Vidyalankar Institute of Technology

An Autonomous Institute affiliated to University of Mumbai

Honours/Minor Degree Programme

for

Bachelor of Technology

in

Information Technology

(R-2022 Curriculum)

(As per AICTE guidelines, with effect from the Academic Year 2024-25)

Preamble

To meet the challenge of ensuring excellence in engineering education, the issue of quality needs to be addressed, debated, and taken forward in a systematic manner. Therefore, autonomy for Vidyalankar Institute of Technology is not merely a transition from pre-cooked syllabi to self-designed curriculum. The autonomous curriculum of the Institute offers required academic flexibility with emphasis on industry requirements and market trends, employability and problem-solving approach which leads to improving competency level of learners with diverse strengths. In line with this, the curriculum framework designed is **Choice Based Credit and Grading System (CBCGS)**. The number of credits for each category of courses learnt by learners, internships and projects is finalized considering the scope of study and the ability that a learner should gain through the programme. The overall credits and approach of curriculum proposed are in line with the AICTE model curriculum.

The curriculum comprises courses from various categories like basic sciences, humanities and social sciences, engineering sciences, general education, and branch-specific courses, including professional electives and open electives. The curriculum has core courses of branch of engineering positioned and sequenced to achieve sequential and integral learning of the entire breadth of the specific branch. These courses are completed by the third year of the engineering programme that enables learners to prepare for higher education during their final year. Professional elective courses, that begin from third year of programme, offer flexibility and diversity to learners to choose specialization from a basket of recent developments in their field of technology. The selection of unique professional elective courses based on industrial requirements and organizing them into tracks is a salient feature of this curriculum, ensuring employability. Open Elective courses cover multi-disciplinary, special skill development, project management and similar knowledge that make learners capable of working in an industrial environment.

For holistic development of learners, apart from technical courses, Humanities and Social Science courses develop the required soft-skills and attitude amongst learners. Our curriculum also introduces Social Service Internship and Internship with institutes abroad along with courses like Design Thinking, Wellness-body, Mind & Spirit, Indian Traditional Knowledge System under General Education category. These general education courses aim to create balance in brain hemispheres and hence improve learners' clarity in thoughts and responses. In addition to this, the curriculum is augmented with Life Enrichment audit courses for knowledge inspiring experience.

Additionally, curriculum provides add-on Honours/Minor degree that involves field/ domain study. Learner can avail this degree by completing requirement of additional 18 credits.
Thus, the academic plan of VIT envisages a shift from summative to formative and competency-based learning system which will enhance learner's ability towards higher education, employability and entrepreneurship.

Chairman, Board of Studies
Department of Information Technology
Vidyalankar Institute of Technology

Chairman, Academic Council
Vidyalankar Institute of Technology

[A] Guidelines for Award of Honours/ Minor Degree Programme

Honours and Minor Degree programme is introduced in order to facilitate learners to enhance the depth of knowledge, diversity, breadth and skills in emerging fields. An Honours or Minor Degree typically refers to a higher level of academic achievement either for research orientation or for improving employability. Learners can select any Honours or Minor Degree programme as per his/her choice.

In our curriculum, learners can choose to avail Honours/ Minor Degree programme by completing requirements of 18 credits, which will be over and above the minimum credits required for B.Tech. degree i.e. credit requirement for the award of degree programme and Honours/ Minor degree programme are required to be explicitly carried out. Learners shall opt for Honours or Minor specialisations during the break of Semester 5 and Semester 6. **Learners may complete the B.Tech. Degree programme without opting for Honours/Minor degree programme** i.e. opting for Honours/ Minor Degree programme is not mandatory as a part of B.Tech. degree programme

For an Honours/ Minor Degree, the learner shall select an Honours/ Minor programme offered by his/her home department.

Eligibility Criteria

- Basic eligibility for opting for Honours/Minor shall be minimum CGPA of 6.75 at the end of 4th semester and earned 80 credits from Sem 1 to Sem 4 (41 credits for DSY students).
- If student has already completed any course(s) that is listed in the chosen Honours/ Minor degree programme, as additional learning course(s), then the transfer credits for such course(s) can be carried out towards Honours/ Minor degree programme.
- For a student to get Honours/ Minor degree, it is mandatory that the student completes the relevant courses before graduating.

Syllabus Scheme Template

Course		Head of Learning	Preferred Semester	Credits	Assessment Guidelines (Marks)			Total marks (Passing@40% of total marks)
Code	Name				ISA	MSE	ESE	
HM01	Industry Interaction	Theory	Break of Sem5 and Sem6	1	25	-	-	025
HMXX	Honours / Minor Degree Course 1	Theory	6	2	15	20	40	075
HMXX	Honours / Minor Degree Course 1 Lab	Practical	6	1	25	-	25	050
HM02	Survey Report/ Paper	Theory	Break of Sem6 and Sem7	2	25	-	25	050
HMXX	Honours / Minor Degree Course 2	Theory	7	2	15	20	40	075
HMXX	Honours / Minor Degree Course 2 Lab	Practical	7	1	25	-	25	050
HM03	Seminar	Theory	Break of Sem7 and Sem8	2	25	-	25	050
HMXX	Honours / Minor Degree Course 3	Theory	8	2	15	20	40	075
HMXX	Honours / Minor Degree Course 3 Lab	Practical	8	1	25	-	25	050
HM04	Capstone Project	Practical	8	4	75	-	50	125
			Total	**18**				

[B] Honours/ Minor Degree Programmes offered to B.Tech. Information Technology

The Institute offers the listed Honours Degree Programme for learners of B.Tech. Information Technology

