M.Sc.

NETWORKING & INFORMATION TECHNOLOGY

SYLLABUS

THOSE WHO JOINED FROM THE ACADEMIC YEAR

2023 - 2024

MANONMANIAM SUNDARANAR UNIVERSITY
THIRUNELVELI – 627 012

MANONMANIAM SUNDARANAR UNIVERSITY, TIRUNELVELI

PG PROGRAMME – AFFILIATED COLLEGES

M.Sc. NETWORKING & INFORMATION TECHNOLOGY

(Choice Based Credit System)

(with effect from the academic year 2023-2024)

PREAMBLE

The Learning Outcome-based Curriculum Framework (LOCF) approach has been adopted in M.Sc. Networking & Information Technology Programme to create and disseminate knowledge to the students on the latest technologies by imparting the technical skills to meet industrial needs and inculcate the skills for employability at the point of post graduation.

Vision

Empowering students with computing knowledge to stay in forefront of state-of-art technologies for rendering the need based services to the society.

Mission

- To impart quality based education by inculcating technical, entrepreneurship and leadership skills to meet global challenges.
- To enable the students acquire the skill of employability and entrepreneurship.

Programme Educational Objectives (PEOs):

PEO 1: To equip students with the advanced concepts of Information Technology.

PEO 2: To help students in getting employment by mastering their skills.

PEO 3: To nurture creative thinking and make the students capable of undertaking innovative practices.

PEO 4: To develop environmental awareness, empowerment of humanity and civic consciousness.

PEO 5: To build the ability to cope with the changing environment

PEO 6: To mould them as responsible citizens by imparting value based education.

Program Outcomes (POs):

On successful completion of the M.Sc. Networking & Information Technology program, the graduates will be:

PO 1: Knowledge: Gain in-depth knowledge of software and hardware techniques

PO 2: Problem solving: Ability to critically analyze and provide software solutions for problems

PO 3: Environment and sustainability: Understand the impact of software solutions in environmental and societal context and strive for sustainable development.

PO 4: Team Work: Work in teams to accomplish the objective.

PO 5: Communication Skills: Able to communicate effectively.

Programme Specific Outcomes (PSOs):

PSO 1: Understand and analyze the advanced knowledge in the Information Technology domain.

PSO 2: Enhance the logical and analytical thinking to understand the computational systems.

PSO 3: Ability to comprehend the development methodologies of software systems and to design the software solutions.

PSO 4: Explore the developing areas in the Information Technology sector and to enrich themselves to be skillful to meet the diverse expectations of the industry.

PSO 5: Equipped to be competent in providing optimal and ethical solutions to the technological challenges laid by the professional societies.

	PO 1	**PO2**	**PO3**	**PO4**	**PO5**
PSO 1	S	S	L	S	S
PSO 2	S	S	S	S	S
PSO 3	M	S	M	S	M
PSO 4	S	S	S	S	S
PSO 5	L	S	S	S	S

S – Strong, M- Medium, L- Low

REGULATIONS/ PROGRAMME SPECIFIC REQUIREMENTS

Duration of the Course:

M.Sc. Networking & Information Technology is a 2 years full time programme spread over four semesters.

Eligibility for Admission to the Programme

Candidates who have studied Bachelor's degree in relevant disciplines like B.Sc. in IT/CS, BCA, BE/BTech in IT or CS from recognized university are eligible for this programme (as specified in the admission guidelines given by the Directorate of Collegiate Education 2023-'2024 www.tndce.tn.gov.in)

SEMESTER WISE COURSE LIST

Second Year : Semester – III

Specification	Courses	Credits	No. of Hours
Core – X	Robotic Process Automation	4	5
Core – XI	Research Methodology	4	4
Core – X1I	Wireless Communication	4	4
Core – XIII [LAB]	Robotics - Practical	3	4
Core – XIV [PRJ]	Mini Project	6	6
Elective – V	Virtual and Augmented Reality / Big Data Analytics / Data Mining and Warehousing	3	4
Skill Enhancement Course – II	Artificial Neural Networks	2	3
	Internship	2	-
		28	**30**

Semester-IV

Specification	Courses	Credits	No. of Hours
Core – XV	Project with Viva Voce	20	30
	Extension Activity	1	-
		21	**30**

Total Credits : 91

Scheme of Evaluation (THEORY): Core/ Elective/ Skill Enhancement Courses

Total Marks:100 (Internal:25 Marks, External:75Marks

There is no Passing Minimum for the CIA component. But overall(CIA + External),the student should get 50% or more to get a pass	
CIA-Internal Marks	**External Marks**

i. Average of best two tests from three: 15 Marks ii. Assignment: 05 Marks iii. Seminar: 05 Marks	End Semester Examination
Total: 25 Marks	Total: 75 Marks
Minimum Passing 50% i.e. 38marks	

Scheme of Evaluation (PRACTICAL): Core / Skill Enhancement Course

Total Marks:100 (Internal:50 Marks, External:50 Marks

There is no Passing Minimum for the CIA component. But overall(CIA + External),the student should get 50% or more to get a pass	
CIA-Internal Marks	**External Marks**
i. Completion of Practical in time : 20 Marks ii. Model Practical Test : 20 Marks iii. Completion of Record work: 10 Marks	End Semester Practical Examination
Total: 50 Marks	Total: 50 Marks
Minimum Passing 50% i.e. 38 marks	

Scheme of Evaluation (PROJECT)

