



Re-Accredited 'B++' 2.86 CGPA by NAAC

VEER NARMAD SOUTH GUJARAT UNIVERSITY

University Campus, Udhna-Magdalla Road, SURAT - 395 007, Gujarat, India.

વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી

યુનિવર્સિટી કેમ્પસ, ઉદ્ધના-મગદલ્લા રોડ, સુરત - ૩૯૫ ૦૦૭, ગુજરાત, ભારત.

Tel : +91 - 261 - 2227141 to 2227146, Toll Free : 1800 2333 011, Digital Helpline No.- 0261 2388888
E-mail : info@vnsgu.ac.in, Website : www.vnsgu.ac.in

ક્રમાંક:એસ./સિલેબસ/પરિપત્ર/૨૮૧૯/૨૦૨૩
તા.૦૨/૦૨/૨૦૨૩ -

પ્રતિ,
વડાશ્રી,
ડિપાર્ટમેન્ટ ઓફ કોમ્પ્યુટર સાયન્સ,
વીર નર્મદ દક્ષિણ ગુજરાત યુનિવર્સિટી,
સુરત.

વિષય :- Master of Science (Artificial Intelligence & Machine Learning)
M.Sc.(AI/ML) નો નવા અભ્યાસક્રમ બાબત.

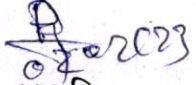
મહાશયશ્રી,

સવિનય જણાવવાનું કે, શૈક્ષણિક વર્ષ ૨૦૨૩-૨૪ થી અમલમાં આવનાર Master of Science (Artificial Intelligence & Machine Learning) M.Sc.(AI/ML) નો નવા અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ બોર્ડ દ્વારા નીમેલ પેટાસમિતિએ તૈયાર કરેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસ સમિતિ વતી ચેરમેનશ્રીએ અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ એકેડેમિક કાઉન્સિલની તા.૩૦/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંક:૨૩ થી સ્વીકારી મંજૂર કરેલ છે. જેની આથી જાણ કરવામાં આવે છે.

એકેડેમિક કાઉન્સિલની તા.૩૦/૦૧/૨૦૨૩ની સભાનાં ઠરાવ ક્રમાંક:૨૪

:: આથી ઠરાવવામાં આવે છે કે, કોમ્પ્યુટર સાયન્સ બોર્ડ દ્વારા રચાયેલ નવા અભ્યાસક્રમ Master of Science (Artificial Intelligence & Machine Learning) M.Sc.(AI/ML) નો કોમ્પ્યુટર સાયન્સ બોર્ડ દ્વારા નીમેલ પેટાસમિતિએ તૈયાર કરેલ અભ્યાસક્રમ કોમ્પ્યુટર સાયન્સ વિષયની અભ્યાસ સમિતિ વતી ચેરમેનશ્રીએ અને કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખાનાં અધ્યક્ષશ્રીએ વિદ્યાશાખા વતી મંજૂર કરી એકેડેમિક કાઉન્સિલને કરેલ ભલામણ સ્વીકારી મંજૂર કરવામાં આવે છે.

બિડાણ: ઉપર મુજબ


કુલસચિવ

પ્રતિ,

- ૧) અધ્યક્ષશ્રી, કોમ્પ્યુટર સાયન્સ એન્ડ ઈન્ફોર્મેશન ટેકનોલોજી વિદ્યાશાખા.
- ૨) પરીક્ષા નિયામકશ્રી, પરીક્ષા વિભાગ, વીર નર્મદ દ. ગુ. યુનિવર્સિટી, સુરત.

...તરફ જાણ તેમજ અમલ સારૂ.

Veer Narmad South Gujarat University, Surat



MASTER OF SCIENCE (ARTIFICIAL INTELLIGENCE
& MACHINE LEARNING)
M.SC. (AI-ML)



M.Sc. (AI – ML) Veer Narmad South Gujarat University

About M.Sc. (AI-ML) :

The M.Sc. AI (Artificial Intelligence) and ML (Machine Learning) is an introduction to modern and advanced AI and ML concepts and practices on real-world problems. The program will expose the foundations of modern AI along with enough attention to the recent explosion of machine learning techniques such as deep learning, artificial neural network, etc. Students will have a good understanding of the fundamental issues and challenges of machine learning. Students will be able to design and implement various machine learning algorithms in a range of real-world applications. This program will make the students understand regarding the strength and weaknesses of many popular machine learning approaches. This program will also impart the knowledge of basic ethical and professional ethics related to the development and application of AI and ML. The program content has the ability to adapt, contribute and innovate new technologies and systems in the key domain of AI and ML. The core knowledge of this program will explore research areas and produce an outstanding contribution in various areas of Artificial Intelligence and Machine Learning. The students who will graduated from this program will become expert solution providers and entrepreneurs in the field of Computer Science with AI/ML specialization.

General Information :

Program Name : M.Sc. (AI-ML)

Duration of Program : 2 Years (Four Semesters)

Intake of the Program : 40

Fees : Rs. 60,000/- per Year (Rs. 30,000/- per Semester) + Examination and University Fees

Admission : On the basis of the Merit of the graduation Marks

Passing Rule : As per the MCA rules of VNSGU

Program will be Offered By : Department of Computer Science, Veer Narmad South Gujarat University



M.Sc. (AI – ML)

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Name of Program	MSc. in Artificial Intelligence and Machine Learning
Abbreviation	MSC in AI & ML
Duration	2Years
Eligibility Criteria	Passed BCA/Bachelor Degree in Computer Science Engineering or equivalent Degree. OR Passed Graduation or Post Graduation with Mathematics or Statistics as a principal Subject OR Passed Graduation or Post Graduation in Engineering
Pre-requisite	Basic computer programming skill, Basic Mathematics and Basic Statistics
Medium Of Instruction	English
Objective of Program	The core objective of the MSC in AI & ML programme is to prepare the students for productive career in AI and ML, Research and academia by providing an outstanding environment to teaching and research in the core and emerging areas of the discipline.
Program Outcome	PO1 : Fundamental Knowledge Enrichment Program trains students with the core Artificial Intelligence and Machine Learning domain. It also makes students capable of using core concepts in the conceptualization of domain specific application development. PO2 : Critical Thinking Development The program develops the skills of critical thinking, problem solving, evaluative learning of various techniques, and understanding the essence of the problem. PO3 : Advanced Emerging Technology Awareness The program trains students with the latest technologies that is being used in the industry. The continuous syllabi review adds value to the program for the outgoing students and make them ready to face challenging demands of the industry. PO4 : Advanced Tools Usage The program teaches the students to apply the advanced tools to solve real world problems. PO5 : Nurturing Research Oriented Approach The program trains students to develop research oriented approach which will help them to make user centric applications. PO6 : Real World Problem / Project Development Real world project provides the candidates exposure to work in the challenging and demanding environment of the industry. The project development training makes students employable and industry ready. PO7 : Team Work and Leadership Development Trains students to work in a team and also to take leadership of the of the project management team.
Program Specific Outcomes	PSO1 : Develop and strengthen the fundamental core concepts that are required to solve complex problems PSO2 : Develop the professional and entrepreneurship skills that needs independent logical and analytical thinking, teamwork and leadership PSO3 : Nurture the students to investigate for the design and development of a workable solution for a real world problem PSO4:Develop students for self-learning and practicing challenging problem solution PSO5:Train students to use recent Artificial Intelligence and Machine Learning domain specific knowledge PSO6 : Inculcate the passion for continuous learning and doing research for



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		making a successful professional career						
Mapping between Pos and PSOs			PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
		PO1						
		PO2						
		PO3						
		PO4						
		PO5						
		PO6						
		PO7						
Medium of Instruction		English						
Program Structure		Semester I						
Course Code	Title	Teaching per Week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
101	Discrete Mathematics	4	0	4	3 Hrs.	70	30	100
102	Descriptive Statistics and Data Visualization	4	0	4	3 Hrs.	70	30	100
103	Advanced Software Engineering	4	0	4	3 Hrs.	70	30	100
104	Python Programming - I	4	0	4	3 Hrs.	70	30	100
105	Artificial Intelligence	4	0	4	3 Hrs.	70	30	100
106	Programming Skills –I	0	5	5	2 Hrs.	70	30	100
107	Programming Skills – II	0	5	5	2 Hrs.	70	30	100
Total		20	10	30	19 Hrs.	490	210	700
Program Structure		Semester II						
Course Code	Title	Teaching per Week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
201	Probability and Statistics	4	0	4	3 Hrs.	70	30	100
202	Optimization Techniques	4	0	4	3 Hrs.	70	30	100
203	Elective – 1 : Advance RDBMS Elective – 2 : Object Oriented Programming	4	0	4	3 Hrs.	70	30	100
204	Python Programming - II	4	0	4	3 Hrs.	70	30	100
205	Machine Learning -I	4	0	4	3 Hrs.	70	30	100
206	Programming Skills – III	0	4	4	2 Hrs.	70	30	100
207	Programming Skills – IV	0	3	3	2 Hrs.	70	30	100
208	Programming Skills – V	0	3	3	2 Hrs.	70	30	100
Total		20	10	30	21 Hrs.	560	240	800
Program Structure		Semester III						
Course	Title	Teaching per Week		Course	University Examination	Internal	Total	



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Code		Theory	Practical	Credits	Duration	Marks	Marks	Marks
301	Machine Learning II : ANN and Deep Learning	4	0	4	3 Hrs.	70	30	100
302	IoT Using Raspberry Pi	4	0	4	3 Hrs.	70	30	100
303	Elective 1: Machine Learning using .NET Elective 2 : Machine Learning using Java	4	0	4	3 Hrs.	70	30	100
304	Elective 3 :Digital Image Processing & Natural Language Processing Elective 4 : Big Data Analysis	4	0	4	3 Hrs.	70	30	100
305	Professional Ethics	4	0	4	3 Hrs.	70	30	100
306	Programming Skills – VI	0	3	3	2 Hrs.	70	30	100
307	Programming Skills – VII	0	3	3	2 Hrs.	70	30	100
308	Programming Skills– VIII	0	3	3	2 Hrs.	70	30	100
309	Programming Skills– IX	0	3	3	2 Hrs.	70	30	100
Total		20	12	32	23 Hrs.	630	270	900

Program Structure		Semester IV						
Course Code	Title	Teaching per Week		Course Credits	University Examination		Internal Marks	Total Marks
		Theory	Practical		Duration	Marks		
401	Blockchain Technology	4	0	4	3 Hrs.	70	30	100
402	No code AI and ML	4	0	4	3 Hrs.	70	30	100
403	Programming Skills – X	0	4	4	2 Hrs.	70	30	100
404	Project	0	20	20	-	280	120	400
Total		8	24	32	8 Hrs.	490	210	700



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Course:101:Discrete Mathematics

