

Resolution No. AC/II/(23-24).2.RPS7

S. P. Mandali's
Ramnarain Ruia Autonomous College
(Affiliated to University of Mumbai)



Syllabus for MSc Information Technology

Program: M.Sc. Part I

Program Code: RPSIT

(As per the guidelines of NEP2020-Academic year 2024-25)

GRADUATE ATTRIBUTE

S. P. Mandali's Ramnarain Ruia Autonomous College has adopted the Outcome Based Education model to make its science graduates globally competent and capable of advancing in their careers. The Masters Program in Science also encourages students to reflect on the broader purpose of their education.

| GA | GA Description |
|-------------|---|
| | A student completing Master's Degree in Science program will be able to: |
| GA 1 | Demonstrate in-depth understanding in the relevant science discipline. Recall, explain, extrapolate and organize conceptual scientific knowledge for execution and application and also to evaluate its relevance. |
| GA 2 | Critically evaluate, analyze and comprehend a scientific problem. Think creatively, experiment and generate a solution independently, check and validate it and modify if necessary. |
| GA 3 | Access, evaluate, understand and compare digital information from various sources and apply it for scientific knowledge acquisition as well as scientific data analysis and presentation. |
| GA 4 | Articulate scientific ideas, put forth a hypothesis, design and execute testing tools and draw relevant inferences. Communicate the research work in appropriate scientific language. |
| GA 5 | Demonstrate initiative, competence and tenacity at the workplace. Successfully plan and execute tasks independently as well as with team members. Effectively communicate and present complex information accurately and appropriately to different groups. |
| GA 6 | Use an objective, unbiased and non-manipulative approach in collection and interpretation of scientific data and avoid plagiarism and violation of Intellectual Property Rights. Appreciate and be sensitive to environmental and sustainability issues and understand its scientific significance and global relevance |
| GA 7 | Translate academic research into innovation and creatively design scientific solutions to problems. Exemplify project plans, use management skills, and lead a team for planning and execution of a task. |
| GA 8 | Understand cross disciplinary relevance of scientific developments and relearn and reskill to adapt to technological advancements. |



PROGRAM OUTCOMES

| PO | Description |
|-------------|---|
| | A student completing Master's Degree in Science program in the subject of Information Technology will be able to: |
| PO 1 | Achieve expertise in various subjects from the broad area of Information technology. |
| PO 2 | Design the solution to real world problems and issues using various software and hardware state of the art tools & softwares. |
| PO 3 | Analyze and compare the existing solutions and tools available to the problems and generate new solutions or tools. |
| PO 4 | Use the techniques, skills and modern computing tools to emerge as a freelancer and entrepreneur in the field. |
| PO 5 | Identify the changing computational domains and adapt the new age technologies and computing domain. |
| PO 6 | Become a responsible citizen totally aware of environmental issues and develop solutions saving the environment. |
| PO 7 | Assimilate professional ethics, managerial and soft skills to emerge as a leader to manage diverse projects in industry |
| PO 8 | Apply domain expertise to pursue research in Computer science and Information Technology discipline. |



PROGRAM OUTLINE

| YEAR | SEM | COURSE CODE | Type of Course | COURSE TITLE | CREDITS |
|---------|-----|----------------|------------------------------|--|---------|
| M.Sc. I | I | RPSIT.O501 | Discipline Specific Core I | Data Science | 3 |
| | | RPSITP.O501 | Practical DSC I | Practical of Data Science | 1 |
| | | RPSIT.O502 | Discipline Specific Core II | Microservices Architecture | 3 |
| | | RPSITP.O502 | Practical DSC II | Practical of Microservices Architecture | 1 |
| | | RPSIT.O503 | Discipline Specific Core III | Blockchain Technology | 3 |
| | | RPSITP.O503 | Practical DSC III | Practical of Blockchain Technology | 1 |
| | | RPSIT.O504 | Skill Enhancement | Professional Ethics | 2 |
| | | RPSRMIT.O505 | RM | Research Methodology | 4 |
| | | RPSIT.O506-I | Discipline Specific Elective | Full Stack Fundamentals | 3 |
| | | RPSITP.O506- | Practical on DSE | Practical of Full Stack Fundamentals | 1 |
| | | RPSIT.O506-II | Discipline Specific Elective | Wireless and Mobile Networks | 3 |
| | | RPSITP.O506-II | Practical on DSE | Practical for Wireless and Mobile Networks | 1 |
| | | RPSIT.E 511 | Discipline Specific Core I | Digital Forensics | 3 |
| | | RPSITP.E512 | Practical DSC II | Practical of Digital Forensics | 1 |
| | | RPSIT.E 512 | Discipline Specific Core II | Big Data Analytics | 3 |

| YEAR | SEM | COURSE CODE | Type of Course | COURSE TITLE | CREDITS |
|------|-----|----------------|---------------------------------|---|---------|
| | | RPSITP.E512 | Practical DSC II | Practical of Big Data Analytics | 1 |
| | | RPSIT.E 513 | Discipline Specific Core III | Machine Learning | 3 |
| | | RPSITP.E513 | Practical DSC III | Practical of Machine Learning | 1 |
| | | RPSIT.E514 | Discipline Specific Core IV | Entrepreneurship Development | 2 |
| | | RPSIT.E515 | On job Training / Field Project | Field Project | 4 |
| | | RPSIT.E516-I | Discipline Specific Elective | Advanced Full Stack | 3 |
| | | RPSITP.E516-I | Practical of DSE | Practical of Advanced Full Stack | 1 |
| | | RPSIT.E516-II | Discipline Specific Elective | Enterprise Application Integration | |
| | | RPSITP.E516-II | Practical of DSE | Practical of Enterprise Application Integration | |



Course Code: RPSIT.O501
Course Title: DATA SCIENCE
Academic year 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|---|
| CO 1 | Develop Analytical solution to Real world data science Problem |
| CO 2 | Apply statistical and mathematical techniques to explore data |
| CO 3 | Compare and Implement various supervised and unsupervised Learning algorithms for specific use cases. |
| CO 4 | Evaluate results of Analytics and suggest Solutions |
| CO 5 | Articulate techniques for handling Time series and Semi-structured data |

| COURSE CODE RPSIT.O501 | DATA SCIENCE | CREDITS 3 / 45 HOURS |
|---------------------------|--|-------------------------|
| I | <p>Introduction to Data Science: What is Data? Different kinds of data, Data Science Process or lifecycle.</p> <p>Data scientist: Role and Profile</p> <p>Pre-requisites for Data science: statistics: Measures, Probability, Hypothesis and Inference ,Linear Algebra: Vectors and Matrices, Calculus: Gradient Descent Strategy</p> <p>Exploratory Data Analysis (EDA): Measures of central tendency and dispersion, Bar plot, Scatter Plot, Line graph, histogram, Box plots, stem-leaf diagram, multi-dimensional modeling</p> | 15 Hrs |
| II | <p>Supervised Learning: Random Forests, Regression,KNN,Application of Artificial neural networks ,Optimization with Genetic Algorithms</p> <p>Unsupervised Learning: Clustering- Advanced hierarchical methods, Model based methods, Grid based method, Constraint based method, density based methods</p> | 15 Hrs |