Total Marks:100 (Internal:50 Marks, External:50 Marks

There is no Passing Minimum for the CIA component. But overall(CIA + External),the student should get 50% or more to get a pass	
CIA-Internal Marks	**External Marks**
i. Completion of Project in time : 10 Marks ii. Review marks(3 reviews) : 30 Marks iii. Completion of Report work: 10 Marks	End of IV Semester Project Submission and Viva-voce Examination
Total: 50 Marks	Total: 50 Marks
Minimum Passing 50% i.e. 38marks	

Project : Individual Project report should be submitted at the end of IV semester for external evaluation. Internal – 50 Marks, External – 50 Marks (Total 100 Marks). The internal marks should be given based on the presentation of three reviews(0^{th} review -10 Marks, 1^{st} review – 10

Marks, 2nd review – 10 Marks) and the performance assessment of the guide (Project completion in time 10 Marks and Report 10 Marks).

Internship/Industrial visit/Field visit/Research Knowledge Updation Activity:

- A report should be submitted at the end of III semester and evaluated by external examiners.
- Internal – 50 Marks, External – 50 Marks (Total : 100 Marks)
- Internship students should submit certificate of attendance from the industry along with report.

Extension Activity :

- Outreach Activities / Conducting Virtual Presentations
  - Outreach Activities
    - Creating awareness of the usage of Computers in remote places
    - Performing any computer exhibition in a village
    - Conducting any type of awareness programmes using computers/ software
  - Conducting Virtual Presentations
    - Encourage the school students through some presentations
    - Conducting higher education awareness among school students using computers
- External examination will be conducted at the end of IV semester.
- Internal – 50 Marks, External – 50 Marks (Total : 100 Marks)

External (End Semester) Examination Question Pattern

Time: 3 hours Max. Marks: 75

Part– A (15 x 1 = 15)

Answer all the questions

Ten Questions, three objective type questions from each unit.

Part–B (5 x 4 = 20)

Answer all the questions

Five Questions, two short answer type questions from each unit with internal choice (Either ... Or ...type)

Part–C (5 x 8 = 40)

Answer all the questions

Five Questions, two descriptive/Analytical type questions from each unit with internal choice (Either... Or …type)

<table>
<tr><td colspan="3">Title of the Course</td><td colspan="8">ROBOTIC PROCESS AUTOMATION</td></tr>
<tr><td colspan="2">Category</td><td colspan="2">CORE</td><td colspan="2">Paper Number</td><td colspan="4">CORE X</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">L</td><td rowspan="2">T</td><td rowspan="2">P</td><td rowspan="2">Year</td><td rowspan="2">Semester</td><td rowspan="2">Credits</td><td rowspan="2">Inst. Hours</td><td colspan="3">Marks</td></tr>
<tr><td>CIA</td><td>External</td><td>Total</td></tr>
<tr><td></td><td>5</td><td>0</td><td>0</td><td>II</td><td>III</td><td>4</td><td>5</td><td>25</td><td>75</td><td>100</td></tr>
<tr><td colspan="3">Pre-requisite</td><td colspan="8">Basic computer operations</td></tr>
<tr><td colspan="3">Objectives of the Course</td><td colspan="8">To automate the robotic process which will be helpful to the future technology</td></tr>
<tr><td colspan="3">Course Outline</td><td colspan="8"></td></tr>
<tr><td colspan="3"></td><td colspan="8">UNIT I: INTRODUCTION TO ROBOTIC PROCESS AUTOMATION
Scope and automation techniques, Robotic process automation - What can RPA do? Benefits of RPA, Components of RPA, RPA platforms, The future of automation. RPA BASICS: History of Automation - What is RPA - RPA vs Automation - Processes & Flowcharts - Programming Constructs in RPA – What Processes can be Automated - Types of Bots - Workloads which can be automated - RPA Advanced Concepts - Standardization of processes - RPA Development methodologies - Difference from SDLC - Robotic control flow architecture</td></tr>
</table>

	UNIT II: RPA TOOL INTRODUCTION AND BASICS Introduction to RPA Tool - The User Interface - Variables - Managing Variables - Naming Best Practices – The Variables Panel - Generic Value Variables - Text Variables - True or False Variables - Number Variables – Array Variables - Date and Time Variables - Data Table Variables – Managing Arguments - Naming Best Practices – The Arguments Panel - Using Arguments - About Imported Namespaces - Importing New Namespaces- Control Flow -Control Flow Introduction - If Else Statements - Loops - Advanced Control Flow - Sequences - Flowcharts – About Control Flow – Control Flow Activities - The Assign Activity - The Delay Activity - The Do While Activity - The If Activity – The Switch Activity - The While Activity - The For Each Activity - The Break Activity - Data Manipulation- Data Manipulation Introduction - Scalar variables, collections and Tables - Text Manipulation – Data Manipulation
	UNIT III: ADVANCED AUTOMATION CONCEPTS & TECHNIQUES Recording Introduction - Basic and Desktop Recording - Web Recording – Input / Output Methods - Screen Scraping - Data Scraping - Scraping Advanced Techniques - Selectors - Defining and Assessing Selectors - Customization -Debugging - Dynamic Selectors - Partial Selectors - RPA Challenge - Image, 36 Text & Advanced Citrix Automation Tables & PDF - Data Tables in RPA - Excel and Data Table basics - Data Manipulation in excel
	UNIT IV: HANDLING USER EVENTS & ASSISTANT BOTS, EXCEPTION HANDLING What are assistant bots? - Monitoring system event triggers - Hotkey trigger - Mouse trigger - System trigger -Monitoring image and element triggers - An example of monitoring email - Example of monitoring a copying event and blocking it - Launching an assistant bot on a keyboard event
	UNIT V: DEPLOYING AND MAINTAINING THE BOT Publishing using publish utility - Creation of Server - Using Server to control the bots - Creating a provision Robot from the Server - Connecting a Robot to Server - Deploy the Robot to Server - Publishing and managing updates -Managing packages - Uploading packages - Deleting packages

