	-	-	-	-	-	-	3	3	3
22ISL72.2	3	3	3	3	3	-	-	-	-	-	-	3	3	3
22ISL72.3	3	3	3	3	3	-	-	-	-	-	-	3	3	3
22ISL72.4	3	3	3	3	3	-	-	-	-	-	-	3	3	3

Pgm. No.	**List of Programs**	**Hours**	**COs**
	Prerequisite Programs		
	Understanding of Software Engineering and Project Management topics, Basics of Java and C programming. Basics on algorithms.	2	NA
	PART-A		
1	Design and develop a program in a language of your choice to solve the triangle problem defined as follows: Accept three integers which are supposed to be the three sides of a triangle and determine if the three values represent an equilateral triangle, isosceles triangle, scalene triangle, or they do not form a triangle at all. Assume that the upper limit for the size of any side is 10. Derive test cases for your program based on decision table approach, execute the test cases and discuss the results.	2	22ISL72.1
2	Design, develop, code and run the program in any suitable language to solve the commission problem. Analyze it from the perspective of boundary value testing, derive different test cases, execute these test cases and discuss the test results.	2	22ISL72.1
3	Design, develop, code and run the program in any suitable Language to implement the Next Date function. Analyze it from the perspective of equivalence class value testing, derive different testcases, execute these test cases and discuss the test results.	2	22ISL72.1
4	Design front-end for any web application and derive the test cases as applicable. Validate the UI elements using JavaScript.	2	22ISL72.2
5	Write a program for matrix multiplication. "Introspect the causes for its failure and write down the possible reasons". Analyze the Positive test cases and Negative Test cases.	2	22ISL72.2
6	Write a JUnit unit test for evaluating calculator Java class.	2	22ISL72.3
	PART-B		
7	Write a Junit test case for checking the database connection.	2	22ISL72.3
8	Illustrate automated testing using selenium to perform tests on login web pages.	2	22ISL72.3
9	Write a program to perform cross-browser testing in Selenium and make use of TestNG to specify different browsers for your test execution.	2	22ISL72.3
10	Develop and test a program to count the number of check boxes on the page checked and unchecked count.	2	22ISL72.4
11	Write and test a program to provide a total number of different objects present on a web page using selenium.	2	22ISL72.4
12	Use selenium to test a program that updates 10 student records into a table from an Excel file.	2	22ISL72.4

PART-C

Beyond Syllabus Virtual Lab Content

(To be done during Lab but not to be included for CIE or SEE)

- **Estimation of Test Coverage Metrics and Structural Complexity**

https://seiitkgp.vlabs.ac.in/exp/metricsstructura-complexity/

- **Designing Test Suites**
  https://se-iitkgp.vlabs.ac.in/exp/designing-test-suites/

CIE Assessment Pattern (50 Marks – Lab)

RBT Levels		Test (s)	Weekly Assessment
		20	30
L1	Remember	-	-
L2	Understand	5	5
L3	Apply	5	10
L4	Analyze	5	10
L5	Evaluate	5	5
L6	Create	-	-

SEE Assessment Pattern (50 Marks – Lab)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	-
L2	Understand	10
L3	Apply	10
L4	Analyze	20
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Reference Books

1. Software Testing: Principles and Practices by Srinivasan Desikan and Gopalaswamy Ramesh ISBN: 9788131706258.
2. Foundations of Software Testing by Rex Black, Dorothy Graham, and Erik van Veenendaal ISBN: 9788131526368.
3. Test Automation Using Selenium WebDriver with Java by Navneesh Garg ISBN: 9788193245279.

OBJECT ORIENTED MODELING AND DESIGN			
Course Code	**22ISE73**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE73.1	Understand Object Oriented Modeling techniques.
22ISE73.2	Apply class modeling by creating class diagrams based on the given problem requirements.
22ISE73.3	Analyze state modeling use case, sequence and activity modeling techniques to represent functional requirements for a particular problem.
22ISE73.4	Analyze the relationships and behavior of system components using Deployment Diagrams to understand dynamic interactions.

22ISE73.5	Apply object-oriented principles to realize associations and relationships among classes for accurate system modeling.
22ISE73.6	Apply the concept of software design patterns by identifying various pattern categories and describing their structure and purpose.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE73.1	2	2	2	3	2	-	-	-	-	1	1	2	2	3
22ISE73.2	2	2	2	3	2	-	-	-	-	1	1	2	2	3
22ISE73.3	2	2	2	3	2	-	-	-	-	1	1	2	2	3
22ISE73.4	2	2	2	3	2	-	-	-	-	1	1	2	2	3
22ISE73.5	2	2	2	3	2	-	-	-	-	1	1	2	2	3
22ISE73.6	2	2	2	3	2	-	-	-	-	1	1	2	2	3

MODULE1	**INTRODUCTION, MODELING CONCEPTS AND CLASS MODELING**	**22ISE73.1,22ISE73.2**	**8 Hours**

Object Orientation, OO development, OO themes; Modeling, Concepts -1: The three models, Class Modeling: Object and class concepts; Link and associations concepts: multiplicity; ordering, Association Class, Association ends, Association end name, Qualified Association, Generalization and inheritance; A sample class model, Example Scenario: ATM management system.

Text Book	Text Book 1: Ch 1,2

MODULE2	**ADVANCED CLASS MODELING & BEHAVIORAL MODELING**	**22ISE73.3**	**8 Hours**

Advanced Class Modeling: Advanced object and class concepts; Aggregation. State Modeling: Events, States, Transitions and Conditions; State diagrams; State diagram behavior, Problems with flat state Diagram, Advanced State Modeling: Nested state, Nested state diagrams; Concurrency; A sample state model. Sequence scenario, Sequence Diagrams; Procedural sequence models.

Text Book	Text Book 1: Ch 2,3,4 Text Book 2 :10

MODULE3	**BEHAVIORAL, FUNCTIONAL MODELING AND ARCHITECTURAL MODELING**	**22ISE73.3,22ISE73.4**	**8 Hours**

Use case Scenario, use case Diagrams, Guidelines for use case Diagram, use case Relationships, Activity Diagram Notations, Activity Diagram, Guidelines for activity Diagram, Sending and Receiving Signals, Swim lanes. Data Flow Diagram (Level-0, Level-1 and Level-2); Component diagrams and Deployment diagrams; Reverse Engineering.

Text Book	Text Book 2: Ch 6, 7 ,10

MODULE4	**IMPLEMENTATION MODELING**	**22ISE73.5**	**8 Hours**

Development Stages, Development life cycle, System Conception: Devising a System Concept, Elaborating a Concepts, Keeping right classes and removing bad classes, Preparing a Problem Statement. Overview of implementation; Fine-tuning classes; Fine-tuning generalizations; Realizing associations; Testing.

Text Book	Text Book 1: Ch 7-9 Text Book 2 :15

MODULE5	**DESIGN PATTERNS**	**22ISE73.6**	**8 Hours**

What is Pattern? Pattern categories, Pattern Description, Singleton pattern, Prototype pattern, Builder pattern, Factory method pattern, Abstract factory pattern, Proxy Pattern, Facade Pattern.

Text Book	Text Book 1: Ch 13-16

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		**Marks Distribution**		
		Test (s)	**AAT1**	**AAT2**
		25	**15**	**10**
L1	**Remember**	-	-	-
L2	**Understand**	10	5	5
L3	**Apply**	10	10	5

L4	**Analyze**	5	-	-
L5	**Evaluate**	-	-	-
L6	**Create**	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	-
L2	**Understand**	20
L3	**Apply**	20
L4	**Analyze**	10
L5	**Evaluate**	-
L6	**Create**	**-**

Suggested Learning Resources:

Text Books:

1. Object-Oriented Analysis and Design using UML Authors: Ugrasen Suman, Sanjeev K. Sharma, Maya Rathore Publisher: Cengage India, 1st Ed (2019) ISBN-13: 978-9387994218 .
2. "Systems Analysis and Design" by Kenneth E. Kendall & Julie E. Kendall,10th Edition, Pearson, volume 10,2021.

Reference Books:

1. Object-Oriented Analysis and Design Through UML , Gandharba Swain, Laxmi Publications, 2022 (1st Edition).
2. K. Venugopal Reddy, Sampath Korra, "Object –Oriented Analysis and Design Using UML", BSP BOOKS, November 6, 2019.
3. Vaskaran Sarcar, "Java Design Patterns: A Hands-On Experience with Real-World Examples", Apress; 2nd ed. edition, December 7, 2018.

Web links and Video Lectures (e-Resources):

- Object-Oriented System Development using UML – NPTEL (Prof. Rajib Mall, IIT Kharagpur) http://onlinecourses.nptel.ac.in/noc23_cs46/preview.
- Pattern-Oriented Software Architecture – YouTube Playlist (Coursera/Deep Dive) http://www.youtube.com/playlist?list=PLZ9NgFYEMxp6CHE-QQ040tlDILNcBqJnc
- Systems Analysis and Design – NPTEL Course (IISc Bangalore) http://archive.nptel.ac.in/courses/106/108/106108103/

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Quizzes and Assignments.
- Contents related activities (Activity-based discussions)
  - For active participation of students, instruct the students to prepare UML Diagrams and Organizing Group wise discussions.

