Two-Year Postgraduate Programme

Master of Technology

Information Technology

Faculty of Engineering & Technology

Parul University

Vadodara, Gujarat, India

Faculty of Engineering & Technology
Master of Technology in Information Technology

1. Vision of the Department

To be a centre par excellence for creating skilled professionals in Engineering.

2. Mission of the Department

To offer state-of-art education through undergraduate, postgraduate and doctoral programmes, for promoting entrepreneurship, enhancing employability, and engaging in research.

3. Program Educational Objectives

The statements below indicate the career and professional achievements that the B.Tech. Computer Science engineering curriculum enables graduates to attain.

PEO 1	Apply Information Technology theories, principles, and skills to address societal challenges
PEO 2	Display a lifelong learning mindset and adapt to quick technological developments in the sector.
PEO 3	Exhibit professionalism, collaboration, leadership abilities, and awareness of contemporary demands.

4. Program Learning Outcomes

Program Learning outcomes are statements conveying the intent of a program of study.

PLO 1	**Engineering knowledge:**	Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PLO 2	**Problem analysis:**	Identify, formulate, review research literature, and analyse complex engineering problems reaching substantiated conclusions using the first principles of mathematics, natural sciences, and engineering sciences.
PLO 3	**Design/development of solutions:**	Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety, and cultural, societal, and environmental considerations.
PLO 4	**Conduct investigations of complex problems:**	Use research-based knowledge and research methods including design of experiments, analysis

		and interpretation of data, and synthesis of the information to provide valid conclusions.
PLO 5	**Modern tool usage:**	Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PLO 6	**The engineer and society:**	Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PLO 7	**Environment and sustainability:**	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.
PLO 8	**Ethics:**	Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PLO 9	**Individual and team work:**	Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PLO 10	**Communication:**	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PLO 11	**Project management and finance:**	Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PLO 12	**Life-long learning:**	Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

5. Program Specific Learning Outcomes

PSO 1	**Demand as per recent development**	An ability to analyze, design, verify, validate, code and maintain the solution of given problem to derive execution of software system
PSO 2	**Software skill**	An ability to understand, apply and work with one or more domain using knowledge of mathematical

		techniques and principles with relevant areas of computer science

6. Credit Framework

Semester wise Credit distribution of the programme			Category wise Credit distribution of the programme	
			Category	**Credit**
Semester-1	18		Major Core	13
Semester-2	18		Minor Stream	0
Semester-3	16		Multidisciplinary	5
Semester-4	16		Ability Enhancement Course	0
Total Credits: 68			Skill Enhancement Courses	22
			Value added Courses	0
			Summer Internship	0
			Research Project/Dissertation	28
			Total Credits:	**68**

7. Program Curriculum

Semester 1						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203200101	Research Methodology & IPR	2	2	0	0
2	303205111	Mathematical Foundations of Information Technology	3	3	0	0
3	203202102	Advance Data Structure	5	3	4	0
5		AUDIT-1 (Compulsory Subjects-1)	Audit	2	0	0
6		Elective-1 (Compulsory Subjects-1)	4	3	2	0
7		Elective-2 (Compulsory Subjects-1)	4	3	2	0
		Total	**18**	**16**	**8**	**0**
Semester 1 AUDIT-1						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203200102	English for Research Paper Writing	Audit	2	0	0
2	203200103	Disaster Management	Audit	2	0	0
3	203200104	Sanskrit for Technical Knowledge	Audit	2	0	0

4	203200105	Value Education	Audit	2	0	0
Semester 1 Elective-2						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	303205112	Advanced Machine Learning	4	3	2	0
2	203202135	Advanced Wireless and Mobile Networks	4	3	2	0
3	203205131	Data Warehouse and Mining	4	3	2	0
Semester 1 Elective-1						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203202131	Wireless Sensor Network	4	3	2	0
2	203202133	Data Science	4	3	2	0
3	203205130	Information and Network Security	4	3	2	0
Semester 2						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
8	203202152	Advance Algorithm	2	0	4	0
9	203202153	Soft Computing	4	3	2	0
10	203205151	Seminar & Mini Project	4	3	2	0
11		AUDIT-2 (Compulsory Subjects-1)	Audit	0	0	2
12		Elective-3 (Compulsory Subjects-1)	4	3	2	0
13		Elective - 4 (Compulsory Subjects :1)	4	3	2	0
		Total	**18**	**12**	**12**	**2**
Semester 2- AUDIT-2						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203200151	Constitution of India	Audit	0	0	2
2	203200152	Pedagogy Studies	Audit	0	0	2
3	203200153	Stress Management by Yoga	Audit	0	0	2
4	203200154	Personality Development through Life Enlightenment Skills	Audit	0	0	2
Semester 2- Elective-3						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203205180	Service Oriented Architecture	4	3	2	0
2	203205181	Information Theory & Coding	4	3	2	0
3	203205182	Big Data Analytics	4	3	2	0
4	303205152	Blockchain and smart contracts	4	3	2	0

Semester 2- Elective-4						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203205183	Cloud computing & Application	4	3	2	0
2	203205184	Intrusion Detection	4	3	2	0
3	203205185	Web Analytics and Development	4	3	2	0
4	303205151	Generative AI	4	3	2	0
Semester-3 Open Elective						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203200201	Business Analytics	3	3	0	0
2	203200202	Industrial Safety	3	3	0	0
3	203200203	Operation Research	3	3	0	0
4	203200204	Cost Management of Engineering Projects	3	3	0	0
5	203200205	Composite Materials	3	3	0	0
6	203200206	Waste to Energy	3	3	0	0
Semester -3 Elective-5						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
1	203202232	Optimization Techniques	3	3	0	0
2	203205230	IoT and Smart Cities	3	3	0	0
3	203205231	Distributed Database	3	3	0	0
Semester 3						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
14	203205201	Phase-1 Dissertation	10	0	20	0
15		Elective-5 (Compulsory subjects-1)	3	3	0	0
16		Open Elective (Compulsory Subjects-1)	3	3	0	0
		Total	**16**	**6**	**20**	**0**
Semester 4						
Sr. No.	**Subject Code**	**Subject Name**	**Credit**	**Lect**	**Lab**	**Tut**
17	203205251	Phase-II Dissertation	16	0	32	0
		Total	**16**	**0**	**32**	**0**
		Total Credits	**68**			

1.1 Detailed Syllabus

Semester 1

(1)

a. **Course Name:** Research Methodology & IPR
b. **Course Code:** 203200101
c. **Prerequisite:** Knowledge of Electronics and Communication Systems and Technologies. Basic Computer Skills Fundamental Knowledge of Area of Interest in relevant discipline.
d. **Rationale:** The objective of the course is intended to develop the research skills in a systematic manner which will impart the ability to select appropriate research methodology, experimental design, follow professional ethics and academic integrity, and develop oral and written presentation skills.
e. **Course Learning Objective:**

CLOBJ 1	Understand the Foundations of Research Methodology
CLOBJ 2	Acquire practical skills in designing research studies, including formulating research questions and hypotheses.
CLOBJ 3	Distinguish between different types of intellectual property, such as patents, copyrights, trademarks, and trade secrets.
CLOBJ 4	Recognize and address ethical considerations in research, including the importance of informed consent and confidentiality.

f. **Course Learning Outcomes:**

CLO 1	Understand research problem formulation.
CLO 2	Analyze research related information
CLO 3	Follow research ethics
CLO 4	Understand that todays world is controlled by Computer, Information Technology, but tomorrow world will be ruled by ideas, concept, and creativity.
CLO 5	Understanding that when IPR would take such important place in growth of individuals & nation, it is needless to emphasis the need of information about Intellectual Property Right to be promoted among students in general & engineering in particular.
CLO 6	Understand that IPR protection provides an incentive to inventors for further research work and investment in R & D, which leads to creation of new and better products, and in turn brings about, economic growth and social benefits.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
				Internal Evaluation			**ESE**		
L	**T**	**P**	**C**	**MSE**	**CE**	**P**	**Theory**	**P**	**Total**
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Meaning of research problem:** Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and objectives of research problem. Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	**20%**	**10**
2	**Effective literature studies approach:** Analysis Plagiarism, Research ethics,	**15%**	**5**
3	**Effective technical writing:** how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	**25%**	**10**
4	**Nature of Intellectual Property:** Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International Scenario: International cooperation on Intellectual Property. Procedure for grant of patents, Patenting under PCT.	**20%**	**10**
5	**Patent Rights:** Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	**20%**	**10**

i. Text Book and Reference Book:

1. Intellectual Property Rights Under WTO" by T. Ramappa; S. Chand, 2008
2. "Research methodology: an introduction for science & engineering students" by Stuart Melville and Wayne Goddard; Juta & Co Ltd
3. "Research Methodology: An Introduction, Wayne Goddard" by Stuart Melville; Juta and Company Ltd, 2004
4. "Research Methodology: A Step-by-Step Guide for Beginners" by Ranjit Kumar; PEARSON; 3rd Edition.
5. "Resisting Intellectual Property" by Halbert; Taylor & Francis Ltd., 2007
6. "Industrial Design" by Mayall; McGraw Hill, 1992
7. "Product Design" by Niebel; McGraw Hill, 1974
8. "Introduction to Design" by Asimov; Prentice Hall, 1962
9. "Intellectual Property in New Technological Age" by Robert P. Merges, Peter S. Menell, and Mark A. Lemley; 2016

(2)

a. **Course Name:** Mathematical Foundation of Information Technology
b. **Course Code:** 203202101
c. **Prerequisite:** Discrete Mathematics.
d. **Rationale:** To understand the mathematical fundamentals that are prerequisites for a variety of courses like Data mining, Network protocols, analysis of Web traffic, Computer security, Software engineering, Computer architecture, operating systems, distributed systems, Bioinformatics, and Machine learning. It develops the understanding of the mathematical and logical basis of many modern techniques in information technology like machine learning, programming language design, and concurrency.
e. **Course Learning Objective:**

CLOBJ 1	Develop a comprehensive understanding of definite and improper integrals, including the application of integration techniques to find areas and volumes in both Cartesian and Polar coordinates.
CLOBJ 2	Utilize differential equations to model and solve practical scenarios, demonstrating proficiency in various solution techniques.
CLOBJ 3	Analyse the convergence and divergence of sequences and series, employing tests such as the Alternating Series Test and Ratio Test
CLOBJ 4	Analyse matrix operations and determinants, exploring their properties and applications in solving systems of linear equations.
CLOBJ 5	Apply Fourier series for representing periodic functions, verifying Dirichlet's conditions.
CLOBJ 6	Solve optimization problems using multivariable calculus concepts, such as Lagrange's multiplier.

f. **Course Learning Outcomes:**

CLO 1	Know the basic knowledge of sampling and non-sampling errors, principal steps in sample surveys, limitations of sampling etc.,
CLO 2	Make use of the basics of the design of experiments such as randomization and blocking
CLO 3	Measure the Ratio-to-Moving Average and Link Relative methods
CLO 4	Know the concepts of time reversal test, factor reversal test and circular test.
CLO 5	Know the concept of Life Tables, their construction and uses.
CLO 6	Know the 'conditions for the consistency' and criteria for the independence of data based on attributes.
CLO 7	Identify the components of a classical hypothesis test
CLO 8	Use the statistical inferential methods based on small and large sampling tests

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Probability mass, density:** Probability mass density and cumulative distribution functions, Parametric families of distributions, Expected value, variance, conditional expectation, Applications of the univariate and multivariate Central Limit Theorem, Probabilistic inequalities, Markov chains.	15%	7
2	**Random samples:** Sampling distributions of estimators, Methods of Moments and Maximum Likelihood.	15%	7
3	**Statistical inference:** Introduction to multivariate statistical models: regression and classification problems, principal components analysis, The problem of overfitting model assessment.	15%	8
4	**Graph Theory:** Isomorphism, Planar graphs, graph colouring, hamilton circuits and euler cycles. Permutations and Combinations with and without repetition. Specialized techniques to solve combinatorial enumeration problems.	25%	11
5	**Data Mining:** Extracting patterns from large datasets, Network Protocols-Applying mathematical models for efficient data communication protocols, Analysis of Web Traffic-Utilizing mathematical models to interpret and optimize web traffic patterns, Computer Security-Implementing robust system and data security algorithms **Operating Systems:** Applying optimize resource management in OS, Bioinformatics-Applying Computational analysis in biological data, Machine Learning-Apply Algorithms for automated learning.	20%	10
6	**Applying mathematical models for soft computing problem:** Solving, data-driven analysis in bioinformatics, image processing and pattern recognition, Latest advancements in distribution functions.	10%	5

i. Text Book and Reference Book:

1. Foundation Mathematics for Computer Science, By John Vince | Springer
2. Probability and Statistics with Reliability, Queuing, and Computer Science Applications.By K. Trivedi | Wiley
3. Probability and Computing: Randomized Algorithms and Probabilistic Analysis. By M. Mitzenmacher and E. Upfal
4. Mathematical Foundations of Information Technology
5. Applied Combinatorics By Alan Tucke | Wiley

(3)

a. Course Name: Advance Data Structure
b. Course Code: 203202102
c. Prerequisite: Induction / recursion, asymptotic notation, recurrence relations. Data structures: linked lists, stacks, queues, binary trees, heaps. Algorithms: binary search, sorting.
d. Rationale: To develop, implement, and analyze algorithms for working with this data to solve real world problems.

e. Course Learning Objective:

CLOBJ 1	The fundamental design, analysis, and implementation of basic data structures.
CLOBJ 2	Basic concepts in the specification and analysis of programs.
CLOBJ 3	Principles for good program design, especially the uses of data abstraction.
CLOBJ 4	Significance of algorithms in the computer field
CLOBJ 5	Various aspects of algorithm development
CLOBJ 6	Qualities of a good solution

f. Course Learning Outcomes:

CLO 1	Understand the implementation of symbol table using hashing techniques.
CLO 2	Develop and analyze algorithms for red-black trees, B-trees and Splay trees. Understand Develop
CLO 3	Data structures and develop algorithms for computational geometry problems
CLO 4	Algorithms for text processing applications. Define the Concepts of EMS, IP security and Identify suitable.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	4	5	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Dictionaries:** Definition, Dictionary Abstract Data Type, Implementation of Dictionaries. Hashing: Review of Hashing, Hash Function, Collision Resolution Techniques in Hashing, Separate Chaining, Open Addressing, Linear Probing, Quadratic Probing, Double Hashing, Rehashing, Extendible Hashing.	10%	7
2	**Skip Lists:** Need for Randomizing Data Structures and Algorithms, Search and Update Operations on Skip Lists, Probabilistic Analysis of Skip Lists, Deterministic Skip Lists	10%	5
3	**Trees:** Binary Search Trees, AVL Trees, Red Black Trees, 2-3 Trees, B-Trees, Splay Trees	20%	9
4	**Text Processing:** Sting Operations, Brute-Force Pattern Matching, The Boyer Moore Algorithm, The Knuth-Morris-Pratt Algorithm, Standard Tries, Compressed Tries, Suffix Tries, The Huffman Coding Algorithm, The Longest Common Subsequence Problem (LCS), Applying Dynamic Programming to the LCS Problem.	25%	12
5	**Computational Geometry:** One Dimensional Range Searching, Two Dimensional Range Searching, Constructing a Priority Search Tree, Searching a Priority Search Tree, Priority Range Trees, Quadtrees, k-D Trees.	20%	10
6	**Recent Trands in Hashing:** Trees, and various computational geometry methods for effeciently solving the new evolving problem	15%	5

i. Text Book and Reference Book:

1. Data Structures and Algorithm Analysis in C++ By Mark Allen Weiss | Pearson | 2nd Edition, Pub. Year 2004

2. Algorithm Design By M T Goodrich, Roberto Tamassia, | John Wiley | 2002

j. List of Experiment:

Sr. No.	List of Experiment
1.	List the factors that may influence the space complexity of a program. Write a recursive and non-recursive function to compute n! Compare the space requirements of no recursive function with those of recursive version.
2.	Write a program to determine whether or not a character string has an unmatched parenthesis. Use a stack. What is the time complexity of your program? Can we replace the stack with a queue?
3.	Write a program in C to implement insertion and deletion in AVL trees
4.	Write a Program in C to implement Tree Traversal in tree.
5.	Write a program that implement divide and conquer method to find the maximum and minimum of n elements. Use recursion to implement the divide and conquer scheme.
6.	Write a program in C to implement Breadth First search using graph.
7.	Write a program in C to implement Depth first search using graph.
8.	Write a program in C to create a minimum spanning tree using Kruskal's& Prim's algorithm
9.	Write a program that implements change making solution. Assume that the cashier has currency notes in the denominations Rs. 100, Rs. 50, Rs. 20, Rs. 10, Rs. 5 and Rs. 1 in addition to coins. Program should include a method to input the purchase amount and the amount given by the customer as well as method to output the amount of change and a breakdown by denomination. Apply greedy algorithm at the cashier side that is give less number of coins if sufficient currency of that denomination available
10	Implement the Rabin - Karp matcher and Boyer Moore string matching algorithm.

