B.T. Semester –VIII B. TECH Internet of Things (IOT)
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme

<table>
<tr><td colspan="6">B. TECH Internet of Things (IOT)</td><td colspan="6">B.T. SEM: VIII</td></tr>
<tr><td colspan="6">Course Name: Introduction to Industry 4.0</td><td colspan="6">Course Code: PCC- IOT801</td></tr>
<tr><td colspan="6">Teaching Scheme (Program Specific)</td><td colspan="6">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="6">Modes of Teaching / Learning / Weightage</td><td colspan="6">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="6">Hours Per Week-Theory (100)</td><td colspan="2">IA</td><td>ESE</td><td>Practical /Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>ISE</td><td>IE</td><td>-</td><td>OR</td><td>TW</td><td rowspan="2">150</td></tr>
<tr><td>3</td><td>-</td><td>2</td><td>5</td><td>4</td><td>20</td><td>20</td><td>60</td><td>25</td><td>25</td></tr>
<tr><td colspan="12">ISE: In-Semester Examination - Paper Duration – 1 Hours
IE: Innovative Examination
ESE: End Semester Examination - Paper Duration - 2 Hours
The weightage of marks for continuous evaluation of Term work/ Report: Formative (40%), and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="12">Prerequisite: Database Management System, Data Warehouse and Mining, Machine Learning</td></tr>
</table>

Course Objective: :

- To impart basic idea in Industry 4.0.
- To provide students with good depth of knowledge of designing Industrial 4.0 Systems for various application.
- Learn the design and analysis of Industry 4.0 systems for Energy and smart vehicular applications and future trends.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the basic concepts of Industry 4.0 and the other related fields	L1.L2
2	Understand cyber physical system and the emerging applications.	L1.L2
3	To learn and explain various key technologies in industry 4.0	L1.L2,L3
4	Understand design principle and reference architecture model for industry 4.0	L1.L2
5	To understand migration from industry 4.0 to Industry 5.0	L1.L2
6	To study and understand various real world implementation of industry 4.0	L1.L2

Detailed Syllabus:

Module No.	Topics		Cognitive levels of attainment as per Bloom's Taxonomy
1	**Overview of Industry 4.0** Definition of Industry 4.0, Key paradigm of Industry 4.0, Industrial Revolution: Phase of development, Environmental impact of industrial revolution, Industrial internet, Additive manufacturing, Robotization & Automation, conventional Automation and Industry4.0, Todays factory vs Industry 4.0 factory, Key benefits and Impact of Industry 4.0, Design requirements, Drivers of Industry 4.0	7	L1, L2
2	**Industry 4.0: Cyber Physical System** Industry 4.0 Component model and specification, Introduction to Cyber Physical System (CPS) Architecture of CPS – Components, Data science and Technology for CPS, Emerging applications, application of CPS in healthcare, Challenges for CPS development, CPS and IIOT, 3D printing.	8	L1, L2
3	**Key technologies :On site Technologies** Introduction, Nine pillars of technological advancement- Big data Analytics, Autonomous robot, Simulation, Horizontal and Vertical System integration, Industrial IoT, Cyber Security, The cloud, Additive manufacturing and Augmented reality. Other Onsite technologies: Smart Grids, Virtual reality, Bigdata advanced analytics, Smart factories and its Lean manufacturing system. Cloud computing, AI & ML, Edge computing, Cyber Security, Digital Twin.	9	L1, L2, L3
4	**Design principle of Industry 4.0 & RAMI4.0** Design Principle of Industry 4.0 , Reference Architecture Model Industry 4.0 (RAM I4.0), Blockchain for industry 4.0, Industrial Data transmission and Industrial Data Acquisition. Servitization, Product Service System	8	L1, L2
5	**Industry 4.0 to Industry 5.0** Introduction to Industry 5.0, characteristics, Main principles, Digital transformation from Industry 4.0 to Industry 5.0, Collaborative robots, Artificial Intelligence, 4D printing	7	L1, L2
6	**Study of various industries and Real world Implementation of Industry 4.0** Manufacturing Industry, Mining Industry, Automotive Industry, Real time use cases from different Industries like OIL, Chemical and Pharma and Uses of UAV in industries	6	L1, L2
	Total Hours	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1.	Introduction to Industrial Internet of Things and Industry 4.0	Sudip Mishra, Chandana Roy, Anandarup Mukherjee	CRC Press	First	2021
2.	Handbook of Industry 4.0 and Smart System	Diego Galar Pascual, Pasquale Daponte, Uday Kumar	CRC Press		
3.	Industry 4.0 Interoperability, Analytics, Security, and Case Studies	G. Rajesh, X. Mercilin Raajini, Hien Dang	CRC Press	First	2021

Online References:

1. Jean-Claude André, ―Industry 4.0‖, Wiley- ISTE, July 2019, ISBN: 781786304827,2019.
2. Diego Galar Pascual, Pasquale Daponte, Uday Kumar, ―Handbook of Industry 4.0 and SMART Systems‖ Taylor and Francis,2020
3. Miller M, ―The internet of things: How smart TVs, smart cars, smart homes, and smart cities are changing the world‖, Pearson Education, 2015, ISBN: 9780134021300.
4. Pengwei Du and Ning Lu, ―Energy storage for smart grids: planning and operation for renewable and variable energy resources VERs ‖, Academic Press, 2018, Reprint edition , ISBN-13: 978-0128100714
5. Hossam A. Gabbar, ―Smart Energy Grid Engineering‖, Academic Press, 2017, ISBN 978-0-12-805343-0.
6. Mini S. Thomas, John Douglas McDonald, ―Power System SCADA and Smart Grids‖, CRC Press, 2017.

B.T. Semester –VIII B. TECH Internet of Things (IOT)
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2023)
Syllabus under Autonomy Scheme

<table>
<tr><td colspan="10">B. TECH Internet of Things (IOT)</td><td colspan="3">B.T. SEM: VIII</td></tr>
<tr><td colspan="10">Course Name: Ethical Hacking for IoT security</td><td colspan="3">Course Code: PEC-IOT8011</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="8">Examination Scheme (Formative/ Summative)</td></tr>
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<tr><td colspan="10">ISE: In-Semester Examination - Paper Duration – 1 Hours
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ESE: End Semester Examination - Paper Duration - 2 Hours
The weightage of marks for continuous evaluation of Term work/ Report: Formative (40%), and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="10">1. Prerequisite: Basic knowledge of Computers, Networking Concepts</td></tr>
</table>

Course Objective: : The course intends to explore the fundamentals of Ethical hacking, various phases of ethical hacking, types of attacks and how to prevent these attacks.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Recognize the various phases of ethical hacking.	L1, L2
2	Understand footprinting through search engines and web services	L1, L2, L3
3	Know network scanning tools and techniques	L1, L2, L3
4	Aware of various trojans and attacks	L1, L2, L3
5	To practice tools to perform ethical hacking to expose the vulnerabilities.	L1, L2, L3
6	Learning network-based attacks and their countermeasures	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Information Security and Hacking** What is ethical hacking? Types of hacking, advantages, disadvantages and purpose of hacking, Types of hackers, Code of ethics, Types of attacks and attack vector types, Prevention from hackers, The Indian IT Act 2000 and Amendments to the Indian IT Act(2008) ,Phases of hacking. Case studies on hacking in India or abroad.	6	L1, L2
2	**Footprinting And Reconnaissance:** What is footprinting? Active and passive footprinting, purpose of footprinting, objectives of footprinting, footprinting threats, Types of footprinting, footprinting countermeasures.	7	L1, L2, L3
3	**Scanning networks, Enumeration and sniffing: Scanning networks** Network scanning and its types, objectives of network scanning, scanning live systems, scanning techniques-TCP Connect / Full Open Scan, Types of Stealth scans, port scanning countermeasures, IDS evasion techniques, Banner grabbing and its tools, vulnerability scanning, proxy servers, anonymizers, IP spoofing and its countermeasures. **Enumeration and Sniffing:** What is Enumeration? Enumeration techniques, Enumeration types, Enumeration countermeasures, what is sniffing? Wiretrapping and its types, packet sniffing, sniffing threats, how sniffers work?, sniffing methods-ARP spoofing and MAC flooding, active and passive sniffing, types of sniffing attacks, sniffing countermeasures, sniffing detection techniques	9	L1, L2, L3
4	**Trojans and other Attacks** Worms, viruses, Trojans, Types of worms, viruses and worms, Preventing malware attacks, types of attacks: (DoS / DDoS), Waterhole attack, brute force, phishing and fake WAP, Eavesdropping, Man-in-the-middle, buffer overflow, DNS poisoning, ARP poisoning, Identity Theft, IoT Attacks, BOTs and BOTNETs, Steganography - text, image and audio and video, types of Social Engineering: Physical social engineering, Remote social engineering and hybrid social engineering.	8	L1, L2, L3, L4
5	**Hacking web servers and web applications** **Session hijacking:** What is session hijacking? why session hijacking is successful? session hijacking techniques, session hijacking process, Types of session hijacking, session hijacking countermeasures: protecting and preventing. **Hacking web servers and web applications:** Causes of webservers being compromised, web server attacks, stages of web server attacks, defending against web server attacks, web	7	L1, L2, L3

	application components, its working, architecture, web server attack vectors, web application threats and counter measures		
6	**Wireless network hacking, cloud computing security, cryptography, Pen testing** Types of wireless Architecture, wireless encryption techniques-WEP and WPA, breaking WEP/WPA and defending WPA encryption, wireless Sniffing, Characteristics, types of cloud computing services, models and benefits, threats and attacks, cryptography and its objectives, cryptography types, cryptography attacks, what is Pen Testing, need for pen testing, types and techniques of pen testing, phases of pen testing.	8	L1, L2, L3
	Total Hours	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Editio n	Year
1.	Penetration Testing: A Hands-On Introduction to Hacking	Georgia Weidman	Penguin Random House Publisher	1st	-
2.	Hands-On Ethical Hacking and Network Defense.	Michael T. Simpson, Kent Backman, and James E. Corley,	Course Technology, Delmar Cengage Learning	2nd	2010
3.	The Basics of Hacking and Penetration Testing	Patrick Engebretson	Micheal T sampson	SYNGRESS, Elsevier	2013

Online References:

S. No.	Website Name	URL	Modules Covered
1	https://nptel.ac.in/	https://archive.nptel.ac.in/courses/106/105/106105217/	M1-M6
2	www.eccouncil.org	https://www.eccouncil.org/cybersecurity-exchange/ethical-hacking/ethical-hacking-understanding-basics/	M1-M6

Capstone Project Hours Distribution:

Sr.No	Practical/ Experiment Topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Study Research papers, articles, mini project	4	L1, L2, L3
2	Title Identification	2	L1, L2, L3
3	Project Title finalization and development ofModules	4	L1, L2, L3

4	Design methodology and tools for implementation	4	L1, L2, L3
5	Implementation of Modules phase-1	2	L1, L2, L3
6	Result Phase	4	L1, L2, L3
7	Implementation of Modules Phase-2	2	L1, L2, L3
8	Result Phase II	2	L1, L2, L3
9	Result validation	2	L1, L2, L3, L4
10	Report Writing	4	L1, L2, L3, L4
	Total Hours	30	

B.T. Semester –VIII

Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020) Syllabus under Autonomy Scheme

B.TECH. Internet of Things (IOT)							**B.T. SEM: VIII**		
Course Name: High Performance Computing							**Course Code**: PEC-IOT8012		
Teaching Scheme (Program Specific)					**Examination scheme**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week- Theory (100)							**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	**150**
3	-	2	3	4	40	60	25	25	
IA: In Semester Assessment - Paper Duration **– 1 Hour** **ESE:** End Semester Examination - Paper Duration - **2 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completionof practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Analytical and Logical Understanding of High Performance Computing.									

