Resolution No. AC/II/(24-25).2.RPS7

S. P. Mandali's

Ramnarain Ruia Autonomous College

(Affiliated to University of Mumbai)

RUIA COLLEGE
Explore • Experience • Excel

Syllabus for MSc Information Technology

Program: M.Sc. Part II

Program Code: RPSIT

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

GRADUATE PROGRAM

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 Bachelors 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.
PSO 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. INFORMATION TECHNOLOGY PART II – SEMESTER III					
M.Sc. IT Part II .	III	RPSITO601	Discipline Specific Core I	Cloud Computing	3
		RPSITPO601	Practical DSC I	Practical of Cloud Computing	1
		RPSITO602	Discipline Specific Core II	Advanced IoT	3
		RPSITPO602	Practical DSC II	Practical of Advanced IoT	1
		RPSITO603	Discipline Specific Core III	Middleware Technology	3
		RPSITPO603	Practical DSC III	Practical of Middleware Technology	1
		RPSRPITO605	RM	Research Project	6
		RPSEITO604 - I	Discipline Specific Elective I	UX/UI	3
		RPSEITPO604 - I	Practical on DSE I	Practical of UX/UI	1
		RPSEITO604 - II	Discipline Specific Elective II	CRM	3
		RPSEITPO604 - II	Practical on DSE II	Practical for CRM	1
M.Sc. INFORMATION TECHNOLOGY PART II – SEMESTER IV					
M.Sc. IT Part II	IV	RPSITE611	Discipline Specific Core I	Robotic Process Automation	3
		RPSITPE611	Practical DSC II	Practical of Robotic Process Automation	1
		RPSITE612	Discipline Specific Core II	Speech Analysis	3
		RPSITPE612	Practical DSC Core II	Practical of Speech Analysis	1
		RPSINTITE614	On job Training / Internship	Internship	10

YEAR	SEM	COURSE CODE	TYPE OF COURSE	COURSE TITLE	CREDITS
		RPSEITE613 - I	Discipline Specific Elective I	Penetration Testing	3
		RPSEITPE613 - I	Practical of DSE I	Practical of Penetration Testing	1
		RPSEITE613 - II	Discipline Specific Elective II	Digital Image Processing	3
		RPSEITPE613 - II	Practical of DSE II	Practical of Digital Image Processing	1

COURSE CODE: RPSITO601
COURSE TITLE: CLOUD COMPUTING

Course Outcomes	After Completing this course student will be able to :
CO 1	Explain the Cloud Computing, Parallel Computing & Virtualization concepts
CO 2	Discuss the Cloud Architecture and its Implementation
CO 3	Demonstrate Cloud Programming and various Software Platforms and Environment
CO 4	Discuss the role of Mobile Computing and its importance in today's world
CO 5	Illustrate various Security & Privacy concepts in Cloud Computing

UNITS	COURSE NAME CLOUD COMPUTING	CREDITS 3 HOURS 45
I	**Distributed System Models and Enabling Technologies:** Scalable Computing Service over the Internet, Technologies for Network-Based Systems, System Models for Distributed and Cloud Computing, Software Environments for Distributed Systems and Clouds, Performance, Security and Energy Efficiency Computer Clusters for scalable parallel computing: Clustering for massive parallelism **Virtual machines and Virtualization of clusters and Data centers:** Implementation levels of virtualization, Virtualization Structures/Tools and Mechanisms, Virtualization of CPU, Memory & I/O Devices, Virtual Cluster Resource Management, Virtualization for Data Center Automation.	15 L
II	**Cloud Platform Architecture over Virtualized Data Centers:** Cloud Computing & Service Models, Data Center Design and Interconnection Networks, Architectural Design of Compute and Storage Clouds, Public Cloud Platforms: GAE, AWS and AZURE, Inter-cloud Resource Management, Cloud Security and Trust Management. **Cloud Programming and Software Environments:** Features of Cloud and Grid Platforms, Parallel and Distributed Programming Paradigms, Programming Support of Google App Engine, Programming on Amazon AWS and Microsoft Azure, Emerging Cloud Software Environments.	15 L

III	**Cloud Computing for Mobility:** Mobile Computing, Mobile Cloud Computing, Offloading in Mobile Cloud Computing, Green Mobile Cloud Computing, Resource Allocation in Mobile Cloud Computing, Sensor Mobile Cloud Computing, Mobile Social Cloud Computing, Application of Mobile Cloud Computing.	15 L

COURSE CODE: RPSITPO601
COURSE TITLE: PRACTICAL OF CLOUD COMPUTING

Course Outcomes	After Completing this course student will be able to :
CO 1	Compare and choose various cloud service platform (IAAS, PAAS, SAAS)
CO 2	Choose various softwares for deploying cloud infrastructure
CO 3	Demonstrate the deployment of various services in the cloud

Sr. No.	PRACTICAL OF CLOUD COMPUTING	CREDITS 1
	1. Create virtual networks of windows 7 systems using VMWare Technologies. 2. Create a Windows based client-server system using Windows 2012 Hyper-V. 3. Create a Linux based client-server system using Citrix Xen Server 4. Implement server clusters using Windows 2012 Hyper-V. 5. Working with a Cloud Management Software(OpenNebula/Eucalyptus) 6. Create a small website application using Google App Engine 7. Create a small website application using Windows Azure 8. Implement MapReduce and Hadoop 9. Using cloud database for storage. (Google/AWS etc)	

References:

1. Kai Hwang, Jack Dongarra, Geoffrey Fox: Distributed and Cloud Computing, From Parallel Processing to the Internet of Things, MK Publishers, 2012.