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| III | <p>Association rules: Frequent Pattern, Apriori, Frequent pattern tree, pattern evaluation, Multidimensional ,multi-level , quantitative associations, Constraint based Pattern generation, Associative Classification and Clustering, Applications</p> <p>Ensemble methods: Increasing the Accuracy, Model Selection and evaluation.</p> <p>Advanced Analytical Theory and Methods</p> <p>Semi-structured systems: Semi-structured data Model, management and querying of data.</p> <p>Time Series Analysis: Overview of Time Series Analysis, ARIMA Model, Additional Methods.</p> <p>Case Studies: Fraud detection, Social network Analysis,Causality,Epidemology.</p> | 15 Hrs |
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PRACTICAL OF RPSIT.O501 (DATA SCIENCE)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Apply tools and techniques for Exploratory Data Analysis |
| CO 2 | Implement supervised and unsupervised algorithms ,Visualizations using programming languages |
| CO 3 | Analyze Time series and Semi structured Data |

| COURSE CODE RPSITP.O501 | COURSE NAME PRACTICAL OF DATA SCIENCE | CREDITS 1 / 15 HOURS |
|----------------------------|--|----------------------|
| | <ol style="list-style-type: none"> 1. Data Cleaning and Pre Processing 2. Exploratory Data Analysis 3. Random Forests 4. DBSCAN 5. Artificial Neural network 6. Genetic Algorithms 7. Association 8. Model validation 9. Data Visualization 10. Semi-structured data analysis 11. Time series | |



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| | Design and implement minimum two case studies based on the subject domain. | |
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Main References:

1. Doing Data Science, Rachel Schutt and Cathy O’Neil, O’Reilly,2013
2. Data Science From Scratch, Joel Grus, O’Reilly,2015
3. J. Han and M. Kamber, ” Data Mining: Concepts and Techniques”, Second Edition, Elsevier, Reprinted2008
4. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services
5. Machine Learning, Tom M. Mitchell
6. Practical Statistics for Data Scientist Peter Bruce and Andrew Bruce, O’Reilly,2017

Additional References:

1. Hands-On Programming with R, Garrett Golemund,1st Edition, 2014
2. An Introduction to Statistical Learning, James, G., Witten, D., Hastie, T., Tibshirani, R.,Springer,2015
3. Machine Learning, 1/e by Subramanian Chandramouli, Amit Kumar Das Saikat Dutt

Course Code: RPSIT.O502
Course Title: MICROSERVICES ARCHITECTURE
Academic Year: 2022-23

| Course Outcomes | After Completing this course student will be able to : |
|------------------------|---|
| CO 1 | Understand and implementing microservices |
| CO 2 | Reconstitute a monolithic system into microservices |
| CO 3 | Develop microservices on FOSS platforms |
| CO 4 | Apply Security mechanism Microservices and deploy them. |



| Course Code RPSIT.O502 | Microservices Architecture | Credits 3 / 45 Hours |
|---|--|-----------------------------|
| UNIT I | <p>Microservices: What Are Microservices? Technology Heterogeneity, Resilience, Scaling, Ease of Deployment, Organizational Alignment, Composability, Optimizing for Replaceability, What About Service-Oriented Architecture?, Other Decompositional Techniques, Shared Libraries, Modules,</p> <p>The Evolutionary Architect: Inaccurate Comparisons, An Evolutionary Vision for the Architect, Zoning, A Principled Approach, Strategic Goals, Principles, Combining Principles and Practices, A Real-World Example, The Required Standard, Monitoring, Interfaces, Architectural Safety, Governance Through Code, Exemplars, Tailored Service Template,</p> <p>Technical Debt, Exception Handling, Governance and Leading from the Center, Building a Team</p> | 15 Hrs |
| UNIT II | <p>Technology Choices, Complexities of Asynchronous Architectures, Services as State Machines, Reactive Extensions , DRY and the Perils of Code Reuse in a Microservice World, Client Libraries, Access by Reference, Versioning, Defer It for as Long as Possible, Catch Breaking Changes Early, Use Semantic Versioning, Coexist Different Endpoints, Use Multiple Concurrent Service Versions, User Interfaces, Toward Digital, Constraints, API Composition, UI Fragment Composition, Backends for Frontends, A Hybrid Approach, Integrating with Third-Party Software , Lack of Control, Customization, Integration Spaghetti, On Your Own Terms, The Strangler Pattern</p> | 15 Hrs |
| UNIT III | <p>Decomposing Monolithic Systems: The Reasons to Split the Monolith, Security, Tangled Dependencies, Getting to Grips with the Problem, Examples, Refactoring Databases, Staging the Break, Transactional Boundaries, Distributed Transactions, Reporting, The Reporting Database, Data Retrieval via Service Calls, Data Pumps, Alternative Destinations, Event Data Pump, Backup Data Pump, Cost of Change, Understanding Root Cause Deployment: A Brief Introduction to Continuous Integration,</p> <p>Mapping Continuous Integration to Microservices, Build Pipelines and Continuous Delivery, And the Inevitable Exceptions, Platform-Specific Artifacts, Operating System</p> | 15 Hrs |



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| | Artifacts, Custom Images, Images as Artifacts, Immutable Servers, Environments, Service Configuration, Service-to-Host Mapping, Multiple Services Per Host, Application Containers, Single Service Per Host, Platform as a Service, Automation, Two Case Studies on the Power of Automation, From Physical to Virtual, Traditional Virtualization, Vagrant, Linux Containers, Docker, A Deployment Interface, Environment | |
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PRACTICAL OF RPSIT.O502 (Microservices Architecture)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Implement microservices for various application |
| CO 2 | Apply the basic concepts of container |
| CO 3 | Use ReactJS to implement microservices |

| Course Code RPSITP.O502 | Practical Of Microservices Architecture | Credits 1 / 15 Hours |
|----------------------------|---|-------------------------|
| | <ol style="list-style-type: none"> 1. Create simple microservice to create TODO app 2. Create a feedback form with backend database connectivity 3. Create microservices for booking app 4. Create microservice to demonstrate use of Runnerly application 5. Create a microservice for chatbot and secure the service. 6. Demonstrate microservices using ReactJS and Flask 7. Demonstrate the working of Strava Token using ReatJS | |



Main References:

1. Python microservices Development Tarek Ziade Packt

Additional References:

1. Kubernetes Microservices with Docker, Deepak Vohra, Apress
2. Microservice Architecture, Irakli Nadareishvali, Ronnie Mitra, Matt McLarty & Mike Amundsen, O'Reilly

Course Code: RPSIT.O503
Course Title: BLOCKCHAIN TECHNOLOGY
Academic year 2024-25

| COURSE OUTCOME | DESCRIPTION |
|----------------|--|
| | After Completing this course student will be able to: |
| CO 1 | Understand Blockchain technology and its application |
| CO 2 | Describe bitcoin working |
| CO 3 | Develop Ethereum application using solidity |
| CO 4 | Explain working of private blockchain using Hyperledger Fabric |
| CO5 | Analyze different blockchain use cases |

DETAILED SYLLABUS

| Course Code RPSIT.O503 | BLOCKCHAIN TECHNOLOGY | Credits 3 / 45 Hours |
|---------------------------|---|-------------------------|
| I | <p>Introduction to Blockchain technology History of blockchain, Properties of blockchain, Centralization vs Decentralization, Consensus, Satoshi Nakamoto's Blockchain Breakthrough, Types of blockchain,Blockchain forking,Structure of block</p> <p>Public blockchain: Bitcoin Overview, Cryptographic keys, Transactions, Blockchain Mining, Bitcoin network, Wallets, Bitcoin payments, Innovation in Bitcoin, Advanced protocols, Bitcoin investment</p> | 15 Hrs |
| II | <p>Public blockchain: Ethereum Overview, Ethereum network, Components of the Ethereum ecosystem, The Ethereum Virtual Machine (EVM), Application</p> | 15 Hrs |