Course Objective:

The objective of this course is

- To Study various computing technology architecture.
- To know Emerging trends in computing technology.
- To highlight the advantage of deploying computing technology

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	**Course Outcomes**	**Cognitive levelsof attainment asper Bloom's Taxonomy**
1	Understand the significance of HPC in scientific computing and data analysis.	L1, L2
2	Master various parallel programming models (e.g., MPI, OpenMP, CUDA). Develop algorithms suitable for parallel processing.	L1, L2, L3
3	Understand the architecture of high-performance computing systems.	L1, L2, L3
4	Analyze performance metrics of parallel programs. Apply optimization techniques to enhance program efficiency.	L1, L2, L3, L4
5	Understand the role of HPC in various scientific and computational domains.	L1, L2, L3, L4
6	Explore emerging trends and advanced concepts in HPC. Engage with cutting-edge technologies and research areas.	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment asper Bloom's Taxonomy
1	**Cluster Computing and its Architecture** Ease of Computing, Scalable Parallel Computer Architecture, Towards Low Cost Parallel Computing & Motivation, Windows opportunity, A Cluster Computer And Its Architecture, Cluster Classification, Commodity Components for Clusters, Network Services/Communication SW, Cluster Middleware and Single Systems Image, Resource management & Scheduling (RMS)	10	L1, L2,L3, L4
2	**Cluster Setup and Administration** Setting up the cluster, Security, System Monitoring, System Tuning	5	L1, L2
3	**Introduction to Grid and its Evolution** Introduction to Grid and its Evolution, Beginning of the Grid, Building blocks of Grid, Grid Application and Grid Middleware, Evolution of the Grid: First, Second & Third Generation	6	L2, L3
4	**Introduction to Cloud Computing** Defining Clouds, Cloud Providers, Consuming Cloud Services, Cloud Models – Iaas, Paas, SaaS, Inside the cloud, Administering cloud services, Technical interface, Cloud resources	8	L2, L3, L4
5	**Nature of Cloud** Tradition Data Center, Cost of Cloud Data Center, Scaling computer systems, Cloud work load, Managing data on clouds, Public, private and hybrid clouds	11	L1, L2
6	**Cloud Elements** Infrastructure as a service, Platform as a service, Software as a service	5	L2, L3
Total Hours		**45**	

Books and References:

SN	Title	Authors	Publisher	Edition
1	High Performance Cluster Computing, Architecture and Systems,	Rajkumar Buyya	Pearson Education.	Volume 1
2	Grid Computing – Making the Global Infrastructure a Reality,	Berman, Fox and Hey	Wiley India.	-
3	Cloud Computing for Dummies	Hurwitz, Bllor, Kaufman, Halper	Wiley India	-

4.	Cloud Security	Ronald Krutz	Wiley India.	-
5.	Cloud Computing, A Practical Approach	Anthony Velte, Toby Velte, Robert Elsenpeter	McGrawHill.	-

LIST OF PRACTICALS:

Sr.No	Practicals
1.	To study the basic commands of linux.
2.	To establish Beowulf Cluster using MPI(Message Passing Interface) Library.
3.	Installation and configuration of Alchemi Grid.
4.	Running a sample application on Alchemi Grid and analysing it.
5.	To study a Grid Simulation Toolkit.
6.	To run two sample programs using GridSim Toolkit.
7.	To study a Cloud Simulation Toolkit
8.	To setup Cloud

B.T.Semester –VIII
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020) Syllabus under Autonomy Scheme

B.TECH. Internet of Things (IoT)							**B.T. SEM: VIII**		
Course Name: Reinforcement Learning							**Course Code**: PCC-IoT8013		
Teaching Scheme (Program Specific)					**Examination scheme**				
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**				
Hours Per Week- Theory (100)							**Practical/Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**IA**	**ESE**	**OR**	**TW**	**150**
3	-	2@	5	4	40	60	25	25	
IA: In Semester Assessment - Paper Duration **– 1 Hour** **ESE:** End Semester Examination - Paper Duration - **3 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completionof practical (40%) and Attendance / Learning Attitude (20%)									
Prerequisite: Knowledge of Basics of AI & ML and Python Language.									

Course Objective: The course intends to apply the concepts of Reinforcement Learning.

Course Outcomes: Upon completion of the course students will be able to:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand Basic Concepts of Reinforcement Learning	L1, L2
2	Understand and apply Markov Decision Process	L1, L2, L3
3	Understand and Analyze different models of Reinforcement Learning.	L1, L2, L3, L4
4	Understand different Model Free Prediction Algorithms.	L1, L2
5	Analyze & Evaluate basic deep reinforcement Learning algorithms.	L1, L2, L3, L4, L5
6	Outline applications of Reinforcement Learning	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Reinforcement Learning** What is Reinforcement Learning? Origin and history of Reinforcement Learning research. Its connections with other related fields and with different branches of machine learning. RL vs Supervised Learning.	**05**	L1, L2
2	**Markov Decision Process** Agent-Environment Interaction, State Vectors, Action & Policy, Exploration vs Exploitation, Markov State, Markov Decision Process, Optimal Policy, State Value function, Action Value Function, Understanding RL Equation, Bellman Equation of Optimality, Solving Bellman Equation, Policy Environment.	**09**	L1, L2, L3
3	**Model Based Method: Dynamic Programming**		

	Dynamic Programming, Policy Iteration Algorithm, Policy Evaluation, Policy Improvement, Policy Iteration, Value Iteration, Generalized Policy Iteration.	**09**	L1, L2, L3, L4
4	**Model Free Prediction**	**09**	L1, L2
	Intuition behind Monte-Carlo Methods, Monte-Carlo Prediction, Monte- Carlo Prediction, Off Policy, Temporal Difference, Q Learning, Q Learning Pseudocode, Importance Sampling, Incremental Monte Carlo Methods for Model Free Prediction.		
5	**Deep Reinforcement Learning**	**09**	L1, L2, L3, L4
	Why Deep Reinforcement learning, Parameterized Representation, Deep Q Learning Model and its implementation, Training in Deep Reinforcement Learning. Replay Buffer, Generate Data for Training, Target in DQN, Architectures of Deep Q Learning		
6	**Reinforcement Learning Applications**	**04**	L1, L2
	Reinforcement Learning for finance, Reinforcement Learning for Trading Strategies, Manufacturing, Business, Robotics		
	Total Hours	**45**	

Books and References:

Sr. No	Name of the Book	Name of the Author	Publisher	Edition	Year
1	Reinforcement Learning: An Introduction	Richard S. Sutton and Andrew G. Barto	MIT Press	2nd Edition	2020
2	Dynamic Programming and Optimal Control (Vol. I and Vol. II)	Dimitri P. Bertsekas	Athena Scientific	4th Edition	2017
3	Reinforcement Learning: An Introduction (Adaptive Computation And Machine Learning Series)	Andrew G. Barto (Author), Richard S. Sutton (Author)	The MIT Press	First edition	1998
4	Foundations of Deep Reinforcement Learning	Laura Harding Graesser , Keng Wah Loon , Laura Graesser , Wah Loon Keng	Pearson Education	First edition	2019

Online References:

SR No	Website Name	URL	Modules covered
1	https://nptel.ac.in	https://nptel.ac.in/courses/106106143	M1-M6
2	https://www.tutorialspoint.com	https://tutorialspoint.dev/computer-science/machine-learning/markov-decision-process	M2
3	https://www.tutorialspoint.com	https://www.tutorialspoint.com/management_concepts/pdf/monte_carlo_analysis.pdf	M3
4	https://www.javatpoint.com	https://www.javatpoint.com/reinforcement-learning	M4
5	https://www.tutorialspoint.com	https://www.tutorialspoint.com/ebook/deep_reinforcement_learning_hands_on/index.asp	M5-M6

Laboratory in Capstone Mode:

Sr. No.	Topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	Problem Definition and Project Title Identification	2	L1, L2
2	Study tool for implementation	6	L1, L2
3	Deciding the modules of the project.	2	L1, L2
4	Design of the proposed architecture	4	L1, L2, L3
5	Implementation and Deployment	10	L1, L2, L3, L4
6	Testing and Evaluation	4	L1, L2, L3, L4, L5
7	Report Preparation	6	L1, L2, L3

B.T. Semester –VIII
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS HME 2020) Syllabus under Autonomy Scheme

B.TECH. Internet of Things (IOT)								**B.T. SEM: VIII**		
Course Name: Virtual and Augmented Reality								**Course Code**: PEC-IOT8014		
Teaching Scheme (Program Specific)					**Examination scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment / Evaluation**					
Hours Per Week- Theory (100)					**IA**		**ESE**	**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISA**	**IE**	**-**	**OR**	**TW**	**125**
3	1	-	4	4	20	20	60		25	
IA: In Semester Assessment - Paper Duration **– 1 Hour** **ESE:** End Semester Examination - Paper Duration - **2 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance (20%)										
Prerequisite: : AI and .NET										

Course Objective:

This course is designed to give historical and modern overviews and perspectives on virtual reality. It describes t fundamentals of sensation, perception, technical and engineering aspects of virtual reality systems.