2. MOBILE CLOUD COMPUTING - Architectures, Algorithms and Applications, Debashis De

Additional Reference:

1. Michael Miller, Cloud Computing: Web-Based Applications that change the Way you work and collaborate Online, Pearson Publication, 2012.
2. Anthony T. Velte, Toby J. Velte, Robert Elsenpeter: Cloud Computing, A Practical Approach, McGraw Fill, 2010.

COURSE CODE: RPSITO602
COURSE TITLE: ADVANCED IOT

Course Outcomes	After Completing this course student will be able to :
CO 1	Identify and Define the Industrial Internet of Things.
CO 2	Design the prototype and give solutions for the real world problems.
CO 3	Develop smart applications with the help of smart devices.
CO 4	Demonstrate the implementation of IoT based applications in the Cloud.
CO 5	Propose and apply automation in industry.

UNITS	ADVANCED IoT	CREDITS 3 HOURS 45
I	**IoT Ecosystems Concepts and Architecture:** Internet of Things An Overview, Open Source Semantic Web Infrastructure for Managing IoT Resources in the Cloud, Device/Cloud Collaboration Framework for Intelligence Applications, Fog Computing: Principles, Architectures and Applications, Programming Frameworks For Internet Of Things, Security And Privacy In The Internet Of Things, Cloud-Based Smart-Facilities Management.	15 L
II	**Industrial Internet of Things:** Introduction to the Industrial Internet, Industrial Internet Use-Cases, The Technical and Business Innovators of the Industrial Internet, IIoT Reference Architecture, Designing Industrial Internet Systems, Examining the Access Network Technology and Protocols, Examining the Middleware Transport Protocols.	15 L

III	**Software's, Protocols and Technologies:** Middleware Software Patterns, Software Design Concepts, Middleware Industrial Internet of Things Platforms, IIoT WAN Technologies and Protocols, Introducing Industry 4.0, Defining IOt Analytics & Challenges, IoT Analytics for Cloud **IoT Applications:** Smart Metering/Advanced Metering Infrastructure, e-Health/Body Area Networks, City Automation, Automotive Applications, Home Automation, Smart Cards, Tracking (Following and Monitoring Mobile Objects), Over-The-Air-Passive Surveillance/Ring of Steel, Control Application Examples, Myriad Other Applications, Smart Factories.	15 L

COURSE CODE: RPSITPO602
COURSE TITLE: PRACTICALS OF ADVANCED IOT

Course Outcomes	After Completing this course student will be able to :
CO 1	Demonstrate the deep understanding of advanced IOT architectures.
CO 2	Choose various IoT devices, sensors, actuators for solving real world problems.
CO 3	Use IoT devices and integrate data with cloud platforms.

Sr. No.	PRACTICAL OF ADVANCED IoT	CREDITS 1
1	Interfacing Sensors (Gas,Water,Fire,Touch etc). Relay Board and Communication with telegram and Display status on 16x2 LCD ie M2M Communication	
2	Interfacing Temperature and Humidity sensor with Cloud and Sending Tweet if temperature and Humidity are beyond set range	
3	Python Flask Server Trigger a set of led Gpios on the pi via a Python Flask web server	
4	MQTT connecting Pis Setup a Mosquito MQTT server and client and write a Python script to communicate data between Pi's And MQTT GYRO Interface with an Accelerometer Gyro Mpu6050 on the i2c bus and send sensor values over the internet via mqtt.	
5	Design Intruder using PIR Sensor and Pi Camera which send Email when Someone is on Door	
6	Design App to Communicate with Device connected to RPi and Display Status of Sensor on App	

7	Using NodeMCU Design Sensor Node, Collect information using Raspberry Pi and Display on Cloud
8	Voice Control of Devices using Blynk, IFTTT and Webhooks
9	Working with IoT cloud platforms - IBM Watson, Google IoT, AWS IoT etc
10	Exploring IoT Simulation Environment

Main References:

1. Internet of Things Principles and Paradigm, Rajkumar Buyya, Amir Vahid Dastjerdi, Morgan Kaufman
2. Industry 4.0 - The Industrial Internet Of Things, Alasdair Gilchrist, Apress
3. Building The Internet of Things with IPv6 and MIPv6, Daniel Minoli, Wiley
4. Analytics for the Internet of Things, Andrew Minteer, Packt

Additional References:

- Interconnecting Smart Objects with IP The Next Internet, Jean-Philippe Vasseur, Adam Dunkels, Morgan Kaufmann Publishers
- Getting Started with Raspberry Pi Zero, Richard Grimmett, Packt
- Getting Started with the Internet of Things, Cuno Pfister, O'Reilly

