

SIES (Nerul) College of Arts, Science and Commerce (Autonomous) Syllabus for Approval M.Sc. (Information Technology)

Sr. No.	Heading	Particulars
1	Title of the course	M. Sc.(Information Technology) Part I
2	Eligibility for admission	B.Sc(IT,CS,AI,DS),B.E(IT,CS,Electronics,A.I, D.S.), BCA, B.Sc(Physics), B.Sc(Maths), B.Sc(Stats), B.Sc(Electronics)
3	Minimum percentage for admission	40%
4	Passing Marks	40%
5	Semesters	Ι
6	Level	PG
7	Pattern	1-2 years & 2-4 semesters Choice Based Grading System
8	Status	New
9	To be implemented from	From Academic year 2023-24 in a progressive manner

Date: 25th July, 2023.

Signature:

Dr. Koel Roychoudhury

Dr. Anu Thomas

AC Chairperson

Head of the Department





SIES (Nerul) College of Arts, Science and Commerce (Autonomous) (Affiliated to University of Mumbai) RE-ACCREDITED GRADE "A" BY NAAC (3rd CYCLE) BOARD OF STUDIES SYLLABUS FOR M.Sc (Information Technology)

(WITH EFFECT FROM THE ACADEMIC YEAR 2023-2024)

OBJECTIVES OF THE PROGRAMME:

- □ Ability to apply the knowledge of Information Technology with recent trends aligned with research and industry.
- Ability to apply IT in the field of Computational Research, Soft Computing, Big Data Analytics, Data Science, Image Processing, Artificial Intelligence, Networking and Cloud Computing.
- Ability to provide socially acceptable technical solutions in the domains of Information Security, Machine Learning, Infrastructure Services as specializations.
- □ Ability to apply the knowledge of Intellectual Property Rights and Cyber Forensics and various standards in interest of National Security and Integrity along with IT Industry.
- □ Ability to write effective project reports, research publications and content development and to work in a multidisciplinary environment in the context of changing technologies.

Programme Outcome:

PO1: Ability to apply the knowledge of Information Technology with recent trends aligned with research and industry.

PO2: Ability to write effective project reports, research publications and content development and to work in multidisciplinary environment in the context of changing technologies

PSO1: Ability to apply IT in the field of Computational Research, Soft Computing, Big Data Analytics, Data Science, Image Processing, Artificial Intelligence, Networking and Cloud Computing.

PSO2: Ability to provide socially acceptable technical solutions in the domains of Information Security, Machine Learning, Internet of Things and Embedded System, Infrastructure Services as specializations.

M.Sc. Information Technology Programme

(To be implemented from Academic Year- 2023-24)

No. of Courses	Course Code	Semester I	Credits
1	Major		
1	M23IT1MJ01	Introduction to Data Science	4
2	M23IT1MJ02	Cloud Computing	4
3	M23IT1MJP03	Practicals of Introduction to Data Science and Cloud Computing	4
4	M23IT1MJ04	Computing Algorithm Efficiency	2
2	Electives(E)		
	M23IT1E01	Soft Computing Using Artificial Neural Networks	
5	M23IT1EP01	Soft Computing Using Artificial Neural Networks Practical	4
	M23IT1E02	Cyber Security	
	M23IT1EP02	Cyber Security Practical	
3	Research Metho	dology	
6	M23IT1RM01	Research Methodology	4
Total Credits			22

Semester I Major (Credit 4) Introduction to Data Science

COURSE CODE: M23IT1MJ01

COURSE CREDIT: 04

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

The objective of this course is to

- 1. Building the fundamentals of data science
- 2. Gaining practical experience in programming tools for data sciences
- 3. Empowering students with tools and techniques used in data science.
- 4. To develop critical thinking and innovative skills.

Course Outcomes:

- 1. Students will be able to implement data science framework
- 2. Students will become proficient in the statistical analysis of data and the use of computation tools.
- 3. Students will apply statistical and computational tools to applied problems, and clearly communicate the results.