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, robotic process, RPA tools and advanced concepts
Recommended Text	Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018
Reference Books	1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation,1st Edition 2015. 2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018. 3. Srikanth Merianda,"Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018. 4. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.
Website and e-Learning Source	1. https://www.uipath.com/learning/video-tutorials 2. https://www.youtube.com/watch?v=kVtgA_PQ5R4 3. https://onlinecourses.nptel.ac.in/noc19_me74/preview

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO's	Course Outcomes
CLO1	Understanding the fundamentals of robotic process
CLO2	Understanding the RPA tool
CLO3	Get the advanced automation concepts and technology
CLO4	Handling user events & assistant bots and exception handling

CLO5	Develop and maintain the bot

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	1	2	3	2	2
CLO2	3	2	2	3	3	2
CLO3	3	2	2	2	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	2	3	3
Weightage of course contribute to each PSO	15	11	11	13	14	13

Title of the Course			RESEARCH METHODOLOGY						
Category		CORE	**Paper Number**			CORE XI			
Course Code	**L**	**T**	**P**	**Year**	**Semester**	**Credits**	**Inst. Hours**	**Marks**	
								CIA	**External**	**Total**
	4	0	0	II	III	4	4	25	75	100
Pre-requisite	Basic critical and writing skills									
Objectives of the Course	To impart knowledge and skills required for research problem formulation, analysis, solutions, technical paper writing and drafting and filing patents.									
Course Outline										
	UNIT-I : **Research Methodology:** Objectives and motivation of research - Types of research - Research approaches - Significance of research - Research methods verses methodology - Research and scientific method - Importance of research methodology - Research process - Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, necessary instrumentations- Criteria of good research. Defining the research problem: Definition of research problem - Problem formulation - Necessity of defining the problem - Technique involved in defininga problem.									

	UNIT-II : **Literature Survey and Data Collection:** Importance of literature survey - Sources of information - Assessment of quality of journals and articles - Information through internet. Effective literature studies approaches, analysis, plagiarism, and research ethics. Data - Preparing, Exploring, examining and displaying.
	UNIT-III : **Research Analysis and Design:** Meaning of research design - Need of research design - Different research designs - Basic principles of experimental design - Developing a research plan - Design of experimental set-up - Use of standards and codes. Overview of Multivariate analysis, Hypotheses testing and Measures of Association. Presenting Insights and findings using written reports and oral presentation.
	UNIT-IV : **Intellectual Property Rights:** Nature of Intellectual Property: Patents, Designs, Trade and Copyright- Process of Patenting and Development: technological research, innovation, patenting, development- Role of WIPO and WTO in IPR establishments, Right of Property, Common rules of IPR practices, Types and Features of IPR Agreement, Trademark, Functions of UNESCO in IPR maintenance.
	UNIT-V: **Patent Rights:** Scope of Patent Rights- Licensing and transfer of technology- Patent information and databases- Geographical Indications - New Developments in IPR: Administration of Patent System, IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs -Licenses, Licensing of related patents, patent agents, Registration of patent agents.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill

Recommended Text	1. R. Ganesan, "Research Methodology for Engineers", MIP Publishers, Chennai, 2011. 2. Catherine J. Holland, "Intellectual property: Patents, Trademarks, Copyrights, Trade Secrets", Entrepreneur Press, 2007.
Reference Books	1. Peter S. Menell ,Mark A. Lemley, Robert P. Merges, "Intellectual Property in the New Technological "Vol. I Perspectives, 2021. 2. Laura R. Ford,"The Intellectual Property of Nations: Sociological and Historical Perspectives on a 3. RatanKhananabis and SuvasisSaha, "Research Methodology", Universities Press, Hyderabad, 2015. 4. David Hunt, Long Nguyen, Matthew Rodgers, "Patent searching: tools & techniques", Wiley, 2007. 5. Ranjit Kumar, 2nd Edition, "Research Methodology: A Step by Step Guide for beginners" 2010
Website and e-Learning Source	4. https://www.coursera.org/courses?query=research%20methodology 5. https://www.researchgate.net/topic/Research-Methodology 6. https://www.wto.org/english/tratop_e/trips_e/intel1_e.htm 7. https://www.isical.ac.in/~palash/research-methodology/RM-lec9.pdf 8. https://mrcet.com/downloads/digital_notes/CSE/Mtech/I%20Year/RESEARCH%20METHODLOGY.pdf

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO's	Course Outcomes
CLO1	Understanding of research, IPR and patent fundamentals
CLO2	Identify the issues involved in research, IPR and patent filing
CLO3	Apply suitable instrumentation and sampling techniques for the research studies and recognize the framework for protecting IPR and process for obtaining patents
CLO4	Analyze data, and interpret research findings using appropriate methods and importance of IPR and patent protection in promoting research and development
CLO5	Design and develop research reports, research proposals, academic papers and patents