COURSE CODE: RPSITO603
COURSE TITLE: MIDDLEWARE TECHNOLOGY

Course Outcome	At the end of the course, students will be able to
CO 1	Identify role in facilitating communication and data exchange between disparate systems
CO 2	Design and implement middleware solutions to solve specific problems
CO 3	Develop and deploy middleware platforms and tools
CO 4	Demonstrate different types of middleware

UNITS	MIDDLEWARE TECHNOLOGY	CREDITS 3 HOURS 45
I	Distributed Information Systems, Layers of Information System, Top Down and Button Up Design of Information System, Architecture of an Information System - 1, 2, 3, and N-tier Architctures, Communication in Information System - Synchronous/ Blocking Calls and Asynchronous/ Non-Blockiing Calls Introduction and Overview of Middleware, Characteristics, Advantages and Disadvantages, Communication Models - Client-Server, Peer to Peer, Publish-Subscribe.	15 L
II	Types Of Midlleware: RPC, TP-Monitors, Object Brokers, Object Monitors, Message-Oriented, How RPC Works, Binding in RPC, Extension to RPC, TP Monitors, Functionality and Architecture of TP Monitors, Object Brokers - Corba, Message-Oriented Middlewares, Message Queues, Transactional Queue.	15 L
III	Introduction to Webservices, Need for B2B integrations and limitations of Conventional Middlewares, Service Description, Service Discovery, Service Interaction, Composition, Infrastructure for Web Services, Simple Object Access Protocol (SOAP), Structure and Content of SOAP, Simple Implementation of SOAP, Web Services Description Language(WSDL), Structure of a WSDL Interface, RESTful WebService, HTTP Libraries, XML and JSON Parsers, Resource Oriented Architecture, URIs, Addressability, Statelessness, Application State Versus Resource State, Uniform Interface - GET, PUT, DELETE, HEAD, OPTIONS, POST, Safety and Idempotence Introduction to Serverless technologies - Function as a service, AWS S3, AWS Lambda, AWS Api Gateway GraphQL	15 L

COURSE CODE: RPSITPO603
COURSE TITLE: PRACTICALS OF MIDDLEWARE TECHNOLOGY

Course Outcome	Description At the end of the course, students will be able to
CO 1	Demonstrate Middleware-Based Projects
CO 2	Choose different middleware architectures and their impact on system performance, reliability, and scalability.
CO 3	Implement appropriate measures to ensure secure communication and data handling.

SR. NO.	MIDDLEWARE TECHNOLOGY	CREDITS 1
1	**Demonstrate Client-Server Architecture**	
2	Demonstrate Publish-Subscribe Communication Model	
3	Demonstrate Synchronous Calls	
4	Demonstrate 3-Tier Architecture	
5	Demonstrate Message Queues	
6	Demonstrate RPC	
7	Demonstrate SOAP API	
8	Demonstrate JSON Parsing in 2 programming languages	
9	Demonstrate use of any 1 HTTP Library	
10	Demonstrate RESTful AP	

Reference Books -

1. Web Services-Concepts, Architectures and Applications By Gustavo Alonso, Fabio Casati, Harumi Kuno, Vijay Machiraju

2. RESTful Web Services By Leonard Richardson and Sam Ruby

COURSE CODE: RPSRPITO605
COURSE TITLE: RESEARCH PROJECT

Course Outcomes	After Completing this course student will be able to :
CO 1	Demonstrate the ability to plan and manage projects effectively.
CO 2	Develop problem-solving and critical thinking skills to solve real world problems.
CO 3	Demonstrate proficiency in technical skills relevant to their chosen projects like programming languages and tools.
CO 4	Develop research skills by conducting literature reviews, gathering and analysing relevant information.

RPSRPITO605	COURSE NAME RESEARCH PROJECT	CREDITS 6 HOURS 90
The syllabus proposes project implementation as part of the semester–IV. 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. He or she needs to spend around 200-250 hours on the project implementation for which the student will be awarded 6 credits.		

COURSE CODE: RPSEITO604 - I
COURSE TITLE: UX / UI DESIGNING

Course Outcomes	After Completing this course student will be able to :
CO 1	Demonstrate a solid understanding of user experience (UX) and user interface (UI) design principles.
CO 2	Organise user research activities such as user interviews, surveys, usability testing, understand user needs, preferences, and behaviours.
CO 3	Choose the process of UX/UI design that includes prototyping, evaluation and implementation.
CO 4	Discuss the principles of interaction design and be able to design intuitive and engaging user interactions.