UNIT	Торіс	HRS
Ι	Introduction to Data Science- Introduction- Definition - Data Science in various fields - Examples - Impact of Data Science - Data Analytics Life Cycle - Data Science Toolkit - Data Scientist - Data Science Team Understanding data: Introduction – Types of Data: Numeric – Categorical – Graphical – High Dimensional Data – Classification of digital Data: Structured, Semi-Structured and UnStructured - Example Applications. Sources of Data: Time Series – Transactional Data – Biological Data – Spatial Data – Data Evolution. Data Science Processing Tools examples like Cassandra, Kafka, R ,Python.	15
II	Hypothesis development –Hypothesis testing with quantitative data.Null and Alternative Hypothesis. Simple and Composite Hypothesis. Type-1 and Type2 Errors. Univariate Data: Descriptive measures related to univariate metric data. Bivariate Data: Descriptive measures related to bivariate metric data: Correlations, linear and polynomial regressions. Descriptive measures related to bivariate categorical data: Measures of associations in a contingency table	15

III	Classification: Classification and Prediction – Basic concepts–Decision tree induction–Bayesian classification, Rule–based classification, Lazy learner. Clustering and Applications: Cluster analysis–Types of Data in Cluster Analysis–Categorization of Major Clustering Methods– Partitioning Methods, Hierarchical Methods– Density–Based Methods, Grid–Based Methods, Outlier Analysis	15
IV	Association Rule Mining: Mining Frequent Patterns–Associations and correlations – Mining Methods– Mining Various kinds of Association Rules– Correlation Analysis– Constraint based Association mining. Graph Pattern Mining, SPM. General Case Study Based on Data Science Model .	15

- 1. Practical Data Science, Andreas François, Vermeulen, APress, 2018
- 2. Principles of Data Science, Sinan Ozdemir, PACKT, 2016
- 3. Data Science from Scratch, Joel Grus, O'Reilly, 2015
- 4. Data Science from Scratch, first Principle in python, Joel Grus, Shroff Publishers, 2017
- 5. Experimental Design in Data science with Least Resources, N C Das, Shroff Publishers, 2018
- 6. Data Science: Concepts and Practice, Vijay kotu and Bala Deshpande, Morgan Kaufmann, 2019

Major (Credit 4) Cloud Computing

COURSE CODE: M23IT1MJ02

COURSE CREDIT: 04

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

The objective of this course is to

- 1. Learn how to use Cloud Services.
- 2. Understand Cloud Security and new developments in cloud technology.
- 3. Comprehend the various architectures in cloud development.
- 4. Understand the economics behind a cloud-based service.

Course Outcomes:

- 1. Implement Virtualization.
- 2. Design the architecture for various cloud platform-based services.
- 3. Build a Private Cloud.
- 4. Prepare Service Level agreements using cloud delivery models with costing and quality metrics.

UNIT	Торіс	HRS
I	Introduction to Cloud Computing: Basic Concepts and Terminology, Goals and Benefits, Risks and Challenges. Virtualization Technology: Hardware Independence, Server Consolidation, Resource Replication, Operating System-based Virtualization, Hardware- Based Virtualization, Virtualization Management.	15
Π	 Fundamental concepts and models: Roles and boundaries, Cloud Characteristics, Cloud Delivery models, Cloud Deployment models. Cloud service models: Infrastructure as a Service (IaaS), Platform as a Service (PaaS) and Software as a Service (SaaS). Fundamental Cloud Security: Basics, Threat agents, Cloud security threats. Industrial Platforms and New Developments: Amazon Web Services, Google App Engine, Microsoft Azure. 	15
III	Fundamental Cloud Architectures: Workload Distribution Architecture, Resource Pooling Architecture, Dynamic Scalability Architecture, Elastic Resource Capacity Architecture, Service Load Balancing Architecture, Cloud Bursting Architecture, Elastic Disk Provisioning Architecture, Redundant Storage Architecture. Advanced Cloud Architectures: Hypervisor Clustering Architecture, Load	15

	Balanced Virtual Server Instances Architecture, Non-Disruptive Service Relocation Architecture, Zero Downtime Architecture, Cloud Balancing Architecture, Resource Reservation Architecture, Dynamic Failure Detection and Recovery Architecture, Bare-Metal Provisioning Architecture, Rapid Provisioning Architecture, Storage Workload Management Architecture	
IV	Cloud Delivery Model Considerations: Cloud Delivery Models: The Cloud Provider Perspective, Cloud Delivery Models: The Cloud Consumer Perspective, Cost Metrics and Pricing Models: Business Cost Metrics, Cloud Usage Cost Metrics, Cost Management Considerations, Service Quality Metrics and SLAs: Service Quality Metrics, SLA Guidelines	15