(4)

a. Course Name: English for Research Paper Writing
b. Course Code: 203200102
c. Prerequisite: Basic Knowledge about sentence formation using different words in present, past tenses and future time. Also, basic knowledge on use of suitable nouns, adjectives, verbs, preposition, etc.
d. Rationale: To provide a better insight for the effective use of grammar knowledge especially in writing and to put their own thoughts in to writing.

e. Course Learning Objective:

CLOBJ 1	Understand that how to improve your writing skills and level of readability
CLOBJ 2	Learn about what to write in each section

CLOBJ 3	Understand the skills needed when writing a Title
CLOBJ 4	Ensure the good quality of paper at very first-time submission

f. Course Learning Outcomes:

CLO 1	Understand that how to improve your writing skills and level of readability
CLO 2	Learn about what to write in each section
CLO 3	Understand the skills needed when writing a Title
CLO 4	Ensure the good quality of paper at very first-time submission

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	Meaning of research problem, Sources of research problem, Criteria Characteristics of a good research problem, Errors in selecting a research problem, Scope and **Objectives of research problem:** Approaches of investigation of solutions for research problem, data collection, analysis, interpretation, Necessary instrumentations.	**20%**	**5**
2	Effective literature studies approaches, analysis Plagiarism, Research ethics	**15%**	**5**
3	**Effective technical writing:** how to write report, Paper Developing a Research Proposal, Format of research proposal, a presentation and assessment by a review committee.	**15%**	**5**
4	**Nature of Intellectual Property:** Patents, Designs, Trademarks and Copyright. Process of Patenting and Development: technological research, innovation, patenting, development. International	**20%**	**5**

	Scenario: International cooperation on Intellectual Property. Procedure for grants of patents, Patenting under PCT.		
5	**Patent Rights:** Scope of Patent Rights. Licensing and transfer of technology. Patent information and databases. Geographical Indications.	**15%**	**5**
6	**New Developments in IPR:** Administration of Patent System. New developments in IPR; IPR of Biological Systems, Computer Software etc. Traditional knowledge Case Studies, IPR and IITs.	**15%**	**5**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Intellectual Property Rights Under WTO
2. T. Ramappa; S. Chand, 2008
3. Research methodology: an introduction for science & engineering students Stuart Melville and Wayne Goddard; Juta & Co Ltd
4. Research Methodology: An Introduction
5. Wayne Goddard, Stuart Melville; Juta and Company Ltd, 2004
6. Research Methodology : A Step by Step Guide for Beginners Ranjit Kumar; PEARSON; 3rd
7. Resisting Intellectual Property Halbert; Taylor & Francis Ltd., 2007
8. Industrial Design
9. Mayall; McGraw Hill, 1992
10. Product Design
11. Niebel; McGraw Hill, 1974
12. Introduction to Design Asimov; Prentice Hall, 1962
13. Intellectual Property in New Technological Age
14. Robert P. Merges, Peter S. Menell, and Mark A. Lemley; 2016

(5)

a. Course Name: Disaster Management
b. Course Code: 203200103
c. Prerequisite: Basics related to the disaster.
d. Rationale: To prepare for a leadership role in disaster management or the humanitarian field with in depth knowledge of resilience and risk reduction.
e. Course Learning Objective:

CLOBJ 1	Ensuring the availability of local emergency equipment and transportation
CLOBJ 2	Achieving quick recovery from disaster.
CLOBJ 3	Long-term planning for particular disaster to reduce its risk.

CLOBJ 4	Shifting exposure from vulnerable area into safe place.

f. Course Learning Outcomes:

CLO 1	To integrate knowledge and to analyse, evaluate and manage the different public health aspects of disaster events at a local and global levels, even when limited information is available.
CLO 2	To describe, analyse and evaluate the environmental, social, cultural, economic, legal and organisational aspects influencing vulnerabilities and capacities to face disasters.
CLO 3	To manage the Public Health aspects of the disasters.
CLO 4	To formulate strategies for mitigation in future scenarios with the ability to clearly present and discuss their conclusions and the knowledge and arguments behind them.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction** Disaster: Definition, Factors And Significance; Difference Between Hazard And Disaster; Natural And Manmade Disasters: Difference, Nature, Types And Magnitude.	**17%**	**5**
2	**Repercussions Of Disasters And Hazards** Economic Damage, Loss Of Human And Animal Life, Destruction Of Ecosystem, Natural Disasters: Earthquakes, Volcanisms, Cyclones, Tsunamis, Floods, Droughts And Famines, Landslides And Avalanches, Man-made disaster: Nuclear Reactor Meltdown, Industrial Accidents, Oil Slicks And Spills, Outbreaks Of Disease And Epidemics, War And Conflicts.	**17%**	**5**
3	**Disaster Prone Areas In India:**	**17%**	**5**

	Study Of Seismic Zones; Areas Prone To Floods And Droughts, Landslides And Avalanches; Areas Prone To Cyclonic And Coastal Hazards With Special Reference To Tsunami; Post-Disaster Diseases And Epidemics.		
4	**Disaster Preparedness And Management Preparedness:** Monitoring Of Phenomena Triggering A Disaster Or Hazard; Evaluation Of Risk: Application Of Remote Sensing, Data From Meteorological And Other Agencies, Media Reports: Governmental And Community Preparedness.	**17%**	**5**
5	**Risk Assessment Disaster Risk:** Concept And Elements, Disaster Risk Reduction, Global And National Disaster Risk Situation. Techniques Of Risk Assessment, Global Co-Operation In Risk Assessment And Warning, People's, Participation In Risk Assessment. Strategies for Survival.	**16%**	**5**
6	**Disaster Mitigation:** Meaning, Concept And Strategies Of Disaster Mitigation, Emerging Trends In Mitigation. Structural Mitigation And Non-Structural Mitigation, Programs Of Disaster Mitigation In India.	**16%**	**5**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Disaster Management in India: Perspect ives, issues and strategies
2. By R. Nishith, Singh AK | 'New Royal book Company.
3. Disaster Mitigation Experiences And Reflections
4. By Sahni, Pardeep Et.Al. (Eds.) | Prentice Hall Of India, New Delhi.
5. Disaster Administration And Management Text And Case Studies
6. By Goel S. L., | Deep &Deep Publication Pvt. Ltd., New Delhi.

(6)

a. Course Name: Sanskrit for Technical Knowledge
b. Course Code: 203200104
c. Prerequisite: Knowledge of an Basic Level of Sanskrit
d. Rationale: To learn Sanskrit to develop the logic in mathematics, science & other subjects enhancing the memory power and also will help scholars equipped with Sanskrit will be able to explore the huge knowledge from ancient literature.
e. Course Learning Objective:

CLOBJ 1	To give a comprehensive knowledge about the scriptural, classical and technical literature in Sanskrit

CLOBJ 2	To impart an in-depth knowledge of the different schools of literary criticism in Sanskrit
CLOBJ 3	To enable the scholars to master the technical nuances of philosophical deliberations
CLOBJ 4	To introduce avenues for recent research in technical literature
CLOBJ 5	To open up vistas of inter-disciplinary research for social welfare
CLOBJ 6	To equip the scholars to resolve the issues of social challenges on grounds of value oriented findings in Sanskrit literature

f. Course Learning Outcomes:

CLO 1	Have a thorough knowledge of Sanskrit technical literature and its implications
CLO 2	Identify, understand and address the conceptual differences among the different schools of thought in Sanskrit literature
CLO 3	Appreciate the sublime beauty of Sanskrit poetical and technical works by applying the principles of literary criticism
CLO 4	Understand the background in which Sanskrit literature developed and learn to empathize and appreciate the situations

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Alphabets in Sanskrit** Past/Present/Future Tense Simple Sentences	**33%**	**10**
2	**Introduction of roots** Technical information about Sanskrit Literature	**33%**	**10**
3	**Technical concepts of Engineering** Electrical, Mechanical, Architecture, Mathematics	**34%**	**10**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. **Reference Books:**
   1. Abhyaspustakam
   2. By Dr.Vishwas | Samskrita-Bharti Publication, New Delhi
   3. Teach Yourself Sanskrit
   4. By Prathama Deeksha-Vempati Kutumbshastri | Rashtriya Sanskrit Sansthanam, New Delhi Publication
   5. India's Glorious Scientific Tradition
   6. By Suresh Soni | Ocean books (P) Ltd., New Delhi

(7)

a. **Course Name:** Value Education
b. **Course Code:** 203200105
c. **Prerequisite:** Nil
d. **Rationale:** This course prepares the students to understand value of education and self- development, imbibe good values in students and Let us know about the importance of character.
e. **Course Learning Objective:**

CLOBJ 1	To teach and inculcate the importance of value based living.
CLOBJ 2	To give students a deeper understanding about the purpose of life.
CLOBJ 3	To teach and inculcate the essential qualities to become a good leader.
CLOBJ 4	To expose students to the compelling challenges in society and make them respond positively.

f. **Course Learning Outcomes:**

CLO 1	To understand the importance of value based living.
CLO 2	To gain deeper understanding about the purpose of their life.
CLO 3	To understand and start applying the essential steps to become good leaders.
CLO 4	To emerge as responsible citizens with clear conviction to practice values and ethics in life

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Values and self-development:** Social values and individual attitudes. Work ethics, Indian vision of humanism. Moral and non- moral valuation. Standards and principles. Value judgments	**20%**	**6**
2	**Importance of cultivation of values:** Sense of duty. Devotion, Self-reliance. Confidence, Concentration. Truthfulness, Cleanliness. Honesty, Humanity. Power of faith, National Unity. Patriotism. Love for nature, Discipline	**27%**	**8**
3	**Personality and Behavior Development**: Soul and Scientific attitude. Positive Thinking. Integrity and discipline. Punctuality, Love and Kindness. Avoid fault Thinking. Free from anger, Dignity of labour. Universal brotherhood and religious tolerance. True friendship. Happiness Vs suffering, love for truth. Aware of self-destructive habits. Association and Cooperation. Doing best for saving nature	**27%**	**8**
4	**Character and Competence Holy books vs Blind faith**: Self-management and Good health. Science of reincarnation. Equality, Nonviolence, Humility, Role of Women. All religions and same message. Mind your Mind, Self-control. Honesty, Studying effectively	**26%**	**8**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Values and Ethics for organizations Theory and practice
2. By Chakroborty, S.K. | Oxford University Press, New Delhi, Pub. Year 1999

(8)

a. **Course Name:** Advanced Machine Learning
b. **Course Code:** 203202130
c. **Prerequisite:** The prerequisite for this course is a basic understanding of problem solving, design and analysis of algorithms and computer programming. A prior course in Artificial Intelligence will be an advantage.
d. **Rationale:** This course is design to provide basic ideas of Machine Learning. This course also makes help to understand different statistical learning algorithms.
e. **Course Learning Objective:**

CLOBJ 1	To understand the basic theory underlying machine learning.
CLOBJ 2	To be able to formulate machine learning problems corresponding to different applications.
CLOBJ 3	To understand a range of machine learning algorithms along with their strengths and weaknesses.
CLOBJ 4	To be able to apply machine learning algorithms to solve problems of moderate complexity.
CLOBJ 5	To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.

f. **Course Learning Outcomes:**

CLO 1	Extract features that can be used for a particular machine learning approach in various IOT applications.
CLO 2	To compare and contrast pros and cons of various machine learning techniques and to get an insight of when to apply a particular machine learning approach.
CLO 3	To mathematically analyse various machine learning approaches and paradigms.
CLO 4	Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**-

Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Machine earning** Different types of learning, Data pre-processing methods, Feature Selection and Generation, Concept of over fitting and under fitting, Bias and Variance.	**20%**	**9**
2	**Supervised Learning** Linear regression, Logistic regression, Multiple Linear regression, Classification- K Nearest-Neighbors, Decision Tree, Random forests, Naive Bayes, Support Vector Machines, Generalized Linear Models, Model selection and evaluation, k-fold cross-validation, Training-Validation-Testing split.	**20%**	**8**
3	**Unsupervised Learning** Clustering- K-means, Agglomerative and Hierarchical clustering, Dimensionality Reduction, Principal Component Analysis and the Curse of Dimensionality. Modeling Sequence/Time-Series Data, Ensemble Methods- Boosting, Bagging, Adaboost.	**15%**	**8**
4	**Semi-supervised Learning and Generative Models** Active Learning, Reinforcement Learning, Feature Representation Learning, Maximum likelihood estimator, Linear Discriminant Analysis, Bayesian learning, Latent variables and Expectation-maximization algorithm.	**15%**	**7**
5	**Recommender System and Optimization Techniques** Content based recommendation, Collaborative filtering-based recommendation, Genetic Algorithm, Ant Colony Optimization, Particle Swarm Optimization.	**15%**	**7**
6	**Foundations of Deep Learning** Artificial Neural Networks, Biological motivation Perceptron, Multilayer Networks, Back Propagation, Stochastic Gradient Descent, Deep neural network, CNN, RNN, Recent trends in machine learning and deep learning techniques for IOT applications.	**15%**	**7**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Machine Learning with Python for Everyone, By Mark E. Fenner|Pearson
2. Deep Learning: Methods and Applications, By Li Deng and Dong Yu
3. Machine Learning, Anuradha Srinivasaraghavan, Vincy Joseph |Wiley
4. Data Mining concepts and Techniques, By Jiawei Han, Micheline Kamber | Elsevier

(9)

a. **Course Name:** Advanced Wireless and Mobile Networks
b. **Course Code:** 203202135
c. **Prerequisite:** Computer Network, Basic knowledge of Wireless Networks & Mobile devices.
d. **Rationale:** This course will examine the area of wireless networking and mobile computing, looking at the unique network protocol challenges and opportunities presented by wireless communications and host or router mobility. The course will give a brief overview of fundamental concepts in mobile wireless systems and mobile computing.
e. **Course Learning Objective:**