UNITS	UX / UI DESIGNING	CREDITS 3 HOURS 45
I	**Introduction and Elements of UX Designing:** Introduction to UX Designing, User Experience and Why It Matters, Meet the Elements, The Strategy Plane, The Scope Plane, The Structure Plane, The Skeleton Plane, The Surface Plane.	15 L
II	**UX Designing Process: The Wheel:** A Lifecycle Template, Contextual Inquiry: Eliciting Work Activity Data, Contextual Analysis: Consolidating and Interpreting Work Activity Data, Extracting Interaction Design Requirements, Constructing Design-Informing Models, Design Thinking, Ideation, and Sketching, Mental Models and Conceptual Design, Design Production, UX Goals, Metrics, and Targets, Prototyping.	15 L
III	**User Experience Research Techniques:** Research Planning, Competitive Research, Universal Tools: Recruiting and Interviewing, Focus Groups, More Than Words: Object-Based Techniques, Field Visits: Learning from Observation, Diary Studies, Usability Tests, Surveys, Global and Cross-Cultural Research, Others' Hard Work: Published Information and Consultants, Analyzing Qualitative Data, Automatically Gathered Information: Usage Data and Customer Feedback. **Introduction to UI Designing:** A Design Process for Digital Products, Understanding the Problem, Designing the Product, Digital Etiquette, Designing for the Web, Design Details: Controls and Dialogs	15 L

COURSE CODE: RPSEITPO604 - I
COURSE TITLE: PRACTICAL OF UX / UI DESIGNING

Course Outcomes	After Completing this course student will be able to :
CO 1	Use prototyping tools to create interactive prototypes of digital interfaces.
CO 2	Design engaging and intuitive interactions for digital interfaces, including microinteractions such as animations, transitions and error handling.
CO 3	Choose the industry-standard UX/UI design tools and technologies, such as Adobe XD, Sketch, Figma, InVision, Axure RP, and Zeplin.

Sr. No.	PRACTICAL OF UX/UI DESIGNING	CREDITS 1
	Designing UX/UI for various domains as given below: ● Interface for online shopping website. ● e learning web site ● Video/ Audio on demand web site ● ATM interface ● Automatic vending machine for Drinks ● Route finder ● Students' Kiosk for institute's information ● Web site for buying Car ● Week end holidays ● Pass port application tracking system ● Zoo information kiosk ● Museum Information Center ● Help desk for Hotel ● Patients information storage ● Catering Service (on-line chef) ● Marriage burro ● Placement agency ● Event management	
	Technologies - JavaScript, JQuery, BootStrap, HTML 5, CSS3, Image Editing Tools (Photoshop, CorelDraw, Illustrator) etc.	

Main References:

1. The Elements Of User Experience - User Centered Design For The Web And Beyond , Jesse James Garrett.
2. The UX Book - Process and Guidelines for Ensuring a Quality User Experience, Rex Hartson, Pardha S. Pyla, Morgan Kaufmann.

3. Observing the User Experience - A Practitioner's Guide to User Research, Elizabeth Goodman, Mike Kuniavsky, Andrea Moed - Morgan Kaufmann.
4. The Essentials of Interaction Design, Alan Cooper, Robert Reimann, David Cronin, Christopher Noessel with Jason Csizmadi, and Doug LeMoine, 4th Edition, Wiley.

Additional References:

1. Interaction Design Beyond Human–Computer Interaction, Preece, Sharp & Rogers, 4th Edition, Wiley.
2. Designing with the Mind in Mind - Simple Guide to Understanding User Interface Design Guidelines, Jeff Johnson, 2nd Edition, Morgan Kaufmann.
3. Designing Interfaces, Jenifer Tidwell, 2nd Edition, O'Reilly.

COURSE CODE: RPSEITO604 - II
COURSE TITLE: CUSTOMER RELATIONSHIP MANAGEMENT

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Define and explain the various forms of CRM and their relevance to business contexts.
CO 2	Acquire the skills to manage the customer journey effectively, including implementing customer acquisition and retention programs.
CO 3	Understand the importance of customer-perceived value and its impact on customer satisfaction, loyalty, and business performance.
CO 4	Apply strategic and operational CRM approaches, such as customer portfolio management and marketing automation, to enhance organizational effectiveness.
CO 5	Develop proficiency in analytical CRM techniques, including data management,analytics for strategy and tactics, and the successful implementation of CRM systems.
CO 6	Analyze and draw insights from real-life case studies and success stories related to CRM.

UNITS	CUSTOMER RELATIONSHIP MANAGEMENT	CREDITS 3 HOURS 45
I	**Understanding Customer Relationships** **Introduction to CRM:** Three forms of CRM, The changing face of CRM,Misunderstandings about CRM, Defining CRM, CRM constituencies,Commercial contexts of CRM,relationships, Relationship Quality, Customer life-time value, Customer satisfaction, loyalty and business performance, Relationship management theories, Benefits of CRM **Managing the customer journey:** customer acquisition, Portfolio purchasing, Prospecting, Key performance indicators of customer acquisition programs, Operational CRM tools that help customer acquisition, Customer retention, Economics and Strategies of customer retention, Key performance indicators of customer retention programs. **Managing customer-experienced value:** Understanding value, modeling customer-perceived value, its sources, Customization, Value through the marketing mix, Customer Experience concepts, Service marketing, Total quality management, relationship management, CRM's influence on CX, How CRM software applications influence customer experience Models of CRM, Understanding	15 L