Honours/ Minor Degree Programmes Offered

Sr. No.	Honours/Minor Degree Programme	Department offering Honours	Honours applicable for	Minors applicable for
1	User Interface and User Experience (UI/UX)	Information Technology	All B.Tech. Information Technology, Computer Engineering students, Electronics and Computer Science and Electronics and Telecommunication Department.	UG Engineering students of Biomedical Department.
2	Blockchain	Information Technology	All B.Tech. Information Technology, Computer Engineering students, Electronics and Computer Science and Electronics and Telecommunication Department.	UG Engineering students of Biomedical Department.
3	Next-Gen Artificial Intelligence and Machine Learning (Next-Gen AI&ML)	Information Technology	B.Tech. Information Technology students who have opted for AI&ML specialization track.	None
4	Next-Gen Data Science (Next-Gen DS)	Information Technology	B.Tech. Information Technology students who have opted for DS specialization track.	None
5	Next-Gen Cyber Security	Information Technology	B.Tech. Information Technology and Computer Engineering students who have opted for Cyber Security specialization track.	None

Sr. No.	Honours/Minor Degree Programme	Department offering Honours	Honours applicable for	Minors applicable for
6	Next-Gen Internet of Things	Electronics and Telecommunication	B.Tech. Information Technology students who have opted for Internet of Things specialization track.	As stated in Honours/Minor Degree document of Electronics and Telecommunication department

List of courses under each Honours/ Minor Programme:

1. User Interface and User Experience (UI/UX)

Semester	Course Code	Course Name
VI	HMIT01T	Foundation of UI/UX
VI	HMIT01P	Foundation of UI/UX Lab
VII	HMIT02T	UX Design, Evaluation and ARVR
VII	HMIT02P	UX Design, Evaluation and ARVR Lab
VIII	HMIT03T	Use cases in UI/UX
VIII	HMIT03P	Use cases in UI/UX Lab

2. Blockchain

Semester	Course Code	Course Name
VI	HMIT04T	Blockchain Technology
VI	HMIT04P	Blockchain Technology Lab
VII	HMIT05T	Smart Contract and Crypto Currencies
VII	HMIT05P	Smart Contract and Crypto Currencies Lab
VIII	HMIT06T	Decentralize & Blockchain Technologies
VIII	HMIT06P	Decentralize & Blockchain Technologies Lab

3. Next-Gen Artificial Intelligence and Machine Learning

Semester	Course Code	Course Name
VI	HMIT07T	Ethics in AI
VI	HMIT07P	Ethics in AI Lab
VII	HMIT08T	Scalable ML and BDA
VII	HMIT08P	Scalable ML and BDA Lab
VIII	HMIT09T	Generative AI models
VIII	HMIT09P	Generative AI models Lab

4. Next-Gen Data Science

Semester	Course Code	Course Name
VI	HMIT10T	Data Visualization Using R-Programming
VI	HMIT10P	Data Visualization Using R-Programming Lab
VII	HMIT11T	Time Series and Forecasting

Semester	Course Code	Course Name
VII	HMIT11P	Time Series and Forecasting Lab
VIII	HMIT12T	Data Ethics and Privacy
VIII	HMIT12P	Data Ethics and Privacy Lab

5. Next-Gen Cyber Security

Semester	Course Code	Course Name
VI	HMIT13T	IT Security Strategic Planning, Policy, and Leadership
VI	HMIT13P	IT Security Strategic Planning, Policy, and Leadership Lab
VII	HMIT14T	Advance Threat Intelligence and Penetration Testing
VII	HMIT14P	Advance Threat Intelligence and Penetration Testing Lab
VIII	HMIT15T	Advanced Computer Forensics Analysis
VIII	HMIT15P	Advanced Computer Forensics Analysis Lab

6. Next-Gen Internet of Things

Semester	Course Code	Course Name
VI	HMET01T*	Embedded Linux System
VI	HMET01P*	Embedded Linux System Lab
VII	HMET02T*	IoT & Data Analytics
VII	HMET02P*	IoT & Data Analytics Lab
VIII	HMET03T*	IoT Applications & Web Development
VIII	HMET03P*	IoT Applications & Web Development Lab

* Detailed Syllabus of these courses can be obtained from the Honours/ Minor document of Electronics and Telecommunication department.

Learners of Information Technology Department who wish to opt for Minor Degree Programme offered by other department can obtain details of the same from Section-B and Section C of the Honour/ Minor Degree Programme document of respective department.

[C] Honours/ Minor Degree Programmes Course Syllabus

Course Name: Foundation of UI/UX

Course Code: HMIT01T

Category: Honours / Minor in UI/UX

Preamble:

Usability engineering is a framework for evaluating digital products or services that focuses on the optimization of usability. It incorporates theories from both psychology and computer science. It involves an iterative approach to design by considering the needs, abilities, or even limitations of the intended users. UX designers focus on the interactions that people have with products like websites, mobile apps, and physical objects. UX designers make everyday interactions usable.

Pre-requisites: Nil

Course Objectives:

1. To stress the importance of User Interface and User Experience.
2. To Learn User Experience Process.
3. To understand how to design Effective and Efficient User Interfaces for intended users.
4. To Learn user research techniques
5. To create personas
6. To understand UX guidelines

Course Outcomes:

CO1: Understand the importance of user interface and User Experience.
CO2: Learn user experience process
CO3: Understand how to design Effective and Efficient User Interfaces for intended users.
CO4: Learn user research techniques.
CO5: Create personas.
CO6: Understand UX guidelines.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the

nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Sr. No.	Module	Detailed Content	Hrs	CO Mapping
0	Prerequisite	Web Technologies, Software Engineering Process	03	-
1	Introduction	What is UX, Ubiquitous interaction, Emerging desire for usability, From usability to user experience, Emotional impact as part of the user experience, User experience needs a business case, Roots of usability.	06	CO1
2	The Wheel: A Lifecycle Template	Introduction, A UX process lifecycle template, Choosing a process instance for your project, The system complexity space, Meet the user interface team, Scope of UX presence within the team, More about UX lifecycles.	06	CO2
3	Contextual Inquiry: Eliciting Work Activity Data	Introduction, User research, User work activity gathering, Look for emotional aspects of work practice, Abridged contextual inquiry process, Data-driven vs. model-driven inquiry, History, Contextual Analysis, Extracting Interaction Design Requirements, Constructing Design-Information Models.	10	CO3
4	Design Thinking, Ideation, and Sketching,	Introduction, Design paradigms, Design thinking, Design perspectives, User personas, Ideation, Sketching, More about phenomenology, Mental Models and Conceptual Design, Wireframe, Prototyping	10	CO4
5	Wireframes and Prototyping	Introduction to wireframes, types of woreframes, prototyping, types of prototyping	08	CO5
6	UX Design Guidelines	Introduction, Using and interpreting design guidelines, Human memory limitations, Selected UX design guidelines and examples, Planning, Translation, Physical actions, Outcomes, Assessment, Overall.	05	CO6