- 1. Cloud Computing Concepts, Technology and Architecture by Ricardo Puttini, Thomas Erl, and Zaigham Mahmood, 2013
- 2. Cloud Computing: A Practical Approach for Learning and Implementation 1st Edition by A. Srinivasan, 2014
- 3. Mastering Cloud Computing: Foundations and Applications Programming by Christian Vecchiola, Rajkumar Buyya, and S.Thamarai Selvi, 2013
- 4. Distributed and Cloud Computing: From Parallel Processing to the Internet of Things by Geoffrey C. Fox, Jack Dongarra, and Kai Hwang, 2012

Major(Credit 4) Practicals of Introduction to Data Science and Cloud Computing

COURSE CODE: M23IT1MJP03

COURSE CREDIT: 04

1 credit - 15 lectures

1 lecture is 120 minutes

Course Objectives:

The objective of this course is to

- 1. Apply quantitative modeling and data analysis techniques to the solution of real world business problems, communicate findings, and effectively present results using data visualization techniques.
- 2. Apply ethical practices in everyday business activities and make well- reasoned ethical business and data management decisions.
- 3. Analyze the Cloud computing setup with its vulnerabilities and applications using different architectures.
- 4. Apply and design suitable Virtualization concepts, Cloud Resource.

Course Outcomes:

- 1. Employ cutting edge tools and technologies to analyze Big Data.
- 2. Apply algorithms to build machine intelligence.
- 3. Demonstrate use of teamwork, leadership skills, decision making and organization theory.
- 4. Assess cloud Storage systems and Cloud security, the risks involved, its impact and develop cloud application

Sr.No.	Practicals of Data Science
1	Create data model using Cassandra
2	 Conversion from different formats to HOURS format. Text-Delimited to HORUS XML to HORUS
3	Utilities and Auditing Fixers Utilities Data Binning or Bucketing
4	 Retrieving Data Program to retrieve different attributes of data Data Pattern
5	 Assessing Data Perform error management on the given data using the pandas package. Drop the Columns Where All Elements Are Missing Values

	• Drop the Columns Where Any of the Elements Is Missing Values
6	Processing DataForecasting
7	Transforming Data Simple Linear Regression
8	Organising Data Horizontal Style Vertical Style
9	Generating Reports Data Visualisation with python
10	Data Visualisation with Power BI
Sr.No.	Practicals of Cloud Computing
Sr.No.	Practicals of Cloud Computing Creating VMs using VMWare workstation.
Sr.No. 1 2	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network.
Sr.No. 1 2 3	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter.
Sr.No. 1 2 3 4	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization.
Sr.No. 1 2 3 4 5	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization. Show the implementation of web services.
Sr.No. 1 2 3 4 5 6	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization. Show the implementation of web services. Implementing Web Service that connects to MySQL database.
Sr.No. 1 2 3 4 5 6 7	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization. Show the implementation of web services. Implementing Web Service that connects to MySQL database. Study and Implementation of Storage as a Service.
Sr.No. 1 2 3 4 5 6 7 8	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization. Show the implementation of web services. Implementing Web Service that connects to MySQL database. Study and Implementation of Platform as a Service.
Sr.No. 1 2 3 4 5 6 7 8 9	Practicals of Cloud Computing Creating VMs using VMWare workstation. Connecting VMs in a network. Implement virtualization using VMWare ESXi Server and managing with vCenter. Implement Windows Hyper V virtualization. Show the implementation of web services. Implementing Web Service that connects to MySQL database. Study and Implementation of Storage as a Service. Study and Implementation of Platform as a Service. Develop an application for Microsoft Azure.

Major (Credit 2) Computing Algorithm Efficiency

COURSE CODE: M23IT1MJ04

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- 1. Analyze the asymptotic performance of algorithms.
- 2. Apply important algorithmic design paradigms and methods of analysis.
- 3. Synthesize efficient algorithms in common engineering design situations.

Course Outcomes:

- 1. Program algorithms in an efficient manner.
- 2. Describe the dynamic-programming paradigm and explain when an algorithmic design situation calls for it.
- 3. Explain the efficiency of an Algorithm
- 4. Analyze and Design an algorithm.