CLOBJ 1	To make students familiar with fundamentals of mobile communication systems.
CLOBJ 2	To identify the limitations of 2G and 2.5G wireless mobile communication and the design of 3G and beyond mobile communication systems.
CLOBJ 3	To understand the fading and shadowing concept in wireless network system.
CLOBJ 4	To understand the multicarrier and multi-antenna advantages in wireless network.
CLOBJ 5	To become familiar with the diversity and equalization concepts in wireless channel.

f. **Course Learning Outcomes:**

CLO 1	Demonstrate advanced knowledge of networking and wireless networking and understand various types of wireless networks, standards, operations and use cases
CLO 2	Be able to design WLAN, WPAN, WWAN, Cellular based upon underlying propagation and performance analysis.
CLO 3	Demonstrate knowledge of protocols used in wireless networks and learn simulating wireless networks.
CLO 4	Design wireless networks exploring trade-offs between wire line and wireless links
CLO 5	Develop mobile applications to solve some of the real world problems.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** Wireless Networking Trends, Key Wireless Physical Layer Concepts, Multiple Access Technologies -CDMA, FDMA, TDMA, Spread Spectrum technologies, Frequency reuse, Radio Propagation and Modelling, Challenges in Mobile Computing: Resource poorness, Bandwidth, energy etc. WIRELESS LOCAL AREA NETWORKS: IEEE 802.11 Wireless LANs Physical & MAC layer, 802.11 MAC Modes (DCF & PCF) IEEE 802.11 standards, Architecture & protocols, Infrastructure vs. Adhoc Modes, Hidden Node & Exposed Terminal Problem, Problems, Fading Effects in Indoor and outdoor WLANs, WLAN Deployment issues	**22%**	**11**
2	**Wireless Cellular Networks** 1G and 2G, 2.5G, 3G, and 4G, Mobile IPv4, Mobile IPv6, TCP over Wireless Networks, Cellular architecture, Frequency reuse, Channel assignment strategies, Handoff strategies, Interference and system capacity, Improving coverage and capacity in cellular systems, Spread spectrum Technologies.	**20%**	**10**
3	**Wimax** (Physical layer, Media access control, Mobility and Networking), IEEE 802.22 Wireless Regional Area Networks, IEEE 802.21 Media Independent Handover Overview **Wireless Sensor Networks** Introduction, Application, Physical, MAC layer and Network Layer, Power Management, Tiny OS Overview.	**19%**	**8**
4	**Wireless Pans** Bluetooth AND Zigbee, Introduction to Wireless Sensors.	**9%**	**4**

5	**SECURITY** Security in wireless Networks Vulnerabilities, Security techniques, Wi-Fi Security, DoS in wireless communication	**20%**	**10**
6	**ADVANCED TOPICS** IEEE 802.11x and IEEE 802.11i standards, Introduction to Vehicular Adhoc Networks	**10%**	**5**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Mobile Communications By Jochen Schiller | Pearson
2. Wireless Communications and Networks By Stallings W. | Pearson Education 2005
3. Handbook of Wireless Networks and Mobile Computing By Ivan Stojmenovic | Wiley
4. Wireless and Mobile network Architectures By Yi-Bang Lin and Imrich Chlamtac | Wiley-India Edition
5. Mobile and Personal Communication System and Servicing By Pandya Raj | IEEE

(10)

a. **Course Name:** Data Warehouse and Mining
b. **Course Code:** 203205131
c. **Prerequisite:** Bachelor-level databases, algorithms and statistics
d. **Rationale:** This course will examine the area of wireless networking and mobile computing, looking at the unique network protocol challenges and opportunities presented by wireless communications and host or router mobility. The course will give a brief overview of fundamental concepts in mobile wireless systems and mobile computing.
e. **Course Learning Objective:**

CLOBJ 1	Be familiar with mathematical foundations of data mining tools.
CLOBJ 2	Understand and implement classical models and algorithms in data warehouses and data mining
CLOBJ 3	Characterize the kinds of patterns that can be discovered by association rule mining, classification and clustering.
CLOBJ 4	Master data mining techniques in various applications like social, scientific and environmental context.
CLOBJ 5	Develop skill in selecting the appropriate data mining algorithm for solving practical problems.

f. **Course Learning Outcomes:**

CLO 1	Identify the key processes of data mining, data warehousing and knowledge discovery process.
CLO 2	Understand the basic principles and algorithms used in practical data mining and their strengths and weaknesses.
CLO 3	Apply data mining techniques to solve problems in other disciplines in a mathematical way.
CLO 4	Compare different approaches of data ware housing and data mining with various technologies.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** Introduction to Data Mining Importance of Data Mining, Data Mining Functionalities, Classification of Data mining systems, Data mining Architecture, Major Issues in Data Mining, Applications of Data Mining, Social impacts of data mining.	**10%**	**5**
2	**Data Pre-processing** Data Pre-processing, Data cleaning, Data Integration and Transformation, Data reduction, Discretization and Concept Hierarchy Generation. Concept Description: characterization and Comparison, Analytical Characterization.	**20%**	**8**
3	**Data Warehouse** Introduction, Multidimensional Data Model, Data Warehouse & OLAP Technology for Data Mining, Architecture, Differences of Data warehouse and Data mart, Data cube computation and Data generalization	**15%**	**7**
4	**Association Rule Mining** Market Basket Analysis, Multilevel association rules and Multidimensional association rules, Correlation analysis, Constraint based association Mining.	**15%**	**7**
5	**Classification** Statistical-Based Algorithms, Decision Tree Based Algorithms, Neural Network Based Algorithms, Combining Techniques	**15%**	**7**
6	**Clustering** Similarity and Distance Measures, Hierarchical Algorithms , Partitioning Algorithms, Clustering Large Databases, Clustering With Categorical Attributes	**15%**	**7**
7	**Applications** Introduction to spatial mining, multimedia mining, temporal mining, text mining and web mining with related algorithms.	**10%**	**4**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Data Mining concepts and Techniques (TextBook) By Jiawei Han, Micheline Kamber | Elsevier
2. Data Mining Techniques By Arun K. Pujari | Universities Press
3. Mordern Data Warehousing, Data Mining and Visualization By George M.Marakas | Pearson
4. Data Mining By Vikram Puri And P.RadhaKrishana | Oxfrod Press
5. Data Warehousing By Reema Theraja | Oxford Press

(11)

Elective - 1

a. Course Name: Wireless Sensor Network
b. Course Code: 203202131
c. Prerequisite: Basic knowledge of Wireless Communication.
d. Rationale: Wireless sensor networks are used in many industrial and consumer applications, such as industrial process monitoring and control, machine health monitoring, and so on. Also used in military application and is also promising research area.
e. Course Learning Objective:

CLOBJ 1	Understand a basic concepts of wireless sensor networks
CLOBJ 2	Estimate the requirements to build a wireless sensor networks
CLOBJ 3	Build a wireless sensor network by implementing IoT
CLOBJ 4	To analyse the sensor network platform and tools state-centric programming.

f. Course Learning Outcomes:

CLO 1	Describe and explain radio standards and communication protocols for wireless sensor networks.
CLO 2	Explain the function of the node architecture and use of sensors for various applications
CLO 3	Be familiar with architectures, functions and performance of wireless sensor networks systems and platforms.
CLO 4	Apply various concepts for assignment of MAC addresses.

g. Teaching & Examination Scheme:

Teaching Scheme	Evaluation Scheme

L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
2	-	-	2	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Wireless Sensor Networks** Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors **Network Architecture** Traditional layered stack, Cross-layer designs, Sensor Network Architecture Hardware Platforms: Motes, Hardware parameters	**19%**	**9**
2	**Introduction to ns-3** Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example.	**19%**	**9**
3	**Medium Access Control Protocol design** Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled **Introduction to Markov Chain** Discrete time Markov Chain definition, properties, classification and analysis **MAC Protocol Analysis** Asynchronous duty-cycled. X-MAC Analysis (Markov Chain).	**17%**	**8**
4	**Security** Possible attacks, countermeasures, SPINS, Static and dynamic key distribution	**17%**	**8**
5	**Routing protocols** Introduction, MANET protocols Routing protocols for WSN: Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast Opportunistic Routing Analysis: Analysis of opportunistic routing (Markov Chain) Advanced topics in wireless sensor networks.	**20%**	**10**
6	**Advanced Topics** Recent development in WSN standards, software applications.	**8%**	**4**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. **Reference Books:**

1. Data Mining concepts and Techniques (TextBook) By Jiawei Han, Micheline Kamber | Elsevier
2. Data Mining Techniquesb By Arun K. Pujari | Universities Press
3. Mordern Data Warehousing, Data Mining and Visualization By George M.Marakas | Pearson
4. Data Mining By Vikram Puri And P.RadhaKrishana | Oxfrod Press
5. Data Warehousing By Reema Theraja | Oxford Press

(12)

a. **Course Name: Data Science**
b. **Course Code:** 203202133
c. **Prerequisite:** Database, Data Mining, Machine Learning.
d. **Rationale:** Provide you with the knowledge and expertise to become a proficient data scientist. Demonstrate an understanding of statistics and machine learning concepts that are vital for data science. Produce Python code to statistically analyze a dataset. Critically evaluate data visualizations based on their design and use for communicating stories from data.
e. **Course Learning Objective:**

CLOBJ 1	Building the fundamentals of data science.
CLOBJ 2	Imparting design thinking capability to build big-data
CLOBJ 3	Developing design skills of models for big data problems
CLOBJ 4	Gaining practical experience in programming tools for data sciences
CLOBJ 5	Empowering students with tools and techniques used in data science

f. **Course Learning Outcomes:**

CLO 1	Explain how data is collected, managed and stored for data science
CLO 2	Understand the key concepts in data science, including their real-world applications and the toolkit used by data scientists
CLO 3	Implement data collection and management scripts using MongoDB
CLO 4	Apply Basic Machine Learning Algorithms

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	

2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to core concepts and technologies** Introduction, Terminology, data science process, data science toolkit, Types of data, Example applications.	**12%**	**6**
2	**Data collection and management:** Introduction, Sources of data, Data collection and APIs, Exploring and fixing data, Data storage and management, Using multiple data sources.	**15%**	**7**
3	**Data analysis** Introduction, Terminology and concepts, Introduction to statistics, Central tendencies and distributions, Variance, Distribution properties and arithmetic, Samples/CLT, Basic machine learning algorithms, Linear regression, SVM, Naive Bayes.	**21%**	**10**
4	**Data visualization** Introduction, Types of data visualization, Data for visualization: Data types, Data encodings, Retinal variables, Mapping variables to encodings, Visual encodings.	**22%**	**11**
5	**Applications of Data Science** Technologies for visualization, Bokeh (Python).	**15%**	**7**
6	**Recent trends in various data collection and analysis techniques** Various visualization techniques, application development methods of used in data science.	**15%**	**7**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Doing Data Science, Straight Talk From The Frontline By Cathy O'Neil and Rachel Schutt. | O'Reilly
2. Mining of Massive Datasets. By Jure Leskovek, AnandRajaraman and Jeffrey Ullman. | Cambridge University Press | 2

(13)

a. **Course Name:** Information and Network Security
b. **Course Code:** 203205130
c. **Prerequisite:** Students should be familiar with basic concepts of Software Flaws, Data Structures and Mathematics including Random numbers, Number theory, finite fields.
d. **Rationale:** This course provides an introduction to the fundamental principles of cryptography and its applications on the network security domain as well as software development domain. This subject covers various important topics concern to information security like symmetric and asymmetric cryptography, hashing, message and user authentication, digital signatures, key distribution and overview of the malware technologies. The subject also covers the applications of all of these in real life situations.
e. **Course Learning Objective:**

CLOBJ 1	Identify the components associated with computer networks
CLOBJ 2	Distinguish and explain the concepts of: hacking and cracking; authorization, and attacks.
CLOBJ 3	Develop a networking plan for self or a client.
CLOBJ 4	Identify the function of a firewall, and how it keeps a computer secure and safe from viruses.

f. **Course Learning Outcomes:**

CLO 1	Define the concepts of Information security and their use.
CLO 2	Describe the principles of symmetric and asymmetric cryptography.
CLO 3	Understand the concepts of hashing with algorithms and apply them.
CLO 4	Understand and use the message authentication and its requirement.
CLO 5	Understand the concepts of digital signature and digital certificates.
CLO 6	Understand and use the various key management and remote authentication mechanisms.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**2**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction:** Computer Security Concept, The OSI Security Architecture, Security Attacks, Security Services, Security Mechanism, A Model for Network Security.	**5%**	**2**
2	**Basic Concepts in Number Theory:** Divisibility and The Division Algorithm, The Euclidean Algorithm, Modular Arithmetic, Groups, Rings, and Fields, Finite Fields of the Form, Polynomial Arithmetic, Finite Fields of the Form GF(2"), Principles of Pseudorandom Number Generation, Pseudorandom Number Generators, Pseudorandom Number Generation Using a Block Cipher, Prime Numbers, Fermat's and Euler's Theorems	**20%**	**9**
3	**Symmetric Ciphers:** Symmetric Cipher Model, Substitution Techniques, Transposition Techniques, Stenography, Block Cipher Principles, Data Encryption Standard (DES), Deferential and Linear Cryptanalysis, Block Cipher Design Principles, Advanced Encryption Standard, Block Cipher Operation, RC4	**20%**	**9**
4	**Asymmetric Ciphers:** Principles of Public-Key Cryptosystems, The RSA Algorithm, Diffie Hellman Key Exchange, Elliptic Curve Cryptography, Pseudorandom Number Generation Based on an Asymmetric Cipher	**15%**	**7**
5	**Cryptographic Data Integrity Algorithms:** Hash Function and its Application, Security Requirements for Cryptographic Hash Functions, Hash Functions Based on Cipher Block Chaining, Secure Hash Algorithm (SHA), Message Authentication Requirements, Message Authentication Functions, Requirements for Message Authentication Codes, Security of MACs, HMAC, Introduction to Digital Signatures, ElGamal Digital Signature Scheme, Schnorr Digital Signature Scheme, Digital Signature Standard.	**20%**	**9**
6	**Key Management and Distribution:** Symmetric Key Distribution Using Symmetric Encryption, Symmetric Key Distribution Using Asymmetric Encryption, Distribution of Public Keys, X.509Certificates, Public-Key Infrastructure.	**15%**	**7**
7	**Software Flaws and Malware:**	**5%**	**2**

	Introduction, Software Flaws, Buffer overflow, Incomplete Mediation,Race Conditions, Malware, Brain, Morris Worm, Code red, SQL Slammer,Trojan Example, Malware Detection, The Future of Malware, CyberDisease versus Biological diseases, Miscellaneous software-based Attacks, Salami Attacks, Linearization, Time bombs, Trusting Software		

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Cryptography and Network Security (TextBook) By William Stallings | Pearson Education
2. Cryptography & Network Security By Behrouz A. Forouzan | Tata McGraw-Hill
3. Information Security Principles and Practice By Deven Shah, | Wiley-India
4. Information Security Principles and Practice By Mark Stamp | Wiley IndiaEdition
5. Information systems security By Nina Godbole | Wiley Publications,2008

Semester 2

(1)

a. **Course Name:** Advance Algorithm
b. **Course Code: 203202152**
c. **Prerequisite:** UG level course in Algorithm Design and Analysis
d. **Rationale:** This course aims to teach students the principals involved in algorithm and their application in various areas. It will cover all types of approach which will be applied in real application.
e. **Course Learning Objective:**