II	**Strategic and Operational CRM** **Customer portfolio management:** Portfolio, customer, Basic disciplines for CPM, CPM in the business-to-business context, customer portfolio management tools, strategically significant customers, The seven core customer management strategies **Marketing automation:** Introduction to marketing automation, Benefits, Software applications for marketing, Sales force automation **Service automation:** Introduction, customer service, Modeling service quality, Customer service standards, service automation, Benefits, Software applications for service	15 L
III	**Analytical CRM** **Developing and managing customer-related databases:** Corporate customer-related data, Structured and unstructured data, Developing a customer-related database, Data integration, Data warehousing, Data marts,Analytics for CRM strategy and tactics, Big data analytics, Analytics for structured data, ways to generate analytical insight, Data-mining procedures, Artificial intelligence (Al), machine learning (ML) and deep learning (DL) **Implementing CRM:** Introduction, develop the CRM strategy, build CRM project foundations, needs specification and partner selection, project implementation, performance evaluation **Case studies and success stories related to CRM**	15 L

Textbooks:

1. Customer Relationship Management Concepts and Technologies, Francis Buttle, Stan Maklan,

Routledge Taylor and Francis Group, 2019

2. Jagdish N Sheth, Parvatiyar Atul, G Shainesh, Customer Relationship Management-Emerging

Concepts, Tools and Applications, 2017

3. Anderrson Kristin , Carol Kerr, Customer Relationship Management, Tata McGraw-Hill, 2017

REFERENCES

1. V. Kumar & Werner J., CUSTOMER RELATIONSHIP MANAGEMENT, Willey India, 2008

2. S. Shanmugasundaram, CUSTOMER RELATIONSHIP MANAGEMENT, Prentice Hall of

India Private Limited, New Delhi, 2008

COURSE CODE: RPSEITPO604 - II
COURSE TITLE: PRACTICALS OF CUSTOMER RELATIONSHIP MANAGEMENT

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Correlate the CRM link with the different aspects of business functions.
CO 2	Understand the role of CRM in a competitive business environment.
CO 3	Apply different CRM models in manufacturing & service industry
CO 4	Analyze the different challenges in implementing CRM

RPSEITPO604 - II	CUSTOMER RELATIONSHIP MANAGEMENT	CREDITS 1
	Practicals around Automating tasks, Contact Management Deal Management Customer Complaints Sales forecasting Customer behaviour tracking Marketing Automation	

SEMESTER IV

COURSE CODE: RPSITE611
COURSE TITLE: ROBOTIC PROCESS AUTOMATION

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Master foundational RPA concepts and tools.
CO 2	Develop and deploy RPA bots efficiently.
CO 3	Integrate RPA solutions into existing IT environments.
CO 4	Understand ethical considerations in RPA implementation

UNITS	ROBOTIC PROCESS AUTOMATION	CREDITS 3 HOURS 45
I	**RPA Basics**: History of Automation, Architecture of RPA, what is RPA, Components of RPA, RPA vs Automation, Processes & Flowcharts, Programming Constructs in RPA, What Processes can be Automated. **Bots**: Types of Bots, Workloads which can be automated, Benefits of RPA, RPA Tools, how to debug.	**15 Lects**
II	**Automation Anywhere**: Objectives of AA, AA Architecture, Control Room, installation of AA, Display Message Box, use Variables, String to Decimal Conversion. **Control Structures**: IF Package, Loop package	**15 Lects**
II	**Packages:** Text file package, Boolean package, browser package, clipboard package, CSV package, Number package, List package,Error Handling, Dictionary package, Triggers package, PDF package **Advance Concepts:**Simulate keystrokes, use excel as Database, Schedule the task in AA, passing variables one task to other, reading data, writing data, Email automation, PDF integration, recorder,OCR	**15 Lect**

COURSE CODE: RPSITPE611
COURSE TITLE: ROBOTIC PROCESS AUTOMATION

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Evaluate and select processes suitable for automation.
CO 2	Evaluating reliable performance and troubleshoot issues.
CO 3	Develop RPA bots to automate repetitive tasks and streamline business processes.

Sr. No.	Practicals	CREDITS 1 HOURS 15
1	Create a bot on Excel	
2	Create a bot on Recorder.	
3	Create a bot on PDF.	
4	Create a bot on send email.	
5	Create a bot on Interactive forms.	
6	Create a bot on excel as Database	
7	Create a bot on Error handing.	
8	Create a bot on Optical character recognition (OCR)	
9	Create a bot on Credientials & Lockers	
10	Create a bot on PGP(encrypting and decrypting files)	

References:

- Learning Robotic Process Automation- Alok Mani Tripathi
- Robotic Process Automation Projects Build real-world RPA solutions using UiPath and Automation Anywhere - Nandan Mullakara Arun Kumar Asokan

COURSE CODE: RPSITE612
COURSE TITLE: SPEECH ANALYSIS

Course Outcome	After Completing this course student will be able to:
CO 1	To learn how to apply basic algorithms & design and implement applications based on natural language processing
CO 2	Implement a rule-based system to tackle morphology/syntax of a language
CO 3	To design an innovative application system that uses NLP components
CO 4	Be able to design, implement and test algorithms for NLP problems
CO5	Be able to apply NLP techniques to design real-world NLP applications