PROJECT PHASE-II			
Course Code	**22ISE74**	**CIE Marks**	**100**
L:T:P:S	**0:0:10:0**	**SEE Marks**	**100**
Hrs / Week	**0**	**Total Marks**	**200**
Credits	**10**	**Exam Hours**	**03**

Course outcomes: At the end of the course, the student will be able to:	
22ISE74.1	Identify an issue and derive problem related to society, environment, economics, energy and technology.
22ISE74.2	Formulate and analyze the problem and determine the solution.

22ISE74.3	Determine, break down, and estimate the parameters needed for the solution. Then, using testing tools, assess the solution by evaluating it in light of the standard data and the objective function, as well as by applying the proper performance metrics.
22ISE74.4	Create the report and take part in present / publishing the finding in a reputed conference / publication.
22ISE74.5	Interpret their communication skills effectively with the technical presentation.
22ISE74.6	Create the article logically, following a structured format with well-defined sections such as Introduction, background, methodology, results, discussion, and conclusion.

Mapping of Course Outcomes to Program Outcomes and Program-Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISE74.1	3	3	3	3	3	3	2	1	3	2	3	3	3	3
22ISE74.2	3	3	3	3	3	3	2	1	3	2	3	3	3	3
22ISE74.3	3	3	3	3	3	3	2	1	3	2	3	3	3	3
22ISE74.4	3	3	3	3	3	3	2	1	3	2	3	3	3	3
22ISE74.5	3	3	3	2	2	-	-	-	3	3	2	2	2	2
22ISE74.6	3	3	2	-	-	2	-	3	3	1	2	2	-	2

- Project Executed in an Industry or at an Institution.
- The CIE for the project will be 100 marks.
- The panel members for the project review comprising of Head of department, expert members, respective guide, will assess the project progress and award the CIE marks based on their evaluations. Project activities should be reported by students to the guide on a regular basis.
- For project work, the minimum CIE mark requirement is 40% of the maximum mark.
- Students will be deemed to have failed the relevant course or courses if they are unable to receive at least 40% of the CIE marks in project work. They will also not be entitled to take the project examination administered by the university. They may, however, show up for exams administered by the university in other courses taken during the same semester, including any backlog courses.
- Student team must apply the learnt concepts of software testing and carry out automation for the testing the final project outcome.
- Students will appear for the SEE after earning the required minimum CIE grades in the course or courses when they are offered during the following semester.
- If a student has already received the minimum number of points needed for a project, they are not eligible to improve their CIE scores.
- In order to pass a project or viva-voce exam, a student must receive at least 40% of the total points required for the university exam.

CIE Assessment Pattern(100 Marks)

Bloom's Category	Tests (100 Marks)
Remember	-
Understand	-
Apply	30
Analyze	20
Evaluate	20
Create	30

SEE Assessment Pattern (100 Marks – Theory)

Bloom's Category	Tests (100 Marks)
Remember	-
Understand	-
Apply	30
Analyze	20
Evaluate	20
Create	30

EIGHTH SEMESTER

SOFTWARE ARCHITECTURE AND DESIGN PATTERNS			
Course Code	**22ISE811**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE811.1	Apply architecture business cycle.
22ISE811.2	Interpret the importance of architectural styles and process control in various scenarios.
22ISE811.3	Recommend various quality attributes for architecture designs.
22ISE811.4	Evaluate different architectural patterns and their applications.
22ISE811.5	Design software architecture for different software projects.
22ISE811.6	Apply the strategies during documentation of software architecture.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE811.1	3	3	3	3	-	-	-	-	-	-	-	1	3	2
22ISE811.2	3	3	3	3	-	-	-	-	-	-	-	1	3	2
22ISE811.3	3	3	3	3	-	-	-	-	-	-	-	1	3	2
22ISE811.4	3	3	3	3	-	-	-	-	-	-	-	1	3	2
22ISE811.5	3	3	3	3	-	-	-	-	-	-	-	1	3	2
22ISE811.6	3	3	3	3	-	-	-	-	-	-	-	1	3	2

MODULE-1	**INTRODUCTION**	**22ISE811.1**	**8 Hours**

Introduction: The Architecture Business Cycle: Software processes and the architecture business cycle; A good architecture principles. Software architecture guidelines; Other points of view; Architectural patterns, reference models and reference architectures; Importance of software architecture; Architectural structures and views.

Text Book	Text Book 1: 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4

MODULE-2	**ARCHITECTURAL STYLES**	**22ISE811.2**	**8 Hours**

Architectural styles: Pipes and filters; Data abstraction and object-oriented organization; Event-based, implicit invocation; Layered systems; Repositories; Interpreters; Process control; Other familiar architectures; Heterogeneous architectures.

Text Book	Text Book 1: 1.1, 1.2, 1.3, 2.1, 2.2, 2.3, 2.4

MODULE-3	**SYSTEM QUALITY**	**22ISE811.3**	**8 Hours**

Functionality and architecture: Architecture and quality attributes; System quality attributes; Quality attribute scenarios in practice; Other system quality attributes; Business qualities; Architecture qualities. Achieving Quality: Introducing tactics; Availability tactics; Modifiability tactics; Performance tactics; Security tactics; Testability tactics; Usability tactics.

Text Book	Text Book 1:8.1,8.4,9.1,9.2,9.3, Text Book 2:5.9		
MODULE-4	**ARCHITECTURAL PATTERNS**	**22ISE811.4**	**8 Hours**
Architectural Patterns: Introduction; From mud to structure: Layers, Pipes and Filters, Blackboard Distributed Systems: Broker; Interactive Systems: MVC, Presentation-Abstraction- Control. Adaptable Systems: Microkernel; Reflection.			
Text Book	Text Book 1: 4.2, 5.1, 5.2, 6.4		
MODULE-5	**DESIGNING SOFTWARE ARCHITECTURE AND DOCUMENTATION**	**22ISE811.5 22ISE811.6**	**8 Hours**
Architecture in the life cycle: Designing the architecture; Forming the team structure; Creating a skeletal system. Uses of architectural documentation; Views; Choosing the relevant views; Documenting a view; Documentation across views.			
Text Book	Text Book 1: 7.1, 7.2,7.3, 8.1, 8.2		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	**AAT1**	**AAT2**	**AAT3**
		25	**7.5**	**7.5**	**10**
L1	**Remember**	5	-	**-**	**2**
L2	**Understand**	5	-	-	2
L3	**Apply**	5	-	2.5	2
L4	**Analyze**	5	-	2.5	2
L5	**Evaluate**	5	7.5	2.5	2
L6	**Create**	**-**	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	10
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	-

Suggested Learning Resources:

Text Books:

1. Len Bass, Paul Clements, Rick Kazman: Software Architecture in Practice, 2nd Edition, Pearson Education, Re print 2019.
2. Frank Buschmann, Regine Meunier, Hans Rohnert, Peter Sommerlad, Michael Stal: Pattern-Oriented Software Architecture, A System of Patterns, Volume 1, John Wiley and Sons, Reprint 2018.
3. Mary Shaw and David Garlan: Software Architecture- Perspectives on an Emerging Discipline, PHI, Re print2019.

Reference Books:

1. E. Gamma, R. Helm, R. Johnson, J. Vlissides: Design Patterns-Elements of Reusable Object-Oriented Software, Pearson Education, Re print2012.

Web links and Video Lectures (e-Resources):

- Software Conceptual Design - Course (nptel.ac.in)
- Lecture - 15 Design Patterns - NPTEL Software Engineering (nptelvideos.com)

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Flip class room.
- Activity-based discussions on application of design pattern in solving real world issues.
- Quiz and online assessment to bring awareness about various design patterns.

MANAGEMENT AND ENTREPRENEURSHIP			
Course Code	**22ISE812**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE812.1	Understand the basic principles and concepts of management.
22ISE812.2	Analyze the internal/external factors affecting a business/organization to evaluate business opportunities.
22ISE812.3	Understand how to manage people, processes, and resources within a diverse organization.
22ISE812.4	Demonstrate the functions, types and roles of an entrepreneur.
22ISE812.5	Describe the features of small-scale industries and understand the institutional support provided for entrepreneurship.
22ISE812.6	Evaluate the preparation of project report, need significance of report. Also to explain about industrial ownership.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISE812.1	3	2	1	1	-	-	-	-	-	1	3	3	3	3
22ISE812.2	3	2	1	1	-	-	-	-	-	1	3	3	3	3
22ISE812.3	3	2	1	1	-	-	-	-	-	1	3	3	3	3
22ISE812.4	3	2	1	1	-	-	-	-	-	1	3	3	3	3
22ISE812.5	3	2	1	1	-	-	-	-	-	1	3	3	3	3
22ISE812.6	3	2	1	1	-	-	-	-	-	1	3	3	3	3

MODULE-1	**INTRODUCTION OF MANAGEMENT AND PLANNING**	**22ISE812.1**	**8 Hours**

Introduction – Meaning, nature and characteristics of management, scope and functional areas of management, goals of management, levels of management, brief overview of evolution of management. Planning- Nature, importance, types of plans, steps in planning, Organizing- nature and purpose, types of organization.

