John Wilson Education Society's

Wilson College (Autonomous)

Chowpatty, Mumbai-400007
RE-ACCREDITED 'A' grade by NAAC

Affiliated to the
UNIVERSITY OF MUMBAI

Syllabus for MScIT-Part-II Semester-III and Semester-IV

Program: M.Sc.I.T.

Program Code: WSITC

Choice Based Credit System (CBCS) with effect from NEP-2020 for Academic year 2024–2025

PROGRAM OUTLINE 2024-2025

YEAR	SEM	COURSE CODE		COURSE TITLE	CREDITS
MSCIT Part-II	**III**		**SEM-III**		
		WSITCMT631	Mandatory-1 (Theory)	**Ethical Hacking**	**4**
		WSITCMT632	Mandatory-2 (Theory)	**Machine Learning**	**4**
		WSITCMT633	Mandatory-3 (Practical)	**Machine Learning Practical**	**2**
		WSITCMP631	Practical 1	**Ethical Hacking Practical**	**2**
		WSITCET631	(Elective) Theory	**Applied Artificial Intelligence**	**2**
		WSITCEP631	(Elective) Practical	**Applied Artificial Intelligence Practical**	**2**
		WSITCRP631	RP(Research Project)(120 Hours)	RP(Research Project)	**4**
MSCIT Part-II	**IV**		**SEM-IV**		
		WSITCMT641	Mandatory 1	**(ARVR)Virtual Reality and Augmented Reality**	**4**
		WSITCMT642	Mandatory 2	**Cyber Forensics**	**4**
		WSITCMT643	Mandatory 3 (Practical)	**Cyber Forensics Practical**	**2**
		WSITCMP644	Practical 1	**(ARVR)Virtual Reality and Augmented Reality Practical**	**2**
		WSITCET641	(Elective) Theory	**Deep learning**	**2**
		WSITCEP642	(Elective) Practical	**Deep learning Practical**	**2**
		WSITCRP641	RP(Research Project)	**FP** (Field project) **(180 Hours)** /Project Implementation)	**6**

PROGRAMME SPECIFIC OUTCOME (PSOs)

After completing two years course of in Information Technology, the learner will be able to:

1. Equip with the professional & technical skills essential for making a career in the Front-end Developer, Back-end Developer, Software Tester, Programmer, Network Administrator, Security Expert etc.

2. Students would demonstrate the ability to apply research principles in a variety of creative, organizational, professional venues.

3. Apply the knowledge of engineering and management principles to manage projects effectively in diverse environments as a member or a leader in the team

4. Learners will understand technology as a system of interrelated forces, including automation, Robotics, Big data analytics, Advance Programming, Networking, Security, Cyber law, Regulatory constraints, and ethical concerns.

5. Learners will be able to create and design technological products, including website, software, robots, RFID, Hardware Automation, Also, will be able to become Software Engineer, Tester and Pen tester

PREAMBLE:

With the introduction of Choice Based Credit System (CBCS) by the esteemed University of Mumbai from academic year 2016-17, the existing syllabus of FYBSCIT is restructured according to the CBCS pattern.

In the last two decades, the technology has made a paradigm shift in the way society functions. Media, being the important segment of the society plays a pivotal role in the political, sociological, psychological, and economical aspects in society. In addition to the knowledge of the technical skills of mass media, the current syllabus orients to the theoretical framework relating to media-audience relationship.

The first year of MSCIT course introduces the students to various fields available under the umbrella of mass Programming, Mathematics, Communication Skills, Software's, Database, and Website Design. The fundamentals of Information Technology prepare the students for advanced theoretical and practical related to filed introduced. In the second year of MSCIT, followed by the elaboration on

Information Technology research concepts and methodologies. Inclusion of field-based learning begins in the third year of MSCIT, with specialization in Information Technology.

SEMESTER III

PROGRAM(s): MSCIT Part-II Mandatory-1(Theory)	SEMESTER:III
Course: Ethical Hacking	Course Code: WSITCMT631

Teaching Scheme					Evaluation Scheme

Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credits	Continuous Assessment (CIA-1 and CIA-2) (20+20=Marks-40)	Semester End Examination (Marks-60)
	-	60 Hours	4	40	60

Learning Objectives:
1. To demonstrate proficiency in reconnaissance and information gathering techniques
2. To identify and assess web application security vulnerabilities.
3. To design network hacking activities
4. To apply ethical hacking methodologies to exploit system vulnerabilities.

Course Outcomes: The students will be able to:
1. Demonstrate proficiency in reconnaissance and information gathering techniques
2. Identify and assess web application security vulnerabilities.
3. Design network hacking activities.
4. Apply ethical hacking methodologies to exploit system vulnerabilities.