UNITS	SPEECH ANALYSIS	CREDITS 3 HOURS 45
I	NATURAL LANGUAGE BASICS Foundations of natural language processing – Language Syntax and Structure- Text Preprocessing and Wrangling – Text tokenization – Stemming – Lemmatization – Removing stop-words – Feature Engineering for Text representation – Bag of Words model- Bag of N-Grams model – TF-IDF model, Morphological Parsing, Lexicon-Free FST: The Porter Stemmer,	15 L
II	TEXT CLASSIFICATION Vector Semantics and Embeddings -Word Embeddings – Word2Vec model – Glove model -FastText **Speech:** Phonetics, Speech sound & phonetic transcription, Articulatory phonetics, Speech Synthesis, Automatic Speech recognition, Computational phonology.	15 L
III	SPEECHSYNTHESIS Overview. Text normalization. Letter-to-sound. Prosody, Evaluation. Signal processing -Concatenative and parametric approaches, WaveNet and other deep learning-based TTS systems. Case study on Application of NLP. Introduction to LLM, Case study based on LLM. Comparison between LLM & NLP.	15 L

COURSE CODE: RPSITPE612
COURSE TITLE: PRACTICAL OF SPEECH ANALYSIS

Course Outcome	After Completing this course student will be able to:
CO 1	Demonstrate to apply algorithms
CO 2	Illustrate morphology along with its affixes
CO 3	Dramatize an innovative application system that uses language processing components
CO 4	Illustrate and test algorithms for speech processing problems

Sr. No.	PRACTICAL OF Speech Analysis	CREDITS 1 HOURS 15
1.	Create Regular expressions in Python for detecting word patterns and tokenizing text	
2.	Getting started with Python and NLTK - Searching Text, Counting Vocabulary, Frequency Distribution, Collocations, Bigrams	
3.	Accessing Text Corpora using NLTK in Python	
4.	Write a function that finds the 50 most frequently occurring words of a text that are not stop words	
5.	Implement the Word2Vec model	
6.	Use a transformer for implementing classification	
7.	Design a chatbot with a simple dialog system	
8.	Convert text to speech and find accuracy	
9.	Design a speech recognition system and find the error rate	
10.	Case Study based on Application	

Text book:

1. Speech and Language Processing - By Daniel Jurafsky, James H. Martin – 2nd Edition, Prentice-Hall, 2008/2009.
2. 1. Daniel Jurafsky and James H. Martin, “Speech and Language Processing: An Introduction to Natural Language Processing, Computational Linguistics, and Speech Recognition”, Third Edition, 2022.

REFERENCES:

1. Dipanjan Sarkar, "Text Analytics with Python: A Practical Real-World approach to Gaining Actionable insights from your data", APress,2018.
2. Tanveer Siddiqui, Tiwary U S, "Natural Language Processing and Information Retrieval", Oxford University Press, 2008.
3. Lawrence Rabiner, Biing-Hwang Juang, B. Yegnanarayana, "Fundamentals of Speech Recognition" 1st Edition, Pearson, 2009.
4. Steven Bird, Ewan Klein, and Edward Loper, "Natural language processing with Python", O'REILLY. CO's-PO's & PSO's MAPPIN
5. Foundations of Statistical Natural Language Processing - By Christopher D. Manning and HinrichSchutze -The MIT Press(1999), Cambridge, Massachusetts, London, England.
6. Natural Language Processing with Python" Analyzing Text with Natural Language Toolkit. -By Steven Bird, Ewan Klein, Edward Loper,O'Reilly Media

COURSE CODE: RPSINTITE614
COURSE TITLE: OJT / INTERNSHIP

Course Outcomes	After Completing this course student will be able to :
CO 1	Apply theoretical knowledge gained from the academic course-work.
CO 2	Develop professional skills required in a professional work environment.
CO 3	Create a network with professionals in their field for future career opportunities.
CO 4	Develop a professional portfolio enhancing their competitiveness in the market.

RPSINTITE614	COURSE NAME INTERNSHIP (Approx. 600-650 hrs)	CREDITS 10
The syllabus proposes an internship for about 600-650 hours to be done by a student. It is expected that a student chooses an IT or IT-related industry and formally works as a full time intern during the period. The student should give a presentation of the internship subject as the part of internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organization. Proper certification (as per the guidelines given) by the person, to whom the student was reporting, with the Organization's seal should be attached as part of the documentation. Students will be awarded 14 credits for the entire internship along with the final presentation in front of the examiners.		

COURSE CODE: RPSEITE613 - I
COURSE TITLE: PENETRATION TESTING

Course Outcomes	After Completing this course student will be able to :
CO 1	Identify the core concepts related to computer software and hardware.
CO 2	State vulnerabilities and provide solutions to them.
CO 3	DEscribe various vulnerabilities in the network and systems.
CO 4	Recognize various errors that users, administrators, and programmers can lead to exploitable insecurities.
CO 5	Explain the legal issues and IT Laws laid down under Cyber Security.