Text Book	Text Book 1: Chapter 1

MODULE-2	STAFFING, CONTROLLING, COMMUNICATION AND COORDINATION	22ISE812.3	8 Hours
Staffing- meaning, process of recruitment and selection. Directing and controlling- meaning and nature of directing, leadership styles, motivation theories. Controlling- meaning, steps in controlling, methods of establishing control, Communication- Meaning and importance, Coordination- meaning and importance.			
Text Book	Text Book 1: Chapter 2, 3		
MODULE-3	**BASIC KNOWLEDGE ABOUT ENTREPRENEURSHIP**	**22ISE812.2 22ISE812.4**	**8 Hours**
Entrepreneur – meaning of entrepreneur, types of entrepreneurships, stages of entrepreneurial process, role of entrepreneurs in economic development, entrepreneurship in India, barriers to entrepreneurship. Identification of business opportunities- market feasibility study, technical feasibility study, financial feasibility study and social feasibility study.			
Text Book	Text Book 1: Chapter 5		
MODULE-4	**MARKETING AND ADVERTISING**	**22ISE812.5 22ISE812.6**	**8 Hours**
Marketing Management - Definition of Marketing, Marketing Concept, Objectives and Functions of Marketing. Marketing Research - Meaning; Definition; Objectives; Importance; Limitations; Process. Advertising - Meaning of Advertising, Objectives, Functions, Criticism.			
Text Book	Text Book 1: Chapter 6		
MODULE-5	**FINANCIAL MANAGEMENT**	**22ISE812.5 22ISE812.6**	**8 Hours**
Financial Management - Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the Concept of Capital Structure and Various Sources of Finance.			
Text Book	Text Book 1: Chapter 7		

CIE Assessment Pattern(50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	AAT1	AAT2	AAT3
		25	7.5	7.5	10
L1	Remember	5	-	-	2
L2	Understand	5	-	-	2
L3	Apply	5	-	2.5	2
L4	Analyze	5	-	2.5	2
L5	Evaluate	5	7.5	2.5	2
L6	Create	-	-	-	-

SEE Assessment Pattern(50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10

L3	**Apply**	10	
L4	**Analyze**	10	
L5	**Evaluate**	10	
L6	**Create**	-	

Suggested Learning Resources:

Text Books:

1. Principles of Management -P. C. Tripathi, P. N. Reddy; Tata McGraw Hill, 4th / 6th Edition, 2010.
2. Dynamics of Entrepreneurial Development & Management -Vasant Desai Himalaya Publishing House.

Reference Books:

1. Management Fundamentals -Concepts, Application, Skill Development Robert Lusier – Thomson.
2. Entrepreneurship Development -S S Khanka -S Chand & Co.

Web links and Video Lectures (e-Resources):

- http://dspace.vnbrims.org:13000/xmlui/bitstream/handle/123456789/4983/Management%20and%20Entrepreneurship.pdf?sequence=1

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- NPTEL course.
- Contents related activities (Activity-based discussions).
- For active participation of students, instruct the students to solve and analyze various algorithms.

VIRTUAL REALITY AND AUGMENTED REALITY			
Course Code	**22ISE813**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE813.1	Understand the fundamentals of Virtual Reality Systems.
22ISE813.2	Summarize the Fundamentals of VR and hardware and software of the Virtual Reality.
22ISE813.3	Analyze the applications of Virtual Reality.
22ISE813.4	Illustrate technology, underlying principles, its potential and limits.
22ISE813.5	Describe the criteria for defining useful applications and the Process of creating Virtual environments.
22ISE813.6	Evaluate the fundamentals of Augmented Reality Systems.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISE813.1	3	2	2	2	-	-	-	-	-	-	-	1	2	2
22ISE813.2	3	2	2	1	-	-	-	-	-	-	-	1	2	2
22ISE813.3	3	3	2	2	-	-	-	-	-	-	-	1	2	2
22ISE813.4	3	2	2	2	-	-	-	-	-	-	-	1	2	2
22ISE813.5	3	2	2	2	-	-	-	-	-	-	-	1	2	2
22ISE813.6	3	3	2	2	3	-	-	-	-	-	-	1	2	2

MODULE-1	INTRODUCTION TO VR	22ISE813.1	8 Hours
Introduction: The three I's of virtual reality, commercial VR technology and the five classic components of a VR system. Input Devices: Three-dimensional position trackers, navigation and manipulation.			
Self-study	The Effects of Fully Immersive Virtual Reality on the Learning of Physical Tasks.		
Text Book	Text Book 1: 1.1, 1.3, 1.5, 2.1, 2.2 and 2.3		
MODULE-2	**OUTPUT DEVICES**	**22ISE813.2**	**8 Hours**
Gesture Interfaces - The Pinch Glove, The 5DT Data Glove, The Didji glove, The Cyber Glove. Output Devices: Graphics displays, sound displays & haptic feedback.			
Text Book	Text Book 1: 3.1,3.2,3.3		
MODULE-3	**MODELING**	**22ISE813.3**	**8 Hours**
Modeling: Geometric modeling, Kinematics Modeling, Physical Modeling, behavior modeling, model management.			
Self-study	Development and Analysis of VR Technician Training and Methods.		
Text Book	Text Book 1: 5.1, 5.2, 5.4 and 5.5		
MODULE-4	**HUMAN FACTORS AND APPLICATIONS OF VR**	**22ISE813.4, 22ISE813.5**	**8 Hours**
Human Factors: Methodology and terminology, user performance studies, VR health and safety issues. Applications of VR: Medical, Military, Robotics applications, Applications of Virtual Reality in Manufacturing.			
Self-study	A Modular Interactive Virtual Surgical Training Environment. Virtual Reality Training Improves Operating Room Performance, VR is as effective for training a military-based task as desktop-based training.		
Text Book	Text Book 1: 7.1, 7.2 and 7.3 Text Book 2:8.1,8.3,9.1 and 9.2		
MODULE-5	**AUGMENTED REALITY**	**22ISE813.6**	**8 Hours**
Introduction - Defining augmented reality, history of augmented reality, difference between AR and VR, Challenges with AR, AR systems and functionality, applications of augmented reality, Augmented Reality Concepts- Working principles of Augmented Reality. visualization techniques for augmented reality.			
Self-study	Visualization techniques for augmented reality.		
Text Book	Text Book 3: 1.1 to 1.8,2.1 to 2.5		

CIE Assessment Pattern (50 Marks – Theory) –

RBT Levels		Marks Distribution			
		Test (s)	AAT1	AAT2	AAT3
		25	7.5	7.5	10
L1	Remember	5	-	-	2
L2	Understand	5	-	-	2
L3	Apply	5	-	2.5	2
L4	Analyze	5	-	2.5	2
L5	Evaluate	5	7.5	2.5	2
L6	Create	-	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10

L5	**Evaluate**	10
L6	**Create**	--

Suggested Learning Resources:

Text Books:

1. Samuel Greengard, Steven Jay Cohen, "Virtual Reality", Gilden Media, First Edition, 2019.
2. Gregory C. Burdea& Philippe Coiffet, "Virtual Reality Technology", Second Edition, John Wiley& Sons, 2006.
3. Allan Fowler-AR Game Development||, 1st Edition, A press Publications, 2018, ISBN 978-1484236178.

Reference Books:

1. Jason Jerald, "The VR Book: Human-Centered Design for Virtual Reality", ACM Books, First Edition, 2015.
2. Tony Parisi, "Learning Virtual Reality", O'Reilly, First Edition, 2015.

Web links and Video Lectures (e-Resources):

- https://techooid.com/input-devices-vr
- https://www.marxentlabs.com/what-is-virtual-reality/
- https://www.techtarget.com/whatis/definition/virtual-reality

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of VR input and output devices.
- Demonstration graphics, sound feed back .
- Demonstration of modeling techniques.
- Video demonstration of latest trends in Virtual Reality.
  - Organizing Group wise discussions on Applications of VR .
  - Seminars.