DETAILED SYLLABUS

Course Code/ Unit	Unit	Course/ Unit Title	Credits/ Lectures 4
I		**Introduction to Ethical Hacking and Reconnaissance**	15
	1.1	Introduction to ethical hacking and its objectives, Foot printing and reconnaissance techniques, Scanning networks and identifying vulnerabilities	

	1.2	Enumeration and gathering information about systems and services	
	1.3	Introduction to system hacking and gaining unauthorized access	
II		**Malware Threats and Web Application Security**	**15**
	2.1	Understanding different types of malware and their characteristics, Analysing and combating malware threats.	
	2.2	Sniffing techniques and analysing network traffic, Social engineering and its impact on security.	
	2.3	Introduction to web application security and vulnerabilities.	
III		**Network Hacking**	**15**
	3.1	Exploiting network vulnerabilities and weaknesses, Denial of Service (DoS) attacks and their impact.	
	3.2	Session hijacking techniques and prevention, Hacking web servers and database servers	
	3.3	Wireless network hacking and securing wireless networks	
IV		**Cryptography,Vulnerability Analysis, and Countermeasures**	**15**
	4.1	Fundamentals of cryptography and encryption algorithms, Public key infrastructure (PKI) and digital certificates	
	4.2	Vulnerability analysis and assessment techniques, Penetration testing	

		methodologies and tools,	
	4.3	Implementing countermeasures and security best practices	

References:

Learning Resources		
1	**Text Books**	• Walker, M. (2020). CEH Certified Ethical Hacker All-in-One Exam Guide. McGraw-Hill Education. • Harper, A., Regalado, D., Linn, R., Sims, S., Spasojevic, B., Martinez, L., Baucom, M., Eagle, C., & Harris, S. (2020). Gray Hat Hacking: The Ethical Hacker's Handbook. McGraw-Hill Education
2	**Reference books**	• Kim, P. (2018). The Hacker Playbook 3: Practical Guide to Penetration Testing. Independently published. • Engebretson, P. (2013). The Basics of Hacking and Penetration Testing: Ethical Hacking and Penetration Testing Made Easy. Syngress • Weidman, G. (2014). Penetration Testing: A Hands-On Introduction to Hacking. No Starch Press
3	**Websites**	• Hack This Site! https://www.hackthissite.org • OWASP https://www.owasp.org • Metasploit Unleashed https://www.metasploitunleashed.com • Cybrary https://www.cybrary.it • Offensive Security https://www.offensive-security.com
4	**Journals**	• Eric Filiol, Journal of Computer Virology and Hacking Techniques, Springer, ISSN: 2263-8733 • Tyler Moore, David Pym, Journal of Cybersecurity, Oxford University Press, ISSN 2057-2093
5	**Supplementary Reading**	• CEH v12 - Certified Ethical Hacking Course, https://www.simplilearn.com/cyber-security/ceh-certification • Ethical Hacking Essentials (EHE), https://www.coursera.org/learn/ethical-hacking-essentials-ehe
6	**Practical Components**	• Laboratory experiments on Footprinting techniques, Scanning networks, Enumeration, System hacking, Sniffing, Social Engineering

PROGRAM(s): MSCIT Part-II Mandatory-2 (Theory)			SEMESTER:III			
Course:Machine Learning			Course Code: WSITCMT632			
Teaching Scheme						Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CIA-1 AND CIA-2) (20+20=Marks - 40)		Semester End Examination (Marks- 60)
		60 Hours	4	40		60

Learning Objectives:
1. Understanding Human learning aspects.
2. Understanding primitives in learning process by computer.
3. Understanding nature of problems solved with Machine Learning.

Course Outcomes: The students will be able to:

After completion of the course, a student should be able to:

CO1: Understand the key issues in Machine Learning and its associated applications in intelligent business and scientific computing.

CO2: Acquire the knowledge about classification and regression techniques where a learner will be able to explore his skill to generate data base knowledge using the prescribed techniques.

CO3: Understand and implement the techniques for extracting the knowledge using machine learning methods.

CO4: Achieve adequate perspectives of big data analytics in various applications like recommender systems, social media applications etc.

CO5: Understand the statistical approach related to machine learning. He will also Apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

DETAILED SYLLABUS

Course Code/ Unit	Sub unit	Course/ Unit Title	Credits/ Lectures

I		**Introduction: Machine learning**	15
	1.1	**Introduction:** Machine learning, Examples of Machine Learning Problems, Structure of Learning, learning versus Designing, Training versus Testing, Characteristics of Machine learning tasks, Predictive and descriptive tasks, Machine learning Models: Geometric Models, Logical Models, and Probabilistic Models. Features: Feature types, Feature Construction and Transformation, Feature Selection.	
II	2.1	**Classification and Regression: Classification:** Binary Classification- Assessing Classification performance, Class probability Estimation Assessing class probability Estimates, Multiclass Classification.	15
	2.2	**Regression**: Assessing performance of Regression- Error measures, Overfitting- Catalysts for Overfitting, Case study of Polynomial Regression.	
	2.3	**Theory of Generalization:** Effective number of hypothesis, Bounding the Growth function, VC Dimensions, Regularization theory.	
III	3.1	**Linear Models:** Least Squares method, Multivariate Linear Regression, Regularized Regression, Using Least Square regression for Classification.	15
	3.2	Perceptron,SupportVector Machines, Soft Margin SVM, Obtaining probabilities from Linear classifiers, Kernel methods for non-Linearity.	
IV	4.1	**Logic Based and Algebraic Model: Distance Based Models:** Neighbours and Examples, Nearest Neighbours Classification, Distance based clustering-K means Algorithm, Hierarchical clustering, **Rule Based Models:**Rule learning for subgroup discovery, Association rule mining.	15
	4.2	**Tree Based Models:** Decision Trees, Ranking and Probability estimation Trees, Regression trees, Clustering Trees.	
	4.3	**Probabilistic Model:**Normal Distribution and Its Geometric Interpretations, Naïve Bayes Classifier, Discriminative learning with Maximum likelihood, Probabilistic Models with Hidden variables: Estimation-Maximization Methods, Gaussian Mixtures, and Compression based Models.**Trends In Machine Learning :** Model and Symbols- Bagging and Boosting, Multitask learning, Online learning and Sequence Prediction, Data Streams and Active Learning, Deep Learning, Reinforcement Learning.	