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	1	2	3	2	2
CLO2	3	2	2	3	3	2
CLO3	3	2	2	2	3	3
CLO4	3	3	2	3	3	3
CLO5	3	3	3	2	3	3
Weightage of course contribute to each PSO	15	11	11	13	14	13

<table>
<tr><td colspan="3">Title of the Course</td><td colspan="7">WIRELESS COMMUNICATION</td></tr>
<tr><td colspan="2">Category</td><td colspan="2">CORE</td><td colspan="2">Paper Number</td><td colspan="3">CORE XII</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">L</td><td rowspan="2">T</td><td rowspan="2">P</td><td rowspan="2">Year</td><td rowspan="2">Semester</td><td rowspan="2">Credits</td><td rowspan="2">Inst. Hours</td><td colspan="3">Marks</td></tr>
<tr><td>CIA</td><td>External</td><td>Total</td></tr>
<tr><td></td><td>4</td><td>0</td><td>0</td><td>II</td><td>III</td><td>4</td><td>4</td><td>25</td><td>75</td><td>100</td></tr>
<tr><td colspan="3">Pre-requisite</td><td colspan="7">Basic concepts of network</td></tr>
<tr><td colspan="3">Objectives of the Course</td><td colspan="7">To study the usage and applications of wireless communication technology</td></tr>
<tr><td colspan="3">Course Outline</td><td colspan="7"></td></tr>
<tr><td colspan="3"></td><td colspan="7">UNIT I:
Wireless Transmission-I : Frequencies for communication– Frequencies for mobile communication – Frequencies and regulations – Signals (physical representation of data, function of time and location) – Fourier representation of periodic signals – Different representations of signals (w.r.t.freq and amp) – Antennas (isotropic radiator, simple dipoles, directed and sectorized) – MIMO – Signal propagation ranges – Signal propagation – shadowing, reflection, refraction, scattering, diffraction) – Multipath propagation – Effects of mobility</td></tr>
</table>

	UNIT II: **Wireless Transmission-II:** Modulation– Digital – Analog – Spread spectrum technology – DSS – FHSS – Cell structure – Frequency planning– Cell breathing
	UNIT III: **Wireless Telecommunication Systems:** GSM: Overview – Performance characteristics of GSM (wrt. analog sys.) –**GSM:** Mobile Services– Architecture of the GSM system– System Architecture – GSM – TDMA/FDMA – GSM hierarchy of frames – GSM protocol layers for signaling – Mobile Originated Call – Mobile Originated Call – 4 types of handover – Handover decision – Handover procedure – Data services in GSM – GPRS quality of service – GPRS architecture and interfaces – GPRS protocol architecture
	UNIT IV: **3G-The Universal Mobile Telecommunication System (UMTS):** UMTS Network Architecture –Release 99, UMTS Interfaces, UMTS Network Evolution –UMTS Release 5 – UMTS FDD and TDD – UMTS Channels –Logical Channels – UMTS downlink transport and physical channels – UMTS uplink transport and physical channels – UMTS Time Slots – UMTS Network Protocol – Architecture – Mobility Management for UMTS Network
	UNIT V: **Medium Access Control:** Motivation for a specialized MAC – SDMA – FDMA – TDMA – CDMA –Wireless LANs – Characteristics of wireless LANs – Comparison: Infrared vs. radio transmission – Comparison – Infrastructure vs. ad-hoc networks – 802.11 – Architecture of an infrastructure network – 802.11 – Architecture of an ad-hoc network – Basics of Satellite communication
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, wireless communication technology, methods and applications

Recommended Text	1. William Stallings, "Wireless Communications and Networks", Pearson/Prentice Hall of India, 2019. 2. Maral. G and Bosquet. M, "Satellite Communications Systems Techniques and Technologies", John Wiley & Sons, Fifth Edition, 2011.
Reference Books	1. Dharma Prakash, Agrawal and Qing-An Zeng, "Introduction to Wireless Mobile Systems" Thomson India, 2015. 2. Vijay K Garg, "Wireless Communication and Networking", Morgan Kaufmann Publishers, 2010. 3. Siva Ram Murthy C and Manoj B S, "Ad Hoc Wireless Networks: Architectures and Protocols", Prentice Hall, 2004.
Website and e-Learning Source	1. https://www.tutorialspoint.com/wireless_communication/index.htm 2. https://www.javatpoint.com/applications-of-wireless-communication

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO's	Course Outcomes
CLO1	Understanding about the wireless transmission
CLO2	Understanding about spread spectrum technology
CLO3	Get the knowledge about wireless telecommunication system
CLO4	Get idea about the universal mobile telecommunication system
CLO5	Understand the usage of medium access control

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	**3**	**1**	**2**	**3**	**2**	**2**
CLO2	**3**	**2**	**2**	**3**	**3**	**2**
CLO3	**3**	**2**	**2**	**2**	**3**	**3**
CLO4	**3**	**3**	**2**	**3**	**3**	**3**
CLO5	**3**	**3**	**3**	**2**	**3**	**3**
Weightage of course contribute to each PSO	**15**	**11**	**11**	**13**	**14**	**13**