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| | <p>Smart Contracts Solidity Programming –Contracts, Creating Contracts, Visibility and Getters, Function Modifiers, Constant State Variables, Functions, Inheritance, Abstract Contracts, Interfaces, Libraries</p> | |
| III | <p>Private blockchain: Hyperledger Fabric Introduction, Features, Architecture, Requirements, Components of fabric, Working of fabric</p> <p>Blockchain Use cases: Business Use Cases, Technology Use Cases, Legal and Governance Use Cases, Private blockchain Use cases</p> | 15 Hrs |

References:

- Understanding Bitcoin, PEDRO Ransomville
- A Practical Guide to Developing Business, Law, and Technology Solutions, Joseph J. Bambara Paul R. Allen
- Ethereum Smart Contract Development, Mayukh Mukhopadhyay, packt 4. Blockchain A Beginners Guide, Blockchain Hub
- Josh Thompson, „Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming“, Create Space Independent Publishing Platform, First Edition - 2017.
- <https://solidity.readthedocs.io/en/v0.6.2/>
- <https://bitcoin.org/bitcoin.pdf>

PRACTICAL OF RPSIT.O503 (Blockchain Technology)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Implement chain of blocks |
| CO 2 | Design smart contract for various application |
| CO 3 | Illustrate working of DAPP |

| Course Code RPSITP.O503 | Practical of Blockchain Technology | Credit 1 / 15 Hours |
|----------------------------|------------------------------------|------------------------|
| 1 | Double link list implementation | |
| 2 | Cryptography Basics | |
| 3 | Single block generation | |
| 4 | Multiple block generation | |
| 5 | Block mining | |
| 6 | Basic smart contracts | |
| 7 | Advanced smart contract-I | |
| 8 | Advanced smart contract-II | |

COURSE CODE – RPSIT.O504
COURSE TITLE – PROFESSIONAL ETHICS
ACADEMIC YEAR 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|---|
| CO1 | Define what is ethics and identify the principles of ethics. |
| CO2 | Describe and discuss the theory behind ethics and its importance. |
| CO3 | Demonstrate ethical behaviour in his/her profession. |
| CO4 | Analyze the responsibilities and rights of professionals and manage the risks associated. |
| CO5 | Evaluate the need of ethical codes and importance of ethical audits. |
| CO6 | Apply human values and ethics in day-to-day life. |

| Course Code RPSIT.O504 | PROFESSIONAL ETHICS | Credits 2 / 30 Hours |
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| <p>I</p> | <p>Basic Ethics - Introduction, Terminology, Contextual Aspects, Personal Ethics, Professional Ethics, Ethical Dilemmas, Life Skills, Emotional Intelligence, Thoughts on Ethics, Value Education, Dimensions of Ethics, Setting Goals in Life.</p> <p>Profession and Professionalism - Introduction, Profession, Professional, Professionalism Professional Associations, Roles of a Professional, Professional Risks, Professional Accountability, Professional Success, Ethics and Profession, Image of a Profession.</p> <p>Ethical Theories - Basic Ethical Principles, Moral Development Theories Classification of Ethical Theories, Some Basic Theories, Moral Issues.</p> <p>Ethics in Engineering Profession – Engineering Profession, Technology and Society, Engineering as Social Experimentation, Engineering Professionals, Engineering Ethics, Roles of Engineers.</p> <p>Contemporary Matters/Issues in Ethics – Ethical issues in IT, Context of It Ethical issues, IT Professional Ethics, Three Codes of Ethics, Management Conflicts, Privacy & Security.</p> <p>Engineer’s Responsibility for Safety – Safety and Risk, Assessment of Risk, Safety in Engineering, Risk and, Engineers’ Responsibility for Safety, Designing for Safety, Risk–Benefit Analysis, Risk Costs and Management, Principles of Risk Management, Severity and Probability of Risk.</p> | <p>15 Hrs</p> |
| <p>II</p> | <p>Responsibility & Rights of Professionals - Rights and Responsibilities, Professional Responsibilities, Professional Rights.</p> <p>Global Issues – Current Scenario, Business Ethics, Corporate Social Responsibility, Environmental Ethics, Computer Ethics, Media Ethics, War Ethics, Bioethics, Research Ethics, Intellectual Property Rights, Professionals and Ethics.</p> <p>Ethical Codes - Need for Ethical Codes, Sample Codes, Codes from Other Professions, Corporate Codes, Development of Codes, Implementation of Codes, Limitations of Codes.</p> <p>Ethics Audit - Need for Ethics Audit, Ethics Profile of Organizations, Consideration for Ethics Audit, Ethics Standards and Benchmarking, Procedure for Ethics Audit, Ethics Audit Report – Examples, Ethics Indices.</p> | <p>15 Hrs</p> |



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| | <p>Human Values & Attitudes – Terminology, Domains of Learning, Human Values, Value System, Degeneration of Values, Acquiring Values, Attitudes, Values, Attitudes, and Professionals.</p> <p>Ethical Living - Needs of Life, Some Thoughts on Life, Ethical Living, Setting Goals in Life, Ethical Living for Professionals.</p> | |
| <p>References:</p> <ul style="list-style-type: none"> Professional Ethics - Includes Human Values, R. Subramanian, Oxford University Press, 2nd edition Contemporary Issues in Ethics and Information Technology, Robert A. Schultz, IRM Press | | |

Course Code – RPSRMIT.O505
Course Title – Research Methodology
Academic Year 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO1 | Define research, formulate problems and describe the research process and research methods. |
| CO2 | Understand and apply basic research methods including research design, data analysis and interpretation. |
| CO3 | Develop and implement the techniques of data collection, analysis of data and interpretation. |
| CO4 | Understand ethical issues in research, write research report, research paper and publish the paper. |



| Course Code RPSRMIT.O505 | RESEARCH METHODOLOGY | Credits 4 / 60 Hours |
|-----------------------------|---|-------------------------|
| I | <p>About Research</p> <p><u>Foundations of Research:</u> Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable. Research Process.</p> <p><u>Research Design:</u> Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables.</p> <p><u>Qualitative and Quantitative Research:</u> Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.</p> | 15 Hrs |
| II | <p>Statistical Concepts & methods</p> <p><u>Measurement:</u> Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.</p> <p><u>Sampling:</u> Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.</p> <p><u>Data Analysis:</u> Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.</p> <p><u>Problem Identification & Formulation</u> – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis –Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance.</p> | 15 Hrs |



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| <p>III</p> | <p>Preparation of Dissemination of Research</p> <p><u>Interpretation of Data and Paper Writing</u> – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.</p> <p>Use of Encyclopaedia, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.</p> <p>Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism.</p> | <p>15 Hrs</p> |
| <p>IV</p> | <p>Publication</p> <p><u>Technical Writing:</u> Writing a Research Proposal, what is a Scientific Paper? Ethics in Scientific Publishing.</p> <p><u>Preparing the Text:</u> How to Prepare the Title, how to List the Authors and Addresses, how to Prepare the Abstract, how to Write the Introduction, how to Write the Materials and Methods Section, how to Write the Results, how to Write the Discussion, how to State the Acknowledgments, how to Cite the References.</p> <p><u>Preparing the Tables and Figures:</u> How to Design Effective Tables, how to Prepare Effective Graphs, how to Prepare Effective Photographs.</p> <p><u>Publishing the Paper:</u> Rights and Permissions, How to Submit the Manuscript, How and When to Use Abbreviations, How to Write a thesis, Outcome of Research, Ethical issues in research</p> <p>How to measure the impact of Research Publications?</p> | <p>15 Hrs</p> |
| <p>References:</p> <ul style="list-style-type: none"> • Research Methodology – Methods & Techniques, C. R. Kothari, Gaurav Garg, New Age International Publishers, 3rd Edition • Researching Information Systems & Computing, Briony Oates, Sage Publications | | |