UNITS	PENETRATION TESTING	CREDITS 3 HOURS 45
I	Introduction to Ethical Hacking, System Fundamentals, Cryptography, Footprinting, Scanning, Enumeration	15 L
II	System Hacking, Malware, Sniffers, Social Engineering, Denial of Service, Session Hijacking, Physical Security	15 L
III	Web Servers & Applications, SQL Injection, Hacking Wi-Fi & Bluetooth, Mobile Devices, Evasion, Indian Cyber & Data Protection Law	15 L

COURSE CODE: RPSEITPE613 - I
COURSE TITLE: PRACTICAL OF PENETRATION TESTING

Course Outcomes	After Completing this course student will be able to :
CO 1	Demonstrate penetration testing methodologies.
CO 2	Use different tools to exploit system
CO 3	Create reports, documents and give recommendations based on penetration testing.

Sr. No.	PRACTICAL OF PENETRATION TESTING	CREDITS 1 HOURS 15
	1. Using Footprinting, Reconnaissance & Social Engineering tools 2. Using Network Scanning & Enumeration tools 3. Using System Hacking tools 4. Using Trojans, Backdoors, Viruses & Worms tools 5. Using tools for sniffing 6. Using tools for Web Hacking (webservers, session hijacking, sql injections) 7. Using tools for wireless hacking 8. Using tools for evading IDS, Firewalls 9. Using Cryptanalysis.	

ext Books:

1. Ethical Hacking Study Guide, Sean-Philip Oriyano, Wiley Publishing
2. Hacking Exposed Network Security Secrets & Solutions, Stuart McClure, Joel Scambray
3. The Indian Cyber Law, Suresh T. Vishwanathan, Bharat Law House, New Delhi

COURSE CODE: RPSEITE613 - II
COURSE TITLE: DIGITAL IMAGE PROCESSING

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Understand the relevant aspects of digital image representation and their practical implications.
CO 2	Design pointwise intensity transformations and spatial filtering to meet stated specifications.
CO 3	Apply alternative color spaces, and the design requirements leading to choices of color space and understand different mechanisms of image compression.
CO 4	Appreciate the basic image restoration and reconstruction techniques.
CO 5	Analyze and apply morphological image processing techniques
CO 6	Perform advanced image segmentation and feature extraction through various methods.

UNITS	Digital Image Processing	CREDITS 3 HOURS 45
I	**Introduction:** Digital Image Processing, Origins of Digital Image Processing, Applications and Examples of Digital Image Processing, Fundamental Steps in Digital Image Processing, Components of an Image Processing System, **Digital Image Fundamentals:** Elements of Visual Perception, Light and the Electromagnetic Spectrum, Image Sensing and Acquisition, Image Sampling and Quantization, Basic Relationships Between Pixels, Basic Mathematical Tools Used in Digital Image Processing, **Intensity Transformations and Spatial Filtering:** Basics, Basic Intensity Transformation Functions, Basic Intensity Transformation Functions, Histogram Processing, Fundamentals of Spatial Filtering, Smoothing (Lowpass) Spatial Filters, Sharpening (Highpass) Spatial Filters, Highpass, Bandreject, and Bandpass Filters from Lowpass Filters, Combining Spatial Enhancement Methods, Using Fuzzy Techniques for Intensity Transformations and Spatial Filtering **Filtering in the Frequency Domain:** Background, Preliminary Concepts, Sampling and the Fourier Transform of Sampled Functions, The Discrete Fourier Transform of One Variable, Extensions to Functions of Two Variables, Properties of the 2-D DFT and IDFT, Basics of Filtering in the Frequency Domain, Image Smoothing Using Lowpass Frequency Domain Filters, Image Sharpening Using Highpass Filters, Selective Filtering, Fast Fourier Transform	15 L
II	**Image Restoration and Reconstruction**: A Model of the Image Degradation/Restoration Process, Noise Models, Restoration in the Presence of Noise Only-----Spatial Filtering, Periodic Noise Reduction Using Frequency Domain Filtering, Linear, PositionInvariant Degradations, Estimating the Degradation Function,Inverse Filtering, Minimum Mean Square Error (Wiener) Filtering, Constrained Least Squares Filtering, Geometric Mean Filter, Image Reconstruction from Projections **Wavelet and Other Image Transforms:** Preliminaries, Matrix -based Transforms, Correlation, Basis Functions in the Time -Frequency Plane, Basis Images, Fourier -Related Transforms, Walsh -Hadamard Transforms, Slant Transform, Haar Transform, Wavelet Transforms **Color Image Processing:** Color Fundamentals, Color Models, Pseudocolor Image Processing, Full -Color Image Processing, Color Transformations, Color Image Smoothing and Sharpening, Using Color in Image Segmentation, Noise in Color Images, Color Image Compression. **Image Compression and Watermarking:** Fundamentals, Huffman Coding, Golomb Coding, Arithmetic Coding, LZW Coding, Run -length Coding, Symbol -based Coding, 8 Bit -plane Coding, Block Transform Coding, Predictive Coding, Wavelet Coding, Digital Image Watermarking,	15 L