CLOBJ 1	To become conversant with sorting algorithms, including the advantages and disadvantages of each.
CLOBJ 2	To learn to write and analyze recursive programs, functions, and methods.
CLOBJ 3	To learn to traverse and to implement linked data structures such as linked lists and trees.
CLOBJ 4	To analyze algorithms and to determine algorithm correctness and time efficiency class

f. Course Learning Outcomes:

CLO 1	Analyse the complexity/performance of different algorithms
CLO 2	Determine the appropriate data structure for solving a particular set of problems
CLO 3	Categorize the different problems in various classes according to their complexity.
CLO 4	Students should have an insight of recent activities in the field of the advanced data structure

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	-	2	4	20	20	20	60	30	150

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Sorting:** Review of various sorting algorithms, topological sorting **Graph:** Definitions and Elementary Algorithms: Shortest path by BFS, shortest path in edge-weighted case (Dijkstra's), depth-first search and computation of strongly connected components, emphasis on correctness proof of the algorithm and time/space analysis, example of amortized analysis.	**15%**	6
2	**Matroids:** Introduction to greedy paradigm, algorithm to compute a maximum weight maximal independent set. Application to MST. **Graph Matching:** Algorithm to compute maximum matching. Characterization of maximum matching by Augmenting paths, Edmond's Blossom algorithm to compute augmenting path.	**15%**	8
3	**Flow-Networks:** Max flow - min cut theorem, Ford-Fulkerson Method to compute maximum flow, Edmond-Karp	20%	**9**

	Maximum-flow algorithm. **Matrix Computations:** Strassen's algorithm and introduction to divide and conquer paradigm, the inverse of a triangular matrix, the relation between the time Complexities of basic matrix operations, LUP-decomposition.		
4	**Shortest Path in Graphs:** Floyd-Warshall algorithm and introduction to dynamic programming paradigm. More examples of dynamic programming. Modulo Representation of integers/polynomials: Chinese Remainder Theorem, Conversion between base-representation and modulo-representation. Extension to polynomials. Application: Interpolation problem. **Discrete Fourier Transform (DFT):** In complex field, DFT in modulo ring. Fast Fourier Transform algorithm. Schonhage- Strassen's Integer Multiplication algorithm	**20%**	**10**
5	**Linear Programming:** Geometry of the feasibility region and Simplex algorithm NP-completeness: Examples, proof of NP-hardness and NP-completeness. One or more of the following topics based on time and interest Approximation algorithms, Randomized Algorithms, Interior Point Method, Advanced Number Theoretic Algorithm	**20%**	**10**
6	Recent Trends in problem solving paradigms using recent searching and sorting techniques by applying recently proposed data structures.	**10%**	**5**

i. Text Book and Reference Book:

1. Introduction of Computer algorithm (TextBook) By T. H. Cormen, Leiserson , Rivest and Stein | PHI
2. The Design and Analysis of Computer Algorithms By Aho, Hopcroft, Ullman
3. "Algorithm Design" By Klein berg and Tardos

(2)

a. Course Name: Soft Computing
b. Course Code: 203202153
c. Prerequisite: Basic knowledge of mathematics
d. Rationale: It provides an approach to problem-solving using means other than computers. With the human mind as a role model, soft computing is tolerant of partial truths, uncertainty, imprecision and approximation, unlike traditional computing models.
e. Course Learning Objective:

CLOBJ 1	It refers to principle components like fuzzy logic, neural networks and genetic algorithm, which have their roots in Artificial Intelligence.
CLOBJ 2	To apply ANN training algorithms for solving real world problems

CLOBJ 3	To understand and interpret fuzzy systems
CLOBJ 4	Healthy integration of all these techniques has resulted in extending the capabilities of the technologies to more effective and efficient problem solving methodologies

f. Course Learning Outcomes:

CLO 1	Identify and describe soft computing techniques and their roles in building intelligent machines
CLO 2	Apply fuzzy logic and reasoning to handle uncertainty and solve various engineering problems
CLO 3	Apply genetic algorithms to combinatorial optimization problems.
CLO 4	Evaluate and compare solutions by various soft computing approaches for a given problem.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction To Soft Computing And Neural Networks** Evolution of Computing: Soft Computing Constituents, From Conventional AI to Computational Intelligence: Machine Learning Basics	**10%**	7
2	**Fuzzy Logic** Fuzzy Sets, Operations on Fuzzy Sets, Fuzzy Relations, Membership Functions: Fuzzy Rules and Fuzzy Reasoning, Fuzzy Inference Systems, Fuzzy Expert Systems, Fuzzy Decision Making.	20%	8
3	**Neural Networks**	20%	**10**

	Machine Learning Using Neural Network, Adaptive Networks, Feed forward Networks, Supervised Learning Neural Networks, Radial Basis Function Networks : Reinforcement Learning, Unsupervised Learning Neural Networks, Adaptive Resonance architectures, Advances in Neural networks		
4	**Genetic Algorithms** Introduction to Genetic Algorithms (GA), Applications of GA in Machine Learning : Machine Learning Approach to Knowledge Acquisition.	**15%**	**5**
5	**Matlab/Python Lib** Introduction to Matlab/Python, Arrays and array operations, Functions and Files, Study of neural network toolbox and fuzzy logic toolbox, Simple implementation of Artificial Neural Network and Fuzzy Logic	**15%**	**13**
6	**Recent Trends** Recent Trands in deep learning, various classifiers, neural networks and genetic algorithm. Implementation of recently proposed soft computing techniques.	**20%**	**5**

i. Text Book and Reference Book:

1. MATLAB Toolkit Manual (TextBook)

(3)

a. Course Name: Seminar & Mini Project
b. Course Code: 203205151
c. Prerequisite: Nil
d. Rationale: To explore the breadth of research that is being performed within the college/institution. To explore an discipline that is outside of immediate research interest or area.
e. Course Learning Objective:

CLOBJ 1	To plan for various activities of the project and distribute the work amongst team members.
CLOBJ 2	To inculcate electronic hardware implementation skills by Learning PCB artwork design using an appropriate EDA tool.
CLOBJ 3	Imbibing good soldering and effective trouble-shooting practices.
CLOBJ 4	Following correct grounding and shielding practices.
CLOBJ 5	To understand the importance of document design by compiling Technical Report on the Mini Project work carried out.

f. Course Learning Outcomes:

CLO 1	Understand, plan and execute a Mini Project with team.

CLO 2	Implement electronic hardware by learning PCB artwork design, soldering techniques, testing and troubleshooting etc.
CLO 3	Prepare a technical report based on the Mini project.
CLO 4	Deliver technical seminar based on the Mini Project work carried out.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	4	2	-	-	50	-	50	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Seminar & Mini Project :** Introduction to Seminar, Introduction to Seminar Report Writing, Understanding and Detailing of M. Tech Seminar Topic Selection, Preliminary Topic Selection, Studying State of Art knowledge of Selected Topic, Finding out the current research trends of the Topic, Presentation-1 and Report-1 Submission., Review discussion of Presentation-1 and Report-1., Finding of Problems associated with the Topic., Finding of Methods associated for addressing solutions of the problems associated with the Topic., Prepare the comparisons of the various Methods or techniques involved in solutions of the Topic.	**100%**	**36**

(4)

a. **Course Name:** - Constitution of India
b. **Course Code:** 203200151
c. **Prerequisite:** Nil
d. **Rationale:** Outlining the role and rights of citizens as well as defining the structure and powers of the government and its organs. Creating a path for the future citizens to build a corruption free society. Indicating the nature of future society that has to be built by the joint efforts of the state and the citizens.
e. **Course Learning Objective:**

CLOBJ 1	Create an awareness about the Constitution of India, Fundamental Rights and Duties, Directive Principles 2. 3. 4. 5.
CLOBJ 2	Learn the role of Prime Minister, President and the Council of Ministers and the State Legislature
CLOBJ 3	Learn the divisions of executive, legislative and judiciary and so on.
CLOBJ 4	Know how a municipal office, panchayat office etc. works
CLOBJ 5	Understand the importance and role of Election Commission Function

f. Course Learning Outcomes:

CLO 1	To know the importance of Constitution and government.
CLO 2	To become Good Citizens and know their fundamental rights, duties and principles.
CLO 3	To learn about the role of PM, President, Council of Ministers and Local Administration.
CLO 4	Understand the importance of Election Commission.
CLO 5	Will know about Secularism, Federalism, Democracy, Liberty, Freedom of Expression, Special Status of States etc.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
-	2	-	Audit	-	60	40	-	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction to Constitution:** Meaning and importance of the Constitution, salient features of Indian Constitution. Preamble of the Constitution. Fundamental rights- meaning and limitations. Directive principles of state policy and Fundamental duties -their enforcement and their relevance.	**20%**	**7**
2	**Union Government:** Union Executive- President, Vice-president, Prime Minister, Council of Ministers. Union Legislature- Parliament and	**20%**	**6**

	Parliamentary proceedings. Union Judiciary-Supreme Court of India – composition and powers and functions.		
3	**State and Local Governments:** State Executive- Governor, Chief Minister, Council of Ministers. State Legislature-State Legislative Assembly and State Legislative Council. State Judiciary-High court. Local Government-Panchayat raj system with special reference to 73rd and Urban Local Self Govt. with special reference to74th Amendment.	**20%**	**7**
4	**Election provisions, Emergency provisions, Amendment of the constitution:** Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.	**20%**	**6**

***Continuous Evaluation:**

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books and Text books:

1. M.V.Pylee, "Introduction to the Constitution of India",4th Edition, Vikas publication,2005.
2. Durga Das Basu(DD Basu) , "Introduction to the constitution of India",(Student Edition),19th edition,Prentice-Hall EEE, 2008.
3. Merunandan, "Multiple Choice Questions on Constitution of India", 2 nd Edition,Meraga publication,2007.

(5)

a. Course Name: - Pedagogy Studies

b. Course Code: 203200152

c. Prerequisite: Clear and effective communication is crucial in research pedagogy. Instructors need to be able to explain complex concepts, guide students through the research process, and provide constructive feedback. Strong communication skills also facilitate collaboration and discussion in the research learning environment.

d. Rationale: Research pedagogy encourages students to think critically and analytically. Engaging in research requires evaluating information, making informed decisions, and developing a deeper understanding of subject matter.

e. Course Learning Objective:

CLOBJ 1	Students will be able to design and articulate a research question or problem, select appropriate research methodologies, and develop a comprehensive research plan.

CLOBJ 2	Students will demonstrate advanced information literacy skills, including the ability to critically evaluate and synthesize information from various sources to support research objectives.
CLOBJ 3	Students will develop and apply critical thinking skills to analyze research findings, draw meaningful conclusions, and assess the implications of their research within the context of existing knowledge.
CLOBJ 4	Students will understand and adhere to ethical considerations in research, including responsible conduct, proper citation practices, and the ethical treatment of research subjects, ensuring the integrity of the research process.

f. Course Learning Outcomes:

CLO 1	Understand the concept, nature, characteristics of growth and development
CLO 2	Oriented towards Basics of pedagogy and familiarized with the educational process.
CLO 3	Understand the concept of Assessment and learning.
CLO 4	Apply the methods and strategies of Knowledge Acquisition, Retention and Transformation in new and unfamiliar situations.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	-	**60**	**40**	-	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction and Methodology:** Aims and rationale, Policy background, Conceptual framework and terminology, Theories of learning, Curriculum, Teacher education Conceptual framework, Research questions Overview of methodology and Searching	**25%**	**4**

2	**Thematic overview** Pedagogical practices are being used by teachers in formal and informal classrooms in developing countries Curriculum, Teacher education.	**13 %**	**2**
3	**Evidence on the effectiveness of pedagogical practices** Methodology for the in depth stage Quality assessment of included studies. How can teacher education (curriculum and practicum) and the school curriculum and guidance materials best support effective pedagogy? Theory of change, Strength and nature of the body of evidence for effective pedagogical practices Pedagogic theory and pedagogical approaches, Teacherṡ attitudes and beliefs and Pedagogic strategies	**25%**	**4**
4	**Professional development** Alignment with classroom practices and follow-up support, Peer support, Support from the head teacher and the community Curriculum and assessment Barriers to learning: limited resources and large class sizes	**25%**	**4**
5	**Research Gaps:** Research gaps and future directions, Research design, Contexts Pedagogy, Teacher education, Curriculum and assessment, Dissemination and research impact.	**12%**	**2**

Continuous Evaluation:

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Argumentative Writing in a Second Language: Perspectives Research and Pedagogy by Alan R. Hirvela and Diane Belcher
2. Child Psychology and Pedagogy: The Sorbonne Lectures 1949-1952 by Maurice Merleau-Ponty translated by Talia WelshResearch Methodology: An Introduction
3. Wayne Goddard, Stuart Melville; Juta and Company Ltd, 2004
4. Research Methodology : A Step by Step Guide for Beginners Ranjit Kumar; PEARSON; 3rd
5. Class in the Composition Classroom: Pedagogy and the Working Class
6. edited by Genesea M. Carter and William H. Thelin

(6)

a. **Course Name:** - Personality Development through Life Enlightenment Skills
b. **Course Code:** 203200154
c. **Prerequisite:** Nil
d. **Rationale:** The course provides details of personality development using study of Srimad Bhagavad Gita.
e. **Course Learning Objective:**

CLOBJ 1	To develop and improve qualities such as communication skills.
CLOBJ 2	To develop and improve confidence and emotional intelligence.
CLOBJ 3	To improve self-awareness and leadership abilities
CLOBJ 4	To develop and improve interpersonal skills, and overall personal effectiveness.

f. **Course Learning Outcomes:**

CLO 1	Develop his personality and achieve the highest goal in life with study of Shrimad-Bhagwad-Geeta.
CLO 2	Lead the nation and mankind to peace and prosperity after studying Geeta.
CLO 3	Develop versatile personality with the study of Neetishatakam.
CLO 4	To manage personal and professional problems separately.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	-	**60**	**40**	-	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Neetisatakam-Holistic development of personality** Verses- 19,20,21,22 (wisdom) Verses- 29,31,32 (pride & heroism) Verses- 26,28,63,65 (virtue) Verses- 52,53,59 (donts) Verses- 71,73,75,78 (dos)	**32%**	**8**

2	**Approach to day to day work and duties.** Shrimad Bhagwad Geeta : Chapter 2-Verses 41, 47,48, Chapter 3-Verses 13, 21, 27, 35, Chapter 6-Verses 5,13,17, 23, 35, Chapter 18-Verses 45, 46, 48.	**34%**	**8**
3	**Statements of basic knowledge.** Shrimad Bhagwad Geeta: Chapter2-Verses 56, 62, 68 Chapter 12 -Verses 13, 14, 15, 16,17, 18 Personality of Role model. Shrimad Bhagwad Geeta: Chapter2-Verses 17, Chapter 3-Verses 36,37,42, Chapter 4-Verses 18, 38,39 Chapter18 Verses 37,38,63	**33%**	**8**

Continuous Evaluation:

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. **Reference Books:**

1. Srimad Bhagavad Gita By Swarupananda, Swami | Advaita Ashrama
2. Bhartrihari's Three Satakam (Niti-sringar-vairagya) By P.Gopinath, Rashtriya Sanskrit Sansthanam | Rashtria Sanskrit Sansthan

(7)

a. **Course Name:** - Stress Management by Yoga
b. **Course Code:** 203200153
c. **Prerequisite:** Knowledge of Sanskrit & different languages to learn from different holy books
d. **Rationale:** Students will be able to manage the stress.
e. **Course Learning Objective:**

CLOBJ 1	Comprehend the basic rules of stress management.
CLOBJ 2	Understand your stress-triggers and controlling them.
CLOBJ 3	Develop proactive reactions to stressful conditions.
CLOBJ 4	To achieve overall Good Health of Body and Mind.

f. **Course Learning Outcomes:**

CLO 1	Develop healthy mind in a healthy body thus improving social health also improve efficiently.
CLO 2	Develop body awareness. Learn how to use their bodies in a healthy way. Perform well in sports and academics.