UNIT	Торіс	HRS
Ι	The Role of Algorithms in Computing, Analyzing Algorithms, Designing algorithms,. O-notation, Ω-notation, and ,Θ-notation,Time and space complexity: A Survey of Common Running Times:Linear Time,O(n log n) Time, Quadratic Time,Cubic Time,O(nk) Time,Beyond Polynomial Time,Sublinear Time Computational complexity: Problem classes: P, NP, NP-complete, NP-hard. Reduction	15
II	Analysis of Algorithms (Real World Scenario) A First Problem:Stable Matching, Five Representative problems Analysis of Algorithms (Java Code), Scientific Method, Observations, Analysis of experimental Data, Mathematical models, Tilde approximations, Approximate running time,Order of growth hypothesis, Analysis of Algorithms, Cost model, Order of Growth classification, Designing faster algorithms, Warmup:2-sum, Fast algorithm for 3-sum,	15

Lower bounds, Doubling Ratio Experiments, Estimating the feasibility of solving large problems, Caveats, Coping with dependence of Inputs, Memory, Perspective

- 1. Introduction to Algorithms, Thomas H. Cormen, Charles E. Leiserson, Ronald Rivest, Clifford Stein, MIT Press
- 2. Algorithms Unlocked, Thomas H. Cormen, MIT Press
- 3. Algorithms, Robert Sedgewick and Kevin Wayne, Princeton University
- 4. The Algorithm Design Manual, Steven S. Skiena, Springer
- 5. Algorithm Design, Authors: Éva Tardos, Jon Kleinberg, Pearson

Elective (Credit 2+2) Soft Computing Using Artificial Neural Networks

COURSE CODE: M23IT1E01

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- 1. Gain knowledge about biological neural networks and create equivalent models of neurons
- 2. Understand the structure, learning algorithms, and challenges associated with feed-forward and feedback neural networks.
- 3. Applications of neural networks to solve problems in varieties of application domains.

Course Outcomes:

- 1. Upon completion of this course, students will be able to:
- 2. Construct diverse neural networks with different architectures, including both feed-forward and feedback types.
- 3. Apply various learning rules to train neural networks effectively.
- 4. Test neural networks and analyze their performance for different pattern recognition tasks.

UNIT	Торіс	HRS
Ι	Introduction to Soft Computing And Artificial Neural Network: Concept of computing systems, "Soft" computing versus "Hard" computing, Characteristics of Soft computing and its applications. Types of soft computing-Fuzzy Computing, Neural Computing, Genetic Algorithms, Associative Memory, Adaptive Resonance Theory, Classification, Clustering, Bayesian Networks, Probabilistic reasoning Introduction: A Neural Network, Human Brain, Models of a Neuron , Network Architectures. Learning Process: Error Correction Learning, Memory Based Learning, Hebbian Learning, Competitive, Boltzmann Learning. Basic Models, McCulloh-Pitts Neuron, Linear Separability, Hebb Network.	15
	Learning Networks: Supervised Learning Network: Perceptron Networks, Adaptive Linear Neuron, Multiple Adaptive Linear Neurons, Backpropagation Network Associative Memory Networks: Training algorithm for pattern Association,	
Π	Autoassociative memory network, hetero associative memory network, bi-directional associative memory, Hopfield networks.	15

UnSupervised Learning Networks: Fixed weight competitive nets, Kohonen
self-organizing feature maps, counter propagation networks. Third Generation
Neural Networks: Spiking Neural networks, convolutional neural networks,
Introduction to deep learning neural networks

1.Principles of Soft computing S.N.Sivanandam S.N.Deepa, Wiley 3 rd 2019

Neural Networks a Comprehensive Foundations, Simon Haykin, PHI edition.
 Artificial Intelligence and Soft Computing Anandita Battacharya Das SPD 3rd 2018

Soft Computing Using Artificial Neural Networks Practical

COURSE CODE: M23IT1EP01

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture is 120 minutes

Course Objectives:

- 1. Gain knowledge about biological neural networks and create equivalent models of neurons
- 2. Understand the structure, learning algorithms, and challenges associated with feed-forward and feedback neural networks.
- 3. Applications of neural networks to solve problems in varieties of application domains.