Course Code	101						
Course Title	Discrete Mathematics						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15 (Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1- A major goal of this course is to teach the students how to understand and construct correct mathematical arguments and The basic concepts involving functions needed in discrete mathematics.</p> <p>CO2- Students will learn Identify sets, different properties of sets, set operations and set identities.</p> <p>CO3-Explain and train students to Demonstrate an understanding of relations and functions and be able to determine their properties</p> <p>CO4- Demonstrate the concept of Propositional Logic which help them to understand the logic and theory.</p> <p>CO5-Demonstrate different traversal methods for trees and graphs.</p> <p>CO6 : After studying the course, students will be able to understand how the fundamental concepts of Sets, Relations and Functions, Mathematical Logic, Group theory, Counting Theory, Probability, Mathematical Induction and Recurrence Relations, Graph Theory, Trees and Boolean Algebra.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit1:Sets Theory</p> <ol style="list-style-type: none"> 1.1. Introduction to set 1.2. Finite Sets, 1.3. Power Set, 1.4. Cardinality of finite sets, 1.5. Cartesian Product, 1.6. Properties of Sets, 1.7. Vector Implementations of Sets <p>Unit2:Relational Structures on Sets and Lattices</p> <ol style="list-style-type: none"> 2.1. Relations, Properties of Relations, Closure of Relations, 2.2. Equivalence of Relations, 2.3. Partial Ordering Equivalence Relations. 2.4. Functions, Bijections, Posets, and Lattices 2.5. Overview of Physical and Logical Structures <p>Unit3:Group Theory</p> <ol style="list-style-type: none"> 3.1. Definition of a group, 3.2. Groups as symmetries, 3.3. Homomorphisms, 3.4. Subgroups and quotient groups, 3.5. Cosets, 3.6. Conjugacy classes, 3.7. Normal subgroups, 3.8. Lagrange's theorem, 3.9. The isomorphism theorems, 						



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	<p>3.10. Ring theory, Definition and examples 3.11. Ring</p> <p>Unit4:Propositional Logic 4.1 Proposition, 4.2 well-formed formula, 4.3 Truth tables, 4.4 Tautology, 4.5 Satisfiability, 4.6 Contradiction, 4.7 Algebra of proposition, 4.8 Theory of Inference Predicate Logic: First order predicate, 4.9 well-formed formula of predicate, quantifiers, Inference theory of predicate logic</p> <p>Unit5:Graph Theory and Trees 5.1. Introduction to Graph, 5.2. Graph terminology, 5.3. Applications of Graph, 5.4. Characteristics of Graphs, 5.5. Types of Graphs, Introduction to Trees, 5.6. Application of Trees, 5.7. Binary tree, 5.8. Binary tree traversal, 5.9. Binary search tree Privileged Accounts & Privileges</p>
Reference Books	<p>(1) Discrete Mathematics (Fifth Edition), K. A. Ross and C. R. B. Wright, Prentice Hall, 2003 (2) Discrete Mathematics, A. Chetwynd and P. Diggle, Arnold, 1995. (3) Discrete And Combinatorial Mathematics (Fifth Edition), R. P. Grimaldi, Addison Wesley, 2003 (4) Discrete Mathematics An Open Introduction, Oscar Levin · 2018 (5) Discrete Mathematics, N. Chandrasekaren, M. Umavparvathi · 2015, Prentice Hall India Pvt., Limited (6) A Textbook of Discrete Mathematics Paperback, Harish Mittal (Author), Vinay Kumar Goyal, Wiley, 2021</p>
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30%Internalassessment 70%ExternalAssessment



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Course:102:Descriptive Statistics and Data Visualization

Course Code	102						
Course Title	Descriptive Statistics and Data Visualization						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain the concept of Population and Sample, Method of Data collection and Frequency Distribution.</p> <p>CO2 : Apply appropriate data visualization techniques to provide trends/insights for the given dataset.</p> <p>CO3 : Impart the knowledge of perception and cognition to evaluate visualization design alternatives.</p> <p>CO4 : Learn statistical techniques to work with data and their relationships.</p> <p>CO5 : Understand the concept of deviation, and measures of dispersion.</p> <p>CO6 : To learn the use of statistical data visualization for the various application area like Data Science, Business Intelligence and Machine Learning</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit 1: Types of Data and Data Condensation</p> <p>1.1 Concept of Population and Sample</p> <p style="padding-left: 20px;">1.1.1 Finite Population</p> <p style="padding-left: 20px;">1.1.2 Infinite Population</p> <p>1.2 Methods of Data Collection</p> <p style="padding-left: 20px;">1.2.1 Primary data: concept of a Questionnaire and a Schedule</p> <p style="padding-left: 20px;">1.2.2 Secondary Data, Types of data: Qualitative and Quantitative Data, Discrete and Continuous Data.</p> <p>1.3 Frequency Distribution</p> <p style="padding-left: 20px;">1.3.1 Univariate frequency distribution of discrete and continuous variables.</p> <p style="padding-left: 20px;">1.3.2 Cumulative frequency distribution</p> <p style="padding-left: 20px;">1.3.3 Bivariate Frequency Distribution of discrete and continuous Variables</p> <p>Unit 2: Measures of Central Tendency</p> <p>2.1 Concept of central tendency of data</p> <p style="padding-left: 20px;">2.1.1 Arithmetic Mean (Simple, weighted mean, combined mean),</p> <p style="padding-left: 20px;">2.1.2 Geometric mean</p> <p style="padding-left: 20px;">2.1.3 Harmonic mean</p> <p style="padding-left: 20px;">2.1.4 Median</p> <p style="padding-left: 20px;">2.1.5 Quartiles</p> <p style="padding-left: 20px;">2.1.6 Deciles</p> <p style="padding-left: 20px;">2.1.7 Percentiles</p> <p style="padding-left: 20px;">2.1.8 Mode</p> <p>2.2 Empirical relation between mean, median and mode</p> <p>2.3 Merits and demerits of using different measures & their applicability.</p> <p>Unit 3: Measures of Dispersion</p>						



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	<p>3.1 Concept of Dispersion 3.2 Requirements of good measure 3.3 Absolute and Relative measures of dispersion 3.3.1 Range, Quartile Deviation, Inter Quartile Range 3.3.2 Mean absolute deviation, Standard deviation 3.3.3 Variance and Combined variance 3.3.4 Raw moments and central moments</p> <p>Unit 4: Skewness & Kurtosis 4.1 Concept of Skewness and Kurtosis 4.2 Measures of Skewness: Karl Pearson's 4.3 Measure of Kurtosis 4.4 Absolute and relative measures of skewness.</p> <p>Unit 5: Data Visualization 5.1 Bivariate Data Visualization 5.2 Multivariate Data Visualization 5.3 Tools for Data Visualization 5.3.1 Graphs 5.3.2 Diagrams 5.3.3 Histogram: Polygon/curve 5.3.4 Ogives</p>
Reference Books	<ol style="list-style-type: none">1. Visualizing data: Exploring and explaining data with the processing environment, Ben Fry, O'Reilly2. Designing Data Visualizations: Representing Informational Relationships, A Julie Steele and Noah Iliinsky, O'Reilly3. Data Visualization: A Successful Design Process, Andy Kirk, PAKT4. Data Points: Visualization that means something, Nathan Yau, Wiley5. An Introduction to Multivariate Statistical Analysis, Anderson T. W., John Wiley6. Applied Multivariate Statistical Analysis, Johnson and Wichern7. Multivariate Statistical Methods, Morrison D.F., McGraw Hill8. An Introduction to Multivariate Statistics, Srivastava and Khatri C.G., North Holland9. Linear Statistical Inference and its Applications, Rao C.R., John Wiley10. Sampling Techniques, Cochran W. G., John Wiley11. Sampling Theory and Methods, Murthy M. N., Statistical Publishing Society, Calcutta.
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course: 103: Advanced Software Engineering

Course Code	103						
Course Title	Advanced Software Engineering						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, <i>examination</i> , preparation, holidays etc.)						
Course Outcome	<p>CO1: Students will be able to understand basics about object oriented analysis and design concepts.</p> <p>CO2: Students will be able to understand the concepts of UML and various UML diagrams and their use in software designing.</p> <p>CO3: Students will be able to understand design pattern concepts; useful in software development.</p> <p>CO4: Students will be able to understand web engineering and its use from the point of view of ML applications.</p> <p>CO5: Students will be able to understand software project management and its concepts applicable to AI & ML applications.</p> <p>CO6: Students will acquire professional software engineering skills, which can be used during their employment with companies working in the area of AI & ML technology, or during their higher studies further.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit 1. Object Oriented Analysis and Design</p> <p>1.1 Object Oriented Analysis & Design</p> <p>1.1.1 Use case model-identifying & refining actors, scenarios and use cases</p> <p>1.1.2 Classification- Identifying Classes, Object relationships, attributes and Methods.</p> <p>1.1.3 Designing Classes & Components- abstraction, encapsulation, reuse, cohesion, coupling</p> <p>1.2 Component-Based Process Models</p> <p>1.2.1 The CBSE Process</p> <p>1.2.2 Domain Engineering</p> <p>1.2.3 Component-based development</p> <p>1.2.4 Component classification, retrieval and reuse</p> <p>Unit 2. UML Diagrams</p> <p>2.1 Class Diagrams</p> <p>2.1.1 Class Notation-Static Structure</p> <p>2.1.2 Object Diagram</p> <p>2.1.3 Class Interface Notation</p> <p>2.1.4 Incorporating Associations, Association role, qualifier, multiplicity, Association class, Binary and N-ary Associations, aggregation and Composition Associations, Generalization</p> <p>2.2 Use case Diagrams</p> <p>2.2.1 Scope, Benefits and Elements</p> <p>2.2.2 Identifying Actors, Scenarios and Use cases</p> <p>2.3 Elements and Guidelines of other diagrams</p>						



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- 2.3.1 Sequence Diagram
- 2.3.2 Collaboration Diagram
- 2.3.3 Activity Diagram
- 2.3.4 State Chart Diagram
- 2.3.5 Component Diagram
- 2.3.6 Deployment Diagram

Unit 3. Design Patterns

- 3.1 Software Design Patterns - Design Principles and Techniques
- 3.2 Types of Design Patterns
 - 3.2.1 Creational Design Patterns
 - 3.2.2 Structural Design Patterns
 - 3.2.3 Behavioural Design Patterns

Unit 4. Web Engineering

- 4.1 Attributes of web-based systems and applications, Web Engineering layers, Web Engineering Process
- 4.2 Analysis Model for WebApps
 - 4.2.1 Content Model, Interaction Model, Functional Model, Configuration Model,
 - 4.2.2 Relationship Navigation Analysis
- 4.3 Design for WebApps
 - 4.3.1 Design issues, WebE Design Pyramid,
 - 4.3.2 Interface, Aesthetic and Content Design
 - 4.3.3 Architecture and Navigation Design
 - 4.3.4 Component Level Design
- 4.4 Testing WebApps
 - 4.4.1 Testing concepts for WebApps - Quality concepts, Error characteristics, Test planning and Testing strategy, Testing Process
 - 4.4.2 Overview of Interface Testing, Content Testing, Component level Testing
 - 4.4.3 Navigation Testing, Configuration Testing, Security Testing, Performance Testing

Unit 5. Software Project Management

- 5.1 4 P's for Project Management – People, Product, Process, Project
- 5.2 Measures, metrics and indicators
 - 5.2.1 Process metrics and process improvement
 - 5.2.2 Project metrics
 - 5.2.2.1 Size oriented metrics
 - 5.2.2.2 Function oriented metrics
 - 5.2.3 Metrics for software quality
 - 5.2.4 Integrating metrics within the software process
- 5.3 Software Project Estimation
 - 5.3.1 Decomposition techniques
 - 5.3.2 Problem based estimation
 - 5.3.2.1 LOC based estimation
 - 5.3.2.2 FP based estimation
 - 5.3.3 Process based estimation
 - 5.3.4 Empirical estimation models
- 5.4 Project Scheduling and Tracking
- 5.5 Risk Management
 - 5.5.1 Strategies
 - 5.5.2 Software Risks
 - 5.5.3 Risk Identification, Assessment, Components, and Drivers