CLO 3	Able to balance, flexibility, and stamina, strengthen muscles and connective tissues enabling good posture.
CLO 4	Manage stress through breathing, awareness, meditation and healthy movement. Build concentration, confidence and positive self-image.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
2	**-**	**-**	**Audit**	-	**60**	**40**	-	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Definitions of Eight parts of yog. (Ashtanga)**	**33%**	**8**
2	**Yam and Niyam.** Do`s and Donts in life. i) Ahinsa, satya, astheya, bramhacharya and aparigraha ii) Shaucha, santosh, tapa, swadhyay, ishwarpranidhan	**34%**	**8**
3	**Asan and Pranayam** i) Various yog poses and their benefits for mind & body ii)Regularization of breathing techniques and its effects-Types of pranayam	**34%**	**8**

Continuous Evaluation:

It consists of Assignments/Seminars/Presentations/Quizzes/Surprise Tests (Summative/MCQ) etc.

i. Reference Books:

1. Yogic Asanas for Group Tarining-Part-I By Janardan Swami | Yogabhyasi Mandal, Nagpur
2. Raja-Yoga; Or, Conquering the Internal Nature By Swami Vivekananda

(8)

a. **Course Name:** Service Oriented Architecture
b. **Course Code:** 203205180
c. **Prerequisite:** Basic knowledge of software, web services
d. **Rationale:** A stage in the evolution of application development and/or integration. It defines a way to make software components reusable using the interfaces.
e. **Course Learning Objective:**

CLOBJ 1	To gain understanding of the basic principles of service orientation
CLOBJ 2	To learn service oriented analysis techniques
CLOBJ 3	To learn technology underlying the service design
CLOBJ 4	To learn advanced concepts such as service composition, orchestration and Choreography

f. **Course Learning Outcomes:**

CLO 1	To understand primary concepts of SOA.
CLO 2	Know the integration of SOA technological points with Web Services.
CLO 3	Implementation of SOA in development cycle of Web Services.
CLO 4	Apply OOP principles to creation of web service solutions.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tut orial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction to SOA** Fundamental of SOA, Characteristics of Contemporary SOA, Misperception about SOA, Tangible Benefits of SOA, Evolution of SOA, Roots of SOA, SOA standard stack	**15%**	**4**

2	**Architectures** Enterprise Architecture, Software Architecture, J2EE Architecture, .NET Architecture, Model Driven Architecture, Concept of Distributed Systems, XML with Document Type Definition, XML Schema and XML Style sheet Language	**15%**	**8**
3	**Web Service** Basics of Web Services its Definition, Standards and Architecture. Service Characteristics, Service description with WSDL, SOAP and UDDI. REST based Web Service	**20%**	**8**
4	**Principle of Service Oriented Computing** Service Lifecycle, Service Service Identification, Service Design and Build, Service Deployment, Publish Web service using UDDI, Service Discovery, Service Selection, Service Composition, Service Execution and Monitoring, Service Termination, Service Composition, Orchestration and Choreography, WS-BPEL (Business Process Execution Language)	**25%**	**12**
5	**WS-* Specifications** WS-Addressing, WS-Reliable Messaging, WS-Policies, WS-Metadata Exchange, SOA Security, WS-Security (with XML Signature, XML Encryption) WS- Eventing, WS-Notification, SAML, Principle of Service Oriented Computing: Message Exchange Patterns, Coordination, Atomic Transaction, Business Activities	**25%**	**10**

i. Text Book and Reference Book:

1. Service Oriented Architecture: Concepts, Technology, and Design By Thomas Erl | Pearson education
2. SOA using JavaTM Web Services By Mark D Hansen | Prentice Hall Publication
3. Service Oriented Computing By Muninder Singh & Michael Huhns | Wiley Publication
4. Applied SOA By Michael Rosen | Wiley Publication
5. SOA based Enterprise Integration By Rosheta | TMH Publication

j. Experiment List:

Sr. NO.	Experiment List
1	Create Well-Formed XML file for Student Information
2	Create Valid and Well formed XML and DTD files for the Book Store

3	Create Valid and Well formed XML and XSD files for Movie Store
4	Display Student Information XML file 1. in tabular format using XSL 2. Short the List according to Enrollment Number of Student. 3. Change background color of Enrollment number whose marks are below 40 4. Student's percentage must have 2 decimal points (do this using patterns)
5	Develop Calculator Web Service in Java and Consume in Java Web Service Client
6	Develop Currency Converter Web Service in .NET and Consume in .NET Client
7	Develop the Web Service in Java and consume that webservice in .NET client
8	Develop the Web Service in .NET and consume that webservice in Java client
9	Demonstrate REST based Web Service
10	Develop the Web Service in Python and share the data in the JSON format

(9)

a. **Course Name:** Information Theory & Coding
b. **Course Code:** 203205181
c. **Prerequisite:** Probability Theory, Computer Networks
d. **Rationale:** The objective of this course is to provide an insight to information coding techniques, error correction mechanism. Various compression techniques for text, video and image are covered for thorough knowledge of efficient information conveying systems.

e. **Course Learning Objective:**

CLOBJ 1	To define and apply the basic concepts of information theory (entropy, channel capacity etc.)
CLOBJ 2	To learn the principles and applications of information theory in communication systems
CLOBJ 3	To study various data compression methods and describe the most common such methods
CLOBJ 4	To understand the theoretical framework upon which error-control codes are built

f. Course Learning Outcomes:

CLO 1	To introduce the principles and applications of information theory.
CLO 2	To understand how information is measured in terms of probability and entropy.
CLO 3	To learn coding schemes, including error correcting codes, The Fourier perspective; and extensions to wavelets, complexity, compression, and efficient coding of audio-visual information.
CLO 4	Differentiate between lossy and lossless compression techniques and decide an efficient data compression scheme for a given information source.

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction** Information and entropy information measures, Shannon's concept of Information. Channel coding, channel mutual information capacity (BW)	**15%**	**8**
2	**Theorems of coding** Theorem for discrete memory less channel, information capacity theorem, Error detecting and error correcting codes.	**18%**	**9**
3	**Types of codes** Block codes, Hamming and Lee metrics, description of linear block codes, parity check Codes, cyclic code, Masking techniques.	**15%**	**8**
4	**Compression technique** Compression: loss less and lossy, Huffman codes, LZW algorithm, Binary Image compression	**25%**	**10**

	schemes, run length encoding, CCITT group 3 1D Compression, CCITT group 3 2D compression, CCITT group 4 2D Compression		
5	**Coding Method** Convolutional codes, sequential decoding. Video image Compression: CITT H 261 Video coding algorithms, audio (speech) Compression. Cryptography and Cipher	**20%**	**9**
6	**Case study** Case study of CCITT group 3 1-DCompression, CCITT group 3 2D compression	**7%**	**4**

i. Text Book and Reference Book:

1. Elements of Information Theory" by Thomas M. Cover and Joy A. Thomas
2. Introduction to the Theory of Error-Correcting Codes" by Vera Pless
3. Information Theory, Inference, and Learning Algorithms" by David J.C. MacKay

j. Experiment List:

Sr. NO.	Experiment List
1	Write a program to calculate different Entropies of Given Probability
2	Write a program to calculate Maximum Information & Channel Capacity of Given Probability
3	Write a program to implement Shannon Fano coding Algorithm
4	Write a program to implement Hamming Distance
5	Write a program to implement Huffman Coding Algorithm
6	Write a program to implement Huffman Coding Algorithm for Compression
7	Write a program to implement Cryptographic Algorithm (Ceaser Cipher)
8	Write a program to implement Run Length Encoding (RLE) Algorithm
9	Write a program to implement LZW Compression Algorithm
10	Case study of CCITT group 3 1-DCompression

(10)

a. **Course Name:** Big Data Analytics
b. **Course Code:** 203205182
c. **Prerequisite:** Data Structure, Computer Architecture and Organizati
d. **Rationale**: Understand big data for business intelligence. Learn business case studies for big data analytics. Understand nosql big data management. Perform map-reduce analytics using Hadoop and related tool
e. **Course Learning Objective:**

CLOBJ 1	To make the students comfortable with tools and techniques required in handling large amounts of datasets.
CLOBJ 2	To provide an idea of using various deep learning methods in NLP, Neural Network etc.
CLOBJ 3	To gain the knowledge of several libraries and datasets publicly available will be used to illustrate the application of these algorithms.

f. **Course Learning Outcomes:**

CO 1	Able to understand the mathematics behind functioning of artificial neural networks
CO 2	Able to analyze the given dataset for designing a neural network- based solution
CO 3	Able to carry out design and implementation of deep learning models for signal/image processing applications
CO 4	Able to design and deploy simple TensorFlow-based deep learning solutions to classification problems

g. **Teaching and Examination Scheme**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. Course Content

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** What is big data, why big data, convergence of key trends, unstructured data, industry examples of big data, web analytics, big data and marketing, fraud and big data, risk and big data, credit risk management, big data and algorithmic trading, big data and healthcare, big data in medicine, advertising and big data, big data technologies, introduction to Hadoop, open source technologies, cloud and big data, mobile business intelligence, Crowd sourcing analytics, inter and trans firewall analytics.	**13%**	**7**
2	**Introduction to NoSQL** Introduction to NoSQL, aggregate data models, aggregates, key-value and document data models, relationships, graph databases, schemaless databases, materialized views, distribution models, sharding, master-slave replication, peer peer replication, sharding and replication, consistency, relaxing consistency, version stamps, map-reduce, partitioning and combining, composing map-reduce calculations.	**16%**	**8**
3	**Hadoop** Data format, analyzing data with Hadoop, scaling out, Hadoop streaming, Hadoop pipes, design of Hadoop distributed file system (HDFS), HDFS concepts, Java interface, data flow, Hadoop I/O, data integrity, compression, serialization, Avro, file-based data structure	**16%**	**8**
4	**MapReduce** MapReduce workflows, unit tests with MRUnit, test data and local tests, anatomy of MapReduce job run, classic Map-reduce, YARN, failures in classic Map-reduce and YARN, job scheduling, shuffle and sort, task execution, MapReduce types, input formats, output format	**25%**	**10**
5	**Data model** Hbase, data model and implementations, Hbase clients, Hbase examples, praxis.Cassandra, Cassandra data model, Cassandra examples, Cassandra clients, Hadoop integration.	**20%**	**9**
6	**Pig model** Pig, Grunt, pig data model, Pig Latin, developing and testing Pig Latin scripts. Hive, data types and file	**10%**	**6**

	formats, HiveQL data definition, HiveQL data manipulation, HiveQL queries		

i. Reference Books

1. Big Data, Big Analytics: Emerging Business Intelligence and Analytic Trends for Today's Businesses
2. By Michael Minelli, Michelle Chambers, and Ambiga Dhiraj | Wiley, Pub. Year 2013
3. NoSQL Distilled: A Brief Guide to the Emerging World of Polyglot Persistence By P. J. Sadalage and M. Fowler | Addison-Wesley Professional, Pub. Year 2012
4. Hadoop: The Definitive Guide By Tom White
5. Hadoop Operations, Eric Sammer, O'Reilley. By 'Reilley
6. Programming Hive, E. Capriolo, D. Wampler, and J. Rutherglen, O'Reilley By E. Capriolo, D. Wampler, and J. Rutherglen
7. HBase: The Definitive Guide, Lars George, O'Reilley By O'Reilley
8. Handbook of Clinical Massage By Mario Paul Cassar | Elsevier

Programming Pig By Alan Gates | O'Reilley,, Pub. Year 2011

j. Experiment List:

Sr. NO.	Experiment List
1	Review the commands available for the Hadoop Distributed File System
2	Copy file foo.txt from local disk to the user's directory in HDFS
3	Get a directory listing of the user's home directory in HDFS
4	Display the contents of the HDFS file user/fred/bar.txt
5	Move that file to the local disk, named as baz.txt
6	Create a directory called input under the user's home directory
7	Delete the directory input_ old and all its contents
8	Review the commands available for PIG (high level scripting language that is used with Apache Hadoop)
9	Review the commands available for HIVE Query Language
10	Review the HBASE Shell Commands
11	Write a program of Word Count in Map Reduce over HDFS

(11)

a. **Course Name:** Cloud computing & Application
b. **Course Code:** 203205183
c. **Prerequisite:** Programming Skills, Familiarity with Databases, Basics of Security and Privacy, Knowledge of Agile Development.
d. **Rationale**: It helps in the delivery of storage, database, software, analytics, networking, and intelligence over the internet or "cloud" for backup storage.
e. **Course Learning Objective:**

CLOBJ 1	An insight into the basics of cloud computing along with virtualization
CLOBJ 2	To introduce concepts related to the analysis, design and implementation of computation and storage clouds.
CLOBJ 3	To assess services provided by lead players in cloud.
CLOBJ 4	To study the emergence of cloud as the next generation computing paradigm.

f. **Course Learning Outcomes:**

CLO 1	Identify security aspects of each cloud model
CLO 2	Develop a risk-management strategy for moving to the Cloud
CLO 3	Implement a public cloud instance using a public cloud service provider
CLO 4	Apply trust-based security model to different layer

g. **Teaching and Examination Scheme**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. **Course Content**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction** Cloud computing at a glance, Historical developments, Building cloud computing	**10%**	**5**

	environments, The cloud reference model, Types of clouds, Economics of the cloud, Open challenges		
2	**Principles of Parallel and Distributed Computing** Parallel vs. distributed computing, Elements of parallel computing, Elements of distributed computing, Technologies for distributed computing	**15%**	**6**
3	**Virtualization** Introduction, Characteristics of virtualized environments, Taxonomy of virtualization techniques, Virtualization and cloud computing, Pros and cons of virtualization, Technology examples	**15%**	**6**
4	**Virtual Machines Provisioning and Migration Services** Introduction, Broad approaches to migrating into the cloud, The seven-step model of migration into a cloud, Virtual machines provisioning and manageability, Virtual machine migration services, VM provisioning and migration in action, Provisioning in the Cloud Context, Future Research Directions	**20%**	**8**
5	**On the Management of Virtual Machines for Cloud Infrastructures** The Anatomy of Cloud Infrastructures ,Distributed Management of Virtual Infrastructures ,Scheduling Techniques for Advance Reservation of Capacity, Capacity Management to meet SLA Commitments	**20%**	**8**
6	**Cloud Security** Cloud security risks, Security: The top concern for cloud users, Privacy and privacy impact assessment, Trust, Operating system security, Virtual machine Security, Security of virtualization, Security risks posed by shared images, Security risks posed by a management OS, A trusted virtual machine monitor	**10%**	**5**
7	**Advanced Topics in Cloud Computing** Energy efficiency in clouds, Market-based management of clouds, Federated clouds/InterCloud, Third-party cloud Services	**10%**	**5**

i. Reference Books

1. Cloud Computing Principles and Paradigms (TextBook) By Rajkumar Buyya , James Broberg, Andrzej Goscinski | Willey
2. Cloud Computing Theory and Practice By Dan C Marinescu | Elsevier(MK)

3. Mastering Cloud Computing Foundations and Applications Programming By Rajkumar Buyya, Christian Vecchiola, S. Thamarai Selvi
4. Cloud Computing for Dummies By Judith Hurwitz, R.Bloor, M.Kanfman, F.Halper | Wiley India Edition

j. Experiment List:

Sr. NO.	Experiment List
1	Study of Public Cloud : Amazon Web Services EC2, Google AppEngine, Microsoft Azure
2	Study of Open Source Cloud Technology : CloudSim, Aneka, Eucalyptus
3	Practical Approach for understanding virtualization concept using VmWare Workstation.
4	Create a Collaborative learning environment for a particular learning topic using Google Apps. Google Drive, Google Docs and Google Slides must be used for hosting e-books, important articles and presentations respectively. The instructor must use the Google Sheets to convey the timetable for different events and for analyzing the scores for individual assignment submission.
5	Modeling and simulation Cloud computing environments, including Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim.
6	Modeling and simulation Cloud computing environments, including Data Centers, Hosts and Cloudlets and perform VM provisioning using CloudSim: Design a host with two CPU cores, which receives request for hosting two VMs, such that each one requires two cores and plans to host four tasks units. More specifically, tasks t1, t2, t3 and t4 to be hosted in VM1, while t5, t6, t7, and t8 to be hosted in VM2. Implement space-shared allocation policy and time-shared allocation policy. Compare the results.
7	Create and launch a virtual machine instance on Amazon web services EC2 cloud and access that virtual machine using putty client.
8	Demonstrate the use of Amazon simple storage services(S3).
9	create applications that write records to Amazon DynamoDB.
10	Create and launch a virtual machine instance on Eucalyptus cloud and access that virtual machine using putty client.