QUANTUM COMPUTING			
Course Code	**22ISE814**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE814.1	Understand the basics of quantum computing.
22ISE814.2	Understand the background of Quantum Mechanics.
22ISE814.3	Analyse the computation models.
22ISE814.4	Model the circuits using quantum computation.
22ISE814.5	Analyse the quantum operations such as noise and error–correction.
22ISE814.6	Analyse the need of quantum computing.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2

22ISE814.1	3	2	2	2	2	-	-	-	-	-	-	-	2	2
22ISE814.2	3	2	2	2	2	-	-	-	-	-	-	-	2	2
22ISE814.3	3	2	2	2	2	-	-	-	-	-	-	-	2	2
22ISE814.4	3	2	2	2	2	-	-	-	-	-	-	-	2	2
22ISE814.5	3	2	2	2	2	-	-	-	-	-	-	-	2	2
22ISE814.6	3	2	2	2	2	-	-	-	-	-	-	-	2	2

MODULE-1	**Introduction to Quantum Computing**	**22ISE814.1**	**8 Hours**
Introducing quantum mechanics: Introduction & Types of Computing, History of Classical Electronic Computing and Quantum Computing, How Is a Quantum Computer Different, Quantum kinematics, quantum dynamics, quantum measurements. Single qubit, multiqubit, gates.			
Text Book	Text Book 1: 1.2, 1.3, 2.1,2.2,2.3,2.4,2.5,3.2		
MODULE-2	**Matrices & Operators**	**22ISE814.2**	**8 Hours**
Matrix representation of 0 and 1 States, Identity Operator I, Applying I to|0⟩and |1⟩ states, Pauli Matrices and its operations on |0⟩and |1⟩states, Explanation of i) Conjugate of a matrix and ii) Transpose of a matrix. Unitary matrix U, Examples: Row and Column Matrices and their multiplication (Inner Product).			
Text Book	Text Book 1: 2.2,1.1,4.2,3.4		
MODULE-3	**Quantum Cryptography**	**22ISE814.3**	**8 Hours**
Cryptography, classical cryptography, introduction to quantum cryptography. BB84, B92 protocols. Introduction to security proofs for these protocols. quantum key distribution, Quantum error correction.			
Text Book	Text Book 1:8.1,8.4,9.1,9.2,9.3, Text Book 1:5.9		
MODULE-4	**Quantum gates and algorithms**	**22ISE814.4**	**8 Hours**
Quantum gates and algorithms: Universal set of gates, quantum circuits Single Qubit Gates; Quantum Not Gate, Pauli-X,Y and Z Gates, Hadamard Gate, Phase Gate or S Gate T Gate or 8 Gate Multiple Qubit Gates; Controlled Gates, Controlled Not Gate or CNOT Gate, Swap Gate, Controlled Z Gate, Toffoli Gate.			
Text Book	Text Book 1: 11.3,12.1,12.2, Text Book 1: 11.3,12.1,12.2		
MODULE-5	**Quantum Algorithms**	**22ISE814.5, 22ISE814.5**	**8 Hours**
Classical computation on quantum computers, Relationship between quantum and classical complexity classes. Deutsch-Jozsa algorithm, Grover's quantum search algorithm, Simon's algorithm. Shor's quantum factorization algorithm. Bernstein Vazirani Algorithm.			
Text Book	Text Book 1: 11.3,12.1,12.2		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		**Marks Distribution**			
		Test (s)	**AAT1**	**AAT2**	**AAT3**
		25	**7.5**	**7.5**	**10**
L1	**Remember**	5	-	**-**	2
L2	**Understand**	5	-	-	2
L3	**Apply**	5	-	2.5	2
L4	**Analyze**	5	-	2.5	2
L5	**Evaluate**	5	7.5	2.5	2

L6	**Create**	**-**	-	-	-	

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	10
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	-

Suggested Learning Resources:

Text Books:

1) Edward Franklin (Author), Madison Matti Charlton, "Mastering Quantum Computing: Practical Applications and Programming", Telephasic Workshop, 2024.
2) John Gribbin (Author), "Quantum Computing from Colossus to Qubits: The History, Theory, and Application of a Revolutionary Science", 2024.
3) Kuldeep Singh Kaswan, Jagjit Singh Dhatterwal, Anupam Baliyan, Shalli Rani, "Quantum Computing: A New Era of Computing", Wiley-IEEE Press, July 2023.

Reference Books:

1) Nikhil Ranjan Roy (Author), Kuntal Mukherjee (Author), "Introductory Quantum Computing: A Practical Approach Using Python", S Chand and Company Ltd, 2024.

Web links and Video Lectures (e-Resources):

- https://nptel.ac.in/courses/106106232
- https://www.coursera.org/learn/introduction-to-quantum-information
- https://www.udemy.com/course/quantum-computers/?couponCode=THANKSLEARNER24
- https://www.youtube.com/watch?v=evTGcFnLu1g

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- NPTEL course.
- Contents related activities (Activity-based discussions)
- For active participation of students, instruct the students to solve and analyze various algorithms.

PROMPT ENGINEERING			
Course Code	**22ISE815**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE815.1	Summarize how prompt engineering aligns with specific requirements.
22ISE815.2	Categorize various prompt engineering techniques.
22ISE815.3	Construct prompt engineering models for critical social issues.
22ISE815.4	Assess prompt engineering models by analyzing design and development principles.

22ISE815.5	Illustrate potential risks and misuse scenarios in prompt engineering through relevant case studies.
22ISE815.6	Explore different applications and tools within the field of prompt engineering.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE815.1	3	3	2	2	3	-	-	-	-	-	-	-	3	-
22ISE815.2	3	3	2	2	3	-	-	-	-	-	-	-	3	-
22ISE815.3	3	3	2	2	3	-	-	-	-	-	-	-	3	-
22ISE815.4	3	3	2	2	3	-	-	-	-	-	-	-	3	-
22ISE815.5	3	3	2	2	3	-	-	-	-	-	-	-	3	-
22ISE815.6	3	3	2	2	3	-	-	-	-	-	-	-	3	-

MODULE-1	**Mastering Prompts: Foundations, Formatting, Elements, and Effective Design**	**22ISE815.1**	**8 Hours**
Basics of Prompting Prompt Formatting, Prompt Elements, General Tips for Designing Prompts: The Instruction, Specificity, Avoiding Impreciseness. -Examples of Prompts: Text Summarization, Information Extraction, Question Answering, Text Classification, Conversation, Code Generation.			
Text Book	Text Book1: 1		
MODULE-2	**Advanced Prompting Strategies - 1**	**22ISE815.2**	**8 Hours**
Zero-Shot Prompting, Few-Shot Prompting, Chain-of-Thought Prompting, Self-Consistency, Generate Knowledge Prompting, Tree of Thoughts (ToT), Retrieval Augmented Generation (RAG), Automatic Reasoning and Tool-use (ART), Automatic Prompt Engineer, Active-Prompt, Directional Stimulus Prompting, ReAct Prompting, Multimodal CoT Prompting, Graph Prompting.			
Text Book	Text Book1: 2		
MODULE-3	**Advanced Language Models: FLAN, ChatGPT, LLaMA, and GPT-4**	**22ISE815.3, 2ISE815.4**	**8 Hours**
Fine-tuned LAnguage Net (FLAN), ChatGPT: Introduction, Reviewing the Conversation Task, Multi-turn Conversations, Single-turn tasks. - Large Language Model Meta AI (LLaMA), GPT-4: Introduction, Vision Capabilities, Steering GPT-4, Limitations. - Model Collection.			
Text Book	Text Book1: 3		
MODULE-4	**Adversarial Prompting: Challenges, Strategies, and Ethical Considerations in AI**	**22ISE815.5**	**8 Hours**
Adversarial Prompting: Prompt Injection, Prompt Leaking, Jail breaking, Illegal Behavior, Do Anything Now (DAN), The Waluigi effect, Defense Tactics, Add Defense in the Instruction, Parameterizing Prompt Components, Quotes and Additional Formatting, Adversarial Prompt Detector. - Factuality, Biases: Distribution of Exemplars, Order of Exemplars.			
Text Book	Text Book1: 4		
MODULE-5	**Development with Program-Aided Language Models and AI-Powered Tools**	**22ISE815.6**	**8 Hours**
Program-Aided Language Models, Generating Data, Generating Code, Turn Comments into Code, Complete Functions, MySQL Query Generation, Explain Code, Editing Code, Debugging Code. Tools: AI Test Kitchen, ChatGPT Prompt Generator, DreamStudio, OpenAI Playground, Visual Prompt Builder.			

Text Book	Text Book1: 5

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	AAT1	AAT2	AAT3
		25	7.5	7.5	10
L1	Remember	5	-	-	2
L2	Understand	5	-	-	2
L3	Apply	5	-	2.5	2
L4	Analyze	5	-	2.5	2
L5	Evaluate	5	7.5	2.5	2
L6	Create	-	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10
L4	Analyze	10
L5	Evaluate	10
L6	Create	-

Suggested Learning Resources:

Text Books:

1. The Art of Prompt Engineering with Chatgpt: A Hands-On Guide, Nathan Hunter, 2023.

Reference Books:

1. Prompt Engineering for Generative AI, James Phoenix, Mike Taylor, ISBN: 9781098153373, O'Reilly Media, Inc., 2023.
2. Prompt Engineering, Padmaraj Nidagundi, https://www.amazon.com/dp/B0BLR6T2MT, 2022.