Online resources

https://nptel.ac.in/courses/107/103/107103083/

https://www.uxbeginner.com/ux-courses/

Course Name: Foundation of UI/UX Lab

Course Code: HMIT01P

Category: Honours/ Minor in UI/UX

Preamble:

Usability engineering is a framework for evaluating digital products or services that focuses on the optimization of usability. It incorporates theories from both psychology and computer science. It involves an iterative approach to design by considering the needs, abilities, or even limitations of the intended users. UX designers focus on the interactions that people have with products like websites, mobile apps, and physical objects. UX designers make those everyday interactions usable.

Pre-requisites: Nil

Course Objectives:

1. To stress the importance of User Interface and User Experience.
2. To Learn User Experience Process.
3. To understand how to design Effective and Efficient User Interfaces for intended users.
4. To Learn user research techniques
5. To create personas
6. To understand UX guidelines

Course Outcomes:

CO1: Understand the importance of user interface and User Experience.
CO2: Learn user experience process
CO3: Understand how to design Effective and Efficient User Interfaces for intended users.
CO4: Learn user research techniques.
CO5: Create personas.
CO6: Understand UX guidelines.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	25	-	25	25

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested Experiments

- Perform user research
- User requirement collection
- User Requirement Analysis
- Create User personas, user scenarios , customer journey maps etc
- Create Wireframes
- Create Prototypes
- Set UX Goals
- Any two case studies or mini project covering the above syllabus

Books and References:

A. Books:

1. The UX Book by Rex Hartson and Pardha Pyla
2. Smashing UX Design by Jesmond Allen and James Chudley
3. Lean UX: Applying Lean Principles to Improve User Experience by Jeff Gothelf and Josh Seiden
4. Don't Make Me Think, Revisited by Steve Krug
5. The User Experience Team of One by Leah Buley
6. The Elements of User Experience by Jesse James Garrett
7. Sketching User Experiences: The Workbook by Saul Greenberg, Sheelagh Carpendale, Nicolai Marquardt and Bill Buxton

B. References:

1. A Project Guide to UX Design by Russ Unger and Carolyn Chandler
2. Agile Experience Design by Lindsay Ratcliffe and Marc McNeill
3. Universal Principles of Design by William Lidwell, Kritina Holden and Jill Butler
4. Human Computer Interaction by Alan Dix

Course Name: Blockchain Technology

Course Code: HMIT04T

Category: Honours/ Minors in Blockchain

Preamble:

Blockchain Technology course provides students with a comprehensive understanding of blockchain fundamentals, decentralized systems, and their applications. Through lectures, case studies, and hands-on exercises, students will learn about the underlying principles of blockchain technology, its evolution, and its potential impact on various industries. Topics covered include distributed ledger technology, consensus mechanisms, smart contracts, cryptocurrencies, and real-world use cases.

Pre-requisites: Computer Network

Course Objectives:

1. To understand conceptual elements for Blockchain Technologies.
2. To summarize the major developments related to Blockchain and cryptocurrencies.
3. To identify real-world applications of Bockchain.

Course Outcomes:

Learner will be able to:

CO1: Identify the importance of Blockchain technology
CO2: Interpret the fundamentals and basic concepts in Blockchain
CO3: Summarize the requirements of the basic design of blockchain.
CO4: Compare the working of different blockchain platforms
CO5: Summarize the different technologies and latest trends in Blockchain
CO6: Analyze the importance of blockchain in finding the solution to the real-world problems.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel consituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to Blockchain Technology	Basic ideas behind block chain, how it is changing the landscape of digitalization, introduction to cryptographic concepts, hashing, public key cryptosystems, private vs public block chain and use cases, Hash Puzzles.	5
2	Blockchain Fundamentals	Basic architecture of Blockchain, different terminologies, Characteristics of Block chain, Types of networks, Introducing Smart contract concept in Blockchain.	5
3	Components of Blockchain	Core components of Blockchain, Types of blockchains, blockchain protocol, and Permission & Permission less Block chains.	5
4	Digital Ledger	Short History of Money and Trust, Bitcoin Mechanics, Introduction to Ethereum, Introduction to Hyperledger, Hyperledger Fabric and its architecture, Hyperledger Composer	5
5	Emerging Trends in Blockchain:	Cloud-based blockchain, Multi chain, Geth, Stellar, Ripple, R3 Corda, Blockchain API, Blockchain Sandboxes	5
6	Block Chain Use Cases	Supply Chain Management, Finance, Health Care, Internet of Things (IoT), Remittance, Land Records, Voting and election, Loyalty Programs, GoGreen (Renewable Energy).	5
Total			**30**

Textbooks:

1. Artemis Caro, "Blockchain: The Beginners Guide to Understanding the Technology Behind Bitcoin & Crypto currency".
2. Scott Marks, "Blockchain for Beginners: Guide to Understanding the Foundation and Basics of the Revolutionary Blockchain Technology", Create Space Independent Publishing Platform

Reference Books:

1. Mark Watney, "Blockchain for Beginners".
2. Alwyn Bishop, "Blockchain Technology Explained".

E-sources:

1. NPTEL Course **"Introduction to Blockchain Technology & Applications"** https://nptel.ac.in/courses/106/104/106104220/
2. NPTEL Course on **"Blockchain Architecture & UseCases"** https://nptel.ac.in/courses/106/105/106105184/

Course Name: Blockchain Technology Lab

Course Code: HMIT04P

Category: Honours/Minors in Blockchain

Pre-requisites: NIL

Course Objectives:

After completion of the course, students will have adequate background, conceptual clarity, and knowledge related to:

1. The working of blockchain technology
2. The real-world applications of Blockchain.

Course Outcomes:

Students who complete this course successfully are expected to:

CO 1. Understand working of Blockchain.
CO 2. Creating Cryptographic hash using a Merkle tree.
CO 3. Understand data protection using Blockchain.
CO 4. Understand the cryptographic basis for cryptocurrency.
CO 5. Creating genesis block using open source tool.
CO6. Choose a blockchain implementation based on real time scenario

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested list of experiments:

Sr. No.	List of experiments
1	Case Study on various Blockchain platforms.

Sr. No.	List of experiments
2	Cryptography in Blockchain, Merkle root tree has
3	Two Factor Authentication using blockchain
4	Blockchain based application Crypto Exchange and Wallet.
5	Create the genesis block using Puppeth, a CLI tool.
6	Implement simple Smart Contracts in Remix IDE

Textbooks:

1. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects by by Elad Elrom.
2. Practical Blockchains and Cryptocurrencies by Karan Singh Garewal

Reference Books:

1. The Blockchain Developer: A Practical Guide for Designing, Implementing, Publishing, Testing, and Securing Distributed Blockchain-based Projects by by Elad Elrom
2. Building Blockchain Projects by Prusty Narayan
3. Building Blockchain Apps| 1st Edition| By Pearson by, Michael Juntao Yuan

Course Name: Ethics in AI

Course Code: HMIT07T

Category: Honors in Next-Gen AI&ML

Preamble:

The rapid advancement of Artificial Intelligence (AI) and Machine Learning (ML) has revolutionized numerous industries and daily life, introducing unprecedented opportunities and challenges. As these technologies integrate deeply into societal structures, it becomes imperative to consider their ethical, social, and environmental implications. This course aims to provide learners with a foundational understanding of ethical principles and frameworks as applied to AI/ML systems.

Pre-requisites:

Artificial Intelligence, Machine Learning

Course Objectives:

- Understand ethical considerations in AI and ML development and deployment.
- Explore frameworks for ethical decision-making in AI systems.
- Assess potential biases, privacy issues, and impacts of AI on society.
- Learn legal and policy implications related to AI and ML.
- Develop skills to implement ethical practices in AI projects.
- Foster critical thinking to address ethical challenges in real-world scenarios.

Course Outcomes:

Learner will be able to:

1. Demonstrate understanding of ethical principles in AI/ML.
2. Identify and mitigate bias and fairness issues in datasets and algorithms.
3. Apply ethical frameworks to evaluate AI systems.
4. Design AI systems with accountability, transparency, and fairness.
5. Understand societal impacts
6. Engage in ethical decision-making during AI system development.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to Ethics in AI/ML	Overview of Ethics: Moral principles, ethics vs. legality. Why Ethics in AI/ML? Risks and challenges. Key Ethical Issues in AI: Bias, fairness, accountability, transparency. Case Studies: Real-world AI ethical dilemmas.	5
2	Bias and Fairness in AI/ML	Definition and Types of Bias in AI: Dataset bias, algorithmic bias. Techniques to Detect and Mitigate Bias in ML Models. Fairness Frameworks: Disparate impact, equalized odds. Ethical Data Collection and Preprocessing.	5
3	Privacy and Security Concerns	Privacy Challenges in AI: Data collection, storage, and sharing. Ethical Guidelines for User Data Protection. Security Risks in AI Systems: Deepfakes, adversarial attacks. GDPR and Other Privacy Regulations.	5
4	Accountability and Transparency	Need for Explainable AI (XAI). Strategies for Creating Transparent AI Systems. Accountability in AI Decision-Making. Ethical Implications of Autonomous Systems.	5
5	Societal Impacts of AI/ML	Impacts on Employment and Workforce. AI and Social Inequality. Misinformation and AI-Generated Content. AI in Healthcare, Education, and Governance.	5
6	Legal and Ethical Frameworks in AI	Overview of AI Ethics Guidelines (IEEE, UNESCO, etc.). AI Laws and Policies: International and regional perspectives. Intellectual Property and AI-Generated Content. Future Directions in AI Ethics.	5
Total			**30**

Textbooks:

1. AI Ethics: A Textbook by Paula Boddington - A comprehensive introduction to ethical challenges in AI systems.
2. Atlas of AI by Kate Crawford - Discusses the societal and environmental impact of AI

Reference Books:

1. The Ethical Algorithm by Aaron Roth & Michael Kearns - Explores designing socially aware algorithms
2. Human Compatible by Stuart Russell - Focuses on aligning AI with human values
3. Moral Machines: Teaching Robots Right From Wrong by Wendell Wallach and Colin Allen - Examines embedding ethics into AI systems.

Online Resources for Learning:

1. **Responsible AI Toolkit Reading List** - A curated set of academic papers and books focusing on responsible AI development and ethics Responsible AI Toolkit

.2. **Oxford Academic Journals** - Offers edited volumes on AI ethics and related fields, often authored by leading experts

Course Name: Ethics in AI Lab

Course Code: HMIT07P

Category: Honors in Next-Gen AI&ML

Preamble:

The rapid advancement of Artificial Intelligence (AI) and Machine Learning (ML) has revolutionized numerous industries and daily life, introducing unprecedented opportunities and challenges. As these technologies integrate deeply into societal structures, it becomes imperative to consider their ethical, social, and environmental implications. This lab manual is designed to equip learners with practical skills to address ethical concerns in AI and ML systems while fostering a deeper understanding of fairness, accountability, transparency, and privacy. Through guided experiments and critical discussions, students will explore the balance between technological innovation and ethical responsibility, preparing them to design and deploy AI systems that respect human values and promote societal good.