(12)

a. **Course Name:** Web Analytics and Development
b. **Course Code:** 203205185
c. **Prerequisite:** Understanding of HTML, CSS, and JavaScript.
d. **Rationale**: The course explores use of social network analysis to understand growing connectivity and complexity in the world ranging from small groups to WWW.
e. **Course Learning Objective:**

CLOBJ 1	Learn how to use and deploy web/social/mobile analytics platforms such as Adobe Analytics, ComScore combined with an introduction to Mobile Analytics, Geo-Tracking and Geo-Location services.
CLOBJ 2	A grounded understanding of web intelligence and business analytics terminology related to the above.
CLOBJ 3	How to deploy web intelligence to improve the outcomes of your marketing or business plan.
CLOBJ 4	How Analysts impact the bottom line within various businesses and lines of business
CLOBJ 5	Growth potentials for Web Analysts and Big Data professionals

f. **Course Learning Outcomes:**

CLO 1	It provides information about the number of visitors to a website and the number of page views, or create user behaviour profiles.
CLO 2	Become familiar with core research communities, publications, focused on web and social media analytics
CLO 3	It helps gauge traffic and popularity trends, which is useful for market research.
CLO 4	The process of analyzing the behaviour of visitors to a website.

g. **Teaching and Examination Scheme**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. **Course Content**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction**	**20%**	**9**

	Social network and Web data and methods, Graph and Matrices, Basic measures for individuals and networks, Information Visualization		
2	**Web Analytics tools** Click Stream Analysis, A/B testing, Online Surveys	**15%**	**8**
3	**Web Search and Retrieval** Search Engine Optimization, Web Crawling and indexing, Ranking Algorithms, Web traffic models	**20%**	**9**
4	**Making Connection** Link Analysis, Random Graphs and Network evolution, Social Connects: Affiliation and identity	**25%**	**12**
5	**Connection** Connection Search, Collapse, Robustness Social involvements and diffusion of Innovation	**20%**	**10**

i. Reference Books

1. The Art of Computer Virus Research and Defence By Peter Szor
2. Crimeware, Understanding New Attacks and Defences By Markus Jakobsson and Zulfikar Ramzan | Symantec Press

j. Experiment List:

Sr. NO.	Experiment List
1	Demonstration of UCINET/NETDRAW software tool
2	Study of How Web Analytics collects Web Data and other types of data, also basic dashboards
3	Importing data into UCINET
4	Symmetrizing & dichotomizing, Running centrality measures
5	Implementation of Cohesion and Subgroups
6	Correlating matrices, Intermediate Metrics, Custom Metrics, Calculated Metrics
7	How Web Analytics Tracks Mobile Visitors, other Web Analytics Reports and Visualizations
8	Web Analytics Ecosystem and Deploying it in Industry - different measures
9	Web Analytics Case Studies
10	Study of different Social Media analytics tools

(13)

a. **Course Name:** Intrusion Detection
b. **Course Code:** 203205184
c. **Prerequisite:** Computer Networks, Computer Programming
d. **Rationale**: Compare alternative tools and approaches for Intrusion Detection through quantitative analysis to determine the best tool or approach to reduce risk from intrusion.
e. **Course Learning Objective:**

CLOBJ 1	Dissect and analyze various types of normal and unusual traffic
CLOBJ 2	Identify false positives and false negatives
CLOBJ 3	Demonstrate appropriate and ethical behaviour and good work habits.
CLOBJ 4	To detect malicious (including policy-violating) actions.

f. **Course Learning Outcomes:**

CLO 1	Apply knowledge of the fundamentals and history of Intrusion Detection in order to avoid common pitfalls in the creation and evaluation of new Intrusion Detection Systems.
CLO 2	Evaluate the security an enterprise and appropriately apply Intrusion Detection tools and techniques in order to improve their security posture
CLO 3	Compare and contrast network intrusion detection and prevention systems, tools, and techniques.
CLO 4	Analyse methods for recognizing and profiling attack patterns.

g. **Teaching and Examination Scheme**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. **Course Content**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**The state of threats against computers,** and networked systems-Overview of computer security solutions and why they fail-Vulnerability assessment, firewalls, VPN's -Overview of Intrusion Detection and Intrusion Prevention- Network and Host-based IDS	**20%**	**10**

2	**Classes of attacks** - Network layer: scans, denial of service, penetration- Application layer: software exploits, code injection-Human layer: identity theft, root access-Classes of attackers-Kids/hackers/sop. Hesitated groups-Automated: Drones, Worms, Viruses	**16%**	**8**
3	**A General IDS model and taxonomy**, Signature-based Solutions, Snort, Snort rules, Evaluation of IDS, Cost sensitive IDS	**16%**	**8**
4	**Anomaly Detection Systems and Algorithms-** Network Behavior Based Anomaly Detectors (rate based)-Host-based Anomaly Detectors-Software Vulnerabilities- State transition, Immunology, Payload Anomaly Detection	**20%**	**10**
5	**Attack trees and Correlation of alerts-**Autopsy of Worms and Botnets-Malware detection-Obfuscation, polymorphism-Document vectors	**16%**	**8**
6	**Email/IM security issues-Viruses/Spam**-From signatures to thumbprints to zero- day detection-Insider Threat issues-Taxonomy-Masquerade and Impersonation- Traitors, Decoys and Deception-Future: Collaborative Security	**8%**	**4**

i. Reference Books

1. The Art of Computer Virus Research and Defence
2. By Peter Szor
3. Crimeware, Understanding New Attacks and Defences
4. By Markus Jakobsson and Zulfikar Ramzan | Symantec Press

j. Experiment List:

Sr. NO.	Experiment List
1	List out different tools used for intrusion detection.
2	Carry Out Software Exploitation testing using JIRA Capture and Teatpad testing tools and assess the report.
3	Carry out Code Injection Vulnerabilities testing using Brup Suite and assess the report.
4	Study different type of Denial of Service attacks.
5	Carry out different Denial of service penetration with kali linux.
6	Carry out an email header analysis on an email received (preferably from a non-gmail email ID) and document the identified information.
7	Carry out information gathering using Metapsloit.
8	Implement Trojan and Backdoors using tools Absolute Startup Manager, Absolute Startup Manager, Netwirx Services Monitor and StartEd Lite.
9	Write a research paper in which Intrusion Detection tools are used to address any problem definition in cyber security.
10	Study of different Malware detection and Removal tools for windows.

(14)

a. Course Name: Generative AI
b. Course Code: 303205151
c. Prerequisite: Artificial Intelligence, Machine Learning
d. Rationale: This course introduces students to the theory, algorithms, and applications of generative artificial intelligence. Through lectures, readings, assignments, and projects, students will explore various generative models, including deep neural networks, probabilistic graphical models, and evolutionary algorithms.
e. Course Learning Objective:

CLOBJ 1	Introduce students to the concept of generative models in artificial intelligence, covering their definition, types, and basic principles.
CLOBJ 2	Provide a solid grounding in the probabilistic foundations of generative models, including probability distributions, Bayesian inference, and maximum likelihood estimation.
CLOBJ 3	Explore classical generative models such as Gaussian Mixture Models (GMMs), Hidden Markov Models (HMMs), and Autoregressive Models, elucidating their strengths, weaknesses, and applications.
CLOBJ 4	Dive into deep generative models, including Variational Autoencoders (VAEs), Generative Adversarial Networks (GANs), and Flow-Based Models, covering their architectures, training procedures, and applications in image generation, text generation, and more.
CLOBJ 5	Teach students about evaluation metrics for generative models, including likelihood-based metrics, qualitative assessment methods, and perceptual metrics.

f. Course Learning Outcomes:

CLO 1	Identify the relevance of AI
CLO 2	Use various Generative model for synthetic data generation
CLO 3	Understand how to be accountable and responsible users of AI
CLO 4	Analyse methods for recognizing and profiling attack patterns.

g. Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. Course Content

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Genetic AI:** The AI Real-time Problems, AI Vs G-AI, Overview of Generative Models, Applications and Significance of Generative AI, Role of AI in Image/Video Generation	15%	9
2	**Knowledge Representation** Approaches to Knowledge Representation, Representation Simple Facts In Logic, Representing Instance And Isa Relationships, Computable Functions And Predicates, Resolution. Procedural Versus Declarative Knowledge, Logic Programming, Forward Versus Backward Reasoning.	15%	8
3	**Deep Learning Fundamentals** Deep learning and architectures such as CNN, RNN and transformers, Hyperparameter tuning, Encoder-decoder architecture, Variational Autoencoders (VAEs), Deep Q-networks (DQNs) for generation tasks, Long Short-Term Memory (LSTM) networks for text generation.	20%	9
4	**Generative Pre-trained Transformer** Introduction to AI Chatbots, Working of AI Chatbots, Popular AI Chatbots, ChatGPT and its working, How to use ChatGPT, Usecases of ChatGPT for various users.	20%	10
5	**Generative adversarial Network** Introduction and motivation, GAN architecture and training procedure, Advanced GAN Architecture, Deep Convolutional GANs (DCGANs), Conditional GANs (CGANs). Pix2Pix and Cycle GAN for image-to-image translation, style GAN for high-quality image synthesis.	20%	10
6	**Applications of Generative Models** Image synthesis and manipulation, Text generation and summarization, Anomaly detection, Chatbots, integration with OpenAI. Ethical and Social Implication -Bias and fairness in generative models, privacy concerns.	10%	4

i. Reference Books

1. The Art of Computer Virus Research and Defence
2. By Peter Szor
3. Crimeware, Understanding New Attacks and Defences
4. By Markus Jakobsson and Zulfikar Ramzan | Symantec Press

j. Experiment List:

Sr. NO.	Experiment List
1	Understand & perform the AI virtual Tool analysis & Open GI tools Handworks through Prolog.
2	Write a program to implement Single Player Game (Using Heuristic Function)
3	Write a program to Implement A* Algorithm.
4	Write a program to solve N-Queens problem using Prolog.
5	Write a program to implement DFS (for 8 puzzle problem or Water Jug problem or any AI search problem) .
6	Write a program to implement Single Player Game (Using Heuristic Function) Write a program to solve travelling salesman problem using Prolog.
7	Convert following Prolog predicates into Semantic Net cat(tom). cat(cat1). mat(mat1). sat_on(cat1,mat1). bird(bird1). caught(tom,bird1). like(X,cream) :– cat(X). mammal(X) :– cat(X). has(X,fur) :– mammal(X). animal(X) :– mammal(X). animal(X) :– bird(X). owns(john,tom). is_coloured(tom,ginger).
8	Write the Conceptual Dependency for following statements. (a) John gives Mary a book (b) John gave Mary the book yesterday
9	Case Study: User Ended Game Development on Prolog.
10	Case study: Advance AI for Face Detection using NLP.

(15)

a. Course Name: Blockchain and Smart Contracts
b. Course Code: 303205152
c. Prerequisite: Introduction to Cryptography.
d. Rationale: This course deals with the fundamental components of Blockchain and its potential applications. The course will introduce the students to the theoretical as well as practical aspects of distributed ledger systems and Smart Contracts. It will develop a strong understanding of the basic concepts underlying blockchain technology while covering the essential mechanisms, cryptographic principles, and consensus building. Further the course equips students with key concepts and developments around cryptocurrencies, Bitcoin and smart contracts. It also demonstrates some of the blockchain use cases in technology, business and enterprise products.
e. Course Learning Objective:

CLOBJ 1	Understanding Blockchain Fundamentals
CLOBJ 2	Exploring Blockchain Applications
CLOBJ 3	Hands-on Experience with Blockchain Development
CLOBJ 4	Analyzing Challenges and Opportunities

f. Course Learning Outcomes:

CLO 1	Develop a workable knowledge of basic concepts of blockchain technology and its underlying mechanisms.
CLO 2	Understand cryptographic primitives in blockchain and its impact on implementation related decisions.
CLO 3	Review the principles behind various consensus mechanism models
CLO 4	Develop a workable knowledge of basic concepts of smart contracts and Ethereum blockchain
CLO 5	Understand and implement the concepts of Solidity
CLO 6	Understand the security aspects of Smart contracts

g. Teaching and Examination Scheme

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**2**	**4**	**20**	**20**	**20**	**60**	**30**	**150**

SEE-Semester End Examination, **CIA**- Continuous Internal Assessment (It consists of Assignments/Seminars/Presentations/MCQ Tests, etc.)