Course Code: RPSIT.O506
Course Title: FULL STACK FUNDAMENTALS
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|------------------------|---|
| CO 1 | Identify and define the need of Angular.js in Web Development. |
| CO 2 | Implement MVC / MVT pattern of efficient and quick application development. |
| CO 3 | Develop secure cloud based applications. |
| CO 4 | Work with React & create applications to combine with Angular. |
| CO 5 | Design responsive and interactive web sites using Reactjs. |

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| Course Code | FULL STACK FUNDAMENTALS | Credits 3 / 45 Hours |
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|-------------------|---|--------|
| RPSIT.O506 | | |
| I | <p>Introduction to Angular.js: Getting Ready, Your First AngularJS App, Putting AngularJS in Context, HTML and Bootstrap CSS Primer, JavaScript Primer, Introduction to MVC, Filters and Modules, SportsStore: A Real Application, Navigation and Checkout , Orders and Administration.</p> <p>Working with Anuglar.js: The Anatomy of an AngularJS App, Using Binding and Template Directives, Using Element and Event Directives, Working with Forms, Using Controllers and Scopes, Using Filters, Creating Custom Directives, Creating Complex Directives, Advanced Directive Features.</p> | 15 Hrs |
| II | <p>Angular.js Web Services: Working with Modules and Services, Services and Server Communication , Services for Global Objects, Errors, and Expressions, Services for Ajax and Promises, Services for REST, Services for Views & Organizing Views, Building a single-page application with Angular: Foundations, Building an SPA with Angular: The next level, Authenticating users, managing sessions, and securing APIs.</p> | 15 Hrs |
| III | <p>Introduction to React.JS: Beginner’s Guide to React.JS, Form Validation, Saving Data Using React.JS, Game Creation using React.JS.</p> | 15 Hrs |

PRACTICAL OF RPSIT.O506 (FULL STACK FUNDAMENTALS)

| Course Outcomes | After Completing this course student will be able to : |
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| CO 1 | Demonstrate the working of Angular Framework |
| CO 2 | Apply MVC pattern in the programs |
| CO 3 | Classify code based on React, Node & modify based on database. |

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| Course Code RPSITP.O506 | PRACTICAL OF FULL STACK FUNDAMENTALS | Credits 1 / 15 Hours |
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| 1 | Designing a login page using captcha with the help of a database. | |
| 2 | Designing home page based on some case study. | |
| 3 | Implementing a shopping cart for some case study. | |
| 4 | Designing responsive photo gallery taking some case study | |
| 5 | Designing a data entry form using all the controls studied. | |
| 6 | <p>Design and implement web pages with its various features on various case studies like:</p> <ul style="list-style-type: none"> ● Online shopping portal ● E-school portal ● Online learning platform etc... <p>Students should be able to implement a new idea after doing all the</p> <p>Make use of various technologies like MongoDB, ExpressJS, NodeJS and AngularJS.</p> | |

Main References:

- Pro Angular JS, Adam Freeman, Apress.
- Beginning Angular JS, Andrew Grant, Apress.
- Express.js Guide, The Comprehensive Book on Express.js, Azat Mardan
- Express in Action - Writing, building, and testing Node.js applications, EVAN M. HAHN, Manning
- Professional CodeIgniter®, Thomas Myer, Wrox Publication
- Practical MongoDB Architecting, Developing, and Administering MongoDB, Shakuntala Gupta Edward, Navin Sabharwal, Apress.
- The Definitive Guide to MongoDB - A complete guide to dealing with Big Data using MongoDB, David Hows, Eelco Plugge, Peter Membrey & Tim Hawkins, Apress.

Additional References:

- Getting MEAN with Mongo, Express, Angular, and Node by SIMON HOLMES, Manning
- <https://www.tutorialsteacher.com/angularjs/angularjs-tutorials>
- <https://www.w3schools.com/angular/>
- <https://docs.angularjs.org/tutorial>
- <https://www.tutorialspoint.com/angularjs/index.htm>
- The Little MongoDB, Kari Seguin



- Practical CodeIgniter 3 From the trenches advice and techniques for making the most out of CodeIgniter, Lonnie Ezell
- CodeIgniter for Rapid PHP Application Development, David Upton, PACKT Publishing
- Next Generation Databases NoSQL, NewSQL, and Big Data, Guy Harrison, Apress

Course Code: RPSIT.O506-II
Course Title: Wireless and Mobile Networks
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|------------------------|--|
| CO 1 | Understand Wireless Networking Systems |
| CO 2 | Describe Mobile Technologies and innovations |
| CO 3 | Use wireless networking for developing applications and projects |
| CO 4 | Explain various mobile communication technologies along with wireless systems. |

| Course Code RPSIT.O506 | Wireless and Mobile Networks | Credits 3 / 45 Hours |
|---------------------------|--|-------------------------|
| I | <p>Wireless transmission</p> <p>Frequencies for radio transmission ,Regulations, Signals , Antennas, Signal propagation ,Path loss of radio signals, Additional signal propagation effects, Multi-path propagation ,Multiplexing , Space division multiplexing , Frequency division multiplexing, Time division multiplexing , Code division multiplexing, Modulation, Amplitude shift keying, Frequency shift keying , Phase shift keying , Advanced frequency shift keying, Advanced phase shift keying, Multi-carrier modulation , Spread spectrum , Direct sequence spread spectrum, Frequency hopping spread spectrum, Cellular systems</p> <p>Hidden and exposed terminals, Near and far terminals, SDMA, FDMA, TDMA, Fixed TDM. Classical Aloha, Slotted Aloha, Carrier sense multiple access, Demand assigned multiple access, PRMA packet reservation multiple access, Reservation TDMA, Multiple access with collision avoidance, Polling, inhibit sense multiple access, CDMA, Spread Aloha multiple access, Mobile communications, Comparison of S/ T/ F/ CDMA</p> | 15 Hrs |
| II | <p>Global Systems for Mobile Communication (GSM), GSM Architecture, AMPS, DAMPS, Cordless Telephony, PACS, Third Generation Wireless Standards. Mobility Management: Handoff Techniques, Handoff Detection and Assignment, Types of Handoff, Radio Link transfer, Roaming Management. Frequency Management, Cellular System Spectrum, Adaptive Channel allocation, Frequency Division, Spectrum Utilization, channel reservation for handoff calls, control channels, channel assignment methods, cell splitting. Mobile Computing, Classification of mobile data networks, Cellular digital packet data (CDPD) Systems. Satellite in Mobile Communication. Global Mobile Communication, Interferences in cellular communication, Mobile internet</p> | 15 Hrs |
| III | <p>Wireless Security: Wireless Threats, Authentication and access control, secrecy in communication, Security arrangements in CDMA, Security of wireless data networks, Wireless Local Loop Architecture: Components in WLL, Problems in WLL, Modern Wireless Loop, LDMS, Wireless Application Protocol: Properties of WAP, Bearer Services, WAP Component Integration, WAP Client Support Networks.</p> | 15 Hrs |