References:

	Books and References:				
Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Machine Learning: The Art and Science of Algorithms that Make Sense of Data	Peter Flach	Cambridge University Press		2012
2.	Introduction to Statistical Machine Learning with Applications in R	Hastie, Tibshirani, Friedman	Springer	2nd	2012
3.	Introduction to Machine Learning	Ethem Alpaydin	PHI	2nd	2013

Course code: **WSITCMT633**	Machine Learning Practical's	Credits **2**
		(30 Hours of lectures)
1.	a. Design a simple machine learning model to train the training instances and test the same.	
	b. Implement and demonstrate the FIND-S algorithm for finding the most specific hypothesis based on a given set of training data samples. Read the training data from a .CSV file	
2	a. Perform Data Loading, Feature selection (Principal Component analysis) and Feature Scoring and Ranking.	
	b. For a given set of training data examples stored in a .CSV file, implement and demonstrate the Candidate-Elimination algorithm to output a description of the set of all hypotheses consistent with the training examples.	

3	a. Write a program to implement the naïve Bayesian classifier for a sample training data set stored as a .CSV file. Compute the accuracy of the classifier, considering few test data sets.	
	b. Write a program to implement Decision Tree and Random forest with Prediction, Test Score and Confusion Matrix.	
4	a. For a given set of training data examples stored in a .CSV file implement Least Square Regression algorithm.	
	b. For a given set of training data examples stored in a .CSV file implement Logistic Regression algorithm.	
5	a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	
	b. Write a program to implement k-Nearest Neighbour algorithm to classify the iris data set.	
6	a. Implement the different Distance methods (Euclidean) with Prediction, Test Score and Confusion Matrix.	
	b. Implement the classification model using clustering for the following techniques with K means clustering with Prediction, Test Score and Confusion Matrix.	
7	a. Implement the classification model using clustering for the following techniques with hierarchical clustering with Prediction, Test Score and Confusion Matrix	
	b. Implement the Rule based method and test the same.	
8	a. Write a program to construct a Bayesian network considering medical data. Use this model to demonstrate the diagnosis of heart patients using standard Heart Disease Data Set.	
	b. Implement the non-parametric Locally Weighted Regression algorithm in order to fit data points. Select appropriate data set for your experiment and draw graphs.	
9	a. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	

	b. Assuming a set of documents that need to be classified, use the naïve Bayesian Classifier model to perform this task.	
10	a. Write a program to demonstrate the working of the decision tree based ID3 algorithm. Use an appropriate data set for building the decision tree and apply this knowledge to classify a new sample.	
	b. Build an Artificial Neural Network by implementing the Backpropagation algorithm and test the same using appropriate data sets.	
10.a	a.Perform Text pre-processing, Text clustering, classification with Prediction, Test Score and Confusion Matrix	

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Course code : **WSITCMP631**	**Ethical Hacking Practical's**	**Credits 2**
		(30 Hours of lectures)
1	Google and Whois Reconnaissance • Use Google search techniques to gather information about a specific target or organization. • Utilize advanced search operators to refine search results and access hidden information. • Perform Whois lookups to retrieve domain registration information and gather details about the target's infrastructure.	
2	Password Encryption and Cracking with CrypTool and Cain and Abel • Password Encryption and Decryption: o Use CrypTool to encrypt passwords using the RC4 algorithm. o Decrypt the encrypted passwords and verify the original values. • Password Cracking and Wireless Network Password Decoding: o Use Cain and Abel to perform a dictionary attack on Windows account passwords.	

	o Decode wireless network passwords using Cain and Abel's capabilities.	
3	Linux Network Analysis and ARP Poisoning • Linux Network Analysis: o Execute the ifconfig command to retrieve network interface information. o Use the ping command to test network connectivity and analyze the output. o Analyze the netstat command output to view active network connections. o Perform a traceroute to trace the route packets take to reach a target host. • ARP Poisoning: o Use ARP poisoning techniques to redirect network traffic on a Windows system. o Analyze the effects of ARP poisoning on network communication and security.	

4	Port Scanning with NMap
	• Use NMap to perform an ACK scan to determine if a port is filtered, unfiltered, or open.
	• Perform SYN, FIN, NULL, and XMAS scans to identify open ports and their characteristics.
	• Analyze the scan results to gather information about the target system's network services.
	5
	Network Traffic Capture and DoS Attack with Wireshark and Nemesy
	   1. Network Traffic Capture:
	   2. Use Wireshark to capture network traffic on a specific network interface.
	   3. Analyze the captured packets to extract relevant information and identify potential security issues.	