<table>
<tr><td colspan="2">Title of the Course</td><td colspan="9">ROBOTICS - PRACTICAL</td></tr>
<tr><td colspan="2">Category</td><td colspan="3">CORE</td><td colspan="2">Paper Number</td><td colspan="3">CORE I</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">L</td><td rowspan="2">T</td><td rowspan="2">P</td><td rowspan="2">Year</td><td rowspan="2">Semester</td><td rowspan="2">Credits</td><td rowspan="2">Inst. Hours</td><td colspan="3">Marks</td></tr>
<tr><td>CIA</td><td>External</td><td>Total</td></tr>
<tr><td></td><td>0</td><td>0</td><td>4</td><td>II</td><td>III</td><td>3</td><td>4</td><td>50</td><td>50</td><td>100</td></tr>
<tr><td colspan="2">Pre-requisite</td><td colspan="9">Basic understanding of C, C++ and Java programming languages</td></tr>
<tr><td colspan="2">Objectives of the Course</td><td colspan="9">This course gives practical experience to automate the robotic processes</td></tr>
<tr><td colspan="2">Course Outline</td><td colspan="9">1. Create a sequence that asks the user for his first and last name, and gives him choices to order from his favorite snacks, and then displays his answers.
2. Write a program to calculate the current age.
3. Design a Process to perform a basic calculation using Arguments.
4. Build a Guessing game using a Flow Chart
5. Design a workflow for transactional process using State Machine
6. Create a workflow that shows the welcome message only if the user enters the correct password.
7. Design a workflow for an integer variable will increase from 5 to 50 in increments of 5.
8. Create an automation process that goes through each element of an array write the length of array and each element to output panel.
9. Design a process to read all PDF files from a folder and then close them all.
10. Automate word file using basic recording
11. Automate Calculator Application using Desktop recoding
12. Design a process to Extract Initial name from full name
13. Design a process to read text from multiple word documents
14. Design a process to Merge Multiple word files into one file
15. Create an automation for PDF to Text Conversion</td></tr>
</table>

Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability and Professional Competency
Recommended Text	Alok Mani Tripathi, "Learning Robotic Process Automation", Packt Publishing, 2018.
Reference Books	1. Frank Casale , Rebecca Dilla, Heidi Jaynes , Lauren Livingston, "Introduction to Robotic Process Automation: a Primer", Institute of Robotic Process Automation,1st Edition 2015. 2. Richard Murdoch, Robotic Process Automation: Guide To Building Software Robots, Automate Repetitive Tasks & Become An RPA Consultant", Independently Published, 1st Edition 2018. 3. Srikanth Merianda,"Robotic Process Automation Tools, Process Automation and their benefits: Understanding RPA and Intelligent Automation", Consulting Opportunity Holdings LLC, 1st Edition 2018. 4. Lim Mei Ying, "Robotic Process Automation with Blue Prism Quick Start Guide: Create software robots and automate business processes", Packt Publishing, 1st Edition 2018.
Website and e-Learning Source	1. https://www.uipath.com/learning/video-tutorials 2. https://www.youtube.com/watch?v=kVtgA_PQ5R4 3. https://onlinecourses.nptel.ac.in/noc19_me74/preview

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO's	Course Outcomes
CLO1	Understand the significance of control statements, loops and functions in creating simple programs.
CLO2	Apply advanced automation concepts and techniques
CLO3	Analyze the real time problem using suitable concepts
CLO4	Assess the complex problems using appropriate concepts

CLO5	Develop the real time applications

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	3	3	3	3	2	2
CLO2	3	3	3	3	3	2
CLO3	3	2	3	3	3	3
CLO4	3	3	3	3	3	3
CLO5	3	3	3	3	3	3
Weightage of course contribute to each PSO	15	13	15	15	13	15

Title of the Course	MINI PROJECT								
Category	CORE		**Paper Number**		CORE XIV				
Course Code	**L**	**T**	**P**	**Year**	**Semester**	**Credits**	**Inst. Hours**	**Marks**	
								CIA	**External**	**Total**
	0	0	6	II	III	6	6	50	50	100
Pre-requisite	UG Level Programming knowledge								

Title of the Course	VIRTUAL AND AUGMENTED REALITY								
Category	Elective		**Paper Number**		ELECTIVE V A				
Course Code	**L**	**T**	**P**	**Year**	**Semester**	**Credits**	**Inst. Hours**	**Marks**	
								CIA	**External**	**Total**
	4	0	0	II	III	3	4	25	75	100

Pre-requisite	Basic knowledge of computer graphics
Objectives of the Course	To provide knowledge on basic principles of virtual & augmented reality and have the ability to use its technology as a platform for real-world applications.
Course Outline	
	UNIT-I : **Virtual Reality**: The Three I's of VR – History – Early commercial VR Technology – Components of a VR System –**Input Devices:** Trackers – Navigation and Manipulation Interfaces – Gesture Interfaces

	UNIT-II : **Output Devices:** Graphics Displays – Sound Displays – Haptic Feedback - **Computer Architecture for VR:** The Rendering Pipeline- PC Graphics Architecture - **VR Programming:** Toolkits and Scene Graphs – Traditional and Emerging Applications of VR
	UNIT-III : **Augmented Reality**: Introduction – **Augmented Reality Concepts:** Working Principle of AR –Concepts related to AR- Ingredients of an Augmented Reality Experience
	UNIT-IV : Augmented Reality Hardware– Augmented Reality Software– Software to create content for AR Application – Tools and Technologies
	UNIT-V: **Augmented Reality Content:** Introduction- Creating Content for Visual, Audio, and other senses – Interaction in AR - **Mobile Augmented Reality:** Introduction – Augmented Reality Applications Areas- Collaborative Augmented Reality
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Grigore C. Burdea and Philippe Coiffet, "Virtual Reality Technology"', Wiley Student Edition , Second Edition (Unit I: Chapter 1,2 & Unit II: Chapter 3,4,6,8 & 9) 2. Alan B. Craig(2013), "Understanding Augmented Reality: Concepts and Applications"(Unit III: Chapter 1, 2, Unit IV : Chapter 3, 4 & Unit V: Chapter 5,6,8) 3. Jon Peddie (2017), "Augmented Reality: Where We Will All Live", Springer, Ist Edition (Unit IV: Chapter 7 (Tools & Technologies)