Web links and Video Lectures (e-Resources):

- https://www.classcentral.com/classroom/youtube-chatgpt-prompt-engineering-course- 146290/641948750c9e7
- https://www.upgrad.com/advanced-certificate-program-generative-ai/
- https://www.udemy.com/course/prompt-engineering
- https://openai.com/blog/chatgpt
- https://www.promptingguide.ai/
- https://www.youtube.com/watch?v=dOxUroR57xs

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Prompt Creation Workshops:
    - Participate in creating prompts for various tasks with different prompt styles and formats to understand their impact on model performance.
- Prompt Analysis and Critique:
    - Analyze and critique the designed prompts. Discuss the strengths and weaknesses of each prompt and how they could be improved.
- Prompt Optimization Challenges:
    - Optimize prompts for specific tasks or objectives. This can include making prompts more concise, clear, or effective in eliciting desired responses.
- Prompt Fine-Tuning Exercises:

- Fine-tune the prompts for specific language models or tasks and evaluate the performance improvements.

- Prompt Modification Scenarios:
  - Discuss the scenarios where you can modify prompts to handle changing requirements or adapt to new data. This helps to understand the dynamic nature of prompt engineering.

DIGITAL MARKETING			
Course Code	**22ISE821**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE821.1	Understanding Markets and Marketing Environment.
22ISE821.2	Classify the Fundamentals of Marketing Management.
22ISE821.3	Characterize various Consumer Behaviour.
22ISE821.4	Analyze various Digital Marketing Strategies.
22ISE821.5	Examine the different Digital Marketing Channels.
22ISE821.6	Evaluate Digital Marketing Tools and Applications.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE821.1	3	1	1	3	-	3	-	3	-	-	3	-	3	2
22ISE821.2	3	3	3	3	-	3	-	3	-	-	3	-	3	2
22ISE821.3	3	3	3	3	-	3	-	3	1	-	3	-	3	2
22ISE821.4	3	3	3	-	-	3	-	3	-	-	-	-	3	2
22ISE821.5	3	3	3	-	-	3	-	3	-	-	-	-	3	2
22ISE821.6	3	3	3	-	-	3	-	3	-	-	-	-	3	2

MODULE-1	**INTRODUCTION TO DIGITAL MARKETING**	**22ISE821.1**	**8 Hours**

Introduction: Importance of marketing and Digital Marketing, Understanding Marketing and Digital Marketing Process, Increasing Visibility, Types of visibility, Visitors Engagement, Examples of engagement, Bringing Targeted Traffic, Inbound and outbound marketing, Converting Traffic into Leads, Types of Conversion, Understanding Conversion Process, Tools Needed.

Text Book	TextBook1:1.1,1.3,1.5,2.1,2.2 and 2.3

MODULE-2	**WEBSITE PLANNING PROCESS**	**22ISE821.2**	**8 Hours**

Understanding domain names and domain extensions, Different types of websites, Planning and Conceptualizing a website, booking a domain name and web hosting, adding domain name to web Server, adding webpages and content, Adding Plugins, identifying objective of website, deciding on number of pages required, Planning for engagement options Landing Pages and Optimization, Creating blueprint of every webpage.

Text Book	TextBook1:3.1,3.2,3.3

MODULE-3	SEARCH ENGINE OPTIMIZATION	22ISE821.3	8 Hours
Introduction to SERP, Major functions of a search engine, Keywords-Different types of keywords, Google keyword planner tool, Keywords research process, Understanding keywords mix, Long Tail Keywords Google Search Tips and Hacks.			
Text Book	Text Book 1: 5.1, 5.2, 5.4 and 5.5		
MODULE-4	**SEARCH ENGINE ALGORITHMS**	**22ISE821.4, 22ISE821.5**	**8 Hours**
Why a Search Engine needs to update its Algorithm, Search Engine Penalties and Recoveries, why a Search Engine penalizes a website, optimize your site for Google, Hummingbird Algorithm, Google Panda Algorithm, Google Penguin, Google EMD Update.			
Text Book	Text Book1:7.1,7.2 and 7.3 Text Book2:8.1,8.3,9.1 and 9.2		
MODULE-5	**LOCAL SEO and SEO PROJECT ESSENTIALS**	**22ISE821.6**	**8 Hours**
Google places optimization, Classified submissions, Citation, NAP, Top tools for SEO, Monitoring SEO process, Preparing SEO reports, Create SEO Strategy for your business, link juice, Importance of domain and page authority.			
Text Book	Text Book 3: 1.1 to 1.8,2.1 to 2.5		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	AAT1	AAT2	AAT3
		25	7.5	7.5	10
L1	Remember	5	-	-	2
L2	Understand	5	-	-	2
L3	Apply	5	-	2.5	2
L4	Analyze	5	-	2.5	2
L5	Evaluate	5	7.5	2.5	2
L6	Create	-	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	20
L3	Apply	10
L4	Analyze	5
L5	Evaluate	5
L6	Create	-

Suggested Learning Resources:

Text Books:

1. Ryan Deissand Russ Henneberry, "Digital Marketing For Dummies", 2nd Edition,John Wileyand Sons,Inc,2020.
2. Eric Enge , Stephan Spencer , Jessie Stricchiola, "The Art of SEO: Mastering Search Engine Optimization", O'Reillypublication,2015.
3. DannyStar, "Digital Marketing 2020: Grow Your Business With Digital Marketing", Amazon Asia- Pacific 2020.

Reference Books:

1. Peter Kent, "Search Engine Optimization For Dummies",6th Edition, Wileyand Sons, Inc, 2020.
2. Vikas Chawla, David Appasamy, Nandita Raman, "Decoding the Digital Jungle",Notion

Press,
2020.

Web links and Video Lectures (e-Resources):

- Digital Marketing Basics, https://www.udemy.com/course/free-digital-marketing-basics-course/.
- The digital marketing Tutorial "",https://learndigital.withgoogle.com/digitalunlocked/course/digital-marketing.

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of Digital Marketing Tools and Platforms.
- Demonstration of Website Creation and Optimization.
- Demonstration of Search Engine Optimization Techniques.
- Video Demonstration of Latest Trends in Digital Marketing.
- Organizing Group-wise Discussions on Digital Marketing Applications.
- Case Study Analysis of Successful Digital Campaigns.
- Seminars on Emerging Topics in Digital Marketing.
- Mini Project: Create a Digital Marketing Plan.
- Practical Session on Google My Business Optimization.
- Hands-on Practice: Content Creation for Marketing.

SERVICE ORIENTED ARCHITECTURE			
Course Code	**22ISE822**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE822.1	Compare different IT architecture.
22ISE822.2	Analyze and design of SOA based applications.
22ISE822.3	Implement web service and realize of SOA.
22ISE822.4	Implement REST full services.
22ISE822.5	Design and implement of SOA based Application Integration using BPEL.
22ISE822.6	Evaluate the implement of web services with SOA-J.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISE822.1	3	3	3	3	-	-	-	-	-	2	2	3	2	3
22ISE822.2	3	3	3	3	-	-	-	3	3	-	2	3	2	3
22ISE822.3	3	3	-	3	-	-	-	3	3	2	-	3	2	3
22ISE822.4	3	1	3	3	-	-	-	3	3	-	-	3	2	3
22ISE822.5	3	1	3	3	2	1	-	3	3	-	-	3	2	3

22ISE822.6	3	3	3	3	2	-	-	3	3	-	-	3	2	3

MODULE-1	SOA BASICS	22ISE822.1	8 Hours

Software Architecture – Types of IT Architecture – SOA – Evolution – Key components – perspective of SOA – Enterprise-wide SOA – Architecture – Enterprise Applications – Solution Architecture for enterprise application – Software platforms for enterprise Applications – Patterns for SOA.

Self-study	SOA programming models.
Text Book	Text Book 1: 1.1, 1.2,1.3,2.2,2.6,3.2,4.2,4.3,5.2,6.2

MODULE-2	SOA ANALYSIS AND DESIGN	22ISE822.2	8 Hours

Service-oriented Analysis and Design – Design of Activity, Data, Client and business process services – Technologies of SOA – SOAP – WSDL – JAX –WS – XML WS for .NET – Service integration with ESB – Scenario – Business case for SOA –stakeholder OBJECTIVES – benefits of SPA – Cost Savings.

Text Book	Text Book 1: 7.3,7.4,7.5,7.6,8.1,8.2,9.1,9.2,9.3

MODULE-3	SOA GOVERNANCE	22ISE822.3	8 Hours

SOA implementation and Governance – strategy – SOA development –SOA governance – trends in SOA – event-driven architecture–software as a service – SOA technologies – proof-of-concept – process orchestration.

Self-study	SOA best practices.
Text Book	Text Book 1:10.1,10.2,10.3,10.4,11.1,11.2

MODULE-4	SOA IMPLEMENTATION	22ISE822.4 22ISE822.5	8 Hours

SOA based integration – integrating existing application –development of web services – Integration - SOA using REST – RESTful services – RESTful services with and without JWS – Role of WSDL, SOAP and Java/XML mapping in SOA.