5	Denial of Service (DoS) Attack:
	   • Use Nemesy to launch a DoS attack against a target system or network.
	   • Observe the impact of the attack on the target's availability and performance.	

6	Persistent Cross-Site Scripting Attack - Set up a vulnerable web application that is susceptible to persistent XSS attacks. - Craft a malicious script to exploit the XSS vulnerability and execute arbitrary code. - Observe the consequences of the attack and understand the potential risks associated with XSS vulnerabilities.	
7	Session Impersonation with Firefox and Tamper Data - Install and configure the Tamper Data add-on in Firefox. - Intercept and modify HTTP requests to impersonate a user's session. - Understand the impact of session impersonation and the importance of session management.	
8	SQL Injection Attack - Identify a web application vulnerable to SQL injection. - Craft and execute SQL injection queries to exploit the vulnerability. - Extract sensitive information or manipulate the database through the SQL injection attack.	
9	Creating a Keylogger with Python - Write a Python script that captures and logs keystrokes from a target system. - Execute the keylogger script and observe the logged keystrokes. - Understand the potential security risks associated with keyloggers and the importance of protecting against them.	
10	Exploiting with Metasploit (Kali Linux) - Identify a vulnerable system and exploit it using Metasploit modules. - Gain unauthorized access to the target system and execute commands or extract information. • Understand the ethical considerations and legal implications of using Metasploit for penetration testing.	

PROGRAM(s):MscIT-Part-II	SEMESTER: III
Course Name: Applied Artificial Intelligence(Elective Theory)	Course Code: WSITCET631

Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CIA-1 AND CIA-2) (20+20=Marks-40)	Semester End Examination (Marks- 60)
		30 Hours	2	40	60

Learning Objectives:-
- **To explore the applied branches of artificial intelligence**
- **To enable the learner to understand applications of artificial intelligence**
- **To enable the student to solve the problem aligned with derived branches of artificial intelligence.**

Learning Outcomes:- After completion of course the learner will:
CO1: be able to understand the fundamentals concepts of expert system and its applications.
CO2: be able to use probability and concept of fuzzy sets for solving AI based problems.
CO3: be able to understand the applications of Machine Learning. The learner can also apply fuzzy system for solving problems.
CO4: learner will be able to apply to understand the applications of genetic algorithms in different problems related to artificial intelligence.
CO5: A learner can use knowledge representation techniques in natural language processing.

Course Code/ Unit	Sub unit	Course/ Unit Title	Credits/ Lectures (2 Credits)
I		**Applied Artificial Intelligence**	
	1.1	**Review of AI:** History, foundation and Applications **Expert System and Applications:** Phases in Building Expert System, Expert System Architecture, Expert System versus Traditional Systems,Rule based Expert Systems, Blackboard Systems, Truth Maintenance System, Application of Expert Systems, Shells and Tools	**8L**

II		**Probability Theory:** joint probability, conditional probability, Bayes's theorem, probabilities in rules and facts of rule based system, cumulative probabilities, rule based system and Bayesian method **Fuzzy Sets and Fuzzy Logic:** Fuzzy Sets, Fuzzy set operations, Types of Member ship Functions, Multivalued Logic, Fuzzy Logic, Linguistic variables and Hedges, Fuzzy propositions, inference rules for fuzzy propositions, fuzzy systems, possibility theory and other enhancement to Logic	7L
III		**Machine Learning Paradigms:** Machine Learning systems, supervised and un-supervised learning, inductive learning, deductive learning, clustering, support vector machines, cased based reasoning and learning. **Artificial Neural Networks:** Artificial Neural Networks, Single-Layer feedforward networks, multi-layer feed- forward networks, radial basis function networks, design issues of artificial neural networks and recurrent networks	8L
IV	4.1	**Evolutionary Computation:** Soft computing, genetic algorithms, genetic programming concepts, evolutionary programming, swarm intelligence, ant colony paradigm, particle swarm optimization and applications of evolutionary algorithms. **Intelligent Agents:** Agents vs software programs, classification of agents, working of an agent, single agent and multiagent systems, performance evaluation, architecture, agent communication language, applications Advanced Knowledge Representation Techniques: Conceptual dependency theory, script structures, CYC theory, script structure, CYC theory, case grammars, semantic web.	7L
	4.2	**Natural Language Processing:** Sentence Analysis phases, grammars and parsers, types of parsers, semantic analysis, universal networking language, dictionary	

Books and References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	Artificial Intelligence	Saroj Kaushik	Cengage	1st	2019
2.	Artificial Intelligence: A Modern Approach	A. Russel, Peter Norvig		1st	
3.	Artificial Intelligence	**Elaine Rich,Kevin Knight,Shivashankar B. Nair**	Tata Mc-Grawhill	3rd	

Course code: WSITCEP631	Applied Artificial Intelligence (Elective Practical)	Credits 2
1.	Design an Expert system using AIML E.g::- An expert system for responding the patient query for identifying the flu.	
2.	Design a bot using AIML.	
3.	Implement Bayes Theorem using Python	
4.	Implement Conditional Probability and joint probability using Python	
5.	Write a program for to implement Rule based system.	
6.	Design a Fuzzy based application using Python / R.	
7.	Write an application to simulate supervised and un-supervised learning model.	
8.	Write an application to implement clustering algorithm.	
9.	Write an application to implement support vector machine algorithm.	
10.	Simulate artificial neural network model with both feed forward and backpropagation approach. [You can add some functionalities to enhance the model].	
10.a	Simulate genetic algorithm with suitable example using Python / R or any other platform.	
10.b	Design an Artificial Intelligence application to implement intelligent agents.	
10.c	Design an application to simulate language parser.	
10.d	Design an application to simulate semantic web.	