Reference Books	1. Alan Craig & William R. Sherman & Jeffrey D. Will, Morgan Kaufmann(2009), "Developing Virtual Reality Applications: Foundations of Effective Design", Elsevier(Morgan Kaufmann Publishers) 2. Paul Mealy (2018), "Virtual and Augmented Reality",Wiley 3. Bruno Arnaldi & Pascal Guitton & Guillaume Moreau(2018), "Virtual Reality and Augmented Reality: Myths and Realities", Wiley
Website and e-Learning Source	1. Manivannan, M., (2018), "Virtual Reality Engineering," IIT Madras, https://nptel.ac.in/courses/121106013 2. Dube, A., (2020), "Augmented Reality - Fundamentals and Development," NPTEL Special Lecture Series, https://www.youtube.com/watch?v=MGuSTAqlZ9Q 3. http://msl.cs.uiuc.edu/vr/ 4. http://www.britannica.com/technology/virtual reality/Living-in - virtual-worlds 5. https://mobidev.biz/blog/augmented-reality-development-guide

Course Learning Outcome (for Mapping with POs and PSOs)

Students will be able to

CO's	Course Outcomes
CLO1	Outline the basic terminologies, techniques and applications of VR and AR
CLO2	Describe different architectures and principles of VR and AR systems
CLO3	Use suitable hardware and software technologies for different varieties of virtual and augmented reality applications
CLO4	Analyze and explain the behavior of VR and AR technology relates to human perception and cognition
CLO5	Assess the importance of VR/AR content and interactions to implement for the real-world problem

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
CLO1	**3**	**1**	**1**	**2**	**2**	**2**
CLO2	**3**	**2**	**2**	**2**	**2**	**2**
CLO3	**3**	**2**	**2**	**3**	**3**	**3**
CLO4	**3**	**2**	**2**	**3**	**3**	**2**
CLO5	**3**	**2**	**3**	**3**	**3**	**3**
Weightage of course contribute to each PSO	**15**	**9**	**10**	**13**	**13**	**12**

<table>
<tr><td colspan="3">Title of the Course</td><td colspan="8">BIG DATA ANALYTICS</td></tr>
<tr><td colspan="3">Category</td><td colspan="2">Elective</td><td colspan="3">Paper Number</td><td colspan="3">ELECTIVE V B</td></tr>
<tr><td rowspan="2">Course Code</td><td rowspan="2">L</td><td rowspan="2">T</td><td rowspan="2">P</td><td rowspan="2">Year</td><td rowspan="2">Semester</td><td rowspan="2">Credits</td><td rowspan="2">Inst. Hours</td><td colspan="3">Marks</td></tr>
<tr><td>CIA</td><td>External</td><td>Total</td></tr>
<tr><td></td><td>4</td><td>0</td><td>0</td><td>II</td><td>III</td><td>3</td><td>4</td><td>25</td><td>75</td><td>100</td></tr>
<tr><td colspan="3">Pre-requisite</td><td colspan="8">This course provides an in-depth understanding of terminologies and the core concepts behind big data problems, applications, systems and the techniques, that underlie today's big data computing technologies.</td></tr>
<tr><td colspan="3">Objectives of the Course</td><td colspan="8">By the end of the course the students will be able to
➢ Identify and distinguish big data analytics applications.
➢ Describe big data analytics tools.
➢ Present cases involving big data analytics in solving practical problems.</td></tr>
<tr><td colspan="3" rowspan="4">Course Outline</td><td colspan="8">UNIT-I :
Overview of Big Data and Data Analytics
Overview of Big Data: Characteristics of Big Data-Big Data Sources-Challenges in Big Data processing-Scalability issues; Business Intelligence v/s Data Analytics-Need of Data Analytics- Data Analytics in Industries-Role of the Data Scientist.
The Design of HDFS- HDFS Concepts- Blocks – Name nodes and Data nodes; The Command- Line Interface: Basic File system Operations; Hadoop File systems: Interfaces-The Java Interface-Data Flow; Hadoop I/O: Data Integrity-Compression-Serialization-File-based data structures.</td></tr>
<tr><td colspan="8">UNIT-II :
MapReduce and its application
Analyzing the Data with Unix Tools- Analyzing the Data with Hadoop- Map and Reduce- Java Map Reduce; Data Flow- Combiner Functions- Running a Distributed Map Reduce Job; Hadoop Streaming; Hadoop Pipes.</td></tr>
<tr><td colspan="8">UNIT-III :
Application development using MapReduce framework
The Configuration API- Configuring the Development Environment- Writing a Unit Test- Running Locally on Test Data- Running on a Cluster-
Tuning a Job- MapReduce Workflows.</td></tr>
<tr><td colspan="8">UNIT – IV :
Working of MapReduce
Mining Data Streams: The Stream Data Model- Sampling data in a stream-Filtering Streams- The Bloom filter; Counting distinct elements in a stream-The Flajolet-Martin Algorithm. How stream works-Streams Processing Language; Apache Spark - Introduction- Features of Apache Spark-Components of Spark- Resilient Distributed Datasets- Data Sharing using Spark RDD-Spark Streaming.</td></tr>
</table>