Self-study	JAXB Data binding.
Text Book	Text Book 1: 7.1, 7.2 and 7.3 Text Book 2:8.1,8.3,9.1 and 9.2

MODULE-5	APPLICATION INTEGRATION	22ISE822.6	8 Hours

JAX –WS 2.0 client side/server side development –Packaging and Deployment of SOA component – SOA shopper case study –WSDL centric java WS with SOA-J – related software – integration through service composition.

Self-study	(BPEL) – case study - current trends.
Text Book	Text Book 3: 1.1 to 1.8,2.1 to 2.5

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	AAT1	AAT2	AAT3
		25	7.5	7.5	10
L1	Remember	5	-	-	2
L2	Understand	5	-	-	2
L3	Apply	5	-	2.5	2
L4	Analyze	5	-	2.5	2
L5	Evaluate	5	7.5	2.5	2
L6	Create	-	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	Remember	10
L2	Understand	10
L3	Apply	10

L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	-

Suggested Learning Resources:

Text Books:

1. "Service-Oriented Architecture (SOA): Concepts, Technology, and Design", Thomas Erl, Publisher: Prentice Hall / Pearson Education, ISBN: 9780138156756.

Reference Books:

1. SOA using Java Web Services Mark D. Hansen Practice Hall 2007.
2. SOA-Based Enterprise Integration Waseem Roshen Tata McGraw-HILL 2009.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=TvGLm7BijJY
- https://docs.oracle.com/en/middleware/soa-suite/soa/14.1.2/concepts/overview-oracle-soa- suite.html
- https://ode.apache.org/userguide/
- https://www.youtube.com/watch?v=cxedHrXna-Q

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Illustration of Monolithic, Client-Server, N-Tier, and SOA models using diagrams and tools.
- Live demo of how WSDL, SOAP, and UDDI interact in a service-oriented environment.
- Practical session on creating simple SOAP and RESTful web services using Java and XML.
- Display videos showing SOA in e-commerce, banking, and healthcare for practical relevance.
- Student-led discussions on how SOA benefits enterprise integration, cost savings, scalability, and maintainability.
- Seminars on Topics like Event-Driven Architecture, SaaS, BPEL, and integration platforms.

PARALLEL COMPUTING			
Course Code	**22ISE823**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE823.1	Understand the key for parallel systems and parallel programs.
22ISE823.2	Understand basic principles of Parallel Hardware and Software.
22ISE823.3	Analyze communication and coordination in parallel computing.
22ISE823.4	Apply shared memory model with threads.
22ISE823.5	Evaluate the Shared memory programming.
22ISE823.6	Evaluate the Parallel Algorithms and OpenMP.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	**PO2**	**PO3**	**PO4**	**PO5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**PSO1**	**PSO2**
22ISE823.1	2	2	2	2	1	-	-	-	-	3	2	-	3	2
22ISE823.2	3	2	2	2	1	-	-	-	-	3	2	-	3	2
22ISE823.3	2	2	2	2	1	-	-	-	-	3	2	-	3	2
22ISE823.4	3	2	2	2	1	-	-	-	-	3	2	-	3	2

22ISE823.5	3	2	2	2	1	-	-	-	-	3	2	-	3	2
22ISE823.6	3	2	2	2	1	-	-	-	-	3	2	-	3	2

MODULE-1	**INTRODUCTION TO PARALLEL COMPUTING**	**22ISE823.1**	**8 Hours**
Need of Performance, Building Parallel Systems, Why to Write Parallel Programs? How to Write Parallel Programs? Approach: Concurrent, Parallel, Distributed.			
Text Book	Text Book 1: 1.1, 1.2, 1.3, 1.4		
MODULE-2	**PARALLEL HARDWARE AND PARALLEL SOFTWARE**	**22ISE823.2**	**8 Hours**
Background, Modifications to the von Neumann Model, Parallel Hardware, Parallel Software, Input and Output, Performance, Parallel Program Design and Writing and Running Parallel Programs.			
Text Book	Text Book 1: 2.1, 2.2, 2.3, 2.4		
MODULE-3	**DISTRIBUTED MEMORY PROGRAMMING WITH MPI**	**22ISE823.3**	**8 Hours**
Getting Started, The Trapezoidal Rule in MPI, Dealing with I/O, Collective Communication, MPI Derived Data types, A Parallel Sorting Algorithm.			
Text Book	Text Book 1:3.1,3.2,3.3,3.4.		
MODULE-4	**SHARED MEMORY PROGRAMMING WITH PTHREADS**	**22ISE822.4 22ISE822.5**	**8 Hours**
Processes, Threads and Pthreads, hello, World program, Matrix-Vector Multiplication, Critical Sections Busy-Waiting, Mutexes, Producer-Consumer Synchronization and Semaphores, Barriers and Condition Variables, Read-Write Locks, Caches, Cache-Coherence, and False Sharing and Thread-Safety.			
Text Book	Text Book 1: 4.2, 4.3,4.4,4.5,4.6.		
MODULE-5	**SHARED MEMORY PROGRAMMING WITH OPENMP**	**22ISE822.6**	**8 Hours**
Introduction to OpenMP, The Trapezoidal Rulem Scope of Variables, The Reduction Clause, The Parallel for Directive, More About Loops in OpenMP: Sorting, Scheduling Loops, Producers and Consumers, Caches, Cache-Coherence, and False Sharing and Thread-Safety.			
Text Book	Text Book 1: 5.1,5.2,5.3,5.4,5.5,5.6.		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		**Marks Distribution**			
		Test (s)	**AAT1**	**AAT2**	**AAT3**
		25	**7.5**	**7.5**	**10**
L1	**Remember**	5	-	**-**	**2**
L2	**Understand**	5	-	-	2
L3	**Apply**	5	-	2.5	2
L4	**Analyze**	5	-	2.5	2
L5	**Evaluate**	5	7.5	2.5	2
L6	**Create**	**-**	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		**Exam Marks Distribution (50)**
L1	**Remember**	10
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10

L6	**Create**	-	

Suggested Learning Resources:

Text Books:

1. An introduction to parallel programming by Peter S Pacheco. 2011. I Edition, Morgan Kaufmann Publishers.

Reference Books:

1. DE Culler, A Gupta and JP Singh, "Parallel Computer Architecture: A Hardware/Software Approach", Morgan-Kaufmann, 1998.
2. Marc Snir, Steve W. Otto, Steven Huss-Lederman, David W. Walker and Jack Dongarra, "MPI The Complete Reference", Second Edition, Volume 1, The MPI Core.

Web links and Video Lectures (e-Resources):

- https://archive.nptel.ac.in/courses/106/102/106102114/
- https://www.youtube.com/watch?v=a8R784VtXBgandlist=PLJ5C_6qdAvBFMAko9JTyDJDIt1W48 Sxmg

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Flip class room
- Quiz and online assessment

SOCIAL NETWORK ANALYSIS

Course Code	**22ISE824**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE824.1	Understand the basic concepts and terminologies of social network analysis.
22ISE824.2	Identify and represent social network data.
22ISE824.3	Identify and describe types of nodes and network relationships.
22ISE824.4	Apply the basics of social network analysis at the network level (density, clustering, degree distribution, etc.) and at the node level (degree, betweeness,closeness).
22ISE824.5	Discuss and Summarize various Social Media in terms of its importance and Marketing.
22ISE824.6	Evaluate various types of analysis are carried out in social media.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE824.1	3	3	3	2	2	-	2	-	-	2	-	1	2	2
22ISE824.2	3	3	3	2	2	-	2	-	-	2	-	1	2	2
22ISE824.3	3	3	3	2	2	-	2	-	-	2	-	1	2	2
22ISE824.4	3	3	3	2	2	-	2	-	-	2	-	1	2	2
22ISE824.5	3	3	3	2	2	-	2	-	-	2	-	1	2	2
22ISE824.6	3	3	3	2	2	-	2	-	-	2	-	1	2	2

MODULE-1	**INTRODUCTION**	**22ISE824.1**	**8 Hours**

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.