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	5.5.4 Risk Projection 5.5.5 RMMM - Risk Mitigation, Monitoring and Management
Reference Books	<ol style="list-style-type: none">1. Software Engineering: A Practitioner's Approach, 7/e Roger S Pressman TataMcGrawHill2. Web Engineering: A Practitioner's Approach 1/e RogerPressman, TataMcGrawHill David Lowe3. Design Patterns: Elements of Reusable Object-Oriented Software, E. Gamma, R. Helm, R. Johnson, and J. Vlissides, 1995, Addison-Wesley.4. Software Engineering Ian Somerville, Pearson Education(Addison-Wesley)5. Web Engineering Emila Mendes, New Age Information Nile Mosley (Springer) Publication6. Object Oriented System Development AliBahrami McGraw Hill7. Object Oriented Modeling and Design withUML J. Rumbaugh, PHI M. Blaha8. Oriented Software Engineering Ivar Jacobson AWL9. Applying UML & Patterns: An Introduction to Larman Pearson Education Object Oriented Analysis and Design,10. Object Oriented Software Engineering using UML Bernd Bruegge, Pearson Education Patterns and Java.Allen H.Dutoit11. Object Oriented Modeling and Design J. Rumbaugh, PHI M. Blaha et al,William Premerlani, FredrickEddy, Willia Lorensen,
Teaching Methodology	Class Work, Discussion ,Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Veer Narmad South Gujarat University

Course: 104: Python Programming -I

Course Code	104						
Course Title	Python Programming - I						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1: Students will be able to Write, Test and Debug Python Programs.</p> <p>CO2: Students will be able to Implement Conditionals and Loops, use functions and represent Compound data using Lists, Tuples and Dictionaries in Python programs.</p> <p>CO3: Students will be able to Read and write data from & to files in Python and develop Real World Application.</p> <p>CO4: Students will be able to Design and implement programs to solve real-world problems using Python Programming Language.</p> <p>CO5: Students will learn essential packages like NumPy and Matplotlib, which are necessary for Machine Learning, Data Analytics, and AI.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit-1: Fundamentals of Python</p> <p>1.1 Features of Python</p> <p>1.2 Python's Integrated Development and Learning Environment (IDLE)</p> <p>1.3 Python identifiers</p> <p>1.4 Python Operators</p> <p>1.5 Python Datatypes</p> <p style="padding-left: 20px;">1.5.1 Numeric: integer, float, complex</p> <p style="padding-left: 20px;">1.5.2 Sequence: list, tuple, range</p> <p style="padding-left: 20px;">1.5.3 Sets</p> <p style="padding-left: 20px;">1.5.4 Texts</p> <p style="padding-left: 20px;">1.5.5 Binary: bytes, bytearray</p> <p style="padding-left: 20px;">1.5.6 Iterator</p> <p style="padding-left: 20px;">1.5.7 Mapping: dictionary</p> <p>1.6 Input/Output in Python</p> <p>Unit-2: Program Logic</p> <p>2.1 Control Structures</p> <p style="padding-left: 20px;">2.1.1 If, if..else, nestedif, shorthand if, shorthand if..else</p> <p style="padding-left: 20px;">2.1.2 while loop</p> <p style="padding-left: 20px;">2.1.3 for loop</p> <p style="padding-left: 20px;">2.1.4 break, continue, pass</p> <p>2.2 Functions in Python</p> <p style="padding-left: 20px;">2.2.1 Function declaration</p> <p style="padding-left: 20px;">2.2.2 Passing arguments to function</p> <p style="padding-left: 20px;">2.2.3 Return values</p> <p style="padding-left: 20px;">2.2.4 Variable scope and namespace</p> <p style="padding-left: 20px;">2.2.5 Lambda function</p>						



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	<p>2.2.6 Recursive function 2.2.7 In-built function</p> <p>Unit-3: Files and Modules</p> <p>3.1 File handling 3.1.1 Reading and writing to a file 3.1.2 Creation of new File 3.1.3 Deletion of a file</p> <p>3.2 Python Modules 3.2.1 Creation on Module 3.2.2 Importing a Module 3.2.3 Date & Time Module</p> <p>Unit-4: Exception, Class and Objects</p> <p>4.1 Exception handling 4.1.1 try, catch, finally 4.1.2 Multiple error handling except 4.1.3 Throwing a particular error : raise</p> <p>4.2 Classes and Objects 4.2.1 Creation of class and objects 4.2.2 The __init__() function 4.2.3 self parameter 4.2.4 Modify the property of a class 4.2.5 Inheritance & Encapsulation</p> <p>Unit-5: Python Packages</p> <p>5.1 Numpy 5.1.1 Installing Numpy 5.1.2 Numpy Array: dtype, shape, reshape, ndim ,itemsize, empty, zeros, ones, fromiter, arrange ,linespace 5.1.3 Indexing and slicing,broadcasting 5.1.4 Array manipulation: changing shapes, transpose, changing dimension, joining and splitting arrays, adding and removing elements 5.1.5 Mathematical functions and matrix library</p> <p>5.2 Introduction to Matplotlib 5.2.1 Installing Matplotlib 5.2.2 Components of a plot 5.2.3 Drawing a Plot 5.2.4 Drawing Scatter Diagram</p>
Reference Books	<ol style="list-style-type: none"> 1. Python Programming, Anurag Gupta, G Biswas,, McGraw Hill 2. Exploring Python, Timothy A. Budd, McGraw Hill Publication 3. Core Python Programming, R. Nageswara Rao, Dreamtech Press 4. Learning Python, 5th Edition, Mark Lutz, O'Reilly Media 5. Python Projects, Laura Cassell, Alan Gauld, Wrox Publication 6. NumPy: Beginner's Guide,3rd Edition ,Ivan Idris, Packt Publishing 7. NumPy Essentials, Leo Chin, Tanmay Dutta, Packt Publishing 8. Matplotlib 2.x By Example, Allen Yu,Claire Chung,Aldrin Yim, Packt Publishing
Teaching Methodology	Class Work, Discussion ,Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course:105:Artificial Intelligence

Course Code	105						
Course Title	Artificial Intelligence						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain to the students the fundamental know how like the types of machine learning algorithms, applications and various required libraries, model selection etc. required to implement machine learning algorithms.</p> <p>CO2 : Train students with can utilize various data wrangling techniques, data cleaning, data transformation, data reduction, data discretization, feature selection, and data visualization</p> <p>CO3 : Train students who can implement supervised learning algorithms utilizing regression and classification algorithm on the real world dataset.</p> <p>CO4 : Train student to have understanding of Artificial Neural Network and its working. Also, to make them capable of implementing ANN for solving real world problems using it.</p> <p>CO5 : Explain to the students to use clustering and association rules as unsupervised learning method to solve complex problems.</p> <p>CO6 : Train students to use machine learning techniques to solve real life complex problems.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit1:</p> <p>1.1 Introduction to Artificial Intelligence</p> <p> 1.1.1 Definition of Artificial Intelligence</p> <p> 1.1.2 History of Artificial Intelligence</p> <p> 1.1.3 Application of Artificial Intelligence</p> <p> 1.1.4 Introduction to Knowledge-Based System</p> <p>1.2 Turing Problem</p> <p>1.3 Knowledge Representation</p> <p> 1.3.1 Knowledge and Knowledge Base</p> <p> 1.3.2 First Order Predicate Logic(FOPL)</p> <p> 1.3.3 Inference Rules</p> <p>Unit2:</p> <p>2.1 Structured Knowledge Representation</p> <p> 2.1.1 Associative network and Conceptual graphs</p> <p> 2.1.2 Frames and Scripts</p> <p> 2.1.3 Conceptual Dependencies</p> <p>2.2 Searching</p> <p> 2.2.1 Search Problem</p> <p> 2.2.2 Initial State, action, transition model, goal test, the cost function</p> <p> 2.2.3 Uninformed Search</p> <p> 2.2.3.1 Depth First Search</p> <p> 2.2.3.2 Breadth-First Search</p> <p> 2.2.3.3 Iterative Deepening Search</p> <p> 2.2.4 Informed Search</p>						



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	<p>2.2.4.1 Heuristics 2.2.4.2 A*Search 2.2.4.3 Minimax 2.2.4.4 Hill-Climbing Method 2.2.4.5 Constraint Satisfaction Search</p> <p>Unit3: 3.1 Uncertainty 3.1.1 Probability 3.1.2 Conditional Probability 3.1.3 Baye’s Rule 3.1.4 Joint Probability 3.1.5 Probability Rules 3.2 Introduction to Hidden Markov Model</p> <p>Unit4: 4.1 Knowledge Acquisition 4.1.1 Knowledge gathering 4.1.2 Learning Models 4.1.2.1 Introduction to Supervised Learning 4.1.2.2 Introduction to Unsupervised Learning 4.1.2.3 Reinforcement Learning 4.1.3 Performance of Learning Model</p> <p>Unit5: 5.1 Expert System 5.2 Characteristics of Expert System 5.3 Architecture of Expert System 5.4 Application of AI in Natural Language Processing 5.5 Application of AI in Computer Vision</p>
Reference Books	<ol style="list-style-type: none"> 1. Artificial intelligence, 3rd Edition, Kevin Knight, Elaine Rich, B.Shivashankar Nair ,McGrawHill 2. Russell Stuart JonathanandNorvig Peter, Artificial Intelligence:AModernApproach,3rdEdition,Prentice-Hall,2010 3. A First Course in Artificial Intelligence, Deepak Khemani, McGrawHill 4. Introduction to artificial intelligence, <u>Akerkar, Rajendra</u>, PHI Learning 5. Foundation of Artificial Intelligence and Expert Systems by V.S.Janakiraman, K. Sarukesi, P. Gopalakrishnan, McMillan 6. Expert Systems Principles and Programming(3rd Edition) by Giarratano & Riley, Thomson(Vikas Publishing House)
Teaching Methodology	Class Work, Discussion, Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course: 106: Programming Skills - I

Course Code	106
Course Title	Programming Skills – I
Credit	5
Teaching per Week	5 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 104 (Python Programming - I)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 107: Programming Skills - II

Course Code	107
Course Title	Programming Skills – II
Credit	5
Teaching per Week	5 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 105 (Artificial Intelligence)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment



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Veer Narmad South Gujarat University