Course Outcomes:

Upon completion of this course, students will be able to:

- 1. Construct diverse neural networks with different architectures, including both feed-forward and feedback types.
- 2. Develop models and apply various learning rules to train neural networks effectively.
- 3. Analyze the performance for different pattern recognition tasks.

Sr.No.	Practicals of Soft Computing Using Artificial Neural Networks
	a) Design a simple linear neural network model.
1	b) Calculate the output of the neural net using both binary and bipolar sigmoidal
	functions.
	a) Create a perceptron with an appropriate number of inputs and outputs. Train it
2	using a fixed increment learning algorithm until no change in weights is required.
2	Output the final weights
	b) Implement basic logic gates using ANN
3	a) Implement Universal Logic gates using ANN
	b) Implement XNOR Logic gate using ANN
4	a) Generate AND/NOT function using McCulloch-Pitts neural net.
	b) Generate XOR function using McCulloch-Pitts neural net.
5	a) Write a program to implement Hebb's rule.
	b) Write a program to implement of delta rule.
6	a) Write a program for Back Propagation Algorithm
6	b) Write a program for the error Backpropagation algorithm.
7	Write a program for Hopfield Network.
8	Write a program to implement the Kohonen Self-organizing map
9	Write a program for Linear separation.
10	Write a program for the Hopfield network model for associative memory

Elective (Credit 2+2) Cyber Security

COURSE CODE: M23IT1E02

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- 1. To get the insight of the security loopholes in every aspect of computing.
- 2. To understand the threats and different types of attacks that can be launched on computing systems.
- 3. To know the countermeasures that can be taken to prevent attacks on computing systems.
- 4. To test the software against the attacks.

Course Outcomes:

- 1. Test the security policies, processes, procedures and activities through one central platform that monitors.
- 2. Evaluate the effectiveness of the individual elements and the overall security system of the organization.
- 3. Configure various use cases and detect various attacks across the network and report them in real time and also take appropriate actions.
- 4. Analyze data and events to identify security breaches and take counter measures to defend systems and maintain system integrity.

UNIT	Торіс	HRS			
	Introduction: Information Security, Threats and Attack vectors, Concepts of				
	Hacking – Ethical and Unethical, Information Security Controls, Concepts				
	penetration Testing, Information Security Laws and Standards.				
	Breaching System Security: Concepts, Cracking passwords, Escalating				
	privileges, Executing Applications, Hiding files, covering tracks, penetration				
	testing. Threats due to malware: Concepts, Malware Analysis, Network				
	Sniffing, Social Engineering.				
Ι	I Vulnerability Management Vulnerability Identification Finding Information about a Vulnerability				
	Vulnerability Scan Penetration Assessment Product Vulnerability Management				
	Vulnerability Analysis and Prioritization Vulnerability Remediation Patch				
	Management.				
	Analysis of Vulnerability: Concepts, Assessment Solutions, Scoring Systems,				
	Assessment Tools, Assessment Reports.				
	Identity and Access Management Phases of the Identity and Access				
	Lifecycle Registration and Identity Validation Privileges Provisioning Access				

	Review Access Revocation Password Management Password Creation					
	Password Storage and Transmission Password Reset Password					
	Incident Response Teams Computer Security Incident Response Teams					
	(CSIRTs) Product Security Incident Response Teams (PSIRTs) Security					
	Vulnerabilities and Their Severity Vulnerability Chaining Role in Fixing					
	Prioritization Fixing Theoretical Vulnerabilities Internally Versus Externally					
	Found Vulnerabilities National CSIRTs and Computer Emergency Response					
	Teams (CERTs) Coordination Centers Incident Response Providers and					
	Managed Security Service Providers (MSSPs)					
II	The Art of Data and Event Analysis Normalizing Data Interpreting	15				
	Common Data Values into a Universal Format Using the 5-Tuple Correlation					
	to Respond to Security Incidents Retrospective Analysis and Identifying					
	Malicious Files Identifying a Malicious File Mapping Threat Intelligence					
	with DNS and Other Artifacts Deterministic Versus Probabilistic Analysis					
	Intrusion Event Categories Diamond Model of Intrusion Cyber Kill Chain					
	Evaluating Security of IT Organization Concepts Methodology Tools					
	Countermeasures Penetration Testing Network Scanning: Concents					
	Scanning beyond IDS and firewalls Tools Banner Grabbing Scanning					
	Techniques, Network Diagrams, penetration testing.					