Course code	Project Documentation and Viva	Credits
WSITCRP31	(120 hours)	**4**
1.	**Periods per week (1 Period is 60 minutes)**	
Evaluation System	**Practical Examination**	**Hours**
	Internal	120 Hours

Project Documentation and Viva

The learners are expected to develop a project beyond the undergraduate level. Normal web sites, web applications, mobile apps are not expected. The learner is supposed to prepare the synopsis and documentation. The same project has to be implemented in Semester IV.
More details about the project is given is Appendix 1.

John Wilson Education Society's Wilson College (Autonomous)
Template for log-book to be maintained by learners for Research Project / Field Project at UG level Academic Year 2024-2025

Front Page

Nature of Project (RP/FP/OJT/CEP) = _____
Programme: _____
Semester: _____
Name of Learner = _____
Roll Number: _____
College Email ID of student (if allotted): _____
Student's mobile Number: _____
Title of Project = _____
Name of Teacher-In-Charge: _____
Department of Teacher-in-Charge: _____

Date	Duration	Work Completed	Signature of Student with date	Signature of In-charge/ Teacher with date

- **A Certified copy of hard-bound journal is essential to appear for the practical examination.**
- **Evaluation of the Research Project**
    1. **Log book**
    2. **Presentation and viva**
    3. **Report**

MScIT Part-II 2024-2025(NEP-2020)

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Modality of Assessment

Theory Examination Pattern:

A. **Internal Assessment- 40%- 40 Marks per paper**

Sr. No.	Evaluation Type	Marks
1	**Written Objective Examination CIA-1**	**20**
2	**Assignment/ Case study/ field visit report/ presentation/ project /Industrial Visit CIA-2**	**20**
	Total	**40**

B. **External Examination- 60%- 60 Marks per paper**

Semester End Theory Examination:

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:
    a. There shall be questions each of marks one on each unit.
    b. All questions shall be compulsory with internal choice within the questions.
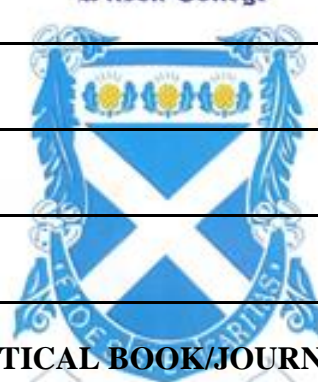3. Duration –External Practical examinations shall be of **two and half hour** duration.

B. **External Examination Practical Examination Pattern: 50 Marks**

Practical Evaluation (50 marks)

A Certified copy of hard-bound journal is essential to appear for the practical examination.

1	Practical Question 1	20
2	Practical Question 2	20
3	Journal	5
4	VIVA	5
	Total Marks	50

[OR]

1	Practical Question 1	40
2	Journal	5
3	VIVA	5
	Total Marks	50

PRACTICAL BOOK/JOURNAL

The students are required to perform 75% of the Practical for the journal to be duly certified.
The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

Overall Examination & Marks Distribution Pattern

Semester I

Course	101			102			Grand Total
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
Practical		50	50		50	50	100

Total Marks(60)

Q.1 Attempt any THREE of the following?   [15 Marks]

1. **Q**
2. **Q**

3. **Q**
4. **Q**
5. **Q**

Q.2Attempt any THREE of the following?   [15 Marks]

1. **Q**
2. **Q**
3. **Q**
4. **Q**
5. **Q**

Q.3Attempt any THREE of the following?   [15 Marks]

1. **Q**
2. **Q**
3. **Q**
4. **Q**
5. **Q**

Q.4 Attempt any THREE of the following?   [15Marks]

1. **Q**
2. **Q**
3. **Q**
4. **Q**
5. **Q**

30 Marks (Elective) Theory Examination

Q1A(4Marks)
Q1B(4 Marks)
Q2(A) (4 Marks)
Q2(B)(3 Marks)
Q3A(4Marks)
Q3B(4 Marks)
Q4(A) (4 Marks)
Q4(B)(3 Marks)

Practical Examination Pattern:

Course	MSCIT Part-II Sem-III		MSCIT Part-II Sem-IV	Marks
Practicals	50(External Practical Examination)	50	50(External Practical Examination)	50

PRACTICAL BOOK/JOURNAL

3. The students are required to perform 75% of the Practical for the journal to be duly certified.
4. The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

SEMESTER-IV

PROGRAM(s):MscIT	SEMESTER: IV
Course Name:Virtual Reality and Augmented Reality	Course Code: WSITCMT641

Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	Practical (Hours per week)	Tutorial (Hours per week)	Credit	Continuous Assessment (CIA-1 AND CIA-2) (20+20=Marks-40)	Semester End Examination (Marks- 60)
		-	4	40	60

Learning Objectives:- · To learn background of VR including a brief history of VR, different forms of VR and related technologies, and broad overview of some of the most important concepts · To provide background in perception to educate VR creators on concepts and theories of how we perceive and interact with the world around us

· To make learner aware of high-level concepts for designing/building assets and how subtle design choices can influence user behavior

· To learn about art for VR and AR should be optimized for spatial displays with spatially aware input devices to interact with digital objects in true 3D

· Walkthrough of VRTK, an open source project meant to spur on cross-platform development

Course Outcomes: After completion of the course, a student should be able to:

CO1: Apply the concepts of VR and AR in real life.

CO2: Reduce the greatest risk to VR.

CO3: Design the way users interact within the scenes they find themselves in.

CO4: be exposed to VR, AR and today's resources

CO5: Effectively use open source VR software.

Course Code/ Unit	Sub unit	Course/ Unit Title	Credits/ Lectures
		Virtual Reality and Augmented Reality	8L
I	1.1	**Introduction:** What Is Virtual Reality, A History of VR, An Overview of Various Realities, Immersion, Presence, and Reality Trade-Offs, The Basics: Design Guidelines, Objective and Subjective Reality, Perceptual Models and Processes, Perceptual Modalities	
II		**Perception of Space and Time, Perceptual Stability, Attention, and Action, Perception:** Design Guidelines, Adverse Health Effects, Motion Sickness, Eye Strain, Seizures, and Aftereffects, Hardware Challenges, Latency, Measuring Sickness, Reducing Adverse Effects, Adverse Health Effects: Design Guidelines	7L

III		**Content Creation, Concepts of Content Creation, Environmental Design, Affecting Behavior, Transitioning to VR Content Creation, Content Creation:** Design Guidelines, Interaction, Human-Centered Interaction, VR Interaction Concepts, Input Devices,Interaction Patterns and Techniques, Interaction: Design Guidelines	**8L**
IV	**4.1**	Design and Art Across Digital Realities, Designing for Our Senses, Virtual Reality for Art, 3D Art Optimization, Computer Vision That Makes Augmented Reality Possible Works, Virtual Reality and Augmented Reality: Cross-Platform Theory	**7L**
	4.2	**Virtual Reality Toolkit**: Open Source Framework for the Community, Data and Machine Learning VisualizationDesign and Development in Spatial Computing, Character AI and Behaviors, The Virtual and Augmented Reality Health Technology Ecosystem	

References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	The VR Book, Human Centered Design for Virtual Reality	Jason Jerald	ACM Books	1st	2016
2.	Creating Augmented and Virtual Realities	Erin Pangilinan, Steve Lukas, Vasanth Mohan	O'Reilly	1st	2019
3.	Virtual reality with VRTK4	Rakesh Baruah	APress	1st	2020

PROGRAM(s):MscIT	SEMESTER: IV
Course Name: Cyber Forensics(Mandatory-2 Theory)	**Course Code: WSITCMT642**

Teaching Scheme					Evaluation Scheme
Lectures (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credits**	**Continuous Assessment (CIA-1 AND CIA-2) (20+20=Marks- 40)**	**Semester End Examination (Marks- 60)**
		-	4	**40**	**60**

Learning Objectives:-
- Explain laws relevant to computer forensics
- Seize digital evidence from pc systems
- Recover data to be used as evidence
- Analyse data and reconstruct events
- Explain how data may be concealed or hidden

Course Outcomes: After completion of the course, a student should be able to:

CO1: Investigate the cyber forensics with standard operating procedures.

CO2: Recover the data from the hard disk with legal procedure.

CO3: To recover and analyse the data using forensics tool

CO4: Acquire the knowledge of network analysis and use it for analysing the internet attacks.

CO5: Able to investigate internet frauds done through various gadgets like mobile, laptops, tablets and become a forensic investigator.

Course Code/ Unit	Sub unit	Course/ Unit Title	Credits/ Lectures
		Cyber Forensics	**8L**
I	**1.1**	**Computer Forensics:** The present Scenario, The Investigation Process, Computers – Searching and Seizing, Electronic Evidence, Procedures to be followed by the first responder.	
II	**2.1**	Setting up a lab for Computer Forensics, Hard Disks and File Systems, Forensics on Windows Machine, Acquire and Duplicate Data	**7L**

III	**3.1**	Recovery of deleted files and partitions, Using Access Data FTK and Encase for forensics Investigation, Forensic analysis of Steganography and Image files, Cracking Application passwords.	**8L**
IV	**4.1**	Capturing logs and correlating to the events, Network Forensics – Investigating logs and Network traffic,Investigating Wireless and Web Attacks.	**7L**
	4.2	Email Tracking and Email Crime investigation. Mobile Forensics, Reports of Investigation, Become an expert witness.	