Course:201:Probability and Statistics

Course Code	202						
Course Title	Probability and Statistics						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO 1: Understand the terminologies of basic probability, two types of random variables and their probability functions</p> <p>CO 2: Observe and analyze the behavior of various discrete and continuous probability distributions</p> <p>CO 3 :Students will learn Sampling and various techniques and perform Test of Hypothesis as well as calculate confidence interval for a population parameter for single sample and two sample cases. Understand the concept of p-values.</p> <p>CO 4 :Students will learn Test of Hypothesis and it's significance.</p> <p>CO 5 : Compute and interpret the results of Bivariate and Multivariate Regression and Correlation Analysis.</p> <p>CO 6 : At the end of this course students will learn various probability and statistics techniques and how to implement it to understand its using software</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1 : Introduction to Probability:</p> <p>1.1 Definition of probability, 1.2 Conditional probability, 1.3 Random variables, 1.4 Two dimensional random variables and their distribution functions, 1.5 Expectation and Expected Value 1.6 Probability Distributions 1.7 Discrete Distribution 1.8 Continuous Distribution 1.9 The Normal Distribution Special distributions of importance to Computer Science</p> <p>Unit 2 : Sampling Theory</p> <p>2.1 Population and Sample 2.2 Sampling with and without replacement, 2.3 Random samples and Population parameters, 2.4 Sample statics and mean, 2.5 Sampling distribution of means, 2.6 Sample variances 2.7 Unbiased estimates and efficient estimates</p> <p>Unit 3 :Tests of Hypothesis and Significance</p> <p>3.1 Introduction 3.2 Optimum test under different situation 3.3 Null and Alternate hypothesis, 3.4 test of hypothesis and significance, 3.5 Type I and Type II errors,</p>						



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	<p>3.6 Level of Significance, 3.7 Tests involving the Normal distribution</p> <p>Unit 4 :Correlation and Regression</p> <p>4.1 Definition of correlation. 4.2 Different measures of correlation. 4.3 Coefficient of correlation, 4.4 methods of finding correlation coefficient: scatter diagram, Karalpearson's coefficient of correlation, rank correlation. 4.5 Definition of regression 4.6 best regression. Line, regression equations, 4.7 coefficient of regression, 4.8 interrelation of coefficient of correlation and coefficient of regression.</p>
Reference Books	<ol style="list-style-type: none">(1) M. Spiegel, J. Schiller and R. Srinivasan, Schaum's Outline of Probability and Statistics, McGraw Hill, 2000.(2) W. Mendenhall and R. Beaver, Introduction to Probability and Statistics, Wadsworth Publishing, 1994.(3) S. Ross, Introduction to Probability and Statistics for Engineers and Scientists, John Wiley, 1988.(4) M. Berger, An Introduction to Probability and Stochastic Processes, SpringerVerlag, 1992.(5) J. L. Devore, Probability and Statistics for Engineering and the Sciences, Cengage Learning(6) I. Goon A.M., Gupta M.K. and Dasgupta B. (2002): Fundamentals of Statistics, Vol. I & II, 8th Edn. The World Press, Kolkata.(7) Miller, Irwin and Miller, Marylees (2006): John E. Freund's Mathematical Statistics with Applications, (7th Edn.), Pearson Education, Asia.(8) Mood, A.M. Graybill, F.A. and Boes, D.C. (2007): Introduction to the Theory of Statistics, 3rd Edn., (Reprint), Tata McGraw-Hill Pub. Co. Ltd.
Teaching Methodology	Class Work, ,Discussion, ,Self-Study, ,Seminars and/or Assignment
Evaluation Method	30%Internalassessment 70%ExternalAssessment



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Veer Narmad South Gujarat University

Course:202: Optimization Techniques

Course Code	202						
Course Title	Optimization Techniques						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1- Students will learn of various issues related to linear programming modeling to formulate real-world problems as a LPP and workings of the graphical, simplex and analytical methods for making effective decision on variables so as to optimize the objective function.</p> <p>CO2- Demonstrate the transportation model to minimize total distribution cost and Find the appropriate algorithm for allocation of resources to optimize the process of assignment.</p> <p>CO3- Students will learn the theoretical workings of sequencing techniques for effective scheduling of jobs on machine.</p> <p>CO4-Demonstrate the various inventory control models to analyse and optimize inventory systems.</p> <p>CO5- Students will learn various Network analysis using PERT and CPM which will help them to understand how to optimize project.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1.Linear Programming</p> <p>1.1 Formulation of L.P.P.</p> <p>1.2 Solution Methods</p> <p>1.2.1 Graphical Method</p> <p>1.2.2 Simplex Method</p> <p>1.2.3 TwoPhase Method</p> <p>1.2.4 Big-M Method</p> <p>Unit 2.Special cases of L.P.P.</p> <p>2.1 Transportation Problem</p> <p>2.2 Assignment Problem</p> <p>Unit 3.Job Sequencing</p> <p>3.1 Processing n jobs through 2 machines</p> <p>3.2 Processing n jobs through 3 machines</p> <p>3.3 Processing 2jobs through m machines</p> <p>3.4 Processing n jobs through m machines</p> <p>Unit 4.Inventory Problem</p> <p>4.1 Introduction to Inventory</p> <p>4.2 Deterministic Inventory models</p> <p>4.3 Dynamic Inventory models</p> <p>Unit 5.Network Analysis</p> <p>5.1 PERT</p> <p>5.2 CPM</p>						
Reference Books	<ol style="list-style-type: none"> HillerF.S.&LibermanG.J.:Introductionto Operations Research 2nd Edn.: - Holand DayInc.London,1974 TaraH.A.:Operation Research,3rd Edn.-McMillan Publishing Company,1982 Beightler C.S.&Phillips D.T.:Foundations of Optimization,- 						



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	PrenticeHall,1979 4. McMillanclaudeJr.: Mathematical Programming, 2 nd Edn.- WileySeries,1979 5. Gillett B.G.: Introduction to Operation Research- A Computer oriented Algorithmic approach-McGrow Hill BookComp.,1976 6. N.S.Kambo: Mathematical Programming Techniques
Teaching Methodology	Class Work, Discussion, Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course:203:Advance RDBMS

Course Code	203						
Course Title	Advance RDBMS						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1: Students will be able to understand and evaluate the role of database management systems in IT applications within an organization.</p> <p>CO2: Students will be able to normalise any real-life database and hence they will be able to design and implement properly structured databases of realworld applications.</p> <p>CO3: Students will be able to write queries using Structured Query Language (SQL) and programs using PL/SQL.</p> <p>CO4: Students will understand how Oracle Database works and the importance of various components of OracleDatabase.</p> <p>CO5: Students will understand administration and security enforcement of Oracle Database. This will help them in pursuing higher studies and career in Database Administration</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1: Database Computing Models</p> <p>1.1. Notion of Keys(SuperKey,CandidateKey,PrimaryKey,ForeignKey)</p> <p>1.2. Referential Integrity Constraint</p> <p>1.3. Functional Dependencies</p> <p>1.4. Normalization using Functional Dependencies</p> <p>1.5. Normalization using Multivalued Dependencies</p> <p>1.6. Normalization using Join Dependencies</p> <p>Unit 2: Overview of Oracle Database Server Architecture</p> <p>2.1. Architecture of Oracle Database and Oracle Instance</p> <p>2.2. Overview of Physical and Logical Structures</p> <p>2.3. Oracle Server Start-up and Shutdown</p> <p>2.4. Creating Database</p> <p>Unit 3: Oracle Tools and Utilities</p> <p>3.1. SQL</p> <p>3.2. PL/SQL Procedural Extension.</p> <p>3.2.1 Overview, PL/SQL datatypes & Control Structures</p> <p>3.2.2 Cursors</p> <p>3.2.3 Stored Procedures & Functions</p> <p>3.2.4 Database Triggers</p> <p>3.2.5 Package Creation</p> <p>Unit 4: Database Administration</p> <p>4.1. Managing Users</p> <p>4.1.1. User Authentication Methods</p> <p>4.1.1.1. Password Authentication</p> <p>4.1.1.2. O.S Authentication</p> <p>4.1.2. User Configuration Setup</p>						



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	<ul style="list-style-type: none"> 4.121. Profiles 4.122. Default Table space 4.123. Temporary Table space 4.13. Resource Management <ul style="list-style-type: none"> 4.13.1. Quotas 4.14. Working with user database account <ul style="list-style-type: none"> 4.14.1. Creating, Modifying and deleting user account 4.14.2. Changing password 4.2. Backup & Recovery <p>Unit 5: Database Security</p> <ul style="list-style-type: none"> 5.1. Authentication 5.2. Privileged Accounts & Privileges 5.3. Object Security 5.4. System security 5.5. Database Roles 5.6. Database Auditing
Reference Books	<ol style="list-style-type: none"> 1. Oracle 9i PL/SQL Programming-Scott Urman-Oracle Press 2. Oracle DBA Fundamentals-I-Oracle Press 3. Effective PL/SQL:-A press 4. Expert Oracle Database Architecture 9i and 10g-Tom Kyte-A press 5. Effective Oracle by Design-Peter Norton-Tom Kyte-Oracle Press 6. Oracle 24X7 Tips and Techniques-Venkat Devraj-Oracle Press 7. Expert Oracle Database 11g Administration – Alpati-Wiley Student Edition 8. Fundamentals of Database Management System-Gilleneon-Wiley Student Edition 9. SQL&PL/SQL for Oracle 11g Black Book – Deshpande – McGraw Hill 10. Beginning Oracle Database 11g Administration from novice to professional-Iggy Fernandez-A press/Springer 11. Oracle PL/SQL-Benjam in Rosenweig & Elena Silvestrova-4/e, Pearson 12. Database Systems Using Oracle : A simplified guide to SQL & PL/SQL-Shah Nilesh-PHI 13. Learning Oracle SQL&PL/SQL: ASimplified Guide-Chatterjee,RajeebC-,PHI
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course:203:Object Oriented Programming

Course Code	203						
Course Title	Object Oriented Programming						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1: Articulate the principles of Object Oriented Problem solving and programming.</p> <p>CO2: To demonstrate the differences between traditional imperative design and object Oriented Design</p> <p>CO3: Outline the essential features and elements of C++ programming language.</p> <p>CO4: To grasp and apply the concepts of class, method, constructor, abstraction, inheritance and Static Polymorphism. CO5: To understand and apply Dynamic Polymorphism in real world applications.</p> <p>CO5: To implement Genericity through the usage of Templates.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1: C++ Basics</p> <p>1.1 Data Types</p> <p>1.2 Pointers</p> <p> 1.2.1 Pointer Arithmetic</p> <p> 1.2.2 Array of Pointers</p> <p> 1.2.3 Dynamic Array</p> <p>1.3 ios Class</p> <p>1.4 Input and Output</p> <p>1.5 Manipulators</p> <p>Unit 2: Introduction to Object Oriented Programming</p> <p>2.1 Structure, classes and Objects</p> <p>2.2 Encapsulation & Data Hiding</p> <p>2.3 Constructors</p> <p>2.4 Friend Functions</p> <p>2.5 Inline Functions</p> <p>2.6 Dynamic Object Creation & Destruction</p> <p>2.7 Static Members</p> <p>2.8 This Pointer</p> <p>2.9 Destructors</p> <p>Unit 3: Object Oriented Properties</p> <p>3.1 Introduction to Object Oriented Properties</p> <p>3.2 Abstraction</p> <p>3.3 Polymorphism</p> <p> 3.3.1 Operator Overloading</p> <p> 3.3.2 Function Overloading & Type Conversions</p> <p>3.4 Inheritance</p> <p> 3.4.1 Types of Inheritance</p> <p> 3.4.2 Constructor & Destructor calls during Inheritance</p> <p>3.5 Dynamic Polymorphism</p> <p> 3.5.1 Overriding</p>						