Pre-requisites:

Artificial Intelligence Lab, Machine Learning Lab

Course Objectives:

- Understand ethical considerations in AI and ML development and deployment.
- Explore frameworks for ethical decision-making in AI systems.
- Assess potential biases, privacy issues, and impacts of AI on society.
- Learn legal and policy implications related to AI and ML.
- Develop skills to implement ethical practices in AI projects.
- Foster critical thinking to address ethical challenges in real-world scenarios.

Course Outcomes:

Learner will be able to:

1. Demonstrate understanding of ethical principles in AI/ML.
2. Identify and mitigate bias and fairness issues in datasets and algorithms.
3. Apply ethical frameworks to evaluate AI systems.
4. Design AI systems with accountability, transparency, and fairness.
5. Understand societal impacts
6. Engage in ethical decision-making during AI system development.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

1. Bias Detection and Mitigation in ML Models
2. Privacy Preservation Using Differential Privacy
3. Explainable AI (XAI): Interpreting Black-Box Models
4. Adversarial Attack and Defense Strategies
5. Fairness in AI-Powered Recommendation Systems
6. Simulating Ethical Dilemmas in Autonomous Systems
7. Energy Efficiency Analysis of ML Models
8. Ethical Concerns in NLP Models for Sentiment Analysis
9. Misinformation Detection Using AI
10. Guidelines for Ethical Data Collection and Labeling

Course Name: Data visualization using R Programming

Course Code: HMIT10T

Category: Honors in Next-Gen DS

Preamble:

It introduces fundamental concepts, advanced techniques, and best practices while introducing tools and libraries within the R ecosystem. It will train learners to interpret, design, and communicate insights effectively with real-world applications that bring into closer view the role of data visualization in decision-making.

Course Objectives:

- Develop a good understanding of the theoretical underpinnings of data visualization, including principles of clarity, accuracy, and storytelling.
- Learn how to use R programming and its visualization libraries such as ggplot2, plotly, and sf to create a range of charts and graphs.
- Learn to clean, manipulate, and prepare data effectively for visualization using R's data wrangling packages like dplyr and tidyr.
- Explore advanced visualization techniques, including geospatial mapping, interactive dashboards, and visualizations for complex datasets such as networks and time series.
- Understand how to design and present visualizations that clearly communicate insights, supported by reproducible reports and presentations using R Markdown.
- Demonstrate the ability to apply data visualization methods to real-world problems from a variety of domains, including business, healthcare, and environmental studies, through case studies and projects.

Course Outcomes:

Learner will be able to:

CO1: Understand and apply data visualization principles to enhance decision-making and avoid common pitfalls.
CO2: Demonstrates competence in using R and key libraries for visualization (ggplot2, dplyr, plotly) for data analysis.
CO3: Create and customize appropriate visualizations, such as scatter plots, bar charts, and histograms.
CO4: Prepare and maintain data for visualization through transformation and tidy data principles.
CO5: Improve advanced visualizations for multivariate, time series, and geospatial data, both statically and interactively.
CO6: Design accessible, effective visualizations using strong communication and aesthetic principles for diverse audiences.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to Data Visualization and R Basics	Importance of Data Visualization: Role in data analysis and decision-making, Definition and importance of data visualization in analytics and decision-making, Principles of effective visualization (clarity, simplicity, and accuracy), how to avoid misleading visualizations, Differences between exploratory and explanatory data visualization. Components: data, visual encodings, and context, Understanding visual perception and cognitive load. Introduction to R Programming: Overview of R and RStudio, Key libraries for visualization: ggplot2, dplyr, plotly Understanding Data Structures in R: Vectors, data frames, tibbles, and lists, Loading and exploring datasets in R	5
2	Fundamentals of Data Visualization	Types of Data and Their Visualization Needs: Categorical, numerical, temporal, and geospatial data, Matching chart types to data types. Overview of Chart Types; Scatter plots, bar charts, and line charts, Histograms, density plots, boxplots, and pie charts The Grammar of Graphics (ggplot2): Understanding layers: data, aesthetics, and geometries, Customizing plots with themes, labels, and legends. Understanding data mappings and coordinates Best Practices for Chart Selection: Choosing appropriate charts for categorical, numerical, and temporal data.	5
3	Data Preparation for Visualization	Data transformation: filtering, aggregating, and reshaping. Tidy Data Principles: Importance of structured data for visualization, Using tidyr and dplyr for data preparation.	5

Module No.	Module Name	Content	No of Hours
		Handling Large Datasets: Sampling techniques and data summarization. Efficient visualization strategies for big data	
4	Advanced Visualization Techniques	Visualization of Multivariate Data: Techniques for high-dimensional data (e.g., scatterplot matrices, parallel coordinates), Visualizing clustering and classification results. Multi-Panel Visualizations: Faceting techniques for subset comparison, Overlaying plots and combining visualizations Time Series Visualizations: Trend lines and seasonal patterns, Temporal patterns and trends, Smoothing and seasonal decomposition Geospatial Visualizations: Mapping spatial data and geospatial patterns, Incorporating layers, heatmaps, and choropleth maps, maps with ggplots and sf	5
5	Design Principles and Aesthetic Customization	Designing Visualizations for Communication: Structuring narratives for data-driven presentations, Color Theory and Accessibility: Effective use of color in data visualization, Ensuring accessibility (e.g., colorblind-friendly palettes), Customizing Visualization Elements: Titles, labels, legends, and annotations for clarity, Layout and spacing for better readability.	
6	Interactive and Specialized Visualizations	Interactive Visualization Concepts: The need for interactivity in data exploration, Overview of tools for creating interactive visualizations Specialized Visualization Types: Network visualizations (e.g., node-link diagrams), Statistical visualizations: regression plots, confidence intervals, and distributions, Representing regression results and confidence intervals, Diagnostic plots and residual analysis Tree maps and hierarchical data visualizations, Visualization for Big Data, Techniques for summarizing and aggregating large datasets, Sampling and visual encoding strategies	5
Total			**30**

