



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester
Subject Name: Design and Analysis of Algorithms (DAA)
Subject Code: 4659301

With effective
from academic
year 2018-19

1. Learning Objectives:

To understand alternate methods of writing algorithms under various categories, such as Divide-and-Conquer, Dynamic Programming, Greedy Methods, Backtracking, Branch & Bound, etc. To be able to analyze algorithms by working out complexity of algorithms. To understand the basics of P, NP, and NP Complete problems

2. Prerequisites: Programming Language: C, Data Structure

3. Course Contents:

Sr. No.	Course Content	Percentage Weightage
1	Basic Concepts of Analysis and Design of Algorithms Introduction; Characteristics of iterative algorithms; Efficiency of algorithms; Estimating and specifying execution time; Order notation: Big-Oh, Theta, Omega, Small-Oh, Small-Omega notations; Algorithm strategies	7%
2	Algorithms Using Divide-and-Conquer Strategy Introduction; Examples: $x^{**}n$; Multiplication algorithm and its analysis; Binary search and its analysis; Closest pair; Merge sort and its analysis; Limitations of Divide-and-Conquer strategy; Decrease-and-Conquer approach: Permutation generation	20%
3	Greedy Methods Introduction; Knapsack problem; Job sequencing with deadlines; Minimum spanning trees: Prim's algorithm, and Kruskal's algorithm; Shortest path, Dijkstra's shortest path algorithm, Optimal merge patterns	20%
4	Dynamic Programming Introduction; Examples: Coin exchange problem; Principle of Optimality; Rod cutting problem, Multistage graphs, Traveling salesman problem, Matrix multiplication, Longest common sub-sequence, Maximum flow problem	20%
5	Backtracking, Branch and Bound Algorithms Combinatorial search; Search and traversal: Breadth First Search (BFS), Depth First Search (DFS); 8-Queen problem; M-Coloring problem; Hamiltonian circuits; Branch-and-Bound algorithms, Examples: Shortest path; 16-Puzzle and 8-Puzzle; Scale balancing, 0/1 Knapsack problem, Traveling salesman problem; Limitations of Branch-and-Bound	23%



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6	<p>Efficiency of Algorithms; Complexity Calculation and Categorization Polynomial-time and Non-polynomial-time algorithms; Worst and average case behavior, Probabilistic average case analysis; Time analysis of algorithms; Examples: Matrix multiplication; Efficiency of recursion; Complexity: Notion of complexity, Profiling, Suppressing multiplicative constants, Counting dominant operations, Growth rate, Upper bounds, Asymptotic growth rate; The 'O' notation; Simplified definition of 'O'; 'O' notation rules</p> <p>Examples of Complexity Calculation: Sorting examples: Bucket sort, Radix sort, Simple Insertion sort, Quick sort, Heap sort, Merge sort, Counting Sort; Binary, Binomial and Fibonacci Heaps; Binomial Heap; Dijkstra's shortest path algorithm;</p> <p>Complexity Categorization of Problems: Introduction: P, NP, NPC, NPH; Upper and lower bounds; Four levels of algorithmic behavior; summary</p>	10%
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4. Text Book(s):

1. Parag H Dave, Himanshu B Dave, "Design and Analysis of Algorithms", Pearson, 2nd Edition (2014)

5. Reference Books:

1. Thomas H. Cormen, Charles E. Leiserson, Ronald L Rivest, Clifford Stein, "Introduction to Algorithms", PHI, 2nd Edition
2. Anany Levitin, "Introduction to Design and Analysis of Algorithms", Pearson (2014)
3. S. Baase, "Computer Algorithms: Introduction to Design and Analysis", Pearson (2002)
4. Kleinberg, "Algorithm Design", Pearson (2013)
5. Ellis Horowitz, Sartaj Sahni, Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", Universities Press, 2nd Edition (2008)
6. Thomas H. Cormen, "Algorithms Unlocked", MIT Press (2013)
7. Sanjay Dasgupta, "Algorithms", McGraw-Hill (2006)
8. Gerard Tel, "Introduction to Distributed Algorithms", Cambridge University Press (2004)

6. Unit wise coverage from Text book(s):

Unit 1	Topics
I	Chapter-1; Chapter-4
II	Chapter-9 (9.1: Ex-1; 9.2: Ex-5, Ex-7, Ex-9; 9.4; 9.6.1, 9.6.2)
III	Chapter-10 (10.1, 10.2, 10.3, 10.4.1-10.4.4, 10.5, 10.6)
IV	Chapter-11 (11.1, 11.2, 11.3, 11.4, 11.5, 11.6, 11.9)
V	Chapter-12 (12.1; 12.2; 12.3; 12.4.2, 12.4.3; 12.6.1, 12.6.3, 12.6.4, 12.6.6, 12.6.7)
VI	Chapter-14 (14.1, 14.2, 14.3, 14.3.1, 14.4, 14.5, 14.5.1-14.5.11); Chapter-15 (15.1, 15.2, 15.4, 15.5); Chapter-17 (17.1, 17.2, 17.3, 17,18)



7. Accomplishment of the student after completing the course:

The student will be able to decide on an appropriate category of algorithms for solving a given problem. With an understanding of more than one method of solving problems using algorithms, (s)he will be able to carry out complexity of algorithms and decide on an efficient algorithm for the task on hand. (S)he will also have an idea about categorization of problems into P, NP, NPC, NPH.

Practicals List

Objectives: To develop ability to write algorithms (often more than one different algorithms) for various problems and implement them using C language.