Course Outcomes: Students will be able to:

SN	Course Objectives	Cognitive Levels as per Bloom's Taxonomy
1	Describe how VR systems work and list the applications of VR	L1, L2
2	Understand the design and implementation of the hardware that enables VR systems tobe built.	L1, L2, L3
3	Understand the system of human vision and its implication on perception and rendering	L1, L2, L3
4	Describe how AR systems work and list the applications of AR	L1, L2, L3
5	Understand and analyse the hardware requirement of AR	L1, L2, L3
6	Use computer vision concepts for AR and describe AR techniques	L1, L2

Detailed Syllabus:

Module No	Topics	Hrs.	Cognitive Levels as per Bloom's Taxonomy
1	**Introduction to Virtual Reality** Defining Virtual Reality, History of VR, Human Physiology and Perception, Key Elements of Virtual Reality Experience, Virtual Reality System, Interface to the Virtual World-Input & output-Visual, Aural & Haptic Displays, Applications of Virtual Reality.discrete-time signals and systems. Review of Z-transforms, solution of difference equations using Z-transforms, Systemfunction.	4	L1, L2

2	**Representing the Virtual World** Representation of the Virtual World, Visual Representation in VR, Aural Representation in VR and Haptic Representation in VR. Geometric Models, Changing Position and Orientation, Axis-Angle Representations of Rotation, Viewing Transformations, Chaining the Transformations, Human Eye, eye movements & implications for VR.	8	L1, L2, L3
3	**Visual Perception & Rendering** Visual Perception - Perception of Depth, Perception of Motion, Perception of Color, Combining Sources of Information Visual Rendering -Ray Tracing and Shading Models, Rasterization, Correcting Optical Distortions, Improving Latency and Frame Rates	8	L1, L2, L3
4	**Introduction to Augmented Reality (A.R)** What Is Augmented Reality - Defining augmented reality, history of augmented reality, The Relationship Between Augmented Reality and Other Technologies-Media, Technologies, Other Ideas Related to the Spectrum Between Real and Virtual Worlds, applications of augmented reality Augmented Reality Concepts-How Does Augmented Reality Work? Concepts Related to Augmented Reality, Ingredients of an Augmented Reality Experience.	8	L1, L2, L3
5	**Augmented Reality Hardware** Augmented Reality Hardware – Displays – Audio Displays, Haptic Displays, Visual Displays, Other sensory displays, Visual Perception , Requirements and Characteristics, Spatial Display Model. Processors – Role of Processors, Processor System Architecture, Processor Specifications. Tracking & Sensors - Tracking, Calibration, and Registration, Characteristics of Tracking Technology, Stationary Tracking Systems, Mobile Sensors, Optical Tracking, Sensor Fusion.	9	L1, L2, L3
6	**Computer Vision for Augmented Reality & A.R. Software** Computer Vision for Augmented Reality - Marker Tracking, Multiple-Camera Infrared Tracking, Natural Feature Tracking by Detection, Simultaneous Localization and Mapping, Outdoor Tracking Augmented Reality Software - Introduction, Major Software Components for Augmented Reality Systems, Software used to Create Content for the Augmented Reality Application..	8	L1, L2

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	Virtual Reality	Steven M. LaValle,	Cambridge University Press	4th Edition	2016
2	Allan Fowler-AR Game Development‖	Oppenheim A., Schafer R., Buck J.	A press Publications	1st Edition	2018

Online References:

S. No.	Website Name	URL	Modules Covered
1	https://swayam.gov.in	https://nptel.ac.in/courses/106/106/106106138/	M1, M2, M3, M4, M5,
2	https://udemy.com/	https://www.udemy.com/course/master-computer-vision-with-opencv-in-python	M1, M4, M6, M4, M5, M6

B.T. Semester – VIII
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020) Syllabus under Autonomy Scheme

B.TECH. Internet of Things (IOT)							B.T. SEM: VIII			
Course Name: Cyber-Physical Systems in IoT							Course Code: PEC-IOT8015			
Teaching Scheme (Program Specific)							Examination scheme			
Modes of Teaching / Learning / Weightage							Modes of Continuous Assessment / Evaluation			
Hours Per Week- Theory (100)					IA		ESE	Practical/ Oral (25)	Term Work (25)	Total
Theory	Tutorial	Practical	Contact Hours	Credits	ISA	IE	-	OR	TW	150
3	-	2	5	4	20	20	60	25	25	
IA: In Semester Assessment - Paper Duration – **1 Hour** **ESE:** End Semester Examination - Paper Duration - **2 Hours** **The weightage of marks for continuous evaluation of Term work/Report:** Formative (40%), Timely completion of practical (40%) and Attendance (20%)										
Prerequisite: Computer Science Fundamentals, Control Systems, Mathematics.										

Course Objective: To impart fundamental knowledge about Machine learning basics and its algorithms for understanding the development o various applications.

Course Outcomes:

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Students will demonstrate an understanding of foundational concepts in machine learning, including supervised and unsupervised learning, regression, classification, clustering, and dimensionality reduction techniques.	L1, L2
2	Students will grasp the basic principles and architectures of neural networks, including feedforward, convolutional, and recurrent neural networks, and understand their applications in Cyber-Physical Systems.	L1, L2, L3
3	Students will be able to apply optimization methods to enhance the performance of Cyber-Physical Systems, optimizing parameters and models to achieve desired system behavior.	L1, L2, L3, L4
4	Students will be proficient in solving regression problems using a variety of machine learning techniques, selecting and applying appropriate models to predict continuous outcomes within Cyber-Physical Systems.	L1, L2, L3, L4
5	Students will demonstrate the ability to solve classification and clustering problems within Cyber-Physical Systems, employing diverse machine learning algorithms to classify data and discover inherent structures.	L1, L2, L3, L4
6	Students will apply dimensionality reduction methods to reduce the complexity of data in Cyber-Physical Systems, extracting essential features while preserving relevant information.	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Cyber-Physical Systems (CPS)** Definition and Overview of Cyber-Physical Systems Characteristics and Components of CPS Interdisciplinary Nature of CPS Examples and Applications of CPS in Real-World Scenarios	6	L1, L2
2	**Fundamentals of Cyber-Physical Systems** Basics of Embedded Systems and Real-Time Computing Sensors and Actuators in CPS Communication Protocols in CPS (e.g., MQTT, CoAP) Control Systems and Feedback Mechanisms in CPS	8	L1, L2, L3
3	**Modeling and Simulation in Cyber-Physical Systems** Modeling Techniques for CPS (Discrete Event, Continuous, Hybrid) Simulation Tools and Platforms (e.g., Simulink, OMNeT++) Case Studies and Hands-On Simulation Exercises	8	L1, L2, L3, L4
4	**Security and Privacy in Cyber-Physical Systems** Threats and Vulnerabilities in CPS Security Measures and Techniques (Cryptography, Access Control) Privacy Concerns and Data Protection in CPS Case Studies on CPS Security Breaches and Mitigation Strategies	9	L1, L2, L3, L4
5	**Networking and Connectivity in Cyber-Physical Systems** Wireless Communication Technologies in CPS (e.g., WiFi, Bluetooth, Zigbee) Internet of Things (IoT) Integration in CPS Edge Computing and Fog Computing in CPS Quality of Service (QoS) Considerations in CPS Networks	7	L1, L2, L3, L4
6	**Applications and Future Trends in Cyber-Physical Systems** Case Studies of CPS in Various Domains (Healthcare, Smart Cities, Industry 4.0) Emerging Trends and Innovations in CPS Ethical and Societal Implications of CPS Group Projects or Presentations on CPS Applications	6	L1, L2, L3, L4

Books and Reference:

SN	Title	Authors	Publisher	Edition	Year
1	"Cyber-Physical Systems: A Computational Perspective"	Rajeev Alur, Insup Lee	CRC Press	1st	2017
2	"Principles of Cyber-Physical Systems"	Raj Rajkumar	MIT Press	1st	2015
3	"Cyber-Physical Systems: Foundations, Principles and Applications"	Houbing Song, Danda B Rawat, Sabina Jeschke	Academic Press	1st	2016
4	"Cyber-Physical Systems: From Theory to Practice"	Heng Zhang, Liang Cheng	CRC Press	1st	2020
5	"Introduction to Embedded Systems: A Cyber-Physical Systems Approach"	Edward Ashford Lee, Sanjit Arunkumar Seshia	Lee & Seshia	1st	2011

Online Resources:

S. No.	Website Name	URL	Modules Covered
1	Coursera - "Cyber-Physical Systems"	www.coursera.org	Modules 1, 2, 3, 4, 5, 6
2	edX - "Introduction to CPS"	www.edx.org	Modules 1, 2, 3, 4, 5, 6
3	IEEE Xplore	www.ieee.org/xplore	Modules 2, 4, 5 - Research papers, articles, and conference proceedings on CPS and related topics
4	MIT OpenCourseWare	ocw.mit.edu	Modules 1, 2, 3 - Lecture notes, assignments, and materials from MIT courses on CPS
5	SpringerLink	link.springer.com	Modules 3, 4, 5 - Academic books, journals, and articles covering CPS modeling, security, and networks

Suggested list of Practical/ Experiments:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive Levels as per Blooms Taxonomy
1	**Basic Experiments**	System Identification Exercise: Collect data from a simple CPS (e.g., temperature control system) and identify its components and characteristics.	2	L1, L2
2		Embedded System Design: Develop a basic embedded system using Arduino or Raspberry Pi to control a physical device.	2	L1, L2, L3
3		Real-Time Control Simulation: Simulate a simple control system (e.g., traffic light control) using Simulink or similar software.	2	L1, L2, L3
4		Traffic Flow Simulation: Model and simulate traffic flow using discrete event simulation tools like AnyLogic or SimEvents.	2	L1, L2, L3
5		Robotics Simulation: Use robotics simulation software (e.g., ROS, Gazebo) to simulate robot movements and interactions.	2	L1, L2, L3
6		IoT Security Analysis: Set up a basic IoT network and perform security assessments using tools like Wireshark to analyze data packets.	2	L1, L2, L3
7	**Design Experiments**	CPS Vulnerability Assessment: Analyze a CPS system for vulnerabilities and propose mitigation strategies.	2	L1, L2, L3, L4
8		IoT Device Integration: Integrate IoT devices (sensors, actuators) using MQTT or other protocols into a local network for data exchange.	2	L1, L2, L3, L4
9		Edge Computing Setup: Set up an edge computing environment to demonstrate its benefits in reducing latency in a CPS.	2	L1, L2, L3, L4
10	**Advanced Experiments**	Smart Home Automation: Develop a prototype of a smart home system using CPS principles to control various home appliances.	2	L1, L2, L3, L4
11-12	**Mini/Minor Projects/ Seminar/ Case Studies**	Industry 4.0 Simulation: Simulate a small-scale manufacturing process demonstrating Industry 4.0 concepts like predictive maintenance.	6	L1, L2, L3, L4, L5
13-15	**Group Presentation**	Case Study Analysis: Analyze real-world CPS case studies and present findings on their design, challenges, and impact.	4	L1, L2, L3, L4, L5

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24) (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science							**B.Tech. SEM:** VIII			
Course Name: Open Elective III :(Project Management)							**Course Code:** OEC-IOT8011			
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			**100**
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- Data Structure, Software Engineering										

Course Objective: The objective of the course is to familiarize the students with the use of a structured methodology/approach for each and every unique project undertaken, including utilizing project management concepts, tools and techniques and appraise the students with the project management life cycle and make them knowledgeable about the various phases from project initiation through closure.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Apply selection criteria and select an appropriate project from different options	L1, L2, L3, L4
2	Write work break down structure for a project and develop a schedule based on it	L1, L2, L3, L4
3	Identify opportunities and threats to the project and decide an approach to deal with them strategically.	L1, L2, L3, L4
4	Use Earned value technique and determine & predict status of the project.	L1, L2, L3, L4
5	Compare and contrast various project execution, Monitoring and Controlling Projects, Project Contracting, Project Leadership and Ethics and Closing the Project	L1, L2, L3, L4
6	Capture lessons learned during project phases and document them for future reference	L1, L2

Detailed Syllabus:

Module No.	Topics	Hr s.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Project Management Foundation** Definition of a project, Project Vs Operations, Necessity of project management, Triple constraints, Project life cycles (typical & atypical) Project phases and stage gate process. Role of project manager, Negotiations and resolving conflicts, Project management in various organization structures, PM knowledge areas as per Project Management Institute (PMI).	6	L1, L2, L3, L4
2	**Initiating Projects** How to get a project started, Selecting project strategically, Project selection models (Numeric /Scoring Models and Non-numeric models), Project portfolio process, Project sponsor and creating charter; Project proposal. Effective project team, Stages of team development & growth (forming, storming, norming &performing), team dynamics	6	L1, L2, L3, L4
3	**Project Planning and Scheduling** Work Breakdown structure (WBS) and linear responsibility chart, Interface Co-ordination and concurrent engineering, Project cost estimation and budgeting, Top down and bottoms up budgeting, Networking and Scheduling techniques. PERT, CPM, GANTT chart, Introduction to Project Management Information System (PMIS).	8	L1, L2, L3, L4
4	**Planning Projects** Crashing project time, Resource loading and levelling, Goldratt's critical chain, Project Stakeholders and Communication plan Risk Management in projects: Risk management planning, Risk identification and risk register, Qualitative and quantitative risk assessment, Probability and impactmatrix. Risk response strategies for positive and negative risks	8	L1, L2, L3, L4
5	**Executing Projects, Monitoring and Controlling Projects & Project Contracting** 5.1 Executing Projects: Planning monitoring and controlling cycle, Information needs and reporting, engaging with all stakeholders of the projects, Team management, communication and project meetings 5.2 Monitoring and Controlling Projects: Earned Value Management techniques for measuring value of work completed; Using milestones for measurement; change requests and scope creep, Project audit. 5.3 Project Contracting : Project procurement management, contracting and outsourcing,	10	L1, L2, L3, L4
6	**Project Leadership and Ethics & Closing the Project** 6.1 Project Leadership and Ethics: Introduction to project leadership, ethics in projects, Multicultural and virtual projects 6.2 Closing the Project: Customer acceptance; Reasons of project termination, Various types of project terminations (Extinction, Addition, Integration, Starvation), Process of project termination, completing a final report; doing a lessons learned analysis; acknowledging successes and failures; Project management templates and other resources; Managing without authority; Areas of further study.	7	L1, L2
	Total Hours	**45**	

Books and References:

S.No	Title	Authors	Publisher	Edition	Year
1	Project Management Foundation:	Project Management: A managerial approach, Jack Meredith & Samuel Mantel.	Wiley India	Seventh Edition	2009
2	Initiating Projects & Project Planning and Scheduling	A Guide to the Project Management Body of Knowledge (PMBOK® Guide)	Project Management Institute PA, USA	Fifth Edition	--
3	Planning Projects	Project Management, Gido Clements	Cengage Learning	--	--
4	Executing Projects, Monitoring and Controlling Projects & Project Contracting	Project Management, Gopalan Wiley India	Wiley India	--	--
5	Project Leadership and Ethics & Closing the Project	Project Management, Dennis Lock.	Gower Publishing England	Ninth Edition	--

Online Resources:

Sr. No.	Website Name	URL	Modules Covered
1	http://www.opentextbooks.org.hk	http://www.opentextbooks.org.hk/system/files/export/15/15694/pdf/Project_Management_15694.pdf	M1-M6
2	https://www.nesacenter.org	https://www.nesacenter.org/uploaded/conferences/SEC/2014/handouts/Rick_Detwiler/15_Detwiler_Resources.pdf	M1-M3, M6
3	http://www.edo.ca	http://www.edo.ca/downloads/project-management.pdf	M1,M4

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

<table>
<tr><td colspan="5">B. Tech. Artificial Intelligence and Data Science</td><td colspan="5">B.Tech. SEM: VIII</td></tr>
<tr><td colspan="5">Course Name: Open Elective III
(Energy Audit and Management)</td><td colspan="5">Course Code: OEC-IOT8012</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment/ Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="3">Theory (100)</td><td rowspan="2">Practical/ Oral (25)</td><td rowspan="2">Term Work (25)</td><td rowspan="2">Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>ISE</td><td>IE</td><td>ESE</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>20</td><td>60</td><td>-</td><td>-</td><td>100</td></tr>
<tr><td colspan="10">ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination</td></tr>
<tr><td colspan="10">ESE: End Semester Examination - Paper Duration - 2 Hours</td></tr>
<tr><td colspan="10">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite- Knowledge of Basic Electrical and Mechanical Systems</td></tr>
</table>

Course objectives: To understand the importance energy security for sustainable development and the fundamentals of energy conservation. To introduce performance evaluation criteria of various electrical and thermal installations to facilitate the energy management. To relate the data collected during performance evaluation of systems for identification of energy saving opportunities.

Course outcomes: After successful completion of the course student will be able:-

SN	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	To identify and describe present state of energy security and its importance.	L1
2	To identify and describe the basic principles and methodologies adopted in energy audit of any utility.	L1, L2, L3
3	To describe the energy performance evaluation of some common electrical installations and identify the energy saving opportunities.	L1, L2, L3, L4
4	To describe the energy performance evaluation of some common thermal installations and identify the energy saving opportunities	L1, L2, L3, L4
5	To analyze the data collected during performance evaluation and recommend energy saving measures	L1, L2, L3
6	To understand the concept of Energy conservation measures in building complex	L1

Detailed Syllabus

Module No.	Unit No.	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Energy Scenario & Energy Conservation measures**		04	L1
	1.1	Present Energy Scenario		
	1.2	Renewable and Non-Renewable form of Energy		
	1.3	Greenhouse Gas effect, Acid Rain, Energy Pricing, Energy Sector Reforms,		
	1.4	Energy Conservation and its Importance: Energy Conservation Act-2001 and its features. Role of Bureau of Energy Efficiency (BEE), Energy Security, Basic idea of Material and Energy balance		
2	**Energy Audit & Energy Economics**		10	L1, L2, L3
	2.1	Energy Audit: Definition, need, types of energy audit, Steps of detailed Energy Audit, Role of Energy Manager and Internal audit Team,		
	2.2	Measuring instruments & Equipment used during Energy audit		
	2.3	Understanding energy costs, Bench marking, Energy performance, Matching energy use to requirement,		
	2.4	Maximizing system efficiencies, Optimizing the input energy requirements, Fuel and energy substitution		
	2.5	Elements of monitoring & targeting, Data and information analysis.		
	2.6	Energy Economics: Simple payback period (SPP), Net Present value (NPV), Return on investment (ROI), Internal rate of return (IRR)		
3	**Energy Management in Electrical System**		10	L1, L2, L3, L4
	3.1	Electricity billing, Basic concept of Electrical load management, Maximum demand Control, Energy management through Power factor improvement		
	3.2	Energy efficient equipment and appliances, Star ratings of Electrical Equipment.		
	3.3	Lighting System control: Occupancy sensors, daylight integration, and use of intelligent controllers. Energy efficiency measures in lighting system		
	3.4	Energy conservation opportunities in water pumps, industrial drives, induction motors, soft starters, variable speed drives.		
4	**Energy Management in Thermal Systems**		10	L1. L2, L3,L4
	4.1	Review of different thermal loads, Steam System: Basic idea of Steam distribution system, Assessment of steam distribution losses, Steam leakages, Steam trapping, Condensate and flash steam recovery system, Energy conservation in Steam distribution system,		

	4.2	Boiler System: General fuel conservation measures in Boilers and furnaces, Waste heat recovery, cogeneration, use of insulation- types and application.		
	4.3	HVAC system: Coefficient of performance, Capacity, factors affecting performance of Refrigeration and Air Conditioning system performance, Energy savings opportunities in HVAC system.		
5	**Energy Performance Assessment**		06	L1, L2, L3,
	5.1	Performance assessment of Motors, variable speed drive, pumps,		
	5.2	Lighting System calculations: Installed Load Efficacy Ratio (ILER) method,		
	5.3	HVAC system calculations; various terms used in assessment of performance		
6	**Energy conservation in Residential and Commercial Buildings**		05	L1
	6.1	Energy Conservation Building Codes (ECBC)		
	6.2	Green Building norms, LEED ratings of buildings, Use of renewable energy sources in building complex		
		Total Hours	**45**	

Books of References

SN	Title	Authors	Publisher
1.	Handbook of Electrical Installation Practice	Geofry Stokes	Blackwell Science
2.	Designing with light: Lighting System Handbook	By Anil Valia	-
3.	Energy Management handbook	W.C. Turner	John Wiley and Sons
4.	Handbook on Energy Audits and Management	A. K. Tyagi,	Tata Energy Research Institute (TERI).
5.	Energy Management Principles	C.B. Smith	Pergamon Press
6.	Energy Conservation Guidebook	Dale R. Patrick, S. Fardo, Ray E. Richardson	Fairmont Press
7.	Handbook of Energy Audits	Albert Thumann, W. J. Younger, T. Niehus	CRC Press

Online Reference

Sr. No.	Website Name	URL	Modules Covered
1	Bureau of Energy Efficiency	https://beeindia.gov.in/content/energy-auditors	1-2
2	You tube	https://youtube/7hDyLuFJ0c8	1-6
3	You tube	https://www.youtube.com/watch?v=UhGZRoUlr8 U	1-6
4	NPTEL by IIT Roorkee	https://www.youtube.com/watch?v=2zWt-pBCU2I	1-3

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science							**B.Tech. SEM:** VIII			
Course Name: Open Elective III (Innovation Management)							**Course Code:** OEC-IOT8013			
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			**100**
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- Financial Accounting and Management and Business Modelling. RBT : Revised Bloom's Taxonomy										

Course Objective: The course intends to apply the concept of Innovation in Business.