Self-study	Investigate the Challenges of social networking, Compare with traditional areas of science and engineering.		
Text Book	Text Book 1: Ch 1.1, 1.2, 1.3, 1.4, 1.5 1.6, 1.7		
MODULE-2	**MODELLING, AGGREGATING AND KNOWLEDGE REPRESENTATION**	**22ISE824.2**	**8 Hours**
Ontology and their role in the Semantic Web: Ontology-based knowledge Representation- Ontology languages for the Semantic Web: Resource Description Framework - Web Ontology Language - Modelling and aggregating social network data: State-of-the-art in network data representation - Ontological representation of social individuals - Ontological representation of social relationships - Aggregating and reasoning with social network data - Advanced representations.			
Self-study	Analysis on building a social media networks or corporate communication.		
Text Book	Text Book Ch 1: 2.1-2.7		
MODULE-3	**EXTRACTION AND MINING COMMUNITIES IN WEB SOCIAL NETWORKS**	**22ISE824.3 22ISE824.4**	**8 Hours**
Extracting evolution of Web Community from a Series of Web Archive - Detecting communities in social networks - Definition of community - Evaluating communities - Methods for community detection and mining - Applications of community mining algorithms - Tools for detecting communities social network infrastructures and communities - Decentralized online social networks - multi-relational characterization of dynamic social network communities.			
Self-study	Explore the Web Community from a Series of Web Archive.		
Text Book	Text Book 1: Ch 3.1-3.9		
MODULE-4	**SOCIAL MEDIA FUNDAMENTALS**	**22ISE824.5**	**8 Hours**
Various social networking sites - What is social media and Why It's Important; FACEBOOK, INSTAGRAM, TWITTER, LINKEDIN – Why and how they matter, history, statistics, demographics, Time Spent, Key Features, Marketing - What You Need to Know.			
Self-study	Investigate on various social media platforms and their importance and Platform-Specific Research.		
Text Book	Text Book 2: Ch - 2 and Ch - 5		
MODULE-5	**SOCIAL MEDIA ANALYSIS**	**22ISE824.6**	**8 Hours**
Four dimensions of analysis, Criteria of effectiveness, metrics, social network analysis, semantic analysis, online sentiment analysis, tools, social media management, centrality, measure's opinion mining, feature based sentiment analysis.			
Self-study	Social Media Analysis on Dimensions, Effectiveness and Tools and Criteria of Effectiveness and Metrics.		
Text Book	Text Book 3: Ch - 7 and Ch-8		

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels		Marks Distribution			
		Test (s)	**AAT1**	**AAT2**	**AAT3**
		25	**7.5**	**7.5**	**10**
L1	**Remember**	5	-	**-**	**2**
L2	**Understand**	5	-	-	2
L3	**Apply**	5	-	2.5	2
L4	**Analyze**	5	-	2.5	2
L5	**Evaluate**	5	7.5	2.5	2
L6	**Create**	**-**	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	10

L2	**Understand**	10	
L3	**Apply**	10	
L4	**Analyze**	10	
L5	**Evaluate**	10	
L6	**Create**	-	

Suggested Learning Resources:

Text Books:

1. I. A. Dhotre "Social Network Analysis", first edition Technical Publication,2021.
2. Melissa Barker, Donald I. Barker, Nicholas F. Bormann, Krista E. Neher "Social Media Marketing: A Strategic Approac", , Cengage Learning Publications, 3rd edition, 2023, ISBN-9781337914126.
3. Marshall Sponder, Gohar F. Khan Routledge "Social Media Analytics: Effective Tools for Building, Interpreting, and Using Metrics" Marshall Sponder, Gohar F. KhanRoutledge 2nd edition, 2021 ISBN- 9780367365323.
4. Stephen P. Borgatti, Martin G. Everett, Jeffrey C. Johnson, "Analyzing Social Networks", SAGE Publications, 3rd edition, 2024, ISBN- 9781529609158.

Reference Books:

1. Pascal Hitzler, Markus Krötzsch, Sebastian Rudolph, "Foundations of Semantic Web Technologies" CRC Press, 2nd edition, 2020, ISBN-9780367332424.
2. Dean Allemang, James Hendler, Ora Lassila "Semantic Web for the Working Ontologist" Morgan Kaufmann Publication, 3rd edition, 2020 , ISBN-9780128046028.

Web links and Video Lectures (e-Resources):

- https://www.youtube.com/watch?v=P33xa4l4GTM.
- Overview of SNA https://www.youtube.com/watch?v=fgr_g1q2ikA.
- https://www.teachengineering.org/activities/view/uno_graphtheory_lesson01_activity.
- The History of Social Media: social Networking Evolution! http://historycooperative.org/ the-history-of-social- media/.
- Social Media Fact Sheet http://www.pewinternet.org/fact-sheet/social-media/.
- https://www.meaningcloud.com/solutions/media-analysis.
- https://www.enotes.com/homework-help/what-hypotheses-social-media-intimate-relationship-488912.

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Demonstration of Human Network Simulation.
- Mini Project: Build Your Own Network.
- Case studies of networked organizations (e.g., criminal networks, disease spread, marketing influencers).
- Demonstration of Understand network structure and connectedness.

DEEP LEARNING			
Course Code	**22ISE825**	**CIE Marks**	**50**
L:T:P:S	**3:0:0:0**	**SEE Marks**	**50**
Hrs / Week	**3**	**Total Marks**	**100**
Credits	**03**	**Exam Hours**	**03**

Course outcomes:

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

22ISE825.1	Identify the deep learning algorithms which are more appropriate for various types of learning tasks in various domains.
22ISE825.2	Derive a simple Feed forward Neural Network (DNN)
22ISE825.3	Apply DNN to real-life problems
22ISE825.4	Understand how to frame problems in the NN framework
22ISE825.5	Apply Back propagation algorithms to get the best performance
22ISE825.6	Evaluate the various Deep neural networks

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
22ISE822.1	3	3	-	-	-	-	-	-	-	-	-	-	-	-
22ISE822.2	3	3	3	3	-	-	-	-	-	-	-	-	3	-
22ISE822.3	3	3	3	3	-	-	-	-	-	-	-	3	3	-
22ISE822.4	3	3	3	3	-	-	-	-	-	-	-	3	3	-
22ISE822.5	3	3	3	3	-	-	-	-	-	-	3	-	3	-
22ISE822.6	3	3	3	3	-	-	-	-	-	-	3	-	-	3

MODULE-1	**INTRODUCTION TO DEEP LEARNING**	**22ISE825.1**	**8 Hours**

Introduction to Deep Learning: Introduction, Deep learning Model, Historical Trends in Deep Learning.
Machine Learning Basics: Learning Algorithms, Capacity, Overfitting and Underfitting, Supervised Learning Algorithms, Unsupervised Learning Algorithms.

Text Book	Text Book 1: Chapter 1

MODULE-2	**DEEP FEEDFORWARD NETWORKS**	**22ISE825.2**	**8 Hours**

Feed Forward Neural Networks, Back propagation, Gradient Descent (GD), Momentum Based GD, Nesterov Accelerated GD, Stochastic GD, AdaGrad, RMSProp, Adam, Principal Component Analysis and its interpretations, Singular Value Decomposition.

Text Book	Text Book 1: Chapter 6

MODULE-3	**REGULARIZATION FOR DEEP LEARNING**	**22ISE825.3**	**8 Hours**

Regularization for Deep Learning: Autoencoders and relation to PCA, Regularization in autoencoders, Denoising autoencoders, Sparse autoencoders, Contractive autoencoders.
Regularization: Bias Variance Tradeoff, L2 regularization, Early stopping, Dataset augmentation, Parameter sharing and tying, Injecting noise at input, Ensemble methods, Dropout.

Text Book	Text Book 1: Chapter 7

MODULE-4	**CONVOLUTIONAL NETWORKS**	**22ISE825.4 22ISE825.5**	**8 Hours**

Convolutional Networks: The Convolution Operation, Pooling, Convolution and Pooling as an Infinitely Strong Prior, Variants of the Basic Convolution Function, Structured Outputs, Data Types, Efficient Convolution Algorithms, Random or Unsupervised Features- LeNet, Alex Net.

Text Book	Text Book 1: Chapter 9

MODULE-5	**SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS**	**22ISE82.6**	**8 Hours**

Recurrent Neural Networks, Back propagation through time (BPTT), Vanishing and Exploding Gradients, Truncated BPTT, GRU, LSTMs, Encoder Decoder Models, Attention Mechanism, Attention over images.

Text Book	Text Book 1: Chapter 10

CIE Assessment Pattern (50 Marks – Theory)

RBT Levels	Marks Distribution			
	Test (s)	AAT1	AAT2	AAT3

		25	7.5	7.5	10
L1	**Remember**	5	-	**-**	**2**
L2	**Understand**	5	-	-	2
L3	**Apply**	5	-	2.5	2
L4	**Analyze**	5	-	2.5	2
L5	**Evaluate**	5	7.5	2.5	2
L6	**Create**	**-**	-	-	-

SEE Assessment Pattern (50 Marks – Theory)

RBT Levels		Exam Marks Distribution (50)
L1	**Remember**	10
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	-

Suggested Learning Resources:

Text Books:

1. Ian Goodfelllow, YoshuaBenjio, Aaron Courville, , "Deep Learning", The MIT Press , 2017.

REFERENCE BOOKS:

1. Richard O. Duda, Peter E. Hart, David G. Stork, "Pattern Classification", John Wiley and Sons Inc.,2018.
2. François Chollet, **"** Deep Learning with Python**"** ,Manning Publications, 2017.

Web links and Video Lectures (e-Resources):

- https://onlinecourses.nptel.ac.in/noc20_cs62/
- https://onlinecourses.nptel.ac.in/noc20_cs50/
- https://www.coursera.org/learn/intro-to-deep-learning/home/welcome
- https://www.coursera.org/learn/neural-networks-deep-learning/home/welcome

Activity-Based Learning (Suggested Activities in Class)/ Practical Based learning

- Contents related activities (Activity-based discussions).
- Organizing Group wise discussions on issues.