Textbooks:

1. R for Data Science by Hadley Wickham and Garrett Grolemund
2. Data Visualization: A Practical Introduction by Kieran Healy

Reference books:

1. Practical Data Science with R by Nina Zumel and John Mount

Course Name: Data visualization using R Programming

Course Code: HMIT10P

Category: Honors in Next-Gen DS

Preamble:

The Data & Feature Engineering Lab provides hands-on experience in applying data preprocessing and feature engineering techniques to real-world datasets. Students will learn to collect, clean, preprocess, and transform data to prepare it for analysis and modeling. In the feature engineering process, you start with your raw data and use your own domain knowledge to create features that will make your machine learning algorithms work. In this module we explore what makes a good feature. Through practical exercises and projects, students will develop proficiency in using tools and libraries commonly employed in data engineering tasks.

Prerequisites: Skill Based Lab-Python

Objective:

- Master R programming and manipulate various data structures effectively.
- Perform exploratory data analysis (EDA) and analyze data patterns.
- Match appropriate visualizations to different data types for meaningful insights.
- Create and customize visualizations using the grammar of graphics (ggplot2).
- Transform and prepare data for visualization using dplyr and tidyr.
- Visualize high-dimensional and geospatial data and communicate insights clearly.

Course Outcomes:

Learner will be able to:

CO1: Apply R and RStudio tools to manipulate and explore data structures.
CO2: Perform basic exploratory data analysis and find insights in the data.
CO3: Select and apply the appropriate visualizations for categorical and numerical data.
CO4: Create and customize visualizations using ggplot2 and the grammar of graphics.
CO5: Transform and aggregate data for visualization using dplyr and tidyr.
CO6: Visualize high-dimensional and geospatial data and effectively communicate insights.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	50

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested list of experiments:

Sr. No.	List of experiments
1	Introduction to R and RStudio
2	Create, access, and modify various data structures in R
3	Loading and Exploring Datasets and perform basic exploratory data analysis (EDA).
4	Visualizing Categorical and Numerical Data and Match the right chart type to different data types
5	Understand the grammar of graphics and create plots like scatter plots, line charts, and box plots using ggplot2
6	Data transformation techniques for data visualization (filtering, aggregating, reshaping).Using dplyr and tidyr to filter and aggregate a dataset
7	Implement data sampling techniques, perform summarization
8	Visualize high-dimensional data using techniques like scatterplot matrices and parallel coordinates.
9	Visualize geospatial data using ggplot2 and sf using choropleth maps
10	Design effective visualizations for storytelling and communication.

Textbooks:

1. R for Data Science by Hadley Wickham and Garrett Grolemund
2. Data Visualization: A Practical Introduction by Kieran Healy

Reference books:

1. Practical Data Science with R by Nina Zumel and John Mount

Course Name: IT Security Strategic Planning, Policy, and Leadership

Course Code: HMIT13T

Category: Honours in Next-Gen Cyber Security

Preamble:

In the rapidly evolving digital landscape, organizations face complex and persistent cybersecurity challenges. IT Security Strategic Planning and Policy is a critical discipline that empowers professionals to design and implement structured approaches to safeguarding information assets. This course aims to equip learners with the knowledge and tools required to develop comprehensive security strategies and policies aligned with organizational goals and regulatory requirements.

Pre-requisites: Computer Networks, Computer Network & Security

Course Objectives:

1. Understand the principles and significance of IT security strategic planning.
2. Learn the structure and components of IT security policies.
3. Explore methods for performing risk assessments and integrating them into strategic plans.
4. Gain knowledge of compliance with regulatory frameworks and standards.
5. Understand the evaluation and maintenance of security policies.

Course Outcomes:

Learner will be able to:
CO1: Explain the key components of IT security strategic planning.
CO2: Design theoretical IT security policies for organizational use.
CO3: Perform conceptual risk assessments and recommend appropriate mitigations.
CO4: Evaluate compliance requirements and propose strategies for regulatory adherence.
CO5: Assess and refine IT security policies based on organizational needs and industry best practices.
CO6: Utilize metrics to evaluate the effectiveness of security strategies.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	15	20	40	75

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module No.	Module Name	Content	No of Hours
1	Introduction to IT Security Strategic Planning	Definition and importance of strategic planning in IT security. Alignment of IT security strategies with business objectives. Overview of security frameworks: NIST CSF, ISO 27001, COBIT.	4
2	Fundamentals of IT Security Policies	Policy structure: Definitions, objectives, scope, and responsibilities. Types of IT security policies: Acceptable use, data protection, access control, and incident management. Policy lifecycle: Development, approval, communication, and review.	6
3	Risk Management and Business Impact Analysis	Risk assessment fundamentals: Threats, vulnerabilities, and impact. Risk management methodologies (e.g., NIST SP 800-30). Business Impact Analysis (BIA): Identifying critical assets and dependencies.	6
4	Regulatory and Compliance Requirements	Introduction to major regulations: GDPR, HIPAA, PCI DSS, SOX. Compliance as part of IT security strategy. Industry best practices for achieving and maintaining compliance.	6
5	Security Metrics and Policy Evaluation	Security metrics: Types, importance, and measurement techniques. Methods for evaluating the effectiveness of security policies. Reporting and improving policies using feedback and audit results.	4
6	Emerging Trends and Challenges in IT Security Strategic Planning	Emerging security threats and their impact on strategic planning: Advanced Persistent Threats (APTs), ransomware, and zero-day vulnerabilities. Incorporating Artificial Intelligence (AI) and Machine Learning (ML) in IT security strategies. Cloud security considerations in policy development. Challenges in aligning policies with new technologies such as IoT and blockchain. Future directions in IT security frameworks and standards.	4
Total			**30**