Course Outcomes: Upon completion of the course students will be able to:
L1: Remembering **L2:** Understanding **L3:** Applying **L4:** Analysing **L5:** Evaluating **L6:** Creating

Sr. No.	Course Outcomes	RBT level
1	Able to analyze and apply impact of innovation on society	L1,L2,L4
2	Able to understand the role of technology in creating wealth	L1,L2,L3
3	Recognize markers of business models which appear as a response to digital revolution	L1,L2,L3,L4
4	Search for real cases which represent new business models	L1,L2,L3,L4
5	Identify similar and distinguished features of business build on identical business models	L1,L2,L3,L4
6	Know the most important cases of data-driven business founded on new business models	L2,L4

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
01	**Sources of Innovation** Sources of Innovation: Innovation / wealth creation process, three critical trajectories impacting the innovation process creative transformations, the importance of technological Innovation, The impact of technological innovation on society. Case study on impact of technological innovation on society. Industry dynamics of technological innovation, transcending creativity into innovation, innovation as a collaborative effort.	08	L1,L2,L4
02	**Types and patterns of innovation** Types and patterns of innovation: Technology S curves, formulation of technological innovation strategy, implementing technological innovation strategies. Managing new product development. Case study on new product development.	06	L1,L2,L3
03	**Collaboration strategies and Choosing innovative projects** Collaboration Strategies: The role of technology in the creation of wealth, historical perspective, long-wave cycle, evolution of production technology, technology and national economy. Case study on Collaboration Strategies. Choosing innovative projects: Management of technology, the conceptual frame work, technology and society, knowledge and technology, technology and business.Case study on How to choose innovative projects.	08	L1,L2,L3,L4
04	**Introduction to Business Models** What is a Business Model? Importance of Business Model. History of Business Model. Type of Business Model	7	L1,L2,L3,L4
05	**Business models as a key concept of strategic management.** Variety of business model frameworks: Canvas, 'Zott-Amit' model, BM navigator, 4W approach, Hybrid business models. Resource-based view (RBV). Industrial organization.	8	L1,L2,L3,L4
06	**Digital business Models.** E-commerce. Innovative business model in retail and consumer goods. Omnichannel retail. Manufacturing business models. Digital manufacturing. Developers as new decision makers. Case-study of Apple, Android, Tinkoff.	8	L2,,L4,
Total Hours		**45**	

Books and References:

Sr. No	Title of the book	Authors	Publisher	Edition	Year
1	Strategic management of technological Innovation	Melissa A. Schilling	McGraw-Hill	Fifth Edition	2017
2	Management of technology	Tarek M. Khalil	McGraw Hill	Second Edition	2009
3	Business model generation: a handbook for visionaries, game changers, and challengers	Osterwalder, A., &Pigneur, Y.	John Wiley & Sons	ThirdEdition	2010
4	Value creation in e-business.	Amit, R., &Zott, C.	Strategic management journal,	22(6-7), 493-520.	2001

Online References:

SNo.	Website Name	URL	Modules Covered
1.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M1,M2
2.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M3,M4
3.	Ideaconnection.com	https://www.ideaconnection.com/innovation-videos/	M5,M6
4.	https://nptel.ac.in	https://nptel.ac.in/courses/110/107/110107094/	M1,M2,M3,M4,M5, M6
5.	Coursera.org	https://www.coursera.org/learn/digital-business-models/lecture/nJTB0/lesson-4-asymmetric-business-models-creating-unfair-advantage	M4,M5,M6
6.	online.stanford.edu	https://online.stanford.edu/courses/xine249- building-business-models	M1,M2,M3,M4,M5,M6

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective III (Environment Management)								**Course Code:** OEC-IOT8014		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	**100**
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- Fundamentals of Chemistry and biology										

Course Objective: The course intends to give an understanding of environmental issues relevant to India and global concerns, the concept of ecology and familiarize the learner with environment related legislations.

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

S. No	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand the concept of environmental management and the Energy scenario.	L1 L2
2	Understand ecosystem and interdependence, food chain etc.	L1 L2
3	Understand and interpret environment related legislations	L1 L2 L3 L4

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of Attainment as per Bloom's Taxonomy
1	**Introduction and Definition of Environment**	6	L1 L2
	Significance of Environment Management for contemporary managers, Career opportunities, Environmental issues relevant to India, Sustainable Development, the Energy scenario.		
2	**Global Environmental concerns**	7	L1 L2
	Global Warming, Acid Rain, Ozone Depletion, Hazardous Wastes, Endangered life-species, Loss of Biodiversity, Industrial/Man-made disasters, Atomic/Biomedical hazards, etc.		
3	**Concepts of Ecology**	8	L1 L2
	Ecosystems and interdependence between living organisms, habitats, limiting factors, carrying capacity, food chain, etc.		
4	**Scope of Environment Management**	8	L1 L2 L3 L4
	Role and functions of Government as a planning and regulating agency Environment Quality Management andCorporate Environmental Responsibility.		
5	**Total Quality Environmental Management**	8	L1 L2 L3 L4
	ISO-14000, EMS certification.		
6	**General overview of major legislations**	8	L1 L2 L3
	Environment Protection Act, Air (P & CP) Act, Water (P & CP) Act, Wildlife Protection Act, Forest Act, Factories Act, etc.		
	Total Hours	**45**	

Books and Reference:

Sr. No.	Title	Author	Publisher	Edition	Year
1	Environmental Management: Principles and Practice	C J Barrow	Routledge Publishers	1st	1999
2	A Handbook of Environmental Management	John C. Lovett and David G. Ockwell	Edward Elgar Publishing	----------	2010
3	Environmental Management	V Ramachandra and Vijay Kulkarni	TERI Press	1st	2006
4	Indian Standard Environmental Management Systems — Requirements With Guidance For Use	Bureau Of Indian Standards	----------	---------- --	2005
5	Environmental Management: An Indian Perspective	S N Chary and Vinod Vyasulu	Macmillan India	---------- --	2000
6	Introduction to Environmental Management	Mary K Theodore and Louise Theodore	CRC Press	---------- --	2009
7	Environment and Ecology	Majid Hussain	Access Publishing	3rd	2015

Online References:

Sr.No.	Website Name	URL
1	Alison	https://alison.com/course/introduction-to-ecology
2	ISO	https://www.iso.org/iso-14001-environmental-management.html
3	Certified Environment Law Analyst	https://www.vskills.in/certification/legal/environment-law-certification

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective III (Intellectual Property Rights and Patenting)								**Course Code:** OEC-IOT8015		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			**100**
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- NA										

Course Objective: To understand intellectual property rights protection system.To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures .To get acquaintance with Patent search and patent filing procedure and applications

Course Outcome:

Sr.No.	**Course Outcomes**	**Cognitive Levels as per Blooms Taxonomy**
1	Understand Intellectual Property assets	L1, L2
2	assist individuals and organizations in capacity building	L1, L2, L3
3	work for development, promotion, protection, compliance, and enforcement of Intellectual Property and Patenting	L1, L2, L3

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	**Introduction to Intellectual Property Rights (IPR)** Meaning of IPR, Different category of IPR instruments - Patents, Trademarks, Copyrights, Industrial Designs, Plant variety protection, Geographical indications, Transfer of technology etc. **Importance of IPR in Modern Global Economic Environment:** Theories of IPR, Philosophical aspects of IPR laws, Need for IPR, IPR as an instrument of development	7	L1,L2
2	**Enforcement of Intellectual Property Rights**	8	
	Introduction, Magnitude of problem, Factors that create and sustain counterfeiting/piracy, International agreements, International organizations (e.g. WIPO, WTO) active in IPR enforcement **Indian Scenario of IPR:** Introduction, History of IPR in India, Overview of IP laws in India, Indian IPR, Administrative Machinery, Major international treaties signed by India, Procedure for submitting patent and Enforcement of IPR at national level etc.		L1,L2,L3
3	**Emerging Issues in IPR** Challenges for IP in digital economy, e-commerce, human genome, biodiversity and traditional knowledge etc.	6	L1,L2,L3
4	**Basics of Patents** Definition of Patents, Conditions of patentability, Patentable and non-patentable inventions, Types of patent applications (e.g. Patent of addition etc),Process Patent and Product Patent, Precautions while patenting, Patent specification Patent claims, Disclosures and non-disclosures, Patent rights and infringement, Method of getting a patent	8	L1,L2,L3
5	**Patent Rules** Indian patent act, European scenario, US scenario, Australia scenario, Japan scenario, Chinese scenario, Multilateral treaties where India is a member (TRIPS agreement, Paris convention etc.)	8	L1,L2
6	**Procedure for Filing a Patent (National and International)** Legislation and Salient Features, Patent Search, Drafting and Filing Patent Applications, Processing of patent, Patent Litigation, Patent Publication etc, Time frame and cost, Patent Licensing, Patent Infringement **Patent databases:** Important websites, Searching international databases	8	L1,L2,L3
	Total Hours	**45**	

Books and References:

SR. No.	Title	Authors	Publisher	Edition	Year
1	Patent system and related issues at a glance	Keayla B K	National Working Group	First	2004
2	The enforcement of Intellactual Property Rights	Lous Harns	Wipo	3rd	2018

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective III (Supply Chain Management)								**Course Code:** OEC-IOT8016		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			**100**
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite-										

Course Objective: To acquaint with key drivers of supply chain performance and their inter-relationships with strategy.
To impart analytical and problem-solving skills necessary to develop solutions for a variety of supply chain management & design problems. To study the complexity of inter-firm and intra-firm coordination in implementing programs such as e- collaboration, quick response, jointly managed inventories, and strategic alliances.

Course Outcome:

SN	Course Outcomes	Cognitive Levels as per Bloom's Taxonomy
1	To acquaint with key drivers of supply chain performance and their inter-relationships with strategy.	L1, L2, L4
2	To impart analytical and problem-solving skills necessary to develop solutions for a variety of supply chain management & design problems.	L1, L3, L4
3	To study the complexity of inter-firm and intra-firm coordination in implementing programs such as e-collaboration, quick response, jointly managed inventories and strategic alliances.	L1,L2,L4

Detailed Syllabus:

Module	Detailed Contents	Hours	Cognitive Levels as per Bloom's Taxonomy
01	**Building a Strategic Framework to Analyze Supply Chains** Supply chain stages and decision phases, Process view of supply chain: Supply chain flows, Examples of supply chains, Competitive and supply chain strategies, Achieving strategic fit: Expanding strategic scope, Drivers of supply chain performance. Framework for structuring drivers: inventory, transportation facilities, information obstacles to achieving fit.	06	L1,L2,L3
02	**Designing the Supply Chain Network** Distribution Networking: Role, Design, Supply Chain Network(SCN):Role, Factors, Framework for design decisions.	05	L1,L3,L4
03	**Materials Management** Scope, Importance, Classification of materials, Procurement, Purchasing policies, Vendor development and evaluation. Inventory control systems of stock replenishment, Cost elements, EOQ and its derivative modules.	08	L1,L2,L3
04	**Dimensions of Logistics** Introduction: A Macro and Micro Dimensions, Logistics interfaces with other areas, Approach to analyzing logistics system, Logistics and systems analyzing: Techniques of logistics system analysis, factors affecting the cost and Importance of logistics.	08	L1,L3,L4
05	**Warehouse and Transport Management** Concept of strategic storage, Warehouse functionality, Warehouse operating principles, Developing warehouse resources, Material handling and packaging in warehouses, Transportation Management, Transport functionality and principles, Transport infrastructure, transport economics and Pricing. Transport decision making.	08	L1,L2,L3
06	**IT in Supply Chain** 6.1 IT framework, Customer Relationship Management (CRM),internal Supply chain management, Supplier Relationship Management (SRM) and Transaction Management. Coordination in a Supply Chain 6.2 Lack of supply chain coordination and the Bullwhip effect, Obstacle to Coordination, Managerial levers, Building partnerships and trust. Emerging Trends and Issues 6.3 Vendor managed inventory-3PL-4PL, Reverse logistics: Reasons, Role, Activities; RFID systems: Components, Applications, Implementation; Lean supply chain, Implementation of Six Sigma in supply chain, Green supply chain.	10	L1,L3,L4
	Total Hours	**45**	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Supply Chain Management Strategy, Planning, and operations	Sunil Chopra and Peter Meindl	Pearson	6th Edition	2016
2	Designing & Managing Supply chain	David Simchi Levi, Philip Kaminsky& Edith Smichi	McGraw Hill	3rd Edition	2007
3	Supply Chain Redesign: Transforming Supply Chains into Integrated Value Systems,	Robert B Handfield, Ernest L Nicholas	Prentice Hall	--	2002
4	The Management of Business Logistics: A Supply Chain Perspective	Coyle, Bardi, Langley	Thomson learning	--	2003
5	Supply chain management: for global competitiveness	B S Sahay	Macmillan	--	1999