INTERNSHIP			
Course Code	**22ISE83**	**CIE Marks**	**100**
L:T:P:S	**0:0:10:0**	**SEE Marks**	**100**
Hrs / Week	**0**	**Total Marks**	**200**
Credits	**10**	**Exam Hours**	**03**

Course outcomes:

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

21ISE83.1	Students should be able to understand advanced application development concepts.
21ISE83.2	Students should be able to implement technical module/unit as project as per industry requirements.
21ISE83.3	Determine, break down, and estimate the parameters needed for the solution. Then, using testing tools, assess the solution by evaluating it in light of the standard data and the objective function, as well as by applying the proper performance metrics.
21ISE83.4	Create the report and take part in presentation.
21ISE83.5	Evaluate how the internship placement site fits into their broader career field.
21ISE83.6	Compile the internship experience in terms of their personal, educational and career needs.

Mapping of Course Outcomes to Program Outcomes and Program Specific Outcomes:

	PO 1	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO8**	**PO 9**	**PO1 0**	**PO1 1**	**PO1 2**	**PSO1**	**PSO2**
21ISE83.1	3	3	3	3	3	3	2	1	3	1	3	3	3	3
21ISE83.2	3	3	3	3	3	3	2	1	3	1	3	3	3	3
21ISE83.3	3	3	3	3	3	3	2	1	3	1	3	3	3	3
21ISE83.4	3	3	3	3	3	3	2	1	3	1	3	3	3	3
21ISE83.5	3	3	3	3	3	3	2	1	3	1	3	3	3	3
21ISE83.6	3	3	3	3	3	3	2	1	3	1	3	3	3	3

Description:

The student shall be capable of identifying a problem related to the field of Information Science and Engineering and carry out an internship on the problem defined. The code developed during the internship will be reviewed by a panel of experts. Plagiarized implementation will automatically get an **"F" GRADE** and the student will be liable for further disciplinary action. At the completion of an internship the student will submit a report, which will be evaluated by duly appointed examiner(s).

Evaluation Stages:

Activity	**Evaluation Attribute**
Abstract Submission	Problem Statement
Review-I	Algorithm and outline design
Review-II	Partial code development and or partial execution
Review-III	Final Implementation PPT(10-12 slides) + Results verification + Report Submission in defined format

Recommended Application domains:

1) Data Sciences
2) Cyber Security
3) Data Mining
4) Societal Issues
5) Healthcare
6) Surveillance and security
7) Enterprise Resource Planning
8) Data Management & application
9) Interdisciplinary application, etc.,

CIE Assessment Pattern (100 Marks)

Bloom's Category		Tests (100 Marks)
L1	**Remember**	-
L2	**Understand**	20
L3	**Apply**	20
L4	**Analyze**	20
L5	**Evaluate**	20
L6	**Create**	20

SEE Assessment Pattern (50 Marks – Theory)

Bloom's Category		Tests (50 Marks)
L1	**Remember**	-
L2	**Understand**	10
L3	**Apply**	10
L4	**Analyze**	10
L5	**Evaluate**	10
L6	**Create**	10

APPENDIX A

Assessment Pattern

1. Assignment
2. Group Discussions
3. Case Studies
4. Practical Orientation on Design Thinking , Creativity & Innovation
5. Participatory & Industry-Integrated Learning
6. Practical activities/Problem Solving exercises
7. Class Presentations
8. Analysis of Industry/Technical/Business Reports
9. Reports on Industrial Visits
10. Industrial/Social/Rural Projects
11. Participation in external Seminars/Workshop
12. Online/Offline Quizzes

APPENDIX B

Outcome Based Education

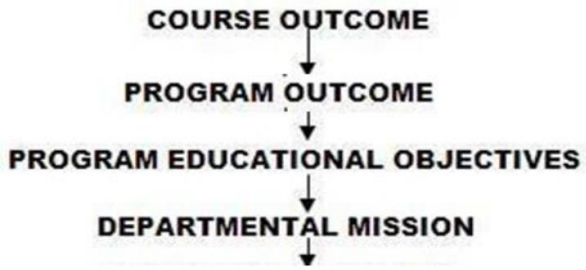
Outcome-based education (OBE) is an educational theory that bases each part of an educational system around goals (outcomes). By the end of the educational experience each student should have achieved the goal. There is no specified style of teaching or assessment in OBE; instead classes, opportunities, and assessments should all help students achieve the specified outcomes. There are three educational Outcomes as defined by the National Board of Accreditation:

Program Educational Objectives: The Educational objectives of an engineering degree program are the statements that describe the expected achievements of graduate in their career and also in particular what the graduates are expected to perform and achieve during the first few years after graduation. [nbaindia.org]

Program Outcomes: What the student would demonstrate upon graduation. Graduate attributes are separately listed in Appendix C

Course Outcome: The specific outcome/s of each course/subject that is a part of the program curriculum. Each subject/course is expected to have a set of Course Outcomes

Mapping of Outcomes



APPENDIX C

The Graduate Attributes of NBA

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

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

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

Conduct investigations of complex problems: The problems that cannot be solved by straightforward application of knowledge, theories and techniques applicable to the engineering discipline that may not have a unique solution. For example, a design problem can be solved in many ways and lead to multiple possible solutions that require consideration of appropriate constraints/requirements not explicitly given in the problem statement (like: cost, power requirement, durability, product life, etc.) which need to be defined (modeled) within appropriate mathematical framework that often require use of modern computational concepts and tools.

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

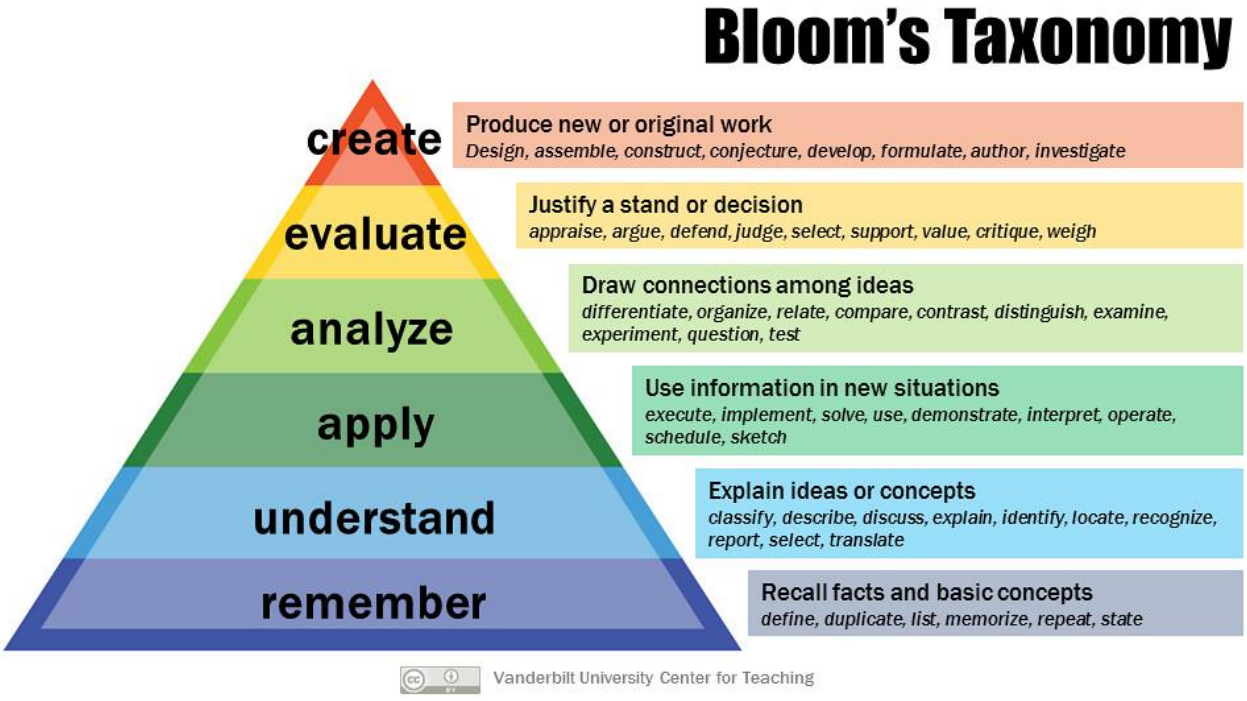
The engineer and society: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice.

Environment and sustainability: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

APPENDIX D

BLOOM'S TAXONOMY

Bloom's taxonomy is a classification system used to define and distinguish different levels of human cognition—i.e., thinking, learning, and understanding. Educators have typically used Bloom's taxonomy to inform or guide the development of assessments (tests and other evaluations of student learning), curriculum (units, lessons, projects, and other learning activities), and instructional methods such as questioning strategies.



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