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	<p>3.5.2 Virtual Functions 3.5.3 Abstract Class</p> <p>Unit 4: Data Files and Exception Handling</p> <p>4.1 Streams 4.2 File Types and Modes 4.3 File Pointers & their manipulations 4.4 Sequential Input & Output operations 4.5 Random access 4.6 Error handling during File operations 4.7 Exception Handling</p> <p>Unit 5: Generic Programming and C++ Standard Template Library (STL)</p> <p>5.1 Template Classes 5.2 Template Functions 5.3 Implementation of Object-Oriented Properties on Template Classes 5.4 STL 5.4.1 Algorithms 5.4.2 Containers 5.4.3 Functions 5.4.4 Iterators</p>
Reference Books	<ol style="list-style-type: none">1. The C++ Programming Language, Stroustrup, Addison Wesley2. The Complete Reference C++, Schildt, Tata McGraw Hill3. OOP in Turbo C++, Robert Lafore, Galgotia Publication4. C++ Primer, Lippman, Addison Wesley5. Object Oriented Programming with ANSI and Turbo C++, Kamthane, Pearson Education6. Thinking in C++, Bruce Eckel, Pearson7. Object Oriented Modelling & Design, Rumbaugh, PHI8. Object Oriented Analysis & Design with Application, Grady Booch, LPE9. Standard C++ with Object Oriented Programming, Paul S. Wang, Thomson10. C++ Primer Plus, Stephan Prata, Addison Wesley11. Programming with ANSI C++, Bhushan Trivedi, Oxford University Press
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Veer Narmad South Gujarat University

Course:204:Python Programming -II

Course Code	204						
Course Title	Python Programming - II						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO 1: To develop the ability to write database applications in Python</p> <p>CO 2: Understand and apply core concepts like Data Frames and series, and use data analysis libraries like pandas and matplotlib</p> <p>CO 3: Learn fundamentals of matplotlib library, customize objects and plots, create multiple plots, and also understands different plot types available</p> <p>CO 4: To be able to learn and implement basic image processing operations like crop, scale, rotate, flip, etc.</p> <p>CO 5: Understand and use TensorFlow to build a Neural network model from scratch in python and also understands the TensorFlow visor to plot a graph</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1: Database programming using Python</p> <p>1.1 Connecting to a database (sqlite) using Python</p> <p>1.2 Sending DML and DDL queries and processing the result from a Python Program</p> <p>Unit 2: Basic data analysis using Python</p> <p>2.1 Introduction to Pandas</p> <p>2.2 Pandas data structures – Series and DataFrame</p> <p>2.3 Data wrangling using pandas</p> <p style="padding-left: 20px;">2.3.1 Loading a dataset into a dataframe</p> <p style="padding-left: 20px;">2.3.2 Selecting Columns from a dataframe</p> <p style="padding-left: 20px;">2.3.3 Selecting Rows from a dataframe</p> <p style="padding-left: 20px;">2.3.4 Adding new data in a dataframe</p> <p style="padding-left: 20px;">2.3.5 Deleting data from a dataframe</p> <p>Unit 3: Basic data visualization using Python</p> <p>3.1 Introduction to Matplotlib</p> <p>3.2 Scatter plot</p> <p>3.3 Line plot</p> <p>3.4 Bar chart</p> <p>3.5 Histogram</p> <p>3.6 Box plot</p> <p>Unit 4: GUI Programming : Tkinter</p> <p>4.1 Tkinter Fundamentals :</p> <p style="padding-left: 20px;">Window, Tk themed widgets, command binding, event binding, label, button, entry</p> <p>4.2 Layout Management : pack, grid, place method</p> <p>4.3 Tkinter Widgets : Text, Scrollbar, Canvas, Checkbutton, Entry, Frame, Label, Listbox, Combobox, Menubutton, Menu, Message, Radiobutton, Slider, LabelFrame, Treeview</p> <p>4.4 Dialogs and Menus : Messagebox, Yes/No Dialog, OK/Cancel Dialog, Retru/Cancel Dialog, Open File Dialog</p> <p>4.5 Tkinter Themes and Styles : Changing the ttk theme, Modifying ttk theme</p>						



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	Unit 5 : Tensor Flow 5.1 Introduction 5.2 Tensor Data types 5.3 TensorFlow Operations : Add, Subtract, Multiply, Divide, Square, Reshape 5.4 TensorFlow Models : 5.4.1 Collecting Data 5.4.2 Creating a Model 5.4.3 Adding Layers to the Model 5.4.4 Compiling the Model 5.4.5 Training the Model 5.4.6 Using the Model 5.5 TensorFlow Visor 5.5.1 Scatter Plots 5.5.2 Bar Graphs 5.5.3 Line Graphs
Reference Books	<ol style="list-style-type: none">1. “Fluent Python : Clear, Concise, and Effective Programming 2nd Edition” by Luciano Romalho2. “Python in Nutshell : A Desktop Quick Reference 3rd Edition” by Alex Martelli, Anna Ravenscroft and Steve Holden3. “Python for Data Analysis” by Wes McKinney4. “Learning the Pandas Library” by Matt Harrison5. “Mastering Matplotlib” by Duncan M. McGreggor6. “Computer Vision : A Modern Approach” by David Forsyth and Jean Ponce7. “Programming Computer Vision with Python” by Jan Erik Solem8. “Learn TensorFlow 2.0 : Implement Machine Learning and Deep Learning Models with Python” by Pramod Singh and Avish Manure9. “Hand-On Computer Vision with Tensorflow 2” by Benjamin Planche and Eliot Andres
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course:205:Machine Learning - I

Course Code	205						
Course Title	Machine Learning - I						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain to the students the fundamental know how like the types of machine learning algorithms, applications and various required libraries, model selection etc. required to implement machine learning algorithms.</p> <p>CO2 : Train students with can utilize various data wrangling techniques, data cleaning, data transformation, data reduction, data discretization, feature selection, and data visualization</p> <p>CO3 : Train students who can implement supervised learning algorithms utilizing regression and classification algorithm on the real world dataset.</p> <p>CO4 : Train student to have understanding of Artificial Neural Network and its working. Also, to make them capable of implementing ANN for solving real world problems using it.</p> <p>CO5 : Explain to the students to use clustering and association rules as unsupervised learning method to solve complex problems.</p> <p>CO6 : Train students to use machine learning techniques to solve real life complex problems.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit 1 : Introduction</p> <p>1.1. Definition of Machine Learning</p> <p>1.2. Types of Machine Learning : Supervised , Unsupervised and Semi-supervised</p> <p>1.3 Applications and tools of Machine Learning (Scikit learn library)</p> <p>1.3.1 Introduction to Scikit-Learn : Prerequisite, Installation and Features</p> <p>1.3.2 Dataset loading</p> <p>1.3.3 Splitting a Dataset</p> <p>1.3.4 Train the Model</p> <p>1.3.5 Scikit Learn – Data Representation</p> <p>1.3.6 Implementation of Machine Learning Algorithms using Scikit-Learn (kNN, Decision Tree, Naïve Bayes Classifier, Support Vector Machine)</p> <p>Unit II : Model performance evaluation and Tuning:</p> <p>2.1 Model performance evaluation :</p> <p>2.1.1 RMSE, MSE, MSAE</p> <p>2.1.2 Accuracy, F1-Score, confusion matrix</p> <p>2.1.3 Type-1 and Type-2 errors, True positive and True negative</p> <p>2.1.4 TP, TN, FP, FN,</p> <p>2.1.5 Precision, Recall</p> <p>2.1.6 Specificity, Sensitivity.</p> <p>2.2 Model Performance and Enhancement</p> <p>2.2.1 Methods to improve model performance.</p>						



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	<p>Unit 3 : Data Wrangling</p> <p>3.1 Definition and goal of Data Wrangling</p> <p>3.2 Importance of Data Wrangling</p> <p>3.3 Data Pre-processing and Data Cleaning</p> <p> 3.3.1 Data Cleaning</p> <p> 3.3.2 Data Transformation</p> <p> 3.3.3 Data Reduction</p> <p> 3.3.4 Data Discretization</p> <p> 3.3.5 Feature Selection</p> <p>3.4 Data Visualization</p> <p>Unit 4 : Supervised Learning</p> <p>4.1 Supervised Learning: Classification and Regression</p> <p>4.2 Regression</p> <p> 4.2.1 Simple and Multiple Regression</p> <p> 4.2.2 Linear Regression</p> <p> 4.2.3 Gradient Decent</p> <p> 4.2.4 Logistic Regression</p> <p>4.3 Classification Algorithms:</p> <p> 4.3.1 K-nearest Neighbour</p> <p> 4.3.2 Support Vector Machines</p> <p> 4.3.3 Decision Trees</p> <p> 4.3.4 Naïve Bayes Classifier</p> <p>4.4 Introduction to Support Vector Machine</p> <p>Unit 5 : Unsupervised Learning</p> <p>5.1 Introduction to Unsupervised learning</p> <p>5.2 Clustering</p> <p> 5.2.1 Selection of Clusters</p> <p> 5.2.2 Algorithms:</p> <p> 5.2.2.1 K-means clustering</p> <p> 5.2.2.2 Hierarchical Clustering</p> <p>5.3 Association Rule Learning</p> <p> 5.3.1 Algorithms:</p> <p> 5.3.1.1 FP-Growth</p> <p> 5.3.1.2 Apriori Algorithm</p>
Reference Books	<ol style="list-style-type: none"> 1. "Machine Learning" by Tom M. Mitchell, McGraw Hill 2. "Understanding Machine Learning" by Shai Shalev-Shwartz, Shai Ben-David 3. "Machine Learning" by Anuradha Srinivasaraghavan, Vincy Joseph 4. "Machine Learning using Python" by UDineshKumar Manaranjan Pradhan 5. "Real-World Machine Learning" by Henrik Brink, Joseph Richards, Mark Fetherolf 6. "Python Machine Learning" by Sebastian Raschka and Vahid Mirjalili 7. "Hands-On Machine Learning with Scikit-Learn and TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems" by Aurelien Geron 8. "Machine Learning in Action" by Peter Harrington 9. "Introduction to Machine Learning with Python: A Guide for Data Scientists" by Andreas C. Muller, Sarah Guido
Teaching Methodology	Class Work ,Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course: 206: Programming Skills - III

Course Code	206
Course Title	Programming Skills – III
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 203 (Advance RDBMS/Object Oriented Programming)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 207: Programming Skills - IV

Course Code	207
Course Title	Programming Skills – IV
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 204 (Python Programming - II)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 208: Programming Skills - V

Course Code	208
Course Title	Programming Skills – V
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 205 (Machine Learning - I)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment



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Course:301: Machine Learning II : ANN and Deep Learning