References:

Course code WUSITC4P3	Cyber Forensics Practical's Wilson College	Credits 2
1.	File System Analysis using The SleuthKit (Autospy)	
	Capturing and analyzing network packets using Wireshark (Fundamentals) a. Using Web attack detection tools [Wireshark] b. Using Log & Traffic Capturing & Analysis Tools [Wireshark]	
2.	Using Forensic Toolkit(FTK) &Writing report usingFTK (AccessData FTK)	
3.	Using File Recovery Tools [FTK Imager]	
4.	Using Sysinternals tools for Network Tracking and Process Monitoring.	
5.	Dump Memory contents using PMdump	
6.	Using Data Acquisition Tools [ProDiscover Pro]	
7.	Using Steganography Tools [S-Tools]	
8.	Performing Password Cracking [Cain & Abel] Performing Sniffing [Cain & Abel]	
9.	Web Browser Forensics	
10.	Email Forensics	

Course code : WSITCMP644	**ARVR Practical**	Credits 2
1.	Creation of game Application in unity and development of simple game using script.	
2	Develop a 2D UFO game in Unity	
3.	Develop a 3D Coin collector game in Unity.	
4.	Develop a 3D racing Car game in Unity.	
5.	Used of 3D objects in unity with scripts.	
6.	Develop a 3D roll ball game in Unity.	
7.	Develop a 3D space shooter game in Unity.	
8.	Develop a 3D game to demonstrate Collison detection in unity.	
9.	Develop a 3D game to demonstrate various mouse handling events in unity.	
10.	Develop a 3D game to demonstrate single and double jump of game object in unity.	

PROGRAM(s):MscIT-Part-II	SEMESTER: IV
Course Name:Deep Learning **(Elective Theory)**	**Course Code: WSITCET641**

Teaching Scheme						Evaluation Scheme

Lectures (Hours per week)	**Practical (Hours per week)**	**Tutorial (Hours per week)**	**Credit**	**Continuous Assessment (CIA-1 AND CIA-2) (20+20=Marks-40)**	**Semester End Examination (Marks- 60)**
5	2	-	2	40	60

Course Objectives:

- To present the mathematical, statistical and computational challenges of building neural networks

- To study the concepts of deep learning

- To enable the students to know deep learning techniques to support real-time applications

Course Outcomes:

After completion of the course, a student should be able to:

CO1: Describes basics of mathematical foundation that will help the learner to understand the concepts of Deep Learning.

CO2: Understand and describe model of deep learning

CO3: Design and implement various deep supervised learning architectures for text & image data.

CO4: Design and implement various deep learning models and architectures.

CO5: Apply various deep learning techniques to design efficient algorithms for real-world applications.

Course Code/ Unit	Sub unit	Course/ Unit Title	Credits/ Lectures
I	**1.1**	**Applied Math and Machine Learning Basics:** Linear Algebra: Scalars, Vectors, Matrices and Tensors , Multiplying Matrices and Vectors , Identity and Inverse Matrices, Linear Dependence and Span , norms, special matrices and vectors, eigen decompositions.	**15L**

	1.2	**Numerical Computation:** Overflow and under flow, poor conditioning, Gradient Based Optimization, Constraint optimization.	
II	2.1	**Deep Networks:** Deep feedforward network, regularization for deep learning , Optimization for Training deep models	15L
III	3.1	Convolutional Networks, Sequence Modelling, Applications	15L
IV	4.1	Deep Learning Research: Linear Factor Models,Autoencoders, representation learning	15L
	4.2	Approximate Inference, Deep Generative Models	

References:

Sr. No.	Title	Author/s	Publisher	Edition	Year
1.	**Deep Learning**	Ian Goodfellow, Yoshua Bengio, Aaron Courvile	An MIT Press book	1st	2016
2.	**Fundamentals of Deep Learning**	Nikhil Buduma	O'Reilly	1st	2017
3.	**Deep Learning: Methods and Applications**	Deng & Yu	Now Publishers	1st	2013
4.	**Deep Learning CookBook**	Douwe Osinga	O'Reilly	1st	2017

Course code : **WSITCEP642**	**Deep Learning Practical (Elective Practical)**	**Credits**

		2
1.	Performing matrix multiplication and finding eigen vectors and eigen values using TensorFlow	
2.	Solving XOR problem using deep feed forward network.	
3.	Implementing a deep neural network for performing binary classification task.	
4.	a) Aim: Using deep feed forward network with two hidden layers for performing multiclass classification and predicting the class. b) Aim: Using a deep feed forward network with two hidden layers for performing classification and predicting the probability of class. c) Aim: Using a deep feed forward network with two hidden layers for performing linear regression and predicting values.	
5.	a)Evaluating feed forward deep network for regression using KFold cross validation. b)Evaluating feed forward deep network for multiclass Classification using KFold cross-validation.	
6.	Implementing regularization to avoid overfitting in binary classification.	
7.	Demonstrate recurrent neural network that learns to perform sequence analysis for stock price.	
8.	Performing encoding and decoding of images using deep autoencoder.	
9.	Implementation of convolutional neural network to predict numbers from number images	
10.	Denoising of images using autoencoder.	