Text book:

- "Wireless and Mobile Communication" by T.G. Nakkeeran, R. Palanivelu

References:



- Wireless Communications: Principles and Practice, 2e Paperback – 2010 by Rappaport
- Wireless Communications & Networks, 2e Paperback – 2009 by Stallings
- Mobile Communications, 2e Paperback – 2008 by Schiller

Course Code RPSITP.O506-II

| Course Outcomes | After Completing this course student will be able to : |
|------------------------|---|
| CO 1 | Demonstrate satellite communication |
| CO 2 | Illustrate the wireless local loops. |
| CO 3 | Demonstrate working of an intelligent cell |

| Course Code RPSITP.O506 -II | PRACTICAL OF Wireless and Mobile Networks | Credits 1 / 15 Hours |
|--|---|---------------------------------|
| 1 | Demonstrate Frequency distribution in Cellular Network | |
| 2 | Demonstrate and over in Adhoc networks | |
| 3 | Demonstrate satellite communication with earth stations | |
| 4 | Illustrate the wireless local loops. | |
| 5 | Demonstrate the LDM systems | |
| 6. | Develop a Bluetooth ad hoc network | |
| 7. | Demonstrate the working of an intelligent cell | |
| 8. | Demonstrate MANET | |



SEMESTER II

Course Code: RPSIT.E511
Course Title: DIGITAL FORENSICS
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Understand Digital Forensics Process |
| CO 2 | Study different types of evidences and procedure to maintain integrity |
| CO 4 | Apply evidence acquisition techniques |
| CO 5 | Analyze challenges of Digital forensics process |

| Course Code RPSIT.E511 | DIGITAL FORENSICS | Credits 3 / 45 Hours |
|---------------------------|---|-------------------------|
| I | <p>Computer Forensics Computer Forensics and Investigation Processes, Understanding Computing Investigations, The Investigator's Office and Laboratory, Data Acquisitions</p> <p>Data Recovery Data Recovery and Backup, Role of Data Recovery, Hiding and Recovering Hidden Data. Evidence Collection: Need to Collect the Evidence, Types of Evidence, The Rules of Evidence, Collection Steps, Computer Image Verification and Authentication: Special Needs of Evidence Authentication. Identification of Data: Timekeeping, Forensic Identification and Analysis of Technical Surveillance Devices</p> | 15 L |
| II | <p>Network Forensics Types of digital evidence, Challenges to network evidence, Network forensics methodology, Sources of Network Based Evidence</p> <p>Network Evidence Acquisition and analysis Physical Interception, Traffic Acquisition Software, Active Acquisition, Protocol Analysis, Packet Analysis, Flow Analysis, Higher-Layer Traffic analysis. Statistical Flow Analysis, Collection and Aggregation</p> | 15 L |
| III | <p>Cloud Forensics Need of cloud forensics, usage of forensics, Dimensions of forensics, Challenges in cloud forensics, opportunities in cloud forensics, Evidence Collection in the Cloud, Admissibility of Cloud Evidence</p> <p>Mobile forensics</p> | 15 L |



| | | |
|--|--|--|
| | Mobile attacks, Mobile forensics process, possible evidences, sources of evidences, security mechanism | |
|--|--|--|

References:

- Guide to Computer Forensics and Investigations Bell Nelson, Amelia Phillips, Christopher Steuart, 4th Edition, Cengage Learning.
- Computer Forensics Computer Crime Scene Investigation, John R. Vacca, Second Edition, 2005.
- Network Forensics, Sherri Davidoff, Jonathan HAM, Prentice Hall, 2012.
- Mobile Phone Security and Forensic: A Practical Approach, Second Edition, Iosifl. Andreoulakis, Springer, 2012
- The Basics of Digital Forensics_ The Primer for Getting Started in Digital Forensics, John Sammons

PRACTICAL OF RPSITP.E511 (FULL DIGITAL FORENSICS)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|---|
| CO 1 | Demonstrate tools used for Image acquisition |
| CO 2 | Apply examinations and analysis techniques on digital Evidences |
| CO 3 | Illustrate techniques for data backup and restore |

| Course Code RPSITP.E511 | PRACTICAL OF DIGITAL FORENSICS | Credit 1 / 15 Hours |
|----------------------------|--------------------------------|------------------------|
| 1. | Image acquisition | |
| 2. | Case examination | |
| 3. | Network forensics | |
| 4. | Email forensics | |
| 5. | Browser Forensics | |
| 6. | Steganography tools | |
| 7. | Password cracking tools | |
| 8. | Process monitoring tools | |



Course Code: RPSIT.E512
Course Title: Big Data Analytics
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|------------------------|---|
| CO 1 | Judge the applicability for Big data solution to Use case |
| CO 2 | Interpret Big data Ecosystem and lifecycle |
| CO 3 | Create customised solution using big data technologies to solve real world problems |
| CO 4 | Implement techniques and concepts to handle unstructured data |
| CO 5 | Develop Programs with Map Reduce PAradigm. |

| COURSE CODE RPSIT.E512 | BIG DATA ANALYTICS | CREDITS 3/ 45 Hours |
|----------------------------------|---|----------------------------------|
| UNIT I | <p>INTRODUCTION TO BIG DATA Big Data - From the Business Perspective: Characteristics of Big Data, The 5 Vs of Data, Data in the Warehouse and Data in Hadoop, Importance of Big Data, When to Consider a Big Data Solution Big Data Use Cases: Patterns for Big Data Deployment, IT for IT Log Analytics, The Fraud Detection Pattern, The Social Media Pattern, The Call Centers, Risk: Patterns for Modeling and Management, Big Data and the Energy Sector</p> <p>BIG DATA ANALYTICS FUNDAMENTALS Introduction to Big Data Analytics: Big Data Overview, State of the Practice in Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics Data Analytics Life Cycle: Data Analytics Lifecycle Overview, Discovery, Preparation, Model Planning, Model Building, Communicate Results, Operationalize, Case Study: Global Innovation Network and Analysis (GINA).</p> | 15 Hrs |



| | | |
|----------|--|--------|
| UNIT II | <p>Unstructured data: Basics, Limitations of RDBMS to store unstructured data, Nosql databases: Features, Types, case studies, Natural Language Processing for Text, Introduction to data lake, Data lake Applications and uses</p> | 15 Hrs |
| UNIT III | <p>INTRODUCTION TO MAP REDUCE The map tasks, Grouping by key, The reduce tasks, Combiners, Details of MapReduce Execution, Coping with node failures. Algorithms Using MapReduce: Matrix-Vector Multiplication, Computing Selections and Projections, Union, Intersection, and Difference, Natural Join, sorting, Role of Map reduce.</p> <p>BIG DATA TECHNOLOGIES Fundamentals of Hadoop: Hadoop Ecosystem, Data, Data Storage and Analysis, Querying All Data, Comparison with Other Systems, Moving data in and out of Hadoop The Hadoop Distributed File System: The Design of HDFS, HDFS Concepts, The Command-Line Interface, Hadoop Filesystems, The Java Interface, Data Flow. Hadoop Plugins- Pig fundamentals, working with Hive , Introduction to Spark.</p> | 15 Hrs |