Course Code	301						
Course Title	Machine Learning II : ANN and Deep Learning						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO 1 : Learn the concepts of neural network and its architecture.</p> <p>CO 2: Knowledge about various layers of network , forward and backward propagation.</p> <p>CO 3 Model enhancement by tuning various layers and implementing various kernels.</p> <p>CO 4 : Concepts of Deep Learning and implementation of libraries like Tensor-flow and Keras.</p> <p>CO 5 : Learning about Convolutional layers and implementation of Convolution Neural Network(CNN) and concepts of RecurrentNeural Network (RNN).</p> <p>CO 6 : Performance evaluation and analysis of Neural network basedmodels.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit-1:Artificial Neural Network:</p> <p>1.1 Concepts of Neurons in terms of human brain.</p> <p>1.2 Linear threshold units.</p> <p>1.3 Perceptron: representational limitation and gradient descent training.</p> <p>1.4 Multilayer networks</p> <p>1.4.1 Forward and backpropagation.</p> <p>1.4.2 Understanding Gradient descent</p> <p>1.4.3 Adjusting Weights and Bias of neurons.</p> <p>1.4.4 Activation functions.(Binary step, Linear, Sigmoid, Hyperbolic tangent, ReLU, Leaky ReLU, Softmax)</p> <p>1.5 Hidden layers and constructing intermediate</p> <p>1.5.1 Distributed representations.</p> <p>1.5.2 Overfitting and Under-fitting.</p> <p>1.5.3 Learning network structure</p> <p>1.5.4 Recurrent networks.</p> <p>Unit-2: Deep Learning</p> <p>2.1 Concepts of Deep Learning</p> <p>2.1.1 Difference among Deep Learning and Machine learning</p> <p>2.1.2 Purpose and functionality of Deep Learning</p> <p>2.2 Libraries to implement Deep Learning Problems</p> <p>2.2.1 Installation and functions of Keras Library</p> <p>2.2.2 Installation and functions of Tensorflow</p> <p>2.2.3 Importing Library functions and modules.</p> <p>2.2.4 Importing and Pre-processing dataset</p> <p>2.2.5 Splitting and feature scaling of Dataset.</p> <p>2.2.6 Adding input and hidden layers.</p>						



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	<p>2.3 Prediction model with single output node</p> <p>2.4 Binary classification problem using two output node.</p> <p>2.5 Multi-Class classification using multiple output nodes.</p> <p>Unit-3: Convolution Neural Network (CNN)</p> <p>3.1 Gray and color image conversion in arrays and vectors.</p> <p>3.2 Loading image dataset from cloud</p> <p>3.3 Keras methods:</p> <p style="padding-left: 20px;">3.3.1 Handling two-dimensional and three-dimensional images.</p> <p style="padding-left: 20px;">3.3.2 Splitting dataset and scaling dataset</p> <p style="padding-left: 20px;">3.3.3 Image augmentation</p> <p>3.4 Generating 2-D and 3-D convolution layers</p> <p style="padding-left: 20px;">3.4.1 Use of Feature detector and Feature mapping</p> <p style="padding-left: 20px;">3.4.2 Applying Activation Function</p> <p>3.5 Pooling and Flattening</p> <p style="padding-left: 20px;">3.5.1 types of Pooling (Max, Min, Average)</p> <p style="padding-left: 20px;">3.5.2 Flattening Pooled layers</p> <p style="padding-left: 20px;">3.5.3 Generating Vector of vectors(Tensor) for input layer</p> <p>3.6 Creating full collection</p> <p style="padding-left: 20px;">3.6.1 Types and function of optimizers</p> <p style="padding-left: 20px;">3.6.2 Types of loss functions and tuning</p> <p style="padding-left: 20px;">3.6.3 Compiling the CNN model</p> <p>Unit-4 : Application of CNN models and RNN models:</p> <p>4.1 Prediction and Classification Applications:</p> <p style="padding-left: 20px;">4.1.1 Prediction models using CNN</p> <p style="padding-left: 20px;">4.1.2 Binary class classification</p> <p style="padding-left: 20px;">4.1.3 Multiclass classification</p> <p>4.2 Performance evaluation:</p> <p style="padding-left: 20px;">4.2.1 Evaluating Binary class classification model using CNN</p> <p style="padding-left: 20px;">4.2.2 Evaluating Multi-Class classification model using CNN</p> <p style="padding-left: 20px;">4.2.3 Performance tuning of CNN Model</p> <p>4.3 Recurrent Neural Network(RNN)</p> <p style="padding-left: 20px;">4.3.1 Difference among CNN and RNN</p> <p style="padding-left: 40px;">4.3.1.1 Feed-forward and Back propagation</p> <p style="padding-left: 40px;">4.3.1.2 Purpose, Architecture and working of RNN</p> <p style="padding-left: 40px;">4.3.1.3 RNN activation functions(sigmoid, tanh, RELU)</p> <p style="padding-left: 40px;">4.3.1.4 Backpropagation Through Time (BTT)</p> <p style="padding-left: 20px;">4.3.2 Vanishing Gradient and Exploding Gradients problem in RNN</p> <p style="padding-left: 20px;">4.3.3 Long Short Term Memory Networks(LSTM)</p> <p style="padding-left: 20px;">4.3.4 Gated Recurrent Unit(GRU)</p>	
Reference Books	Book	Author(s)
	Data Structures	Ellis Horowitz, Sartaj Shani
	Discrete Mathematics and its Applications	Kenneth H. Rosen
	Python the Complete Reference	Martin C. Brown
	Artificial Intelligence: A Systems Approach	S. Russell, P. Norvig
	A Hundred-page Machine Learning Book	Andriya Burkov



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	Neural Networks and Fuzzy Systems	Kosko
	Machine Learning: The art and Science of Algorithms that make sense of Data	Peter Flach
	Artificial Intelligence: A Modern Approach	Stuart J. Russell and Peter Norwig
	Deep Learning	Ian Goodfellow, Yoshua Bengio, Aaron Courville, Francis Bach
	Python Machine Learning	Sabastine Raschka and Vahid Miralili
	Pattern Recognition and Machine Learning	Christopher Bishop
	The Elements of Statistical Learning	Trevor Hastie, Robert Tibshirani, Jerome Friedman
	Speech and Language Processing	Daniel Jurafsky and James H. Martin
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment	
Evaluation Method	30% Internal assessment 70% External Assessment	



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Course:302: IoT Using Raspberry Pi

Course Code	302						
Course Title	Internet of Things						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1: Understand the IoT ecosystem and architecture. Understand IoT standards and protocols. Understand the privacy, security and governance issues in IoT applications. Exposing students with IoT botnet and the risks involved with IoT based applications.</p> <p>CO2: Understand the overview and working of the various sensors used in IoT applications. Introduce and Explain various network communication protocols, standards and IoT data Protocols. Understanding the Wireless Sensor Network and how IoT devices communicate with each other.</p> <p>CO3: Understand Micro-Controller and its architecture. Understand the usage of Micro-Controller in IoT applications. Understand how Arduino and NodeMCU interact with sensors and communicate over the network.</p> <p>CO4: Understand Micro-Computer and its architecture. Understand the difference between a Micro-Controller and Micro-Computer. Understand the usage of Micro-Computer in IoT applications. Understand how Raspberry Pi interact with sensors and communicate over the network.</p> <p>CO5: Expose the students with Server-side development in IoT applications. Understand how to develop and deploy applications in Arduino and NodeMCU. Understand how Arduino and NodeMCU communicate among themselves, sensors and the server. Understand how to build a full IoT app by integrating them with mobile applications</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1: Introduction to IoT</p> <p>1.1 IoT fundamentals</p> <p>1.2 IoT Architecture and Protocols</p> <p>1.3 IoT software and Hardware platforms</p> <p>1.4 IoT Applications in Real world</p> <p>1.5 Iot Components: Introductions to Sensors, Working with Sensors</p> <p>Unit 2: Introduction to Microcontrollers</p> <p>2.1 Basics of Ardiuno Hardware and Software</p> <p>2.2 Programming with Ardiuno</p> <p>2.3 Communicating Ardiuno with sensors</p> <p>2.4 Introduction to NodeMCU with its specification and applications</p> <p>2.5 Implementations of basic IoT applications</p> <p>Unit 3: Introduction to Microcomputers</p> <p>3.1 Getting started with Raspberry Pi</p> <p>3.2 Introduction to Raspberry Pi</p> <p>3.3 Comparison of various Rpi Models</p> <p>3.4 Understanding SoC architecture and SoCs used in Raspberry Pi</p> <p>3.5 Pin Description of Raspberry Pi</p> <p>Unit 4: Working with Pi</p>						



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	<p>4.1 Booting Up RPi- Operating System and Basics of linux 4.2 Linux- Introduction, Architecture, File System 4.3 Raspbian O.S.- Introduction, Tools like Leafpad Editor 4.4 Installing Raspbian on Pi 4.5 First boot and Basic Configuration of Pi</p> <p>Unit 5: Working with RPi using Python and Sensing Data using Python 5.1 Introduction to Python 5.2 Applications of Python 5.3 Fundamentals of Python Programming Language 5.3.1 Understanding Python, Interpreted Languages . 5.3.2 Variables, Keywords, Operators and Operands, Data Types in Python, 5.3.3 Importing Libraries 5.3.4 Flow Control, Conditional Statement, Loops 5.4 Sensors Interfacing- Temperature and Humidity Sensor (DHT11), Motion Sensor (PIR), Obstacle detection using Ultrasonic sensor, etc. 5.5 Communicating using RPi- GSM interfacing, Accessing on-board Wi-Fi 5.6 Connecting Database with RPi</p>
Reference Books	<p>1) Getting Started with Internet of Things – By Cuno Pfister, O'Reilly 2) Learning Internet of Things – By Peter Waher , Packt Publication 3) Internet of Things : A Hands-on Approach – By Arshdip Bahga and Vijay Madiseti 4) IoT Governance, Privacy and Security Issues, IERC 5) IoT Fundamentals: Networking Technologies, Protocols and Use Cases for the Internet of Things, Cisco Press 6) Fundamentals of IoT Communication Technologies, Springer 7) Microcontrollers – Architecture, Programming, Interfacing and system design – By Raj Kamal , Pearson 8) Exploring C for Microcontrollers : A hands on approach, Springer 9) Arduino for Dummies, Wiley 10) Make: Getting Started With Arduino - The Open Source Electronics Prototyping Platform, Shroff/Maker Media 11) ESP8266: Get Started With ESP8266 Programming NodeMCU Using Arduino IDE, Createspace Independent Pub Internet of Things Projects with ESP32, Packt Publishing Limited 12) Programming the Raspberry Pi, Second Edition: Getting Started with Python, Simon Monk, McGrawHill 13) Getting Started With Raspberry Pi, by Wallace (Author), Matt Richardson 14) Learning Python with Raspberry Pi, by Alex Bradbury and Ben Everard</p>
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course: 303: Machine Learning using .NET

Course Code	303						
Course Title	Machine Learning using .NET						
Credit	4						
Teaching per Week	4 Hrs.						
Minimum weeks per Semester	15 (Including Class work, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain students the fundamental aspects of .NET framework, C# Language and ASP.NET.</p> <p>CO2 : Train students to use various tools and controls available in .NET in application development, how to integrate them and to get them work as a part of one single unit.</p> <p>CO3 : Train students to work with database using ADO.NET through design alternatives and through coding as well, also learn the concept of Language Integrated Query.</p> <p>CO4 : Explain and train students to work with special type of web applications called web services development and usage.</p> <p>CO5 : Expose the students with the concept of web API ,its development and usages.</p> <p>CO6 : Explain students to utilize tools & techniques available in .NET for Machine Learning and related application development using various nuget packages.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit : 1 : Introduction to .NET Framework, C# and ASP.NET</p> <ol style="list-style-type: none"> 1.1. NET Architecture 1.2. C# Language 1.3. Page Class 1.4. Web Configuration files 1.5. Exception Handling 1.6. Logging Exceptions 1.7. Error Pages 1.8. View State, Query String 1.9. Cookie , Session 1.10. Application , Global.asax <p>Unit : 2 : .NET Controls</p> <ol style="list-style-type: none"> 2.1 Web Controls <ol style="list-style-type: none"> 2.1.1 Common Web Server Controls 2.1.2 Specialized Web Server Controls 						