h. Course Content

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Blockchain fundamentals and Cryptographic concepts in Blockchain:** Introduction, Asset, Transactions, Distributed Ledger Technology, , Blockchain network , Blockchain components, Types of Blockchain (Public, Consortium, and Private), Applications, Benefits of Blockchain Technology, Limitations of blockchain, Distributed systems, Consensus decision-making, Byzantine Generals Problem, Forks and Byzantine Fault Tolerance, Proof of Work, Proof of Stake, Proof of Work v Stake, Asymmetric and Symmetric Cryptography, Digital Signatures, Hashing- SHA256, Data Integrity, Merkle tree. Implications of Cryptography and Decentralization.	**16%**	**8**
2	**Ethereum Blockchain and Smart contracts:** Ethereum Fundamentals: Ethereum, Adoption, Bitcoin vs Ethereum, Ether, Gas and fees, Ethereum Blockchain, Ethereum Nodes, Ethereum accounts- externally owned, contract accounts, Ethereum transactions and blocks, Signing Transactions, Mist wallet, MetaMask wallet Smart contracts: History, Introduction, How Smart Contract	**22%**	**12**
3	**Introduction to Solidity programming basics:** Structure of a contract: Data types and global variables, Access Modifiers, Data Structures- Arrays, Structs, Enum, Mappings, Expressions and control structures, Error Handling, Assert, Require, Revert, Function modifiers and fallbacks, Events, Structure of contract, ERC20 Token Interface, Development workflow.	**20%**	**8**
4	**Interacting with Smart contracts:** Deployment Environment, Differences, Application development life cycle management, The Truffle Development Environment for web, Testing with Truffle, Working with Injected Web3, Working with Web3 Provider	**22%**	**12**
5	**Securing Smart Contracts:** Smart Contract, Errors, Smart contracts vulnerabilities, Attacks in Smart Contracts, Preventive Methodologies, DApp Safety, Proactive Controls, Security Measures	**20%**	**8**

i. Reference Books

1. Antonopoulos A.M., Mastering Bitcoin. 2nd ed. O'Reilly Media, 2017

2. Hands-On Smart Contract Development with Solidity and Ethereum
3. Ritesh Modi," Solidity Programming Essentials", Packt Publishing, April 2018
4. Reed, Jeff (2016). Smart contracts: The essential guide to using blockchain smart

j. Experiment List:

Sr. NO.	Experiment List
1	Demonstrate creation of blocks and block chain addition on a test network
2	Introduction to ETHEREUM tools and Solidity
3	Deploy a smart contract for printing "Hello World" using Java Script VM, Injected Web3 and Web3Provider using Metamask and Ganache.
4	Deploy a smart contract for arithmetic operations using Java Script VM, Injected Web3 and Web3Provider using Metamask and Ganache.
5	Deploy a smart contract for FINDING LARGEST NUMBER OUT OF THREE NUMBERS using Java Script VM, Injected Web3 and Web3Provider using Metamask and Ganache.
6	Create a Smart Contract for a banking application in solidity which allows users to do the following: Mint money into your account Withdraw money from your account Send money from your account to smart contract address Check balance After a contract is created, deploy the contract on Ethereum Testnet network
7	How to build a smart contract that lets user book rooms and pay for them with cryptocurrency
8	Building a blockchain raffle using Solidity programming language. Apart from a coin toss, the most straightforward example of gambling is probably a raffle.
9	Installation of Ether Wallet and deploying smart contract
10	To design an electronic voting system, using the ethereum blockchain (smart contracts) and more precisely the RPC test which enables account generation with a private and public key. Blockchain electronic voting system using smart contracts.
11	Building an improved P2P file system to provide originality and authenticity of published and posted free online digital content such as books, music, and movies. Our solution utilizes a blend of the latest emerging technologies that include IPFS and blockchain smart contracts.

Semester 3

(1)

a. **Course Name:** Optimization Techniques
b. **Course Code: 203202232**
c. **Prerequisite:** Linear Algebra and Numerical Methods
d. **Rationale:** The objective of this course is to provide insight to the mathematical formulation of real world problems. To optimise

e. **Course Learning Objective:**

CLOBJ 1	Impart knowledge on theory of optimization and conditions for optimality for unconstraint and constraint optimization problems
CLOBJ 2	Inculcate modeling skills necessary to describe and formulate optimization problems in design and manufacturing
CLOBJ 3	Familiarize with the working principle of optimization algorithms used to solve linear and non-linear problems
CLOBJ 4	Train the students to solve optimization problems using software tools

f. **Course Learning Outcomes:**

CLO 1	Formulate optimization problems.
CLO 2	Understand and apply the concept of optimality criteria for various types of optimization problems.
CLO 3	Solve various constrained and unconstrained problems in Single variable as well as multivariable.
CLO 4	Apply the methods of optimization in real life situation.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**-**	**-**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Engineering application of Optimization,** Formulation of design problems as Mathematical programming problems.	**15%**	**7**
2	**General Structure of Optimization Algorithms**, Constraints, The Feasible Region.	**15%**	**7**
3	**Branches of Mathematical Programming:** Optimization using calculus, Graphical Optimization, Linear Programming, Quadratic Programming, Integer Programming, Semi Definite Programming.	**20%**	**11**
4	**Optimization Algorithms like Genetic Optimization**, Particle Swarm Optimization, Ant Colony Optimization etc.	**20%**	**12**
5	**Real life Problems and their mathematical formulation** as standard programming problems.	**20%**	**6**
6	**Recent trends:** Applications of ant colony optimization, genetics and linear and quadratic programming in real world applications.	**10%**	**5**

i. Text Book and Reference Book:

1. Integer programming By Laurence A. Wolsey | Wiley, Pub. Year 1998
2. Practical Optimization Algorithms and Engineering Applications By Andreas Antoniou
3. An Introduction to Optimization By Edwin K., P. Chong & Stanislaw h. Zak.
4. Optimization over integers. Dynamic Ideas By Robert Weismantel, Dimitris Bertsimas, Pub. Year 2005
5. Logic and Integer Programming By H. Paul Williams | Springer, Pub. Year 2009
6. Integer programming: theory and practice By John K. Karlof | CRC Press, Pub. Year 2006

(2)

a. Course Name: IoT and Smart Cities
b. Course Code: 203205230
c. Prerequisite: Wireless Communication and Networks
d. Rationale: Explain the basic methodologies and techniques of the arts and humanities, social sciences, business, and science and technology

e. Course Learning Objective:

CLOBJ 1	Bridging the skills gap in the industry and ensuring career advancement for individuals
CLOBJ 2	By acquiring IoT education, individuals gain a deep understanding of the fundamental concepts, hardware, software, data management, networking, and applications of IoT.
CLOBJ 3	Smart cities use IoT devices such as connected sensors, lights, and meters to collect and analyze data.
CLOBJ 4	The cities then use this data to improve infrastructure, public utilities and services, and more.

f. Course Learning Outcomes:

CLO 1	Understanding the fundamental knowledge of the sustainable and smart city
CLO 2	Ability to understand the technologies used for sustainable and smart cities
CLO 3	Ability to integrate and apply the learnt knowledge to conduct a case study in an organized way
CLO 4	Ability to present the study clearly to audiences
CLO 5	Demonstration of critical thinking and discovering

g. Teaching & Examination Scheme:

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**0**	**0**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Introduction and Applications:** smart transportation, smart cities, smart living, smart energy, smart health, and smart Learning	**15%**	**8**
2	**IoT Reference Architecture** methods to assist local governments to develop international good e-practice	**20%**	**9**
3	**Methods to redesign** and redefine back and front offices in order to build smarter and transparent governments	**15%**	**8**

4	**Methods to design** public mobile services aimed at efficiency, costsaving and participation with attention for e-Inclusion	**15%**	**8**
5	**Methodologies for user involvement,** profiling customers and indentifying needs; test methodologies to transfer these needs in appropriate services; and test techniques to fit the right channel to the specific services and customers thereby setting a framework for a higher level of e-services in the NSR	**25%**	**10**
6	**Pilot new service channels,** bluetooth services for public transport, online forms in mobile phones and wireless city Services	**10%**	**5**

i. Text Book and Reference Book:

1. Smart City on Future Life - Scientific Planning and Construction By Xianyi Li
2. The Age of Intelligent Cities: Smart Environments and Innovation-for-all Strategies By NicosKomninos
3. Smart Cities: Big Data, Civic Hackers, and the Quest for a New Utopia By Anthony Townsend

(3)

a. Course Name: Distributed Database
b. Course Code: 203205231
c. Prerequisite: To be able to use a second computer, it is required to know how to use the first one". Distributed systems build upon and extend many classical areas in Computer Science. Strong fundamentals in Operating Systems, Computer Networks, and Algorithms are a must.
d. Rationale: The objective of course is to provide insight to distributed database, normalization techniques and integrity rules. It also includes parallel database systems along with object oriented models.
e. Course Learning Objective:

CLOBJ 1	To Introduce various Distributed Database Applications in real world scenario
CLOBJ 2	To be learning more about various Distributed Database Techniques
CLOBJ 3	Applying efficient Advanced Techniques to solve engineering problems
CLOBJ 4	To be scalable, query performance (speed), and available.

f. Course Learning Outcomes:

CLO 1	To understand relational database management systems, normalization to make efficient retrieval from database and query.
CLO 2	Be able to Compare various Distributed Databases methods

CLO 3	Be able to understand and identify the analytical characteristics of Distributed Databases algorithms.
CLO 4	Employ algorithm to model engineering problems, when appropriate.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction:** Distributed Data processing, Distributed database system (DDBMS), Promises of DDBMSs, Complicating factors and Problem areas in DDBMSs, Overview Of Relational DBMS Relational Database concepts, Normalization, Integrity rules, Relational Data Languages, Relational DBMS	25%	11
2	**Distributed DBMS Architecture:** DBMS Standardization, Architectural models for Distributed DBMS, Distributed DBMS Architecture. Distributed Database Design: Alternative design Strategies, Distribution design issues, Fragmentation, Allocation. Semantic Data Control: View Management, Data security, Semantic Integrity Control.	15%	8
3	**Overview of Query Processing:** Query processing problem, Objectives of Query Processing, Complexity of Relational Algebra operations, characterization of Query processors, Layers of Query Processing. Introduction to Transaction Management: Definition of Transaction, Properties of transaction, types of transaction. Distributed Concurrency Control: Serializability theory, Taxonomy of concurrency control mechanisms, locking bases concurrency control algorithms.	20%	9

4	**Parallel Database Systems:** Database servers, Parallel architecture, Parallel DBMS techniques, Parallel execution problems, Parallel execution for hierarchical architecture.	**15%**	**7**
5	**Distributed Object Database Management systems:** Fundamental Object concepts and Object models, Object distribution design. Architectural issues, Object management, Distributed object storage, Object query processing. Transaction management. Database Interoperability: Database Integration, Query processing.	**15%**	**8**
6	**Recent approaches**, models and current trends in improving the performance of Distributed Database.	**10%**	**5**

i. Text Book and Reference Book:

1. Principles of distributed database systems By Tamer Ozsu
2. Distributed Databases principles and systems By Stefano Ceri, Giuseppe Pelagatti | Tata McGraw Hill

(4)

a. Course Name: Business Analytics
b. Course Code: 203200201
c. Prerequisite: Inclination to learn machine Learning, basic knowledge of differential classification clustering and regression algorithms , Data Mining.
d. Rationale: The course will provide a strong foundation on business analytics and the basic concepts.
e. Course Learning Objective:

CLOBJ 1	To equip the students with basic understanding of business analytics and its role within an organization.
CLOBJ 2	To provide sound domain knowledge of business analytics and its critical concepts
CLOBJ 3	To prepare students for business intelligence systems and applications of business analytics.
CLOBJ 4	To gain an understanding of how managers use business analytics to formulate and solve business problems and to support managerial decision making.

f. Course Learning Outcomes:

CLO 1	Explain business analytics and its role within an organization.
CLO 2	Acquire domain knowledge of business analytics and its critical concepts

CLO 3	Understand business intelligence systems and applications of business analytics
CLO 4	Formulate and solve business problems and to support managerial decision making.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Business analytics:** Overview of Business analytics, Scope of Business analytics, Business Analytics Process, Relationship of Business Analytics Process and organisation, competitive advantages of Business Analytics. Statistical Tools: Statistical Notation, Descriptive Statistical methods, Review of probability distribution and data modelling, sampling and estimation methods overview.	15%	9
2	**Trendiness and Regression Analysis:** Modelling Relationships and Trends in Data, simple Linear Regression. Important Resources, Business Analytics Personnel, Data and models for Business analytics, problem solving, Visualizing and Exploring Data, Business Analytics Technology.	15%	8
3	**Organization Structures of Business analytics,** Team management, Management Issues, Designing Information Policy, Outsourcing, Ensuring Data Quality, Measuring contribution of Business analytics, Managing Changes. Descriptive Analytics, predictive analytics, predicative Modeling, Predictive analytics analysis, Data Mining, Data Mining Methodologies, Prescriptive analytics and its step in the business analytics Process, Prescriptive Modeling, nonlinear Optimization.	20%	9

4	**Forecasting Techniques:** Qualitative and Judgmental Forecasting, Statistical Forecasting Models, Forecasting Models for Stationary Time Series, Forecasting Models for Time Series with a Linear Trend, Forecasting Time Series with Seasonality, Regression Forecasting with Casual Variables, Selecting Appropriate Forecasting Models. Monte Carlo Simulation and Risk Analysis: Monte Carle Simulation Using Analytic Solver Platform, New-Product Development Model, Newsvendor Model, Overbooking Model, Cash Budget Model.	**20%**	**10**
5	**Decision Analysis:** Formulating Decision Problems, Decision Strategies with the without Outcome Probabilities, Decision Trees, The Value of Information, Utility and Decision Making.	**20%**	**10**
6	**Recent Trends in:** Embedded and collaborative business intelligence, Visual data recovery, Data Storytelling and Data journalism.	**10%**	**4**

i. Text Book and Reference Book:

1. "Fundamentals of Business Analytics" by R.N.Prasad and Seema Acharya
2. "Business Analytics – The Science of DataDriven Decision Making" by U. Dinesh Kumar
3. "Data Analytics " by Anil Maheshwari
4. "Business Analytics for Managers: Taking Business Intelligence Beyond" by Jesper Thorlund & Gert H.N. Laursen
5. “Business Analytics ”, by Sahil Raj.

(5)

a. Course Name: Industrial Safety
b. Course Code: 203200202
c. Prerequisite: Knowledge of basics of engineering.
d. Rationale: The course will impart the Industrial safety, Maintenance Engineering, Fault Tracing.
e. Course Learning Objective:

CLOBJ 1	Prevent incidents: Minimize the likelihood of accidents and injuries
CLOBJ 2	Ensure the well-being of industrial employees and protect machinery, materials and property
CLOBJ 3	To demonstrate knowledge of a safe working.
CLOBJ 4	To learn about various functions and activities of safety department.

f. Course Learning Outcomes:

CLO 1	Understand the industrial laws, regulations and source models.
CLO 2	Apply the methods of prevention of fire and explosions.
CLO 3	Accomplish standard safety procedures in an industrial environment.
CLO 4	Understand the methods of hazard identification and preventive measures.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Industrial safety** Accident, causes, types, results and control, mechanical and electrical hazards, types, causes and preventive steps/procedure, describe salient points of factories act 1948 for health and safety, wash rooms, drinking water layouts, light, cleanliness, fire, guarding, pressure vessels, etc, Safety color codes. Fire prevention and firefighting, equipment and methods.	17%	8
2	**Fundamentals of maintenance engineering:** Definition and aim of maintenance engineering, Primary and secondary functions and responsibility of maintenance department, Types of maintenance, Types and applications of tools used for maintenance, Maintenance cost & its relation with replacement economy, Service life of equipment	17%	8
3	**Wear and Corrosion and their prevention:** Wear- types, causes, effects, wear reduction methods, lubricants-types and applications, Lubrication methods, general sketch, working and applications, i.	20%	9

	Screw down grease cup, ii. Pressure grease gun, iii. Splash lubrication, iv. Gravity lubrication, v. Wick feed lubrication vi. Side feed lubrication, vii. Ring lubrication, Definition, principle and factors affecting the corrosion. Types of corrosion, corrosion prevention methods.		
4	**Fault tracing:** Fault tracing-concept and importance, decision tree concept, need and applications, sequence of fault finding activities, show as decision tree, draw decision tree for problems in machine tools, hydraulic, pneumatic, automotive, thermal and electrical equipment's like, I. Any one machine tool, ii. Pump iii. Air compressor, iv. Internal combustion engine, v. Boiler, vi. Electrical motors, Types of faults in machine tools and their general causes.	**20%**	**9**
5	**Periodic and preventive maintenance:** Periodic inspection-concept and need, degreasing, cleaning and repairing schemes, overhauling of mechanical components, overhauling of electrical motor, common troubles and remedies of electric motor, repair complexities and its use, definition, need, steps and advantages of preventive maintenance. Steps/procedure for periodic and preventive maintenance of: I. Machine tools, ii. Pumps, iii. Air compressors, iv. Diesel generating (DG) sets Program and schedule of preventive maintenance of mechanical and electrical equipment, advantages of preventive maintenance. Repair cycle concept and importance	**22%**	**11**

i. Text Book and Reference Book:

1. Maintenance Engineering Handbook By Higgins & Morrow | Da Information Services.
2. Maintenance Engineering By H.P.Garg | S. Chand and Company
3. Pump-hydraulic Compressors By Audels | Mcgrew Hill Publication.
4. Foundation Engineering Handbook By Winterkorn, Hans | Chapman & Hall London.