PRACTICAL OF RPSITP.E512 (BIG DATA ANALYTICS)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Use tools of Big data technologies |
| CO 2 | Demonstrate techniques used in data analytics |
| CO 3 | Apply Data visualisation techniques |



| COURSE CODE RPSITP.E512 | PRACTICAL OF BIG DATA ANALYTICS | CREDITS 1 / 15 Hours |
|--|--|-----------------------------|
| | <ol style="list-style-type: none"> 1. Nosql : key- value pair 2. NoSql:column-store 3. NLP 4. Map reduce for Maximum 5. Map reduce for Semi-join 6. Mapreduce for sorting 7. Moving data in and out of hadoop 8. Hadoop plugins <p>Design and implementation of minimum two case studies based on the domain of the subject.</p> | |

References:

1. Understanding Big data , Chris Eaton, Dirk deRoos et al. , McGraw Hill, 2012.
2. Hadoop The Definitive Guide, Tom White, O'Reilly,3rd edition.
3. Hadoop in Practice , Alex Holmes ,Manning Publications Co.
4. Natural Language processing with Python” Analyzing Text with Natural Language Toolkit. - By Steven Bird, Ewan Klein, Edward Loper, O'Reilly Media
5. Data Science and Big Data Analytics: Discovering, Analyzing, Visualizing and Presenting Data, EMC Education Services,2015.
6. Big Data Analytics with R and Hadoop, Vignesh Prajapati, PACKT Publishing,2013.
7. Mining of Massive Datasets, Anand Rajaraman and Jeffrey David Ullman, Cambridge University Press, 2012.
8. Mastering Apache Spark, Mike Frampton, PACKT Publication

Additional References:

1. Professional Hadoop Solutions, Boris Lublinsky, Kevin T. Smith, Alexey Yakubovich, WROX
2. <http://www.bigdatauniversity.com/>
3. EMC Material/Courseware: <https://education.etnc.com/>

Course Code: RPSIT.E513
Course Title: MACHINE LEARNING
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Develop an appreciation for what is involved in learning from data. |
| CO 2 | Understand a wide variety of learning algorithms. |
| CO 3 | Understand how to apply a variety of learning algorithms to data. |
| CO 4 | Understand how to perform evaluation of learning algorithms and model selection. |

| COURSE CODE RPSIT.E513 | MACHINE LEARNING | CREDITS 3/ 45 Hours |
|---------------------------|---|---------------------------|
| UNIT I | Application of Machine Learning, Learning and Generalization, Probability distribution, Product Rule of Probability, Rules of Probability, Classification: Naïve Bayes for text classification, Support vector machines, K-nearest neighbor, Clustering: Which Clustering Algorithm to Use?, Discovering Holes and Data Regions, Learning from Labeled and Unlabeled Examples, learning from Positive and Unlabeled Examples | 15 Hrs |
| UNIT II | Reinforcement Learning, Learning through Awards, Model-Free Reinforcement Learning Model , Q-Learning , Neural Networks and Reinforcement Learning (RPROP), Gradient Descent Reinforcement Learning, Connectionist Q-Learning , State–action–reward–state–action Algorithm(SARSA) ,Monte Carlo | 15 Hrs |
| UNIT III | Deep Learning: Deep forward Networks: Gradient-Based Learning, Hidden Unit, Back-Propagation and Other Differentiation Algorithms. Regularization of Deep Learning: Parameter Norm Penalties, Norm Penalties as Constrained Optimization, Regularization and Under-Constrained Problems, Dataset Augmentation, Noise Robustness, Semi-Supervised Learning, Multi-Task Learning, Early Stopping, Parameter Tying and Parameter Sharing, Sparse Representations | 15 Hrs |

PRACTICAL OF RPSITP.E512 (MACHINE LEARNING)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Apply Artificial neural networks algorithms. |
| CO 2 | Implement different optimization algorithms |
| CO 3 | Design genetics algorithms |

| COURSE CODE RPSITP.E513 | PRACTICAL OF MACHINE LEARNING | CREDITS 1/ 15 Hours |
|----------------------------|---|---------------------------|
| 1 | Apply Bayesian learning to Gene Regulatory Network. | |
| 2 | Show how to apply Bayesian network and machine learning for Biomonitoring systems. | |
| 3 | Implement classification for books in library using Machine Learning and Bayesian methods | |
| 4 | Develop a semantic searching system to generate more relevant results using Machine Learning. | |
| 5 | For a given image/s perform image cleaning and auto enhancement using ML techniques. | |
| 6 | Create a BN to infer different types of biological network from Bayesian structure learning | |
| 7 | Using Deep Learning for spam filter | |
| 8 | Develop and information retrieval system using Deep Learning. | |

References:

1. Bayesian Reasoning and Machine Learning, David Barber
2. Deep Learning Ian Goodfellow, Yoshua Bengio, Aaron Courville MIT Press
3. Web Data Exploring Hyperlinks, Contents, and Usage Data Second Edition by Bing Liu Springer

Course Code: RPSIT.E514
Course Title: ENTREPRENEURSHIP DEVELOPMENT
Academic Year: 2024-25

Course Outcomes:

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Develop Entrepreneurial Mindset among young brains |
| CO 2 | Describe importance of self-employability |
| CO 3 | Understand role of Entrepreneur in the growth of economy and nation |
| CO 4 | Examine the various start-up support systems that are available for Entrepreneurs in India |
| CO 5 | Apply Entrepreneurship as new life-skill |
| CO 6 | Design ideas into sustainable business opportunities |
| CO 7 | Illustrate technology-based innovation into successful business |

| COURSE CODE RPSIT.E514 | COURSE NAME ENTREPRENEURSHIP DEVELOPMENT | CREDITS 2 / 30 HOURS |
|---------------------------|--|-------------------------|
| UNIT I | The Entrepreneurial Mind-Set, Generating And Exploiting New Entries, Creativity And The Business Idea, The Business Plan: Creating And Starting The Venture, The Marketing Plan, Sources Of Capital, Introduction to Entrepreneurial Finance | 15 Hrs |
| UNIT II | New Venture Development and Sources of Financing, The Financial Environment and Small Businesses, Venture Capital Finance, Microfinance Intervention, Understanding and Analysing Financial Statements, Working Capital Management Legal Issues for the Entrepreneur, IPR, Patenting, Trademark, Copyright, Agreements, Licensing | 15 HRs |

Practicals / Exercises

- Case Studies in various areas.