Research Project (Course Code:WSITCRP641)

Implementation and Viva Voce Evaluation

Goals of the course Project Documentation and Viva-Voce
The student should:

- be able to apply relevant knowledge and abilities, within the main field of study, to a given problem
- within given constraints, even with limited information, independently analyse and discuss complex inquiries/problems and handle larger problems on the advanced level within the main field of study
- reflect on, evaluate and critically review one's own and others' scientific results
- be able to document and present one's own work with strict requirements on structure, format and language usage
- be able to identify one's need for further knowledge and continuously develop one's own Knowledge

To start the project:

- Start thinking early in the programme about suitable projects.
- Read the instructions for the project.
- Attend and listen to other student's final oral presentations.
- Look at the finished reports.
- Talk to senior master students.
- Attend possible information events (workshops / seminars / conferences etc.) about the related topics.

Application and approval:

- Read all the detailed information about project.
- Finalise finding a place and supervisor.
- Check with the Subject teacher about subject/project, place and supervisor.
- Write the project proposal and plan along with the supervisor.
- Fill out the application together with the supervisor.
- Hand over the complete application, proposal and plan to the Subject teacher.
- Get an acknowledgement and approval from the Subject teacher to start the project.

During the project:

- Search, gather and read information and literature about the theory.
- Document well the practical work and your results.
- Take part in seminars and the running follow-ups/supervision.
- Think early on about disposition and writing of the final report.
- Discuss your thoughts with the supervisor and others.
- Plan for and do the mid-term reporting to the examiner.
- Do a mid-term report also at the work-place (can be a requirement in some work-places).
- Write the first draft of the final report and rewrite it based on feedback from the supervisor and possibly others.
- Plan for the final presentation of the report.

Finishing the project:

- Finish the report and obtain an OK from the supervisor.

☐ **Appear for the final exam**.

Project Proposal/research plan

- The student should spend the first 1-2 weeks writing a 1-2 pages project plan containing:
  - **Short background of the project**
  - **Aims of the project**
  - **Short description of methods that will be used**
  - **Estimated time schedule for the project**
- **The research plan should be handed in to the Course Incharge.**
- **Writing the project plan will help you plan your project work and get you** started in finding
- information and understanding of methods needed to perform the project.

Project Documentation

The documentation should contain:

- Introduction - that should contain a technical and social (when possible) motivation of the project topic.
- Description of the problems/topics.
- Status of the research/knowledge in the field and literature review.
- Description of the methodology/approach. (The actual structure of the chapters here depends on the topic of the documentation.)
- Results - must always contain analyses of results and associated uncertainties.
- Conclusions and proposals for the future work.
- Appendices (when needed).
- Bibliography - references and links.
- For the master's documentation, the chapters cannot be dictated, they may vary according to the type of project. However, in Semester III Project Documentation and
- Viva Voce must contain at least 4 chapters (Introduction, Review of Literature,
- Methodology / Approach, Proposed Design / UI design, etc. depending on the type of project.) The Semester III report should be spiral bound.
- In Semester IV, the remaining Chapters should be included (which should include Experiments performed, Results and discussion, Conclusions and proposals for future work, Appendices) and Bibliography - references and links. Semester IV report should include all the chapters and should be hardbound.

III		Mandatory 1	Mandatory 2	practical	Practical 1	Elective	RP(Industrial Projects from companies)
	Credits	4	4	2	2	4(2+2)	**Project Proposal -4 credits (120 Hours)**
IV		Mandatory 1	Mandatory 2	practical	Practical 1	Elective	(RP)Project Implementation)
	Credits	**4**	**4**	**2**	**2**	**4(2+2)**	**6(180 Hours)**

Evaluation of the project

1. Log book

2. Presentation and viva

3. Report

Modality of Assessment

Theory Examination Pattern:

A. **Internal Assessment- 40%- 40 Marks per paper**

Sr. No.	Evaluation Type	Marks
1	**Written Objective Examination CIA-1**	**20**
2	**Assignment/ Case study/ field visit report/ presentation/ project/Industrial Visit CIA-2**	**20**
	Total	**40**

B. **External Examination- 60%- 60 Marks per paper**

Semester End Theory Examination:

1. Duration - These examinations shall be of **two hours** duration.
2. Theory question paper pattern:
    a. There shall be questions each of marks one on each unit.
    b. All questions shall be compulsory with internal choice within the questions.
5. Duration –External Practical examinations shall be of **two and half an hour** duration.

B. **External Examination Practical Examination Pattern: 50 Marks**

Practical Evaluation (50 marks)

A Certified copy of hard-bound journal is essential to appear for the practical examination.

1	Practical Question 1	20
2	Practical Question 2	20
3	Journal	5
4	VIVA	5
	Total Marks	50

[OR]

1	Practical Question 1	40
2	Journal	5
3	VIVA	5
	Total Marks	50

PRACTICAL BOOK/JOURNAL

The students are required to perform 75% of the Practical for the journal to be duly certified.
The students are required to present a duly certified journal for appearing at the practical examination, failing which they will not be allowed to appear for the examination.

Overall Examination & Marks Distribution Pattern

Semester I

Course	101			102			Grand Total
	Internal	External	Total	Internal	External	Total	
Theory	40	60	100	40	60	100	200
Practical		50	50		50	50	100