(6)

a. **Course Name:** Operation Research
b. **Course Code:** 203200203
c. **Prerequisite:** Basics Probability and Applied Mathematics.
d. **Rationale:** Increased productivity is a significant benefit of operation research that attracts numerous firms. The mathematical formulae employed in operations management research provide a number of optimal alternatives for factory size, inventory mix, labour planning, and incorporating new technology, among other things.
e. **Course Learning Objective:**

CLOBJ 1	To develop formulation skills in transportation models and finding solutions
CLOBJ 2	To understand the basics in the field of game theory and assignment problems
CLOBJ 3	To know how project management techniques help in planning and scheduling a project
CLOBJ 4	To enable the student to understand and analyse managerial and engineering problems

f. **Course Learning Outcomes:**

CLO 1	To apply the dynamic programming to solve problems of discreet and Continuous variables.
CLO 2	To apply the concept of non-linear programming
CLO 3	To carry out sensitivity analysis
CLO 4	To model the real world problem and simulate it.

g. **Teaching & Examination Scheme:**

Teaching Scheme				**Evaluation Scheme**					
L	**T**	**P**	**C**	**Internal Evaluation**			**ESE**		**Total**
				MSE	**CE**	**P**	**Theory**	**P**	
3	**0**	**0**	**3**	**20**	**20**	**-**	**60**	**-**	**100**

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. **Course Content:**

Sr. No.	**Content**	**Weightage**	**Teaching Hours**
1	**Optimization Techniques**	**18%**	**8**

	Model Formulation, models, General L.R Formulation, Simplex Techniques, Sensitivity Analysis, Inventory Control Models		
2	**Formulation of a LPP** Graphical solution revised simplex method - duality theory - dual simplex method - sensitivity analysis - parametric programming	**20%**	**8**
3	**Nonlinear programming problem** Kuhn-Tucker conditions min cost flow problem - max flow problem - CPM/PERT	**22%**	**8**
4	**Scheduling and sequencing** single server and multiple server models - deterministic inventory models - Probabilistic inventory control models - Geometric Programming.	**22%**	**9**
5	**Competitive Models** Single and Multi-channel Problems, Sequencing Models, Dynamic Programming, Flow in Networks, Elementary Graph Theory, Game Theory Simulation	**20%**	**10**

i. Text Book and Reference Book:

1. Operations Research By Hamdy Taha | Pearson
2. Principles of Operations Research: By Harvey M Wagner | Prentice Hall of India, Pub. Year 2010
3. Introduction to Optimisation: Operations Research By J.C. Pant, | Jain Brothers
4. Operations Research By Hitler Libermann | McGraw Hill, Pub. Year 2009
5. Operations Research: By Pannerselvam | Prentice Hall of India, Pub. Year 2010

(7)

a. Course Name: Cost Management of Engineering Projects
b. Course Code: 203200204
c. Prerequisite: Basic civil engineering knowledge.
d. Rationale: Project planning management and economics, cost concepts.
e. Course Learning Objective:

CLOBJ 1	Ability to understand the basic concepts of Project planning, execution, and cost control
CLOBJ 2	Discuss about Various types of costs and its behaviour along with Quality Management
CLOBJ 3	Identify various types of Budgets involved in Cost Management process
CLOBJ 4	To arrive at accurate cost estimates and schedules, and to avoid cost overruns and schedule slips

f. Course Learning Outcomes:

CLO 1	Understand principles of Strategic cost management
CLO 2	Understand principles of cost concepts.
CLO 3	Understand principles of cost behavior and Profit planning
CLO 4	Understand principles of quantitative techniques for cost management

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** Introduction and overview of stratigic cost management process	10%	4
2	**Cost Concepts** Cost concepts in decision making; Relevant cost, Diffrential cost, Incremental Cost, Opportunity cost, Objectives of costing system; Inventory valuation, Creation of database for operational control, Provision of data for decision making.	18%	4
3	**Project** Project: meaning, Different types, why to manage, cost overruns centres, various stages of project execution: conception on commissioning. Project execute on as conglomeration of technical and nontechnical activities. Detailed Engineering activiti-es. Pre-project execution main clearances and documents Project team: Role of each member. Importance Project site: Data required with significance. Project contracts. Types and contents. Project execution Project cost control. Bar charts and Network diagram. **Project commissioning:** mechanical and process	26%	13
4	**Cost Behaviour and Profit Planning** Cost Behaviour and Profit Planning Marginal Costing: Distinction between Marginal Costing and Absorption Costing; Break-even analysis, Cost-Volume-Profit Analysis. Various decision-making problems. Standard	26%	13

	Costing and Variance Analysis. Pricing strategies: Pareto Analysis. Target costing, Life Cycle Costing. Costing of service sector. Just-in-time approach, Material Requirement Planning, Enterprise Resource Planning, Total Quality Management and Theory of constraints. Activity-Based Cost Management, Bench Marking; Balanced Score Card and Value-Chain Analysis. Budgetary Control: Flexible Budgets; Performance budgets; Zero-based budgets. Measurement of Divisional profitability pricing decisions including transfer pricing.		
5	**Quantitative techniques** Quantitative techniques for cost management, Linear Programming, PERT/CPM, Transportation problems. Assignment problems, Simulation, Learning Curve Theory.	**20%**	**10**

i. Text Book and Reference Book:

1. Cost accounting a managerial Emphasis By Prentice Hall of India
2. Advanced Management Accounting By Charles T Horngren and George Foster
3. Management and Cost Accounting Model Curriculum of Engineering and technology PG Courses[Vol II]
4. Principles and Practices of Cost Accounting By Ashish K Bhattacharya
5. Quantitative Techniques in Management by N D Vohra, Tata McGraw-Hill

(8)

a. Course Name: - Composite Materials
b. Course Code: 203200205
c. Prerequisite: Fundamental Knowledge of Solid Mechanics.
d. Rationale: Composite materials are extensively used in the aviation & automobile industries for the manufacturing of various parts. Composites are known to have a high strength to weight ratio and they, therefore, become the material of choice for aircraft manufacturing. There are several other benefits of using composite materials. This subject offers the knowledge and understanding of the engineering behaviour of composite materials, preliminary design concepts and their appropriate use.
e. Course Learning Objective:

CLOBJ 1	Explain the behaviour of constituents in the composite materials
CLOBJ 2	Enlighten the students in different types of reinforcement
CLOBJ 3	Understanding the different manufacturing methods available for composite material.
CLOBJ 4	Develop the student's skills of composite materials

f. Course Learning Outcomes:

CLO 1	Explain the advantages and applications of composite materials.
CLO 2	Describe the properties of various reinforcements of composite materials.
CLO 3	Summarize the manufacture of metal matrix, ceramic matrix and C-C composites.
CLO 4	Describe the manufacture of polymer matrix composites.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction** Definition – Classification and characteristics of Composite materials. Advantages and application of composites. Functional requirements of reinforcement and matrix. Effect of reinforcement (size, shape, distribution, volume fraction) on overall composite performance.	15%	7
2	**Reinforcements** Preparation-layup, curing, properties and applications of glass fibers, carbon fibers, Kevlar fibers and Boron fibers. Properties and applications of whiskers, particle reinforcements. Mechanical Behavior of composites: Rule of mixtures, Inverse rule of mixtures. Isostrain and Isostress conditions.	25%	10
3	**Manufacturing of Metal Matrix Composites** Casting – Solid State diffusion technique, Cladding – Hot isostatic pressing. Properties and applications. Manufacturing of Ceramic Matrix Composites: Liquid Metal Infiltration – Liquid phase sintering. Manufacturing of Carbon – Carbon composites: Knitting, Braiding, Weaving. Properties and applications.	20%	10
4	**Manufacturing of Polymer Matrix Composites**	20%	10

	Preparation of Moulding compounds and prepregs – hand layup method – Autoclave method – Filament winding method – Compression moulding – Reaction injection moulding. Properties and applications.		
5	**Strength of Composites** Laminar Failure Criteria-strength ratio, maximum stress criteria, maximum strain criteria, interacting failure criteria, hygrothermal failure. Laminate first play failure-insight strength; Laminate strength-ply discount truncated maximum strain criterion; strength design using caplet plots; stress concentrations.	**20%**	**8**

i. Text Book and Reference Book:

1. Introduction to composite materials design / 2nd ed.Ever J. Barbero.
2. Design and Analysis of Composite Structures: With Applications to Aerospace, By Christos Kassapoglou
3. Mechanics of composite structures / László P. Kollár, George S. Springer.
4. Composite materials : production, properties, testing and applications / K. Srinivasan.

(9)

a. Course Name: - Waste to Energy
b. Course Code: 203200206
c. Prerequisite: Knowledge of Renewable Energy Sources.
d. Rationale: This course provides knowledge of utilization of the energy from waste and conversion of waste into Bio gas.
e. Course Learning Objective:

CLOBJ 1	To enable students to understand of the concept of Waste to Energy.
CLOBJ 2	To link legal, technical and management principles for production of energy form waste.
CLOBJ 3	To learn about the best available technologies for waste to energy.
CLOBJ 4	To analyze of case studies for understanding success and failures.
CLOBJ 5	To facilitate the students in developing skills in the decision making process.

f. Course Learning Outcomes:

CLO 1	Make students aware about all the waste available and the ways to turn it into energy.
CLO 2	Utilize the bio mass energy in problem solving where conventional energy are not fruitful and require replacement.
CLO 3	Describe procedural approach for the biomass derived fuel system.
CLO 4	Apply the knowledge in planning and operations of Waste to Energy plants.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
3	0	0	3	20	20	-	60	-	100

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Introduction to Energy from Waste** Classification of waste as fuel – Agro based, Forest residue, Industrial waste - MSW – Conversion devices – Incinerators, gasifiers, digesters	10%	4
2	**Biomass Pyrolysis** Pyrolysis – Types, slow fast – Manufacture of charcoal – Methods – Yields and application – Manufacture of pyrolytic oils and gases, yields and applications.	15%	7
3	**Biomass Gasification** Gasifiers – Fixed bed system – Downdraft and updraft gasifiers – Fluidized bed gasifiers – Design, construction and operation – Gasifier burner arrangement for thermal heating – Gasifier engine arrangement and electrical power –Equilibrium and kinetic consideration in gasifier operation.	20%	9
4	**Biomass Combustion** Biomass stoves – Improved chullahs, types, some exotic designs, Fixed bed combustors, Types, inclined grate combustors, Fluidized bed combustors, Design, construction and operation - Operation of all the above biomass combustors.	20%	8
5	**Biogas** Properties of biogas (Calorific value and composition) - Biogas plant technology and status - Bio energy system Design and constructional features - Biomass resources and their classification - Biomass conversion processes Thermo chemical conversion - Direct combustion biomass gasification - pyrolysis and liquefaction biochemical conversion - anaerobic digestion – Types	35%	17

	of biogas Plants – Applications - Alcohol production from biomass – Bio diesel production - Urban waste to energy conversion - Biomass energy programme in India.		

i. Text Book and Reference Book:

1. Non Conventional Energy (TextBook) By Desai, Ashok V. | Wiley Eastern Ltd.
2. Biogas Technology - A Practical Hand Book By Khandelwal, K. C. and Mahdi, S. S. | Tata McGraw Hill Publishing Co. Ltd., Pub. Year 1983
3. Food, Feed and Fuel from Biomass (TextBook) By Challal, D. S. | IBH Publishing Co. Pvt. Ltd., Pub. Year 1991
4. Biomass Conversion and Technology (TextBook) By C. Y. WereKo-Brobby and E. B. Hagan | John Wiley & Sons, Pub. Year 1996

(10)

a. Course Name: - Phase - I Dissertation
b. Course Code: 203205201
c. Prerequisite: Nil
d. Rationale: To assess student's ability to communicate his/her ideas and work.
e. Course Learning Objective:

CLOBJ 1	To facilitate student to carry out extensive research and development project
CLOBJ 2	Technical project at place of work through problem
CLOBJ 3	A gap identification, development of methodology for problem solving, interpretation of findings,
CLOBJ 4	The presentation of results and discussion of findings in context of national and international research.
CLOBJ 5	To display the knowledge and capability required for independent work.

f. Course Learning Outcomes:

CLO 1	Ability to synthesize knowledge and skills previously gained and applied to an in depth study and execution of new technical problem.
CLO 2	Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
CLO 3	Ability to present the findings of their technical solution in a written report.
CLO 4	Presenting the work in International/ National conference or reputed journals.

g. Teaching & Examination Scheme:

Teaching Scheme	Evaluation Scheme

L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	20	10	-	-	100	-	100	200

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**A document report** comprising of summary of literature survey, detailed objectives, Project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.	100%	20

Semester-4

(1)

a. Course Name: - Phase - II Dissertation
b. Course Code: 203205251
c. Prerequisite: Nil
d. Rationale: To assess student's ability to communicate his/her ideas and work.
e. Course Learning Objective:

CLOBJ 1	To facilitate student to carry out extensive research and development project
CLOBJ 2	Technical project at place of work through problem
CLOBJ 3	A gap identification, development of methodology for problem solving, interpretation of findings,
CLOBJ 4	The presentation of results and discussion of findings in context of national and international research.
CLOBJ 5	To display the knowledge and capability required for independent work.

f. Course Learning Outcomes:

CLO 1	Ability to synthesize knowledge and skills previously gained and applied to an in depth study and execution of new technical problem.
CLO 2	Capable to select from different methodologies, methods and forms of analysis to produce a suitable research design, and justify their design.
CLO 3	Ability to present the findings of their technical solution in a written report.
CLO 4	Presenting the work in International/ National conference or reputed journals.

g. Teaching & Examination Scheme:

Teaching Scheme				Evaluation Scheme					
L	T	P	C	Internal Evaluation			ESE		Total
				MSE	CE	P	Theory	P	
-	-	32	16	-	-	100	-	100	200

L- Lectures; **T**- Tutorial; **P-** Practical; **C**- Credit; **MSE-** Mid-Semester Evaluation, **CE**- Continuous Evaluation, **ESE-** End Semester Examination

h. Course Content:

Sr. No.	Content	Weightage	Teaching Hours
1	**Document Report** A document report comprising of summary of literature survey, detailed objectives, project specifications, paper and/or computer aided design, proof of concept/functionality, part results, A record of continuous progress.	100%	32