- 1. CCNA Cyber security Operations Companion Guide 1st edition by CISCO ,2018
- 2. CCNA Cyber Ops SECOPS 210-255 Official Cert Guide Omar Santos, Joseph Muniz CISCO 1 st edition, 2017
- 3. CCNA Cyber Ops SECFND 210-250 Official Cert Guide Omar Santos, Joseph Muniz CISCO 1 st edition, 2017
- 4. CEH V10: EC-Council Certified Ethical Hacker Complete Training Guide I.P. Specialist IPSPECIALIST 2018
- 5. CEHv10, Certified Ethical Hacker Study Guide Ric Messier Sybex Wiley 2019
- 6. All in One, Certified Ethical Hacker Matt Walker Tata McGraw Hill 2012

Cyber Security Practical

COURSE CODE: M23IT1EP02

COURSE CREDIT: 02

1 credit - 15 lectures

1 lecture is 120 minutes

Course Objectives:

- 1. To get hands-on training on using various system hacking tools.
- 2. To learn how to evaluate the security strength of systems.
- 3. To analyze various threats and devise countermeasures to protect against these.
- 4. To learn the steps of penetration testing .

Course Outcomes:

- 1. Scan networks and systems for possible threats or vulnerabilities.
- 2. Use various system hacking tools to conduct efficient penetration testing.
- 3. Set firewall security rules that will protect networks and systems.
- 4. Analyze vulnerabilities and devise strong countermeasures to protect against exploitation.

Sr.No.	Practicals of Cyber Security
1	Using the tools for scanning network, IP fragmentation, war dialing countermeasures, SSI Proxy, Censorship circumvention
2	Using NETBIOS Enumeration Tool, SNMP Enumeration tool, LINUX/UNIX Enumeration tools, NTP Enumeration, DNS analyzing Enumeration.
3	Study of System hacking tools, backdoors and trojan tools, sniffing tools, Denial of service attack tools, wireless hacking tools.
4	Encrypting and Decrypting Data Using OpenSSL
5	Demonstrate the use of Snort and Firewall Rules
6	Demonstrate Extract an Executable from a PCAP
7	Demonstrate Analysis of DNS Traffic
8	Analysis of the Security Vulnerabilities of E-commerce services.
9	Study of the features of firewall in providing network security and to set Firewall Security in windows.
10	Steps to ensure Security of any one web browser (Mozilla Firefox/Google Chrome)

Research Methodology (Credit 4) Research Methodology

COURSE CODE: M23IT1RM01

COURSE CREDIT: 04

1 credit - 15 lectures

1 lecture is 60 minutes

Course Objectives:

- 1. To conduct research with an understanding of all the latest theories.
- 2. To develop the ability to explore research techniques used for solving any real world or innovative problem.
- 3. To Promote good scientific practice

Course Outcomes:

- 1. Conduct research using various techniques.
- 2. Publish and present research work
- 3. Conduct interdisciplinary research using tools in IT.

UNIT	Торіс	HRS
Ι	Introduction: The IS and computing disciplines, Evidence-based practice, The Internet and research, What is research?, Rigour and relevance in research, The 6Ps of research The Purpose and Products of Research: Reasons for doing research, Possible products —the outcomes of research, Finding and choosing research topics, Evaluating the purpose and products of research Overview of the Research Process :A model of the research process, Alternative models of the research process, Evaluating the research process	15
II	Internet Research :Background to the Internet and World Wide Web, Internet research topics, The Internet and a literature review, The Internet and research strategies and methods, Internet research, the law and ethics Participants and Research Ethics :The law and research, Rights of people directly involved, Responsibilities of an ethical researcher, Design and creation:projects and ethics, Internet research and ethics, Evaluating research ethics Reviewing the Literature : Purpose of a literature review, Literature resources, The Internet and literature reviews, Conducting a literature review, Evaluating literature reviews	15