Textbooks:

1. "Information Security Policies, Procedures, and Standards: A Practitioner's Reference" by Douglas J. Landoll
2. "Managing Risk in Information Systems" by Darril Gibson
3. Cybersecurity and Cyberwar: What Everyone Needs to Know by P.W. Singer and Allan Friedman

Reference Books:

1. "Handbook of Digital Forensics and Investigation" edited by Eoghan Casey
2. "Windows Forensic Analysis Toolkit: Advanced Analysis Techniques for Windows 10" by Harlan Carvey
3. "Network Forensics: Tracking Hackers through Cyberspace" by Sherri Davidoff and Jonathan Ham
4. "Mobile Forensic Investigations: A Guide to Evidence Collection, Analysis, and Presentation" by Lee Reiber

Course Name: IT Security Strategic Planning, Policy, and Leadership Lab

Course Code: HMIT13P

Category: Honours in Next-Gen Cyber Security

Preamble:

This lab course provides practical, hands-on experience in developing, implementing, and evaluating IT security strategies, policies, and leadership practices. Through real-world simulations, case studies, and group projects, students will apply strategic planning frameworks, draft security policies, and practice leadership skills required for effective IT governance and risk management.

Pre-requisites: Computer Networks Lab- IT06P, Operating system Lab- IT05P, Computer & Network Security Lab- IT24P

Course Objectives:

1. By the end of this course, students will be able to:
2. Design and implement strategic security plans aligned with organizational goals.
3. Develop IT security policies addressing regulatory and business requirements.
4. Use leadership and communication techniques to manage security teams effectively.
5. Conduct risk assessments and propose mitigation strategies.
6. Collaborate in a team to solve complex cybersecurity challenges.

Course Outcomes:

Learner will be able to:

LO1: Develop Comprehensive IT Security Strategies
LO2: Draft and Evaluate IT Security Policies
LO3: Conduct Effective Risk Assessments
LO4: Lead and Manage Cybersecurity Teams
LO5: Implement and Evaluate Incident Response Plans
LO6: Monitor and Report Cybersecurity Metrics

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
-	1	-	1

Assessment guidelines:

Head of Learning	ISA	MSE	ESE	Total
Practical	25	-	25	050

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practicals:

Sr No.	Title of Practicals
1	Course Overview and Lab Setup • Overview of IT security leadership and strategic planning. • Introduction to lab tools and virtual environments. • Basics of organizational alignment in security planning.
2	Risk Assessment and Business Impact Analysis • Conducting a risk assessment using industry frameworks (e.g., NIST, ISO). • Analyzing and presenting business impact findings.
3	Designing IT Security Strategies • Hands-on: Creating a strategic security plan. • Balancing security with business objectives.
4	IT Security Policy Development • Drafting an IT security policy document (e.g., access control, incident response). • Addressing compliance requirements (e.g., GDPR, HIPAA).
5	Incident Response Planning • Developing an incident response plan and playbook. • Lab simulation: Responding to a security breach.
6	Governance, Risk, and Compliance (GRC) • Lab exercises in setting up GRC dashboards. • Conducting compliance audits and presenting findings.
7	Security Awareness and Training Programs • Designing employee security awareness programs. • Delivering mock training sessions for end-users.
8	Cybersecurity Metrics and Reporting • Creating and analyzing security dashboards and reports. • Lab: Presenting key metrics to a mock C-suite team.

Textbooks:

1. "Information Security Policies, Procedures, and Standards: A Practitioner's Reference" by Douglas J. Landoll

Reference Books:

1. "CISO Desk Reference Guide: A Practical Guide for CISOs" by Bill Bonney, Gary Hayslip, and Matt Stamper
2. "Managing Risk in Information Systems" by Darril Gibson
3. "IT Security Governance Guidebook with Security Program Metrics on CD-ROM" by Fred Cohen
4. "NIST Cybersecurity Framework: A Pocket Guide" by Alan Calder
5. "Cybersecurity Leadership: Powering the Modern Organization" by Mansur Hasib

Course Name: Embedded Linux System

Course Code: HMET01T

Category: Honours in Next-Gen IoT

Preamble:

The rapid growth of Linux as an embedded operating system in many products is due to the ease of using embedded Linux to replace home-grown operating systems. Linux-based embedded systems are widely used in smartphones, in-vehicle infotainment systems, in countless consumer electronics and for numerous industrial applications. It may be the need for TCP/IP networking, USB support, Secure Digital support, or some other standard that causes a company to dump their current operating system and switch to Linux. But it is the joy of developing with Linux that keeps the engineers promoting it for future products. The objective of the course is to give students solid introductory knowledge on Linux OS and internals of Linux for embedded system design.

Pre-requisites:

- C Programming
- Object Oriented Programming
- Microprocessor and microcontroller

Course Objectives:

- To understand role of operating system in embedded system development.
- To understand architecture of operating systems for embedded system applications.
- To understand different types of kernels.
- To understand kernel module of Linux.
- To understand communication between user and operating system.
- Use Linux operating system in embedded system application.

Course Outcomes:

Learner will be able to:
CO1: Understand fundamental concepts of operating System.
CO2: Understand architecture of Linux operating system for embedded system applications.
CO3: Understand concept of kernel.
CO4: Use Linux kernel module.
CO5: Do communication between user space and kernel space.
CO6: Develop applications.