Online References:

S. No.	Website Name	URL	Modules covered
1.	https://nptel.ac.in	https://nptel.ac.in/courses/110/106/110106045/	2
2.	https://nptel.ac.in	https://nptel.ac.in/courses/110/107/110107074/	3
3.	https://www.scmhub.com	https://www.scmhub.com/courses/BBA	2
4.	https://www.udemy.com	https://www.udemy.com/topic/supply-chain/	4

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B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective IV (Management Economics)								**Course Code:** OEC-IOT8021		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	**100**
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- Financial Accounting										

Course Objective: By the end of the course, students will be able to understand both the theory and practice of Managerial Economics, the students will be in a position to appreciate the finer nuances of the subject, this subject will help the students in applying the knowledge so acquired in policy planning and managerial decision making.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	RBT level
1	Analyze and apply the theory and practice of Managerial Economics	L1,L2,L3,L4
2	Understand the need to locate various factors affecting demand of products and plan marketing & business strategies accordingly. Also they will develop an understanding of the practical application of law of demand.	L1,L2,L3,L4
3	Understand the analytics of supply and demand and its various uses.	L1,L2,L3,L4,L5
4	Understand the holistic approach of production economy.	L1,L2,L3,L4,L5
5	Learn about the intricacies of the various market forms and their impact on the economy and business.	L1,L2,L3,L4,L5
6	Realize the importance of the different methods of capital budgeting as a tool of project management.	L1,L2,L3,L4,L5

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
1	**Introduction to Managerial Economics**	5	L1,L2,L3,L4
	The meaning, scope and methods of Managerial Economics, Dominic Salvatore model of application of Economics to business decision making. Scarcity, choice & production possibility curve.		
2	**Consumer Behavior**	11	L1,L2,L3,L4
	Demand, types of demand, factors affecting demand & demand function. Making of linear demand function & linear demand curve. Law of demand. Consumer's surplus. Concept of elasticity of demand and its significance for a businessman. Types of Elasticity – Price Elasticity of Demand, Income Elasticity of Demand, Cross elasticity of demand & Promotional Elasticity of Demand, Demand forecasting – features, significance & methods.		
3	**Production Function**	5	L1,L2,L3,L4,L5
	Concept, Isoquant & Iso-cost analysis. Laws of returns to scale, economies & diseconomies of scale. Revenue Analysis, Cost analysis and break even analysis		
4	**Supply**	7	L1,L2,L3,L4,L5
	Concept of supply, factors affecting supply& the law of supply Determination of equilibrium price: effects of changes in demand & supply on equilibrium price.		
5	**Types of markets**	9	L1,L2,L3,L4,L5
	Perfect competition, monopoly, oligopoly & monopolistic competition – features and price determination. Pricing practices: Factors affecting pricing decision. Marginal cost pricing, mark up pricing, transfer pricing, product line pricing, price skimming and penetration price.		
6	**Profit Management**	8	L1,L2,L3,L4,L5
	Profit management • Role of profits in a market economy • Nature and measurement of profit, profit policies • The hypothesis of profit maximization and its alternatives. Demand for capital • Supply of capital • Capital Rationing • Capital Budgeting, Net Present Value (NPV), Internal Rate of Return (IRR). • Appraising – the profitability of projects		
	Total Hours	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Managerial Economics in a Global Economy	Dominick Salvatore	Oxford University Press	Seventh	2011
2	Managerial Economics	Suma Damodaran	Oxford University Press	Second	2010
3	Microeconomics for Business	Satya P Das	SAGE	First	2007
4	Economics	Paul Samuelson and Richard Nordhaus	MIT Press 1998.	FIRST	1998
5	Managerial Economics	Milton Spencer and Louis Siegelman	Palala Press	Second	2015
6	Managerial Economics: Concepts and Cases	Mote, Paul and Gupta	Princeton, 2010	First	2010

Online References:

Sr. No.	Website Name	URL	Modules Covered
1	NPTEL.ac.in	https://nptel.ac.in/courses/110/101/110101005/	M1,M2,M3,M4,M5,M6
2	Udemy.com	https://www.udemy.com/course/introduction-t o-managerial-economics/	M1,M2,M3,M4,M5,M6
3	Swayam.ac.in	https://onlinecourses.swayam2.ac.in/imb19_mg16/previ ew	M1,M2,M3,M4,M5,M6
4	Harvard.edu	https://online-learning.harvard.edu/course/managerial-economics?delta=0	M1,M2,M3,M4,M5,M6
5	Courseera.org	https://www.coursera.org/courses?query=managerial%2 0economics	M1,M2,M3,M4,M5,M6

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B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective IV (Digital Business Management)								**Course Code:** OEC-IOT8022		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	**100**
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- NA										

Course Objective: To understand intellectual property rights protection system.To promote the knowledge of Intellectual Property Laws of India as well as International treaty procedures.To get acquaintance with Patent search and patent filing procedure and applications

Course Outcome:

SN	Course Outcomes	Cognitive Levels as per Blooms Taxonomy
1	understand Human Resource Management	L1,L2
2	assist Organization of Personnel Functions	L1,L2,L3
3	work for Manpower Planning	L1,L2,L3
4	work for Motivating Employees	L1,L2,L3
5	work for Performance Appraisal Systems and Training	L1,L2,L3
6	work for Development Organisation Development	L1,L2,L3

Detailed Syllabus:

Module No.	Topics	Hrs	Cognitive Levels as per Blooms Taxonomy
1	**Introduction to Digital Business-** 1.1 Introduction, Background and current status, E-market places, structures, mechanisms, economics and impacts Difference between physical economy and digital economy,. 1.2 **Drivers of digital business**- Big Data & Analytics, Mobile, Cloud Computing, Social media, BYOD, and Internet of Things(digitally intelligent machines/services) 1.3opportunities and Challenges in Digital Business,	8	L1,L2
2	**Overview of E-Commerce** **2.1 Overview of E-Commerce** E-Commerce- Meaning, Retailing in e-commerce-products and services, consumer behavior, market research and advertisement **B2B-E-commerce**-selling and buying in private e-markets, public B2B exchanges and support services, e-supply chains, Collaborative Commerce, Intra business ECand Corporate portals 2.2 **Other E-C models and applications**, innovative EC System-From E- governmentand learning to C2C, mobile commerce and pervasive computing EC Strategy and Implementation-EC strategy and global EC, Economics and Justification of EC, **2.3 Using Affiliate marketing to promote your e-commerce business,** Launching a successful online business and EC project, Legal, Ethics and Societal impacts of EC	10	L1,L2,L3
3	**Digital Business Support services** 3.1 **Digital Business Support services**: ERP as e –business backbone, knowledgeTope Apps, Information and referral system 3.2 **Application Development**: Building Digital business Applicationsand Infrastructure	6	L1,L2,L3
4	**Managing E-Business** 4.1 Managing E-Business-Managing Knowledge, Management skills for e- business, 4.2 Managing Risks in e –business Security Threats to e-business -Security Overview, Electronic Commerce Threats,Encryption, Cryptography, Public Key and Private Key Cryptography, Digital Signatures, Digital Certificates, Security Protocols over Public Networks: HTTP,SSL, Firewall as Security Control, Public Key Infrastructure (PKI) for Security, Prominent Cryptographic Applications	8	L1,L2,L3
5	**E-Business Strategy-** 5.1 E-Business Strategy-E-business Strategic formulation- Analysis of Company's Internal and external environment, Selection of strategy. E-business strategy into Action, challenges and E-Transition (Process of Digital Transformation)	6	L1,L2,L3
6	**Materializing e-business**	7	

	6.1 Materializing e-business: From Idea to Realization-Business plan preparation 6.2 Case Studies and presentations		L1,L2,L3
	Total Hours	**45**	

Books and References:

S. No.	Title	Authors	Publisher	Edition	Year
1	A textbook on E-commerce	Er Arunrajan Mishra, Dr W K Sarwade	Neha Publishers & Distributors		2011
2	E-commerce from vision to fulfilment	Elias M. Awad,	PHI-Restricted,		2002
3	Digital Business and E-Commerce Management	Ed, Dave Chaffey,	Pearson,		August 2014
4	Introduction to E-business-Management and Strategy,	Colin Combe,	ELSVIER		2006
5	Digital Business Concepts and Strategy,	Eloise Coupey	Pearson	2nd Edition,	2009
6	Trend and Challenges in Digital Business Innovation,	VinocenzoMorabito,	Springer		
7	Digital Business	Discourse Erika Darics	Palgrave Macmillan		April 2015
8	E-Governance-Challenges and Opportunities in	Proceedings in 2 nd International Conference theory and practice of Electronic Governance	Oxford Publications		
9	Perspectives the Digital Enterprise –	A framework for Transformation, TCS consulting journal Vol.5			
10	Measuring Digital Economy-	A new perspective -	DOI:10.1787/9789 2 64221796-enOECD Publishing		

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<table>
<tr><td colspan="5">B. Tech. Artificial Intelligence and Data Science</td><td colspan="5">B.Tech. SEM: VIII</td></tr>
<tr><td colspan="5">Course Name: Open Elective IV (Social Network Analysis)</td><td colspan="5">Course Code: OEC-IOT8023</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment/ Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="3">Theory (100)</td><td>Practical/ Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>ISE</td><td>IE</td><td>ESE</td><td></td><td></td><td>100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>20</td><td>60</td><td>-</td><td>-</td><td></td></tr>
<tr><td colspan="11">ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination</td></tr>
<tr><td colspan="11">ESE: End Semester Examination - Paper Duration - 2 Hours</td></tr>
<tr><td colspan="11">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="11">Prerequisite- NA</td></tr>
</table>

Course Objective: The Objective of this course is to deliver the fundamental concepts of theory of computation describing formal mathematical models of computation such as FA,PDA,LBA and TM by comparing their power, limitations, languages and their applications in computation and complexity theory and also to learn that not all problems are solvable by computers.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	understand the basic concepts of social networks	L1, L2, L3
2	understand the fundamental concepts in social network mining	L1, L2, L3
3	understand the modelling and visualization of network	L1, L2, L3
4	understand the concepts of social network graph analysis	L1, L2, L3,L4
5	Perform visualization and exploration using Gephi software.	L1, L2, L3,L4
6	understand the dynamic social networks	L1,L2

Detailed Syllabus:

Module No.	Introduction	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction** Introduction to Semantic Web, the Social Web - Social Network analysis, Development of Social Network Analysis – the concepts and measures in network analysis , Blogs and online communities - Web-based networks - Applications of Social Network Analysis. Advantages and disadvantages in social networks.	9	L1, L2, L3
2	**Social Network Mining** Introduction to social network mining. Social network extraction from big data, Various social network mining tasks with real-world examples. Community detection and Shingling algorithm, Social Networks as Graphs. Random graph models, ranking algorithms, Graph and Matrices, Basic measures for individuals and networks,	7	L1,L2, L3
3	**Modelling and visualization of network** Mechanisms : Homophily, Opportunity, and Balance, edges , nodes Analyze a social network by data wrangling and visualizing a network.	7	L1,L2, L3
4	**Social Network Graph Analysis** Graph kernels, Graph classification, mining and outlier detection, centrality measures , network level measures, partitioning of graphs, components and bridges, cliques	7	L1, L2,L3,L4
5	**Gephi** Download and Install Gephi, load network data, manipulate the color, structures and shapes ,get Network-Level Measures, centrality measures,	9	L1, L2, L3,L4
6	**Dynamic Social Networks** Social learning on networks, Information and Biological networks, Various applications of Social Network mining in real world applications, Social Connects: Affiliation and identity	6	L1, L2
	Total Hours	**45**	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Social Network Data Analytics	Charu C. Aggarwal ·	Springer	1st	2011
2	Network Graph Analysis and Visualization with Gephi	Ken Cherven	Packt	1st	2013
3	Social network analysis: A handbook	Scott, J.	Sage	2nd	2007
4	Social Network Analysis,	Knoke	Sage	2nd	2008

Online References:

S. No.	Website Name	URL	Modules Covered
1	www. towardsdatascience.com	https://towardsdatascience.com/how-to-get-started-wi th-social-network-analysis-6d527685d374	M6
2	www.iopscience.iop.org	https://iopscience.iop.org/article/10.1088/1742-6596/1235/1/012111/pdf	M1-M5

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B. Tech. Artificial Intelligence and Data Science								**B.Tech. SEM:** VIII		
Course Name: Open Elective IV (Basic Taxation for Engineers)								**Course Code:** OEC-IOT8024		
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			**100**
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- NA										

Course Objective: This course discusses taxation, its principles, its objectives, and its effects; the nature and purposes of taxation, whether taxes should be classified as direct or indirect. It also instils an awareness in students that taxes constitute significant costs to businesses and households and therefore have a major impact in economic and other decision-making, also these costs are potentially controllable through legitimate tax minimization strategies. The course also shall enable students to appreciate the wider economic, social, administrative-compliance and political contexts within which taxes are imposed.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	**Course Outcomes**	**Cognitive levels of attainment as per Bloom's Taxonomy**
1	Understand the basic principles of taxation in India and the various provisions of Income Tax Act 1961	L2
2	Understand and apply the computation of taxable income under the heads capital gain and other sources	L3
3	Apply the provisions of clubbing of income, set off of losses and deductions permitted under the Income Tax Act, 1961.	L3
4	Analyze the computation of taxable income under the head Salaries, Income from House Property and Profits and Gains of Business or Profession	L4
5	Differentiate between Direct and Indirect Tax	L4
6	Understand the Concept of Service Tax and laws	L2

Detailed Syllabus:

Module No	Topics	Hrs	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Principles of Taxes** Objectives of Taxation, Principles related to taxation system, Characteristics of good tax system, Effects of Taxation on Production, Distribution and Employment, Taxable capacity – Absolute and Relative Capacity, Factors determining Taxable Capacity, The Income tax Act, 1922, Present system of taxation in India - Income Tax Act 1961	08	L1, L2
2	**Introduction to Income tax** Basis of Charge, Rates of Tax, Residential Status of Individual, HUF, Firm, Company, AOP/BOI, Local Authority, Practical problems on determination of residential status and incidence of tax, Scope of total income	07	L1, L2, L3
3	**Incomes Exempt from Tax** Different categories of Exempted Income, Incomes which are neither included in Total Income nor Income Tax is payable, Incomes which are included in Total Income, but no income Tax is payable.	07	L1, L2, L3
4	**Income from Salaries** Basis of Charge, Different Forms of Salary, Treatment of provident fund, Allowances, Perquisites, treatment of other items included in salary, Profit-in-lieu of Salary Gratuity, Pension and Commuted pension, Encashment of earned leave, Retrenchment compensation, Provident Fund – Types of provident fund and tax treatment, Deductions, Computation of Income from Salary.	08	L1, L2, L3, L4
5	**Direct and Indirect Taxes** Classification of Taxes, Meaning of direct tax, Basic Concepts: Assessee, Assessment Year, Previous Year, Person, Income, Gross Total Income, Total Income. Meaning of Indirect Taxes, Features, Advantages, Disadvantages, Distinction between Direct and Indirect Taxes, Central Indirect Tax Laws, Indirect Tax Laws of the States, convergence of indirect taxes, Movement to GST	08	L1, L2, L3, L4
6	**Service Tax** Service Tax Law in India, the concept of 'Negative List', Categorization of Taxable and Tax-free Services, Exemptions and Rebates from Service Tax, Provisions for Rectification of Mistakes and schemes of Assessment	07	L1, L2
	Total Hours	**45**	

Books and References:

Sr. No	Title	Authors	Publisher	Edition	Year
1	Income Tax	Vinod K. Sinhania & Monica Sinhania	Taxmann Publications Pvt. Ltd	64th	2020-21
2	Taxation Law & Practice	Mehtrotra & Goyal	Sahitya Bhavan Publication	61st	2020
3	Direct Taxes	Lal B.B	Konark Publishing House	30th	2012
4	Indirect Taxes	Datey, V.S	Taxmann Publications Pvt. Ltd	44th	2020
5	Systematic Approach to Income Tax	Girish Ahuja& Ravi Gupta	Bharat Law House Pvt. Ltd	33rd	2014-15
6	Indirect Taxation	Balachandran. V	Sultan Chand & Sons	18th	2019

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

<table>
<tr><td colspan="5">B. Tech. Artificial Intelligence and Data Science</td><td colspan="5">B.Tech. SEM: VIII</td></tr>
<tr><td colspan="5">Course Name: Open Elective IV (Product Design Development)</td><td colspan="5">Course Code: OEC-IOT8025</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="5">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="5">Modes of Continuous Assessment/ Evaluation</td></tr>
<tr><td colspan="5">Hours Per Week</td><td colspan="3">Theory (100)</td><td rowspan="2">Practical/ Oral (25)</td><td rowspan="2">Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>ISE</td><td>IE</td><td>ESE</td><td rowspan="2">100</td></tr>
<tr><td>3</td><td>-</td><td>-</td><td>3</td><td>3</td><td>20</td><td>20</td><td>60</td><td>-</td><td>-</td></tr>
<tr><td colspan="10">ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination</td></tr>
<tr><td colspan="10">ESE: End Semester Examination - Paper Duration - 2 Hours</td></tr>
<tr><td colspan="10">The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)</td></tr>
<tr><td colspan="10">Prerequisite- NA</td></tr>
</table>

Course Objectives:

Course intended to deliver the fundamental knowledge of basic principles involved in design of new product and its development.

Course Outcomes:

SN	Course Outcomes	Cognitive levels as per bloom's Taxonomy
1	Identify design and development process of industrial products, considering ergonomic requirements.	L1, L2
2	Explain market requirements and manufacturing aspects of industrial design.	L1, L2, L3
3	Identify consumer products, functions and use.	L1, L2, L3
4	Explain aesthetic concept, symmetry.	L1, L2, L3, L4
5	Explain economic considerations, value analysis and cost reduction.	L1, L2
6	Employ standard organization structure, standardization, record keeping.	L1, L2, L4, L5, L6

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels as per bloom's Taxonomy
1	**Introduction-Approach to Industrial Design** Approach to industrial product based on idea generation and innovations tomeet the needs of the developing society. Design and development process of industrial products, various steps such as creative process involved in idea marketing, designers, mind- criticism, design process, creation. Ergonomics and aesthetic requirements of product design, quality and maintainability consideration in product design, Use of modeling technique, prototype designs, conceptual design.	4	L1, L2
2	**Industrial Product Design** General design situations, setting specifications, requirements and ratings, their importance in the design, Study of market requirements and manufacturing aspects of industrial designs. Aspects of ergonomic design of machine tools, testing equipment, instruments, automobiles, process equipment etc. Convention of style, from and color of industrial design.	8	L1, L2, L3
3	**Design of Consumer Product** Functions and use, standard and legal requirements, body dimensions. Ergonomic considerations, interpretation of information, conversions for style, forms, colors.	8	L1, L2, L3, L4
4	**Aesthetic Concepts** Concept of unity order with variety, concept of purpose, style and environment, Aesthetic expression of symmetry, balance, contrast and continuity, proportion, rhythm, radiation. Form and style of product: visual effect of line and form, mechanics of seeing, psychology of seeing, influence of line and form, Components of style, Basic factors, effect of color on product appearance, color composition, conversion of colors of engineering products.	8	L1, L2, L3
5	**Economic Considerations** Selection of material, Design for production, use of standardization, value analysis and cost reduction, maintenance aspects in design.	10	L1, L2, L3, L4
6	**Design Organization** Organization Structure, Designer position, Drawing office procedure, Standardization, record keeping, legal procedure of Design patents. **Total Hours**	7 **45**	L1, L2, L4, L5,L6

Books and References:

Sr.No.	Title	Authors	Publisher	Edition	Year
1	Industrial Design for Engineers	W. H. Mayall	London Hiffee books Ltd	-	1967
2	Problems of Product Design and Development	Hearn Buck	Pergamon Press	-	-
3	Industrial Designs in Engineering	Charles H. Fluerichem	-	-	-
4	Material of Invention: Materials and Design	Ezio Manzini	The MIT Press	-	1989
5	The Science of Engineering Design	Percy H. Hill	Holt, Rinehart and Winston Publication	-	1970

Online References:

Sr.No.	Website Name	URL	Modules Covered
1	https://nptel.ac.in	https://nptel.ac.in/courses	M1-M6

B.Tech. Semester –VIII B. Tech. Artificial Intelligence and Data Science
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme (w.e.f. A.Y. 2023-24)

B. Tech. Artificial Intelligence and Data Science							**B.Tech. SEM:** VIII			
Course Name: Open Elective IV (Development Engineering)							**Course Code:** OEC-IOT8026			
Teaching Scheme (Program Specific)					**Examination Scheme (Formative/ Summative)**					
Modes of Teaching / Learning / Weightage					**Modes of Continuous Assessment/ Evaluation**					
Hours Per Week					**Theory (100)**			**Practical/ Oral (25)**	**Term Work (25)**	**Total**
Theory	**Tutorial**	**Practical**	**Contact Hours**	**Credits**	**ISE**	**IE**	**ESE**			
3	**-**	**-**	**3**	**3**	**20**	**20**	**60**	**-**	**-**	**100**
ISE: In-Semester Examination - Paper Duration – 1 Hour, IE: Innovative Examination										
ESE: End Semester Examination - Paper Duration - 2 Hours										
The weightage of marks for continuous evaluation of Term work/Report: Formative (40%), Timely completion of practical (40%) and Attendance / Learning Attitude (20%)										
Prerequisite- NA										