III	**Morphological Image Processing:** Preliminaries, Erosion and Dilation, Opening and Closing, The Hit -or -Miss Transform, Morphological Algorithms, Morphological Reconstruction, Morphological Operations on Binary Images, Grayscale Morphology **Image Segmentation I: Edge Detection, Thresholding, and Region Detection**: Fundamentals, Thresholding, Segmentation by Region Growing and by Region Splitting and Merging, Region Segmentation Using Clustering and Superpixels, Region Segmentation Using Graph Cuts, Segmentation Using Morphological Watersheds, Use of Motion in Segmentation **Image Segmentation II:** Active Contours: Snakes and Level Sets: Background, Image Segmentation Using Snakes, Segmentation Using Level Sets. **Feature Extraction:** Background, Boundary Preprocessing, Boundary Feature Descriptors, Region Feature Descriptors, Principal Components as Feature Descriptors, Whole -Image Features, Scale -Invariant Feature Transform (SIFT)	15 L

Textbooks:
1. Digital Image Processing Gonzalez and Woods Pearson/Prentice Hall Fourth 2018 2. Fundamentals of Digital Image Processing A K. Jain PHI 3. The Image Processing Handbook J. C. Russ CRC Fifth 2010

COURSE CODE: RPSEITPE613 - II
COURSE TITLE: PRACTICAL OF DIGITAL IMAGE PROCESSING

COURSE OUTCOME	After Completing this course student will be able to:
CO 1	Acquire and process digital images, correct defects, and enhance image quality.
CO 2	Apply segmentation,thresholding, and process binary images for feature recognition and classification.
CO 3	Analyze and visualize 3D images using advanced imaging techniques.

SR. NO.	DIGITAL IMAGE PROCESSING	CREDITS 1
1	Acquiring Images	
2	Correcting Image Defects	
3	Image Enhancement	

4	Segmentation	
5	Thresholding	
6	Processing Binary Images	
7	Feature Recognition	
8	Feature Classification	
9	3D Image Acquisition	
10	3D Image Visualisation	

MODALITIES OF ASSESSMENT

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**

RESEARCH PROJECT EVALUATION -150 MARKS

Internal evaluation - 60 Marks

- Abstract submission & Literature Survey / sample data collection - 10 Marks
- Technology Implementation - 10 marks
- Mid-Term Presentation - 20 Marks
- Project Documentation- 20 marks

External evaluation - 90 Marks

- Project Quality - 20 Marks.
- Project Implementation - 40 Marks.
- Presentation - 30 Marks.

A Student should submit a project implementation report with the following details:

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

INTERNSHIP EVALUATION - 250 MARKS

Internal evaluation - 100 Marks

Following are the guidelines for evaluation:

1. Job description: 20 Marks
2. Technical knowledge/skills: 20 Marks
3. Innovation & creativity: 20 Marks
4. Adherence to Schedule (weekly activity report): 20 Marks
5. Soft Skills (Communication, Teamwork, Resource Management, Leadership qualities): 20 Marks

External evaluation - 150 Marks (50% by employer & 50% by the external examiner)

On the basis of the detailed internship report submitted by the student duly signed by the employer and the internal faculty. A presentation is expected from the student for sharing his / her learning experience and work done at the internship.

Following are the guidelines for evaluation:

1. Internship Report: 30 Marks
2. Innovation and creativity: 30 Marks
3. Experience-based learning: 30 Marks
4. Viva: 20 Marks
5. Internship Genuineness: 10 Marks
6. Soft Skills: 10 Marks
7. Suitability & Clarity of material presented: 10 Marks
8. Quality of oral presentation: 10 Marks

Note: - Students need to find an Internship by themselves. It's their responsibility.

The following things are expected to be completed by the student for the final evaluation.

1. The syllabus proposes an internship for about 600 hours to be done by a student.
2. It is expected that a student chooses an IT or IT-related industry and formally works as a full-time intern during the period.
3. Evaluation will be done based on the feedback given by the employers about the student.
4. The student should subject himself/herself to an internship evaluation with proper documentation of the attendance and the type of work he or she has done in the chosen organization.

Following are the guidelines laid for the same

1. Internship joining Letter with the proper job description.
2. Weekly Report in Excel format to be shown every week to Internal In-charge
    - Start date
    - End date
    - Task Assigned
    - Task completed
    - Outcome / Learning's
3. Internship Completion Letter with proper hours & task completed.
4. Employer Feedback Form is prepared to assess based on the following:
    - Skills/ Knowledge
    - Self-Management
    - Dependability
    - Attitude
    - Relationships
5. Internship report:
    - Organization Overview
    - Description (Role, Activities, Technology Used, Live project link or screenshots)
    - SWOT Analysis
    - Introspection (knowledge acquired, Skills learned, challenging task performed)

- Employers Feedback.

6. Proper certification by the person, to whom the student was reporting, with Organization's seal should be attached as part of the documentation.

Note: - Students need to find Internships by themselves. It's their responsibility

PASSING CRITERIA 40%: - Students must acquire a minimum of 40% marks in each course individually (Theory, Practical, Project & Internship).