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	<p>2.1.3 Table, Image, FileUpload 2.1.4 PostBack / Auto PostBack 2.2 Validation and Rich Controls 2.3 Windows form controls & Menu</p> <p>Unit : 3 : .NET Application with Database</p> <p>3.1. ADO.NET Architecture 3.2. Direct Data Access 3.3. Disconnected Data Access 3.4. Data Binding & Data Controls 3.4.1. Single-view, Repeated-Value, Data Source 3.4.2. Gridview - Formatting, Edit, Sorting, Paging, Templates 3.4.3. Detail View, Form View 3.4.4. Data Repeater Control 3.5. Introduction to LINQ</p> <p>Unit : 4 : WEB Services & API</p> <p>4.1. WCF Services 4.1.1. Introduction to Web Services 4.1.2. RESTful API 4.1.3. Working with WCF Services</p> <p>4.2. API 4.2.1. Introduction to JSON 4.2.2. Web API 4.2.3. API Creation and Consumption</p> <p>Unit : 5 : Machine Learning</p> <p>5.1. Introduction to ML.NET 5.1.1 Components 5.1.2 Extensibility 5.2. Machine Learning with Model Builder 5.3. Nuget Packages for ML 5.4. Model building using C# 5.5. Consuming the Model</p>
Reference Book	<ol style="list-style-type: none"> 1. Professional ASP.NET, Wrox Publication 2. ASP.NET – From Novice to Professional, Wrox Publication 3. ASP.NET Bible, By Mridula Parihar 4. Beginning ASP.NET 4.5, Wrox Publication 5. Programming Microsoft ASP.NET, Microsoft Press 6. Beginning AJAX with ASP.NET, Wrox Publication 7. Professional ASP.NET MVC 5, Wrox Publication 8. Professional C# 7 and .NET Core 2.0 , Wrox Publication 9. ASP.NET Core 2 Fundamentals, Packt Publication 10. Pro ASP.NET MVC 5, Apress 11. Programming ASP.NET Core, Microsoft Press 12. Pro C# 7 with .NET and .NET Core, Apress
Teaching Methodology	Classroom, seminar and assignment
Evaluation Method	As per University rules



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Course:303: Machine Learning using Java

Course Code	303						
Course Title	Machine Learning using Java						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain students the insight of the various aspects the Java web technologies.</p> <p>CO2 : learn to access database through Java programs, using Java Data Base Connectivity (JDBC).</p> <p>CO3 : Create dynamic web pages, using Servlets and JSP, make a reusable software component, using Java Bean.</p> <p>CO4 : Understand the multi-tier architecture of web-based enterprise applications using Enterprise JavaBeans (EJB), develop Session and Entity Beans</p> <p>CO5 : Expose the students with the analysis and development process of the web application development using Java.</p> <p>CO6 : Map Java classes and object associations to relational database tables with JPA</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit 1: Stream handling</p> <p>1.1 Overview of Streams</p> <p>1.2 Stream Handling</p> <p>1.3 File Handling</p> <p>Unit 2: Threading</p> <p>2.1 Threading</p> <p>2.1.1 Creating Threads</p> <p>2.1.2 Extending Thread class</p> <p>2.1.3 Implementing Runnable interface</p> <p>2.1.4 Thread scheduling</p> <p>2.2 Thread Synchronization</p> <p>2.2.1 Use of 'synchronized' keyword</p> <p>2.2.2 wait, notify and notifyall methods</p> <p>2.2.3 'volatile' modifier</p> <p>Unit 3: Database</p> <p>3.1 Working with JDBC</p> <p>3.1.1 Connecting to databases like Access, MySQL, SqlServer, Oracle</p> <p>3.1.2 Basis for Processing SQL Statements</p> <p>3.1.3 Creating Statements: PreparedStatement</p> <p>3.1.4 Executing Queries</p> <p>3.1.5 JDBC Objects: Connection, Resultset, Statement, Metadata, DataSource, RowSet, RowSet events</p> <p>3.2 Calling Stored Procedures</p> <p>3.3 Managing Transactions</p> <p>3.4 JDBC Connection Pooling</p> <p>3.5 Handling Errors/Warning</p>						



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	<p>Unit 4: Java Beans</p> <p>4.1 Concepts of Java Beans 4.2 Working with Beans 4.3 Beans Customization 4.4 Beans Persistence</p> <p>Unit 5: Web services and APIs</p> <p>5.1 Introduction to Web Services and API 5.2 Building Restful web services 5.3 JSON object handling 5.4 Java API for ML 5.4.1 JavaML 5.4.2 Massive Online Analysis</p>
Reference Books	<ol style="list-style-type: none"> 1. Java EE Tutorial Basic Concepts by Oracle Corporation 2. Beginning Java™ EE Platform with Glass Fish™ : From Novice to Professional by Antonio Goncalves 3. Beginning EJB3 Application Development From Novice to Professional by Raghu R. Kodaliand Jonathan Wetherbee with Peter Zadrozny, Apress Publication 4. Pro JPA2:Mastering the Java™Persistence API 5. Head First Servlets and JSP By: Bryan Basham, Kathy Sierra, Bert Bates Publisher:' Reilly Media 6. Core Servlets and Java server Pages : Author Marty Hall, Larry Brown, Sun Micro System 7. Java Servlet & JSP Cookbook by Bruce W. Perry O; reilly Publication 8. Beginning JSP™ ,JSF™ and Tomcat™ Web Development: From Novice to Professional by Giulio Zambonand Michael Sekler 9. JAVA Complete Reference ,TMH Publication 10. Professional Java Development with Spring Framework, Wrox Publication
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Course:304: Digital Image Processing

Course Code	304						
Course Title	Digital Image Processing						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain students the fundamental aspects of Image processing, the concept of image formation, digitization and the role human visual system plays in perception of image data.</p> <p>CO2 : Train students to use various Libraries to perform different operations related to image processing like image transformation, image enhancement, segmentation etc.</p> <p>CO3 : Explain and train students to work with various phases of Natural language processing by making them practically work on them.</p> <p>CO4 : Analyze and implement image processing algorithms for various real-time applications using artificial intelligence and deep learning.</p> <p>CO5 : Demonstrate the state-of-the-art algorithms and techniques for text-based processing of natural languages.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit – 1 Introduction to Image Processing</p> <p>1.1 Image Fundamentals</p> <p>1.2 Elements of Image processing system</p> <p>1.3 Applications of Digital Image Processing</p> <p>1.4 Image Transformation</p> <p>Unit – 2 Image Enhancements</p> <p>2.1 Gray level Transformation</p> <p>2.2 Histogram processing</p> <p>2.3 Spatial & Frequency Domain Methods</p> <p>2.3.1 Image Smoothing</p> <p>2.3.2 Image Sharpening</p> <p>2.3.3 Selective Filtering</p> <p>Unit – 3 Image Restoration</p> <p>3.1 Image degradation</p> <p>3.2 Types of Image Blur</p> <p>3.3 Restoration in the presence of noise–only spatial filtering</p> <p>3.3.1 Weiner filtering</p> <p>3.3.2 Constrained least squares filtering</p> <p>3.3.3 Geometric transforms</p> <p>3.3.4 Introduction to the Fourier transform</p> <p>Unit – 4 Image Segmentation</p> <p>4.1 Feature Extraction: pint, line and edge detection</p> <p>4.2 Region base segmentation techniques</p> <p>4.2.1 Classification of segmentation techniques</p> <p>4.2.2 Region approach to segmentation</p> <p>4.2.3 Clustering technique</p> <p>4.3 Image segmentation based on thresholding</p> <p>4.4 Edge based segmentation</p>						



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	<p>4.4.1 Edge detection and linking 4.4.2 Hough Transformation 4.4.3 Active Contour Image</p> <p>Unit – 5 Image Recognition</p> <p>5.1 Patterns and patterns classes 5.2 Recognition based on decision–theoretic methods 5.3 Optimum statistical classifiers 5.4 Using Neural network 5.5 Structural methods</p>
Reference Books	<ol style="list-style-type: none">1. Digital Image processing, R. C.Gonzalez, R.E.Woods, Pearson edition2. Fundamentals of Digital Image Processing, A.K.Jain,PHI3. Digital Image Processing, Pratt W.K., John Wiley4. Image Processing , Analysis & Machine Vision, Milan Sonka, Thomson Publication5. Digital Signal Processing: Principles, Algorithms, and Applications, John G. Proakis, Dimitris and G.Manolakis, Pearson Education6. Computer Vision and Image Processing, Adrian Low, Second Edition, B.S.Publications7. Digital Image Processing, Rafeal C.Gonzalez, Richard E.Woods, Second Edition, Pearson Education/PHI.
Teaching Methodology	Class Work, Discussion, Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



M.Sc. (AI – ML)

Veer Narmad South Gujarat University

Course:304:Big Data Analysis

Course Code	304						
Course Title	Big Data Analysis						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	CO1: To understand Big Data and its analytics CO2 : To provide students a foundation of Big data analytics tools and technologies CO3: To learn difference between conventional SQL query language and NoSQL basic concepts CO4: Train students to use NoSQL databases and Apache Hadoop.						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
Course Content	<p>Unit 1. Introduction to Big Data</p> <ul style="list-style-type: none"> 1.1 Big Data 1.2 Big Data Importance 1.3 Types Of Big Data <ul style="list-style-type: none"> 1.3.1 Structured 1.3.2 Unstructured 1.3.3 Semi-structured 1.4 Characteristics Of Big Data <ul style="list-style-type: none"> 1.4.1 Volume 1.4.2 Variety 1.4.3 Velocity 1.4.4 Variability 1.5 Advantages of Big Data <p>Unit 2. Introduction to Big Data Analytics</p> <ul style="list-style-type: none"> 2.1 Big Data Analytics : History and evolution of big data analytics 2.2 Importance of Big Data Analytics 2.3 Typical Analytical Architecture 2.4 Challenges in Big Data Analytics 2.5 Big data analytics tools and technology <p>Unit 3. NoSQL databases</p> <ul style="list-style-type: none"> 3.1 Introduction to NoSQL 3.2 Advantages and Disadvantages of NoSQL 3.3 Types of NoSQL Databases 3.4 MongoDB <ul style="list-style-type: none"> 3.4.1 MongoDB Architecture 3.4.2 Documents and Collections 3.4.3 Queries <ul style="list-style-type: none"> 3.4.3.1 Simple Queries 3.4.3.2 Complex Queries : Existential field values, Aggregations and groups 3.4.4 Updates and Deletes 3.4.5 Indexing 3.4.6 MongoDB RESTful API 3.5 NoSQL in cloud 						



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	<p>Unit 4. Hadoop and HDFS</p> <ul style="list-style-type: none">4.1 Hadoop overview4.2 Hadoop Architecture4.3 Hadoop Ecosystem Components4.4 Hadoop Cluster introduction4.5 HDFS Overview4.6 Characteristics of HDFS4.7 HDFS Architecture and Components4.8 HDFS commands4.9 Introduction to MapReduce <p>Unit 5. Hive and HBase</p> <p>5.1 Hive</p> <ul style="list-style-type: none">5.1.1 Hive Introduction5.1.2 Hive Architecture5.1.3 Hive Vs RDBMS5.1.4 HiveQL Querying Data <p>5.2 HBase</p> <ul style="list-style-type: none">5.2.1 HBase concepts5.2.2 Advanced Usage5.2.3 Schema Design5.2.4 Advance Indexing
Reference Books	<ol style="list-style-type: none">1. Chris Eaton,Dirkderooset al. , “Understanding Big data ”, McGraw Hill2. BIG Data and Analytics , Sima Acharya, Subhashini Chhellappan, Willey3. Alex Holmes, Hadoop in Practice, Manning Publication4. Tom White, Hadoop The Definitive Guide, o’Reilly5. Kristina Chodorow, MongoDB Definitive Guide 2e, O’Reilly6. Amol Nayak, Instant MongoDB, Packt Publishing Limited7. Hu, Wen Chen, Big Data Management, Technologies and Applications, IGI Global
Teaching Methodology	Class Work, Discussion, Self Study,Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