Main References:

- Entrepreneurship, Robert D. Hisrich, Michael Peters, Dean Shepherd
- Entrepreneurial Finance for MSMEs_ A Managerial Approach for Developing Markets

- Handbook on Entrepreneurship Development, BS Rathore and JS Saini, Aapga Publications Panchkula

Additional References:

- Entrepreneurship: Strategies and Resources, Marc J Dollinger, Pearson
- Shaping Entrepreneurial Mindsets - Innovation and Entrepreneurship in Leadership Development, Jordi Canals
- Entrepreneurship: Creating and Leading an Entrepreneurial Organization, Arya Kumar, Pearson
- Women Entrepreneurs: Opportunities, Performance, Problems, SK Dhameja, Deep and Deep Publications, Jaipur
- Entrepreneurship Development in India, CB Gupta and NP Srinivisan, Sultan Chand and Sons, New Delhi
- Entrepreneurial Development, SS Khanka, S Chand and Co. Ltd, New Delhi
- Entrepreneurship Development Small Business Enterprises, Poornima M Charantimath, Pearson
- Global Trends in Entrepreneurship, SK Dhameja, Abhishek Publications Chandigarh
- Entrepreneurship in Knowledge Economy, BS Rathore, DD Sharma, SK Dhameja, Abhishek Publications Chandigarh
- Women and Rural Entrepreneurship in India, DD Sharma, SK Dhameja, Abhishek Publications Chandigarh
- Entrepreneurship and Small Business, JS Saini, SK Dhameja, Rawat Publications Jaipur
- Start and Run A Business From Home_ How to turn your hobby or interest into a business (Small Business Start-Ups), Paul Power

Course Code: RPSIT.E515
Course Title: FIELD PROJECT
Academic Year: 2024-25

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Demonstrate the knowledge about the culture and societal |
| CO 2 | Develop sense of responsibility and bond with the local |
| CO 3 | Apply knowledge gained towards significant contributions to the local community and the Society at large |
| CO 4 | Identify opportunities for contribution to the Socio-economic |

| COURSE CODE RPSIT.E515 | PROJECT | CREDITS 4 / 60 Hours |
|--|---------|-------------------------|
| Course Objective: <ul style="list-style-type: none"> ● To make students use their knowledge in solving real world problems. ● To encourage students to take up some research-based projects. ● To encourage students to use the tools/technologies they learn for implementing their ideas. | | |
| <p>The student is expected to give a presentation of the project proposed and get verified and sanctioned by the project guide. In addition, experimental setup, analysis of results, comparison with results of related works, conclusion and future prospects will be part of the project implementation. A student is expected to make a project implementation report and appear for a project viva.</p> | | |

Course Code: RPSIT.E516-I
Course Title: ADVANCED FULL STACK
Academic Year: 2024-25

| Course Outcomes | Description |
|-----------------|---|
| CO 1 | Identify and define the need of Node.js in Web Development. |
| CO 2 | Implement MVC pattern of efficient and quick application development. |
| CO 3 | Develop secure cloud based applications. |
| CO 4 | Use Modern Database technology like MongoDB. |
| CO 5 | Design responsive and interactive web sites. |

| COURSE CODE RPSIT.E516 | ADVANCED FULL STACK | CREDITS / 45 HOURS |
|---------------------------|---|-----------------------|
| UNIT I | <p>Introduction to Node.JS: Setting Up & Understanding Node.js Development, Core Node.js, Node.js Packages, Events and Streams, Getting Started with HTTP, Introducing Express to Create Node.js Web Apps, Persisting Data with MongoDB Simplifying Callbacks.</p> <p>Building Applications with Node.JS: Using token based Authorize and Authenticate, Real-Time Apps with WebSocket, Socket.IO, (Getting Node.js Apps Production Ready, Deploying Node.js Apps, Debugging & Testing, Deploying-Publishing and Scalability of NOde.JS Apps, Modules and contributing to Open Source)</p> | 15 Hrs |
| UNIT II | <p>Working with Express.JS Framework: Introduction, Quickstart, The Interface, Tips & Tricks, Examples, Building a Web server with Express, Foundations of Express, Middleware, Routing, Building APIs, (Views and templates: Pug and EJS,)</p> | 15 Hrs |
| UNIT III | <p>Building a data model with MongoDB and Mongoose, Writing a REST API: Exposing the MongoDB database to the application, Consuming a REST API: Using an API from inside Express Persisting your data with MongoDB, Testing Express applications, Security, Best practice.</p> | 15 Hrs |

PRACTICAL OF RPSITP.E512 (ADVANCED FULL STACK)

| Course Outcomes | After Completing this course student will be able to : |
|-----------------|--|
| CO 1 | Demonstrate the working of Node Js & Express Js |
| CO 2 | Apply & modify Express with Mongoddb |
| CO 3 | Demonstrate code based on Express, React, Node & modify based on database. |

| COURSE CODE RPSITP.E516 | COURSE TITLE PRACTICAL OF ADVANCED FULL STACK | Credits 1/ 15 Hours |
|----------------------------|---|------------------------|
| | Design and implement web pages with its various features on various case studies like: <ul style="list-style-type: none"> ● Online shopping portal ● E-school portal ● Online learning platform etc... Students should be able to implement a new idea after doing all the Make use of various technologies like MongoDB, ExpressJS, NodeJS and ReactJS. | |

Main References:

1. Beginning Node.JS, Basarat Ali Khan, Apress.
2. Practical Node.JS Building Real-world Scalable Web Apps, Azat Mardan. Apress.
3. MERN Quickstart Guide - Build web applications with MongoDB, Express.js, React, and Node, Eddy Wilson Iriarte Koroliova, Packt.
4. Express.JS Guide - The Comprehensive Book on Express.JS, Azat Mardan, Leanpub.
5. The Complete Beginner's Guide to React, Kristen Dyrr.

Additional References:

1. Web Development with Node & Express, Ethan Brown, O'Reilly.
2. The Express Handbook, Flavico Copes
3. Node.JS Notes for Professionals
4. <https://www.w3schools.com/nodejs/>
5. <https://www.tutorialspoint.com/nodejs/index.htm>
6. <https://www.javatpoint.com/nodejs-tutorial>
7. <https://www.tutorialspoint.com/reactjs/index.htm>
8. <https://reactjs.org/tutorial/tutorial.html>
9. https://www.w3schools.com/whatis/whatis_react.asp
10. <https://www.tutorialspoint.com/expressjs/index.htm>
11. <https://www.javatpoint.com/expressjs-tutorial>
12. <https://expressjs.com/>



Course Code: RPSIT.E516-II
Course Title: Enterprise Application Integration
Academic Year: 2024-25

| Course Outcomes | Description |
|------------------------|---|
| CO 1 | Define your specific integration problem in a useful form that enables a real solution |
| CO 2 | Develop your own EAI architecture and ensure interoperability of legacy technology applications |
| CO 3 | Choose the best among messaging architecture, object architecture, and transaction architecture |
| CO4 | Choose best implementation technologies |

| COURSE CODE RPSIT.E516-II | Enterprise Application Integration | CREDITS / 45 HOURS |
|--------------------------------------|---|-------------------------------|
| UNIT I | <p>What Is EAI?, Traditional Systems, Microcomputer Systems, Distributed Systems, Packaged Applications, Making the Business Case for EAI, The Virtual System, e-Business, Types of EAI, Middleware and EAI</p> <p>Data-Level EAI: Data-Level EAI by Example, Database-to-Database EAI, Federated Database EAI, Consider the Data Source, Relational Data, Object-Oriented, Multidimensional, Other Data Storage Models, Hierarchical, ISAM and VSAM, CODASYL, Adabas, Working with Data-Level EAI</p> | 15 Hrs |
| UNIT II | <p>Application Interface-Level EAI: Application Interfaces, What's an API?, Interface by Example, Approaching Application Interfaces, The Interface Tradeoff, Packaged Applications, Packaged Application Technology Architecture, Packaged Application APIs, Types of Services, Types of Interfaces, Other Interfaces, Vertical Market Application Interfaces, SWIFT, FIX, HL7, Custom Applications, Rolling Your Own API, Application Wrapping, Using Application, Interfaces</p> <p>Method-Level EAI: Method-Level Example, What's a Process? Scenarios, Rules, Logic, Data, Objects, Method Warehousing, Leveraging, frameworks for EAI, The Value of Frameworks,</p> | 15 Hrs |