Course Objectives: To familiarize the characteristics of rural Society and the Scope, Nature and Constraints of rural Development. An exploration of human values, which go into making a 'good' human being, a 'good' professional, a 'good' society and a 'good life' in the context of work life and the personal life of modern Indian professionals

Course Outcomes:

SN	Course Outcomes	RBT Level
1	Demonstrate understanding of knowledge for Rural Development.	L1, L2, L3, L4
2	Prepare solutions for Management Issues.	L1, L2, L3, L4
3	Take up Initiatives and design Strategies to complete the task	L1, L2, L3, L4
4	Develop acumen for higher education and research.	L1, L2, L3, L4
5	Demonstrate the art of working in group of different nature	L1, L2, L3, L4
6	Develop confidence to take up rural project activities independently	L1, L2, L3, L4

Detailed Syllabus:

Module No.	Topics	Hrs.	RBT Levels
1	Introduction to Rural Development Meaning, nature and scope of development; Nature of rural society in India; Hierarchy of settlements; Social, economic and ecological constraints for rural development. Roots of Rural Development in India Rural reconstruction and Sarvodaya programme before independence; Impact of voluntary effort and Sarvodaya Movement on rural development; Constitutional direction, directive principles; Panchayati Raj - beginning of planning and community development; National extension services.	06	L1, L2, L3, L4
2	Post-Independence rural Development Balwant Rai Mehta Committee - three tier system of rural local Government; Need and scope for people's participation and Panchayati Raj; Ashok Mehta Committee - linkage between Panchayati Raj, participation and rural development.	09	L1, L2, L3, L4
3	Rural Development Initiatives in Five Year Plans Five Year Plans and Rural Development; Planning process at National, State, Regional and District levels; Planning, development, implementing and monitoring organizations and agencies; Urban and rural interface - integrated approach and local plans; Development initiatives and their convergence; Special component plan and sub-plan for the weaker section; Micro-eco zones; Data base for local planning; Need for decentralized planning; Sustainable rural development	12	L1, L2, L3, L4
4	Post 73rd Amendment Scenario 73rd Constitution Amendment Act, including - XI schedule, devolution of powers, functions and finance; Panchayati Raj institutions - organizational linkages; Recent changes in rural local planning; Gram Sabha - revitalized Panchayati Raj; Institutionalization; resource mapping, resource mobilization including social mobilization; Information Technology and rural planning; Need for further amendments.	06	L1, L2, L3, L4
5	Values and Science and Technology Material development and its values; the challenge of science and technology; Values in planning profession, research and education Types of Values Psychological values — integrated personality; mental health; Societal values — the modern search for a good society; justice, democracy, rule of law, values in the Indian constitution; Aesthetic values — perception and enjoyment of beauty; Moral and ethical values; nature of moral judgment; Spiritual values; different concepts; secular spirituality; Relative and absolute values; Human values— humanism and human values; human rights; human values as freedom, creativity, love and wisdom	07	L1, L2, L3, L4
6	Ethics Canons of ethics; ethics of virtue; ethics of duty; ethics of responsibility; Work ethics; Professional ethics; Ethics in planning profession, research and education	05	L1, L2, L3, L4
	TOTAL	**45**	

Books and References:

Sr. No.	Title	Authors	Publisher	Edition	Year
1	ITPI, Village Planning and Rural Development,	ITPI,	New Delhi	-	-
2	Thooyavan, Human K.R. Settlements:	A 2005 MA Publication, Chennai	A 2005 MA Publication, Chennai	-	-
3	GoI, Constitution (73rdGoI, New Delhi Amendment) Act,	GoI, New Delhi	GoI, New Delhi	-	-
4	Planning Commission, Five Year Plans, Planning Commission	Planning Commission, Five Year Plans, Planning Commission	Planning Commission	-	-
5	Planning Commission, Manual of Integrated District Planning, 2006,	Planning Commission New Delhi	Planning Commission New Delhi	-	-
6	Planning Guide to Beginners	Planning Guide to Beginners	Planning Guide to Beginners	-	-
7	The Complex, Urban Doubleday	Weaver, R.C.,	-	-	-
8	Ethics in Planning, American Planning Association,	Farmer, W.P. et al	Washington		
9	Normative Ethics in Planning, Journal of Planning Literature	How, E.,	Vol.5, No.2, pp. 123-150	-	-
10	Implications for Planning Theory and Ethics, Planning Theory and Practice,	Watson, V. Conflicting Rationalities:	Vol. 4, No.4, pp.395 – 407	-	-

B.T. Semester –VIII B. TECH Internet of Things (IOT)
Choice Based Credit Grading Scheme with Holistic and Multidisciplinary Education (CBCGS- HME 2020)
Syllabus under Autonomy Scheme

<table>
<tr><td colspan="5">B. TECH Internet of Things (IOT)</td><td colspan="4">B.T. SEM: VIII</td></tr>
<tr><td colspan="5">Course Name: Professional Skill-8 (Android App Development)</td><td colspan="4">Course Code: HME- IOTPS801</td></tr>
<tr><td colspan="5">Teaching Scheme (Program Specific)</td><td colspan="4">Examination Scheme (Formative/ Summative)</td></tr>
<tr><td colspan="5">Modes of Teaching / Learning / Weightage</td><td colspan="4">Modes of Continuous Assessment / Evaluation</td></tr>
<tr><td colspan="5" rowspan="2">Hours Per Week-Theory (100)</td><td colspan="2">Theory</td><td>Practical /Oral (25)</td><td>Term Work (25)</td><td>Total</td></tr>
<tr><td>Theory</td><td>Tutorial</td><td>Practical</td><td>Contact Hours</td><td>Credits</td><td>IA</td><td>ESE-</td><td>(AC) Presentation</td><td>(AC)Report</td><td rowspan="2">75</td></tr>
<tr><td>1</td><td>-</td><td>2</td><td>3</td><td>2</td><td>-</td><td>-</td><td>50</td><td>25</td></tr>
<tr><td colspan="9">ISE: In-Semester Examination - Paper Duration – 1 Hours
IE: Innovative Examination
ESE: End Semester Examination - Paper Duration - 2 Hours
The weightage of marks for continuous evaluation of Term work/ Report: Formative (40%), and Attendance/Learning Attitude (20%)</td></tr>
<tr><td colspan="9">Prerequisite: Java Programming Basics</td></tr>
</table>

Course Objective: The course includes to deliver the fundamental knowledge of Android platform and its architecture to apply and create Android UI designing.

Course Outcomes: Upon completion of the course students will be able to:

Sr. No.	Course Outcomes	Cognitive levels of attainment as per Bloom's Taxonomy
1	Understand Android platform, Architecture and features	L1, L2
2	Design User Interface and develop activity for android App Development	L1, L2, L3
3	Use Intent , Broadcast receivers and Internet services in Android App Development	L1, L2, L3
4	Design and implement data base Application and content providers.	L1, L2, L3
5	Apply multimedia, camera and locatio based services in Android App Development	L1, L2, L3
6	Understand various security issues in Android platform	L1, L2

Detailed Syllabus:

Module No.	Topics	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Introduction to Android** Android overview, Features of Android, Android Applications. Setting up Java Development Kit (JDK), Setting up Android SDK, Setting up Eclipse IDE Setting up Android Development Tools (ADT) Plugin, Creating Android Virtual Device.	2	L1, L2
2	**Android Architecture and Design Components** Application: Application Manifest File, Externalizing Resources, Android, Application Lifecycle and Android Application Class. Android Activity: Creating activities, Activity lifecycle and Android Activity classes. User Interface: Fundamental Android UI Design, Layouts, Fragments, Designing UI with views, Creating new views, widget toolbox, Adapters.	3	L1, L2, L3
3	**Intents, Broad Cast receiver and Internet Resources** Introducing Intents, Linking Activities Using intents, Calling Built-in Applications Using intents, Displaying notifications, Creating Intent Filters and Broadcast Receivers, Downloading and Parsing Internet Resources, Using the Download Manager, Internet Services, Connecting to Google App Engine	2	L1, L2, L3
4	**Database Connectivity & Content Providers** Introducing Android Databases, Introducing SQLite, Content Values and Cursors, Working with SQLite Databases, Parsing an XML document, Parsing JSON data. Creating Content Providers, Using Content Providers.	2	L1, L2, L3
5	**Advance Android Programming** Playing Audio and Video, Manipulating Raw Audio, Using Audio, Using the Camera for Taking Pictures, Recording Video, Using Media Effects, Adding Media to the Media Store. Using Location-Based Services, Using the Emulator with Location-Based Services, Selecting a Location Provider, Finding Your Current Location.	3	L1, L2, L3
6	**Android Application Deployment** Android Security Model, Android's Manifest Permissions, Mobile Security Issues, Recent Android Attacks, Pen Testing Android. Preparing for Publishing, Deploying APK Files T	3	L1, L2
	Total Hours	**15**	

Books and References:

SN	Title	Authors	Publisher	Edition	Year
1	Professional Android 4 Application Development	RETO MEIER	Wrox publication	3 rd	2012
2	Beginning Android Application Development	Abhishek Dubey, Anmol Misra	CRC Press	1 st	2013
3	Android Application Development For Dummies Android Cookbook	Ian F. Darwin	O'Reilly	1 st	2011

Online References:

S. No.	Website Name	URL	Modules Covered
1	https://developer.android.com https://www.tutorialspoint.com/	https://developer.android.com/training/basics/firstapp https://www.tutorialspoint.com/android/android_application_components	M1, M2
2	https://www.udemy.com/ https://www.coursera.org/ https://www.tutorialspoint.com/	https://www.udemy.com/learn-android-application-development-y/ https://www.coursera.org/specializations/android-app-development https://www.tutorialspoint.com/android/android_intents_filters.htm	M3. M4, M5, M 6

Suggested List of Practical:

Practical Number	Type of Experiment	Practical/ Experiment Topic	Hrs.	Cognitive levels of attainment as per Bloom's Taxonomy
1	**Basic Experiments**	Install/configurejava development kit(Jdk), android studio, android sdk and AVD	2	L1,L2
2		Write a program to display hello world on screen.	2	L1,L2
3	**Design Experiments**	Write program to implement frame layout, table layout and relative layout.	2	L1,L2, L3
4		Write program to implement login window using UI controls.	2	L1, L2, L3
5		Write a program to implement date and time picker.	2	L1,L2, L3
6		Write a program to implement new activity using explicit intent and implicit intent.	2	L1, L2, L3
7		Write a program to implement content provider.	2	L1, L2, L3
8		Write a program to implement database connectivity using SQLite.	2	L1,L2
9		Write a program to XML document in android.	2	L1, L2, L3
10		Write a program to design camera.	2	L1,L2
11		Write a program to implement to location service.	2	L1, L2, L3
12		Design and deploy application.	2	L1,L2, L3
13	**Case Study**	1. Configuring Android in Linux	2	L1, L2, L3
14	**Mini Project**	1. Android Bluetooth-based Chatting App 2. Smart Travel Guide Application 3. Mobile Banking App	4	L1, L2, L3
		Total Hours	**30**	