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Veer Narmad South Gujarat University

Course:305:Professional Ethics

Course Code	305						
Course Title	Professional Ethics						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	<p>CO1 : Explain students the fundamental aspects ethical practices in profession.</p> <p>CO2 : Identify ethical problems in complex professional and business related situations.</p> <p>CO3 : Explain and train students to apply ethical concepts to particular business and professional situations.</p> <p>CO4 : Evaluate alternative, ethically-relevant, choices and defend a plausible course of action.</p> <p>CO5 : Make the student understand the ethical legacy of our culture.</p> <p>CO6 : Identify prominent ethical issues in different professions, as these can differ slightly from the business world.</p>						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
	CO6						
Course Content	<p>Unit 1: Introduction to Professional Ethics</p> <p>1.1 Introduction</p> <p>1.2 Professional and Ethical Standards</p> <p>1.3 Code of Conduct</p> <p>1.4 Ethical Dilemma</p> <p>1.5 Dimensions of Ethics</p> <p>1.6 Profession and Professionalism</p> <p>1.7 Professional Risk and Success</p> <p>Unit 2: Ethics Problems</p> <p>2.1 Ethics to IT Professionals</p> <p>2.2 Ethical Problems in Computing</p> <p style="padding-left: 20px;">2.2.1 Social Issues</p> <p style="padding-left: 20px;">2.2.2 Privacy</p> <p style="padding-left: 20px;">2.2.3 Conflicts, security</p> <p style="padding-left: 20px;">2.2.4 Personal values</p> <p style="padding-left: 20px;">2.2.5 Global Information</p> <p>2.3 Ethical Responsibility of IT Professionals: Responsibility to clients, employers, employees, professionals, and society</p> <p>Unit 3: Approaches and Theories of Ethics</p> <p>3.1 Approaches</p> <p style="padding-left: 20px;">3.1.1 Values in technology and disclosive computer ethics</p> <p style="padding-left: 20px;">3.1.2 The use of normative theory</p> <p style="padding-left: 20px;">3.1.3 Information ethics</p> <p>3.2 Theories</p> <p style="padding-left: 20px;">3.2.1 Utilitarian Ethics</p> <p style="padding-left: 20px;">3.2.2 Deontological Ethics</p> <p style="padding-left: 20px;">3.2.3 Virtue Ethics</p>						



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	<p>Unit 4: Indian Ethical Values 4.1 Lesson from Ancient Indian Education System 4.2 The law of Karma 4.3 Ethics legacy of National Heroes (Vivekananda, Gandhiji, Tagore, etc.) 4.4 Value building by incorporating ethical practices</p> <p>Unit 5: Case-study Two case studies related to the IT Industry.</p>
Reference Books	<ol style="list-style-type: none">1. Fundamentals of Ethics for Scientists and Engineers, Edmund G Seebauer and Robert L Barry, Oxford University Press2. Professional Ethics, R. Subramanian, Oxford University Press3. Business Ethics Concepts and Cases, Manuel G. Velasquez, PHI4. Ethics in Engineering, Mike W. Martin and Roland Schinzinger, Tata McGraw Hil5. Business Ethics: Decision Making for Personal Integrity and Social Responsibility, Laura P. Hartman and Joe Desjardins, Mc Graw Hill6. Indian Culture, Values and Professional Ethics, PSR Murthy, BS Publication7. Professional Ethics and Human Values, A.Alavudeen, R.KalilRahman and M.Jayakumaran, Laxmi Publications
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



M.Sc. (AI – ML) Veer Narmad South Gujarat University

Course: 306: Programming Skills - VI

Course Code	306
Course Title	Programming Skills – VI
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 301 (Artificial Neural Network and Deep Learning)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 307: Programming Skills - VII

Course Code	307
Course Title	Programming Skills – VII
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 302 (Internet of Things)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment



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Course: 308: Programming Skills - VIII

Course Code	308
Course Title	Programming Skills – VIII
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 303 (Machine Learning using .NET or Machine Learning using Java)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 309: Programming Skills - IX

Course Code	309
Course Title	Programming Skills – IX
Credit	3
Teaching per Week	3 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 304 (Digital Image Processing or Bigdata Analysis)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment



M.Sc. (AI – ML)

Veer Narmad South Gujarat University

Course:401: Blockchain Technology

Course Code	401						
Course Title	Blockchain Technology						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination, preparation, holidays etc.)						
Course Outcome	CO1. Explain the students fundamental concepts of blockchain technology. CO2. Make students understand importance and implementation of Cryptography in blockchains. CO3. Explain different aspects of blockchain, which can help the students to build blockchain based applications. CO4. Impart knowledge of blockchain generations and the direction of development in blockchain technology. CO 5 : Conceptualization of Web 3.0 and Decentralized applications using blockchain technology.						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
	CO5						
Course Content	<p>Unit – 1 Introduction</p> <p>1.1 History of Blockchain 1.2 Types of Blockchain 1.3 Structure of Blockchain : Block, Hash, Blockchain 1.4 Decentralization using Blockchain</p> <p>Unit – 2 Cryptography and Consensus</p> <p>2.1 PKI and Cryptography 2.1.1 Private key Cryptography 2.1.2 Public key Cryptography 2.1.3 Cryptographic Hash Function 2.1.4 SHA – 256 2.1.5 Digital Signature</p> <p>2.2 Consensus 2.2.1 Byzantine Fault 2.2.2 Proof of Work 2.2.3 Proof of Stake</p> <p>Unit – 3 Blockchain</p> <p>3.1 How Blockchain works 3.2 Public v/s Private Blockchain 3.3 Security aspects of Blockchain 3.4 Fault Tolerance</p> <p>Unit – 4 Blockchain generations and Applications</p> <p>4.1 Basic Blockchain (1.0) contemporary proof-of-work based consensus mechanisms</p> <p>4.2 Blockchain with Smart Contract (2.0) Turing complete blockchain scripting – issues of correctness and verifiability</p> <p>4.3 Blockchain with plug and play mechanism (3.0) smart contract evaluation engines, Hyperledger fabric platform</p>						



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	<p>4.4 Blockchain Applications Applications of blockchain in cyber security, integrity of information, E-Governance and other contract enforcement mechanisms.</p> <p>Unit – 5 Web 3.0 and Hyperledger</p> <p>5.1 Introduction to Web 3.0</p> <p>5.1.1 Development Frameworks</p> <p>5.1.2 Decentralize Applications (DApps)</p> <p>5.2 Hyperledger as a protocol</p> <p>5.2.1 Reference Architecture</p> <p>5.2.2 Hyperledger Fabric</p> <p>5.2.3 Distributed Ledger</p>
Reference Books	<ol style="list-style-type: none">1. Blockchain basics, D. Drescher, A Press.2. Crpyptography and Network security Principles and Practices, William Stallings, PHI3. Bitcoin and Cryptocurrency Technologies: A Comprehensive Introduction, Arvind Narayanan, Joseph Bonneau, Edward Felten, Andrew Miller and Steven Goldfeder, Princeton University Press4. Mastering Blockchain: Distributed Ledger Technology, Decentralization and Smart Contracts Explained, Imran Bashir, Packt Publishing5. Blockchain: The Blockchain for Beginnings, Guild to Blockchain Technology and Blockchain Programming, Josh Thompson, Create Space Independent Publishing Platform6. Mastering Bitcoin: Unlocking Digital Cryptocurrencies, Andreas M. Antonopoulos , O'Reilly Media Inc7. Blockchain By Example: A developer's guide to creating decentralized applications using Bitcoin, Ethereum, and Hyperledger, Bellaj Badr, Richard Horrocks, Xun (Brian) Wu, Packt Publishing Limited8. The Science of the Blockchain, Wattenhofer
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment
Evaluation Method	30% Internal assessment 70% External Assessment



M.Sc. (AI – ML)

Veer Narmad South Gujarat University

Course:402: No Code AI and ML

Course Code	402						
Course Title	No Code AI and ML						
Credit	4						
Teaching per Week	4Hrs						
Minimum weeks per Semester	15(Including Classwork, examination,preparation, holidays etc.)						
Course Outcome	CO1 : Impart the knowledge of No Code AI and ML CO2 : Students will be trained with various No code AI ML tools CO3 : Student will learn to use No code platform to solve real world problems through case studies CO4 : Student will learn to implement RPA and meet with challenges related to RPA						
Mapping between COs with PSOs		PSO1	PSO2	PSO3	PSO4	PSO5	PSO6
	CO1						
	CO2						
	CO3						
	CO4						
Course Content	<p>Unit 1: 1.1 Overview/Introduction to No-Code Platforms 1.2 BigML, Akkio, DataRobot, Google AutoML, Clarifai, MonkeyLearn,Levity, nyckel etc.</p> <p>Unit 2: Case Study 1: Based on Image Processing / Classification Case Study 2 : Based on Video Analysis Case Study 3 : Based on Text Analysis</p> <p>Unit 3: Case Study 1: Spam detection Case Study 2: Emotion /Sentiment analysis</p> <p>Unit 4: Case Study 1 : Sales Forecasting Case Study 2 : Inventory Analysis</p> <p>Unit 5: RPA and its challenges</p>						
Reference Books	1. The No-Code Guide to Artificial Intelligence and Machine Learning: What to Think About AI Today by Hyun-Jeong Yoo 2. Mastering No-Code: No-Code AI Apps (Create Your Own Machine Learning Apps) by Paul E. Love 3. No-Code Machine Learning: The Ultimate Guide by Hanna Kleinings						
Teaching Methodology	Class Work, Discussion, Self Study, Seminars and/or Assignment						
Evaluation Method	30% Internal assessment 70% External Assessment						



M.Sc. (AI – ML)

Veer Narmad South Gujarat University

Course: 403: Programming Skills - X

Course Code	403
Course Title	Programming Skills – X
Credit	4
Teaching per Week	4 Hrs
Minimum weeks per Semester	15 (Including lab work, examination, preparation, holidays etc.)
Course Content	Practical based on paper no: 402 (No Code AI and ML)
Reference Books	None
Teaching Methodology	Lab. Work
Evaluation Method	30% Internal assessment and 70% External Assessment

Course: 404: Project

Course Code	404
Course Title	Project
Credit	30
Review / Revision	June 2022

- The students must prepare documentation of the project completed as per the guidelines given by the institute.
- At the end of the semester, the students have to submit the project reports in bounded form to the institution.
- Project Completion Certificate issued by the institute is mandatory for appearing in Project Presentation and Viva – Voce.
- The Project Presentation and Viva – Voce will be conducted as per the University exam schedule.
- Workload for teachers : Guiding 4 students as an internal guide for project work will considered as 1 hr. workload per week.