	UNIT-V: **Analytics for Big Data in motion** Mining Data Streams: The Stream Data Model- Sampling data in a stream- Filtering Streams- Mining Social Network Graphs: Clustering of Social Network Graphs- Direct Discovery of Communities- Partitioning of Graphs- Finding overlapping communities- Simrank; Sentimentanalysis- Document sentiment classification- Rules of Sentiment Composition- Sentiment analysis using Twitter data.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	1. Jure Leskovec, Anand Rajaraman, Jeff Ullman, "Mining of Massive Datasets", 2nd Edition, Cambridge University Press, UK, 2011.
Reference Books	1. Paul C. Zikopoulos, Chris Eaton, Dirk deRoos, Thomas Deutsch, George Lapis, "Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data, McGraw-Hill, 2012. 2. Liu, Bing. "Sentiment analysis and opinion mining." Synthesis lectures on human language technologies, Cambridge University Press, 2015. 3. Holden Karau, Andy Konwinski, Patrick Wendell, MateiZaharia, " Learning Spark: Lightning- Fast Big Data Analysis", O'Reilly Media, 2015. 4. David Loshin, Morgan, "Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL and Graph", Kaufman Publishers, 2013.
Website and e-Learning Source	https://nptel.ac.in/courses/106/105/106105166/ https://onlinecourses.nptel.ac.in/noc21_ee85/preview

CLO1: To understand the basic knowledge of big data analytics.
CLO 2: To learn the techniques and tools for big data analytics.
CLO 3: To conduct application case studies to show the usage of big data analytics.
CLO 4: Design and develop program to big data analytics techniques.
CLO 5: Conduct big data analytics using system tools.

CO/PSO	PSO 1	PSO 2	PSO 3	PSO 4	PSO 5	PSO 6
CO1	3	3	2	2	3	3
CO2	3	2	3	2	3	3

CO3	**3**	**2**	**3**	**2**	**2**	**1**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**2**	**3**	**3**	**3**	**3**
Weightage of course contributed To each PSO	**15**	**12**	**14**	**12**	**14**	**13**

Title of the Course	**DATA MINING AND WAREHOUSING**								
Category	Elective		**Paper Number**		ELECTIVE V C				
Course Code	**L**	**T**	**P**	**Year**	**Semester**	**Credits**	**Inst. Hours**	**Marks**	
								CIA	**External**	**Total**
	4	0	0	II	III	3	4	25	75	100
Pre-requisite	Able to know extract useful data from a sea of un-amassed data and the understanding of data analysis.									
Objectives of the Course	The main objectives of this course are to: Understand the basic data mining techniques and algorithms(K1) ➢ Understand the Association rules, Clustering techniques and Data warehousing contents(K1,K2) ➢ Illustrate the mining techniques like association, classification and clustering on transactional databases(K3) ➢ Illustrate the warehousing techniques like Online Analytical Processing(OLAP) and Multidimensional Data Analysis(K4) ➢ Compare and evaluate different data mining techniques like classification, prediction, Clustering and association rule mining(K5) ➢ Design data warehouse with dimensional modeling and apply OLAP operations(K6)									
Course Outline	**UNIT-I :** **Data Warehousing Data** Warehousing and Business Analysis: - Data warehousing Components –Building a Data warehouse – Mapping the Data Warehouse to a Multiprocessor Architecture – DBMS Schemas for Decision Support – Data Extraction, Cleanup, and Transformation Tools –Metadata – reporting – Query tools and Applications – Online Analytical Processing (OLAP) – OLAP and Multidimensional Data Analysis.									

	UNIT-II : **Data Mining & Association Rule Mining** Data Mining: - Data Mining Functionalities – Data Preprocessing – Data Cleaning – Data Integration and Transformation – Data Reduction – Data Discretization and Concept Hierarchy Generation. Association Rule Mining: - Efficient and Scalable Frequent Item set Mining Methods – Mining Various Kinds of Association Rules – from Association Mining to Correlation Analysis – Constraint-Based Association Mining.
	UNIT-III : **Classification & Prediction** Classification and Prediction: - Issues Regarding Classification and Prediction – Classification by Decision Tree Introduction – Bayesian Classification – Rule Based Classification – Classification by Back propagation – Support Vector Machines – Associative Classification – Other Classification Methods – Prediction – Accuracy and Error Measures – Evaluating the Accuracy of a Classifier or Predictor
	UNIT-IV : **Cluster Analysis** Types of Data in Cluster Analysis – A Categorization of Major Clustering Methods – Partitioning Methods – Hierarchical methods – Density-Based Methods – Grid-Based Methods – Model Based Clustering Methods – Clustering High- Dimensional Data – Constraint-Based Cluster Analysis – Outlier Analysis.
	UNIT-V: **Applied Data Mining** Multidimensional Analysis and Descriptive Mining of Complex Data Objects – Spatial Data Mining – Multimedia Data Mining – Text Mining – Mining the World Wide Web.
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Knowledge, Problem Solving, Analytical ability, Professional Competency, Professional Communication and Transferrable Skill
Recommended Text	K.P. Soman, Shyam Diwakar and V. Ajay "Insight into Data mining Theory and Practice", Easter Economy Edition, Prentice Hall of India, 2006.
Reference Texts	1. G. K. Gupta "Introduction to Data Mining with Case Studies", Easter Economy Edition, Prentice Hall of India, 2006 2. Pang-Ning Tan, Michael Steinbach and Vipin Kumar "Introduction to Data Mining", Pearson Education, 2007.