| | | |
|-----------------|---|---------------|
| | <p>Framework Functionality, framework Types, Service Frameworks, Procedural Frameworks, Component Frameworks, Framework Categories, Application Service Frameworks, Domain Frameworks, Support Frameworks, Enabling Technology, Application or Transaction Servers, Message Brokers, Distributed Objects, Sharing Methods to Bind Your Enterprise</p> | |
| <p>UNIT III</p> | <p>User Interface-Level EAI: Leveraging User Interface-Level EAI, Going to the User Interface, Understanding the Application, Creating the Screen Catalog, Mapping Screens, Finding the Information, Static Extraction, Dynamic Extraction, Error Processing, Approaches, Screens-as-Data, Screens-as-Objects, Enabling Technology, Screen Access Tricks, HLLAPI, ASCII or ANSI, OLE Automation, Screens as Objects,</p> <p>The EAI Process: 12 Step process model.</p> <p>Java Middleware and EAI: Categories of Java Middleware Standards, Database-Oriented, Interprocess, Message-Oriented, Messaging Models, JMS and Application Development, Application-Hosting, Distributed Objects</p> <p>XML and EAI: the Rise of XML, What's XML?, Data Structures, DTDs, XML Parsers, XML Metadata, XML and Middleware, Persistent XML, RDF and EAI, XSL and EAI, XML and EAI</p> | <p>15 Hrs</p> |

Course Code: RPSITP.E516-II

| Course Outcomes | After Completing this course student will be able to: |
|-----------------|---|
| CO 1 | Illustrate different techniques of integrating data from multiple sources |
| CO 2 | Demonstrate data exchange in EAI |
| CO 3 | Design application using API |

| COURSE CODE RPSIT.E516 | Enterprise Application Integration | Credit 1/15 |
|---------------------------|---|-------------|
| 1. | Demonstrate usage of middleware in e-business application. | |
| 2. | Develop a database connector to integrate data from various sources into a single data model. | |
| 3. | Demonstrate the working of distributed objects in an application. | |



| | | |
|---|--|--|
| 4 | Demonstrate Message broker as a Middleware for EAI | |
| 5 | Bank teller application to demonstrate API. | |
| 6 | Develop API for a dummy travel website on appropriate EAI framework. | |
| 7 | Demonstrate working of User interface level EAI | |
| 8 | Demonstrate data exchange in EAI app using XML. | |

Text book:

- Enterprise Application Integration by David S. Linthicum Addison-Wesley Information Technology Series
- Next-Generation Application Integration: From Simple Information to Web Services 1st Edition by Mary O'Brien (Author), David Linthicum (Author), John Fuller (Series Editor)

MODALITY OF ASSESSMENT-DSC/DSE (FOR 3 CREDITS)

Theory Examination Pattern:**A) Internal Assessment (40%) - 30 Marks**

| Sr No | Evaluation type | Marks |
|-------|---|-----------|
| 1 | Class Test | 20 |
| 2 | Class Test/ Project / Assignment / Presentation | 10 |
| | TOTAL | 30 |

B) External Examination (Semester End 60%) - 45 Marks**Semester End Theory Examination:**

1. Duration – The duration for these examinations shall be of **two hours**.
2. Theory question paper pattern:

Paper Pattern:

| Questions | Options | Marks | Questions Based on |
|-----------|--|-----------|--------------------|
| 1 | 3 questions of 5 M each from 4 Questions | 15 | Unit I |
| 2 | 3 questions of 5 M each from 4 Questions | 15 | Unit II |
| 3 | 3 questions of 5 M each from 4 Questions | 15 | Unit III |
| | TOTAL | 45 | |

Practical Examination Pattern:**A) External Assessment Semester End - 50 Marks**

| Sr No | Evaluation type | Marks |
|-------|---|-----------|
| 1 | Practical Implementation for the given question | 40 |
| 2 | Attendance, Punctuality and Lab discipline/Practice | 10 |
| | TOTAL | 50 |

MODALITY OF ASSESSMENT-DSC/DSE (FOR 2 CREDITS)



Theory Examination Pattern:

A) External Examination - 50 Marks

Semester End Theory Examination:

1. Duration – The duration for these examinations shall be of **two hours**.
2. Theory question paper pattern:

Paper Pattern:

| Questions | Options | Marks | Questions Based on |
|-----------|--|-----------|--------------------|
| 1 | 5 questions of 5 M each from 6 Questions OR 7/8 marks questions with option to any one | 25 | Unit I |
| 2 | 5 questions of 5 M each from 6 Questions OR 7/8 marks questions with option to any one | 25 | Unit II |
| | TOTAL | 50 | |

MODALITY OF ASSESSMENT – RESEARCH METHODOLOGY

Theory Examination Pattern:

A) Internal Assessment (40%) - 40 Marks

| Sr No | Evaluation type | Marks |
|-------|--|-----------|
| 1 | Class Test | 20 |
| 2 | Scientific Writing assignment (Abstract /Research Article), Research Review/ Research Proposal Writing | 20 |
| | TOTAL | 40 |

B) External Examination (60%) - 60 Marks**Semester End Theory Examination:**

1. Duration – The duration for these examinations shall be of **two Hours**.
2. Theory question paper pattern:

Paper Pattern:

| Question | Options | Marks | Questions Based on |
|----------|--|-------|--------------------|
| 1 | 3 questions of 5 M each from 4 Questions OR 7/8 marks questions with option to any one | 15 | Unit I |
| 2 | 3 questions of 5 M each from 4 Questions OR 7/8 marks questions with option to any one | 15 | Unit II |
| 3 | 3 questions of 5 M each from 4 Questions OR 7/8 marks questions with option to any one | 15 | Unit III |
| 4 | 3 questions of 5 M each from 4 Questions OR 7/8 marks questions with option to any one | 15 | Unit IV |
| | TOTAL | | |

MODALITY OF ASSESSMENT – FIELD PROJECT**A) Internal Assessment (40%) - 40 Marks**

| Sr No | Evaluation type | Marks |
|-------|--|-----------|
| 1 | Abstract submission & literature Survey / Sample Data Collection | 10 |
| 2 | Technology Implementation | 10 |
| 3 | Adherence to the project schedule | 10 |
| 4 | Project Documentation | 10 |
| | TOTAL | 40 |

B) External Assessment (60%) - 60 Marks

| Sr No | Evaluation type | Marks |
|-------|------------------------|-----------|
| 1 | Project Quality | 20 |
| 2 | Project Implementation | 20 |
| 3 | Final Presentation | 20 |
| | TOTAL | 60 |

A Student should submit project implementation report with following details:

1. **Title:** Title of the project.
2. **Implementation details:** A description of how the project has been implemented. It shall be of 2 to 4 pages.
3. **Experimental set up and results:** A detailed explanation on how experiments were conducted, what software used and the results obtained. Details like screenshots, tables and graphs can come here. It shall be of 6 to 10 pages.
4. **Analysis of the results:** A description on what the results means and how they have been arrived at. Different performing measures or statistical tools used etc may be part of this. It shall be of 4 to 6 pages.
5. **Conclusion:** A conclusion of the project performed in terms of its outcome (May be half a page).
6. **Future enhancement:** A small description on what enhancement can be done when more time and resources are available (May be half a page).
7. **Program code & Output:** The program code may be given as an appendix.

Note:

1. Students have to acquire at least 40% marks in project evaluation.
2. Internal evaluation will be done by the Project guide allotted.
3. Timely submission on google classroom as per requirement is must, regularity will be determined based on that.
4. Attendance should be 75%.