III	 Design and Creation : Defining design and creation, Planning and conducting design and creation research, Creative computing and digital art, The Internet and design and creation research, Examples of design and creation research in IS and computing, Evaluating design and creation research Experiments : Defining experiments, Planning and conducting experiments, The Internet and experiments, Examples of experiments in IS and computing research, Evaluating experiment-based research Quantitative Data Analysis : Defining quantitative data analysis, Types of quantitative data, Data coding, Visual aids for quantitative data analysis , Using statistics for quantitative data analysis, Interpretation of data analysis results, Evaluating quantitative data analysis 	15
IV	 Presentation of the Research :Writing up the research, Conference paper presentations, Posters and exhibitions, Software demonstrations, Presenting yourself, PhD vivas, Evaluating presentations Case Studies Recidivism predictions with COMPAS Facial recognition Facebook advertisement targeting 	15

- 1. Researching Information Systems and Computing, Second Edition, Briony J Oates, Marie Griffiths, Rachel McLean , SAGE Publications
- 2. Big Data and Social Science:Data Science Methods and Tools for Research and Practice, Ian Foster, Rayid Ghani, Ron S. Jarmin, Frauke Kreuter, Julia Lane,2nd Edition,CRC Press
- 3. Research Methodology, Methods and Techniques, Kothari, C.R., 1985, Third edition, New Age International.
- 4. Business Research Methods William G.Zikmund, B.J Babin, J.C. Carr, Cengage, 8th Ed

Revised Scheme of Examination Faculty of Science (Postgraduate Programme)

SCHEME OF EXAMINATION (for 100 marks and 4 credits)

The scheme of examination shall be divided into two parts:

- Internal assessment 40%, i.e. 40 marks
- Semester end examination 60%, i.e. 60 marks

(A) Internal Assessment 40 marks

Description	Marks
An internal test of 20 marks	20
One Project And Viva Voce/Presentation/Case Studies/Assignments	15
Attendance and Class Participation	5
Total	40

B) Semester End examination 60 marks

PAPER PATTERN

Duration: 2 hours		
Total Marks:60		
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15	
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15	
Q.3 15 marks OR 15 marks (7 and 8 marks)-Unit 3	15	
Q.4 15 marks OR 15 marks (7 and 8 marks)-Unit 4	15	
Total	60	

Passing criteria: Minimum 40% in Internal (16 out of 40) and 40% (24 out of 60) in semester end examination.

SCHEME OF EXAMINATION (for 50 marks, 2 credits Theory)

The scheme of examination shall be divided into two parts:

- Internal assessment 40% i.e.20 marks
- Semester end examination 60% i.e.30 marks

(A)Internal Assessment 20 marks

Description	Marks
An internal test	10
Assignment	05
Attendance and Class Participation	05
Total	20

B) Semester End examination 30 marks

PAPER PATTERN

Duration: 1 hour	
Total Marks:30	
Q.1 15 marks OR 15 marks (7 and 8 marks)-Unit 1	15
Q.2 15 marks OR 15 marks (7 and 8 marks)-Unit 2	15
Total	30

Passing criteria: Minimum 40% in Internal (08 out of 20) and 40% (12 out of 30) in semester-end examination.

SCHEME OF PRACTICAL EXAMINATION (for 50 marks, 2 credits)

The scheme of examination shall be divided into two parts:

- Internal assessment 40% i.e.20 marks
- Semester end examination 60% i.e.30 marks

(A)Internal Assessment 20 marks

Description	Marks
Practical Internal Assessment	10
Viva	05
Journal	05
Total	20

B) Semester end examination 30 marks

PAPER PATTERN

Duration: 1.5 hours		
Total Marks:30		
Q.1 Practical Q1	15	
Q.2 Practical Q2	15	
Total	30	

Passing criteria: Minimum 40% in Internal (08 out of 20) and 40% (12 out of 30) in the semester-end examination.

Passing Standard

The learners to pass a course shall have to obtain a minimum of 40% marks in each head of passing, consisting of Internal Assessment and Semester End Examination. The learners shall obtain a minimum of 40% marks (i.e. 16 out of 40 or 8 Out of 20) in the Internal Assessment and 40% marks in the Semester End Examination (i.e. 24 Out of 60 or 12 Out of 30) separately, to pass the course and a minimum of Grade D, wherever applicable, to pass a particular semester. A learner will be said to have passed the course if the learner passes the Internal Assessment and Semester End Examination together.