Website and e-Learning Source	https://www.tutorialspoint.com/datawarehousing/index.htm https://www.mooc-list.com/tags/data-warehousing -MOOC https://onlinecourses.swayam2.ac.in/cec19_cs01/preview-SWAYAM

CLO1: To introduce the concept of data Mining and warehousing as an important tool for enterprise data management and cutting edge technology for building competitive advantage
CLO 2: Enable the students to learn the concepts of Mining tasks, classification, clustering and Data Warehousing.
CLO 3: To make students well versed in all data warehousing algorithms, methods of evaluation.
CLO 4: Develop skills of using recent data mining software for solving practical problems
.**CLO 5:**Develop and apply critical thinking, problem-solving, and decision- making skills.

CO/PSO	PSO1	PSO2	PSO3	PSO4	PSO 5	PSO 6
CO1	3	3	2	2	3	3
CO2	3	2	3	2	3	3
CO3	3	2	3	2	2	1
CO4	3	3	3	3	3	3
CO5	3	2	3	3	3	3
Weightage of course contributed To each PSO	15	12	14	12	14	13

Title of the Course	ARTIFICIAL NEURAL NETWORKS									
Category	SKILL		Paper Number		SKILL II					
Course Code	L	T	P	Year	Semester	Credits	Inst. Hours	Marks		
								CIA	External	Total
	4	0	0	II	III	2	4	25	75	100
Pre-requisite	Able to know the fundamentals of computer networks									
Objectives of the Course	The main objectives of this course are to: • To understand the basics of artificial neural networks • To understand the Activation and Synaptic Dynamics. • To understand the Functional Units Of Ann For Pattern Recognition Tasks • To understand the Feedback Neural Networks • To understand the Applications Of Neural Systems									

Course Outline	**UNIT – I** Basics of Artificial Neural Networks: Characteristics of Neural Networks – Historical development of Neural Network principles – Artificial Neural Networks: Terminology – Models of Neuron – Topology – Basic Learning Laws
	UNIT – II Activation and Synaptic Dynamics: Introduction – Activation Dynamic Models – Synaptic Dynamic Model – Learning Models –Learning Methods.
	UNIT – III Functional Units Of Ann For Pattern Recognition Tasks: Pattern Recognition Problem – Basic Functional Units – Pattern Recognition Tasks by The Functional Units – FEED FORWARD NEURAL NETWORKS: Introduction – Analysis of Pattern Association Networks – Analysis of Pattern Classification Networks – Analysis of Pattern Mapping Networks.
	UNIT – IV Feedback Neural Networks: Introduction – Analysis of Linear Auto Associative FF Networks – Analysis of Pattern Storage Networks. Competitive Learning Neural Networks: Introduction – Components of a Competitive Learning Network – Analysis of Feed Back Layer for Different Output Functions – Analysis of Pattern Clustering Networks – Analysis of Feed Mapping Network
	UNIT – V Applications Of Neural Systems: Applications of Neural Algorithms And Systems Character Recognition – Expert System Applications – Neural Network Control Applications, Spatio – Temporal Pattern Recognition – Neocognitron and other Applications
Extended Professional Component (is a part of internal component only, Not to be included in the External Examination question paper)	Questions related to the above topics, from various competitive examinations UPSC / TRB / NET / UGC – CSIR / GATE / TNPSC / others to be solved (To be discussed during the Tutorial hour)
Skills acquired from this course	Acquire the knowledge about Artificial Neural Network
Recommended Text	1. For Units I to IV : "ARTIFICIAL NEURAL NETWORKS", B.YEGNANARAYANAN, Eastern Economy edition – Chapter 1,2, (2.1, 2.2, 2.3, 2.4 only), 3, 4, 5 (5, 5.1, 5.2, 5.3 only) & 6. 2. For Unit – V : "INTRODUCTION TO ARTIFICIAL NEURAL SYSTEMS", JACEK M.ZURADA – Jaico Publishing House (1994).

Reference Texts	"Introduction to the theory of Neural Computation"- J.Hertz, A.Krogh and R.G.Palmer, Addison – Wesley 1991.

Course Outcomes	
After successful completion of the course, the student will be able to	
CO1	understand the principles of Neural Networks L2
CO2	Identify different types of models of artificial neural networks L3.
CO3	Analyse the feed-forward neural networks. L4
CO4	Analyse the feedback neural networks. L4
CO5	Compare different applications of artificial neural networks. L4

CO/PSO	**PSO1**	**PSO2**	**PSO3**	**PSO4**	**PSO5**	**PSO6**
CO1	**3**	**3**	**2**	**2**	**3**	**3**
CO2	**3**	**2**	**3**	**2**	**3**	**3**
CO3	**3**	**2**	**3**	**2**	**2**	**1**
CO4	**3**	**3**	**3**	**3**	**3**	**3**
CO5	**3**	**3**	**3**	**3**	**3**	**3**
Weightage of course contributed To each PSO	**15**	**13**	**14**	**12**	**14**	**13**

Title of the Course		**PROJECT WITH VIVA VOCE**								
Category		CORE		**Paper Number**			CORE XV			
Course Code	**L**	**T**	**P**	**Year**	**Semester**	**Credits**	**Inst. Hours**	**Marks**		
								CIA	**External**	**Total**
	0	5	25	II	IV	16	30	50	50	100
Pre-requisite		UG Level Programming knowledge								