Course Scheme:

Contact Hours		Credits Assigned	
Theory	Practical	Theory	Practical
2	-	2	-

Assessment Guidelines:

Head	ISA	MSA	ESE	Total (Passing @40% of total)
Theory	15	20	40	075

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Detailed Syllabus:

Module no	Module name	Content	No of Hours
1	RTOS and Linux based Embedded Systems: An Introduction	Introduction to Real Time Operating Systems: Characteristics of RTOS, Tasks Specifications and types, Real-Time Scheduling Algorithms, Concurrency, Inter-process Communication and Synchronization mechanisms, Priority Inversion, Inheritance and Ceiling. Operating systems for embedded systems, Why Linux-based embedded systems? Linux evolution Embedded Linux Vs Desktop Linux, Embedded Linux Distributions, System calls, Static and dynamic libraries, Cross tool chains. Linux-based embedded system: example	05
2	Embedded Linux Architecture and Kernel Architecture	Architecture of Embedded Linux- Real Time Executive, Monolithic kernels, Microkernel.Linux Kernel Architecture- Hardware Abstraction Layer (HAL), Memory manager, Scheduler, File System, I/O and Networking subsystem, IPC. User space, Linux Start-up sequence.	05
3	Building and Debugging	Building the Kernel, Building Applications, Building the Root File System, Integrated Development Environment, Debugging Virtual Memory Problems, Kernel Debuggers, Profiling	05
4	Introduction to Linux kernel modules	Introduction, CPU – I/O interface, I/O interface with polling, I/O interface with interrupt, I/O interface, I/O interface latency, Direct memory access (DMA) architecture - transfer modes, I/O taxonomy, Typical operations, Linux devices, The Virtual File System (VFS) abstraction. Linux kernel modules – the initialization function, the cdev data structure, the initialization function, the clean-up function, custom VFS functions.	06
5	Communication Between Kernel and User Space	Introduction, The reference use case, The CPU/Device interface, The module level – file operations, ioctl() implementation, open()/release() implementation, read() implementation, Passing data to/from the kernel, write() implementation, communication with the device, Memory	06

Module no	Module name	Content	No of Hours
		mapped I/O – initialization, clean-up, read, write, GPIO-based I/O – initialization, clean-up, read, write, Interrupts, Requesting the interrupt line, Freeing the interrupt line, The interrupt handler, Interrupt handling, Top-half and bottom-half, Needed support, Work queue, The user level, The user level – the application	
6	Porting Applications	Architectural Comparison, Application Porting Roadmap, Programming with Pthreads, Operating System Porting Layer (OSPL), Kernel API Driver.	03
Total			**30**

Textbooks:

1. "Embedded Linux System Design and Development", P Raghvan, Amol Lad, Sriram Neelakandan, Auerbach Publications.
2. "Mastering Embedded Linux Programming", Chris Simmonds Second Edition, PACKT Publications Limited.
3. "Embedded Linux Primer: A Practical Real World Approach", Christopher Hallinan, Prentice Hall, 2nd Edition, 2010

Reference Books:

1. "Building Imbedded Linux Systems", Karim Yaghmour, O'Reilly & Associates.
2. Embedded Linux Systems with the Yocto Project, Rudolf K. Sterif

Course Name: Embedded Linux System Laboratory

Course Code: HMET01P

Category: Honours in Next-Gen IoT

Preamble:

The rapid growth of Linux as an embedded operating system in many products is due to the ease of using embedded Linux to replace home-grown operating systems. Linux-based embedded systems are widely used in smartphones, in-vehicle infotainment systems, in countless consumer electronics and for numerous industrial applications. It may be the need for TCP/IP networking, USB support, Secure Digital support, or some other standard that causes a company to dump their current operating system and switch to Linux. But it is the joy of developing with Linux that keeps the engineers promoting it for future products. The objective of the course is to give students solid introductory knowledge on Linux OS and internals of Linux for embedded system design.

Pre-requisites:

- C Programming
- Object Oriented Programming
- Microprocessor and microcontroller

Course Objectives:

- To understand role of operating system in embedded system development.
- To understand architecture of operating systems for embedded system applications.
- To understand different types of kernels.
- To understand kernel module of Linux.
- To understand communication between user and operating system.
- Use Linux operating system in embedded system application.

Course Outcomes:

Student will be able to:

CO1: Demonstrate fundamental concepts of operating System.
CO2: Demonstrate architecture of Linux operating system for embedded system applications.
CO3: Demonstrate concept of kernel.
CO4: Use Linux kernel module with standard commands.
CO5: Establish communication from user space to kernel space.
CO6: Develop embedded system applications based on Linux operating system.

Course Scheme:

Contact Hours		**Credits Assigned**	
Theory	Practical	Theory	Practical
-	2	-	1

Assessment Scheme:

Head	ISA	MSA	ESE	Total
Practical	25	-	25	050

The assessment guidelines for the courses of different credits are mentioned above. Notwithstanding the above, each course faculty shall have the choice to propose her/his assessment methodology based on the nature of the course. However, the proposed assessment methodology shall be approved by a panel constituted at Institute level and published to the learners before the commencement of the semester.

Suggested List of Practical:

1. Introduction to the Board and Workspace Set-Up.
2. Custom Embedded Linux Build Using the Manual Approach.
3. Introduction to Linux Kernel Modules under Yocto.
4. Handling General Purpose I/O Using Linux Kernel Modules.
5. Handling Hc-Sr04 Ranging Sensor Using Linux Kernel Modules.
6. Introduction to Code Development and Debugging Using Yocto.
7. Introduction to Linux Kernel and Application Profiling.
8. Installing Linux kernel and configuration of Rasp-berry Pi computer (SBC)
9. Installation of Free RTOS and integration with Keil IDE for multithreaded application.

Practical can be designed using project based approach.

Textbooks:

1. "Embedded Linux System Design and Development", P Raghvan, Amol Lad, Sriram Neelakandan, Auerbach Publications.
2. "Mastering Embedded Linux Programming", Chris Simmonds Second Edition, PACKT Publications Limited.
3. "Embedded Linux Primer: A Practical Real World Approach", Christopher Hallinan, Prentice Hall, 2nd Edition, 2010

Reference Books:

1. "Building Imbedded Linux Systems", Karim Yaghmour, O'Reilly & Associates.
2. Embedded Linux Systems with the Yocto Project, Rudolf K. Sterif