Prerequisites: C Language, Data Structures

Advice (Note) to Teachers:

- .The list of exercises given below is an indicative list. More than one algorithm is possible for many problems. Teachers should encourage students to try out multiple algorithms for the given problems and discuss among them about relative efficiency (and complexity) of algorithms.
- .All the algorithms are to be implemented in C language
- .First list of exercises have been labeled as “Mandatory” while the exercises in the second list have been marked as “Desirable”. Teachers should encourage bright students to complete desirable exercises as well.

A) List of Mandatory Lab Exercises (Write Algorithms and Implement in C Language)

For the following problems, students are expected to write one or more (as the case may be) algorithms along with the complexity of these algorithms, and implement them in C Language.

1. Find square root of a number. Can we use Divide & Conquer approach for this problem? Can we have a still better algorithm to solve the problem?
2. Determine smallest divisor of an integer.
3. For a given value of n, generate prime numbers $\leq n$ (more than one algorithms are possible)
4. Find X^n . Iterative and recursive algorithms are possible with complexity $\log_2 n$
5. Determine product of 2 integers ($a * b$) as repeated sums. Iterative and recursive algorithms are possible.
6. Determine product of 2 large integers using multiplication of their digits. For simplicity, assume both numbers to have same number of digits. This assumption can be relaxed subsequently.
7. Binary Search of an ordered array. Iterative and Recursive algorithms are possible.
8. Sort a given sequence of numbers using (a) Bubble Sort, and (b) Merge Sort
9. Knapsack problem using Greedy algorithm.
10. Solution of Rod-cutting problem using Dynamic Programming algorithm.
11. Multiplication of n Matrices using Dynamic Programming algorithm.
12. Breadth First Search (BFS) in a binary tree.
13. Depth First Search (DFS) in a binary tree.
14. 8-Puzzle and 16-Puzzle
15. Solve 8 Queens problem.



16. Solve Scale Balancing problem.
17. Prim's algorithm to find minimum spanning (cost) tree (shortest path in a tree).

B) List of Lab Exercises (Write optimized code)

18. Number of ways:

You are given three strings A,B and C. From the strings A and B, you can create all possible strings X such that X contains atleast one character from both the strings, and the order of all the selected characters in individual strings is preserved.

For example:

A = "ab", B = "cd";

All possible strings are: { abc, abcd, abd, ac, acb, acbd, acd, acdb, ad, adb, bc, bcd, bd, ca, cab, cabd, cad, cadb, cb, cbd, cda, cdab, cdb, da, dab, db }

19. Compute the sum of the Bitwise OR of all the subarrays present in the array.

Input Array: 1 2 3

all possible subsets are {1}, {2}, {3}, {1, 2}, {1, 3}, {2, 3}, {1, 2, 3}

Bitwise OR of these subsets are, $1 + 2 + 3 + 3 + 3 + 3 + 3 = 9$.

Output : 18

20. Given an array, we need to calculate the Sum of Bit-wise AND of all possible subsets of given array.

Input Array: 1 2 3

all possible subsets are {1}, {2}, {3}, {1, 2}, {1, 3}, {2, 3}, {1, 2, 3}

Bitwise AND of these subsets are, $1 + 2 + 3 + 0 + 1 + 2 + 0 = 9$.

Output : 9

21. Without using divide operator, write a function to divide two integers.

22. Find if a number is divisible by 17 using bitwise operators

23. Compute Subtract using plus operator.

24. Find maximum of two numbers without any comparison.

25. De Bruijn Sequence : Given a string (like AB), generate shortest String containing all combinations of the given string.

Example:

For given string "AB", all combinations are {AA, AB, BA, BB}

One string containing all these combinations is AAABBABB.

But this is not the shortest.

Shortest string containing all combinations is AABBA

Such a string is called

26. Given a number N, find all pairs of numbers such that $N^2 = X^2 + Y^2$

27. Given some integer N, find all the prime factors of that number.

C) List of Desirable Lab Exercises (Write Algorithms and Implement in C Language)

For the following problems, students are expected to write one or more (as the case may be) algorithms along with the complexity of these algorithms, and implement them in C Language.

28. Generate pseudo-random numbers.

29. Strassen matrix multiplication.



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30. Find the closest pair out of given n points in 2-dimensional space.
31. Unique partitions of a positive integers.
32. Generate permutations of given n numbers. Iterative and recursive algorithms are possible.
33. Generate Gray Code.
34. Kruskal's algorithm to find minimum spanning (cost) tree (shortest path in a tree).
35. Determine largest common subsequence
36. Implement Twister game

Reference Books:

- .Parag H Dave, Himanshu B Dave, "Design and Analysis of Algorithms", Pearson (2014)
- .Anany Levitin, "Introduction to Design and Analysis of Algorithms", Pearson (2014)
- .Thomas H. Cormen, "Algorithms Unlocked", MIT Press (2013)

Accomplishment of the student after completing the course:

The student will be able to write one (and sometimes more than one) algorithm to solve a given problem. (S)he will be able to determine complexity of algorithms and select the most efficient algorithm for a given task.

GTUQuestionPapers.com



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Machine Learning (ML)

Subject Code: 4659302

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1. Learning Objectives:

- Basic concepts of various learning methods
- To learning algorithms used in machine learning

2. **Prerequisites:** Basics of computer science including algorithms, data structure, Basic Linear algebra and Probability theory.

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Introduction to Machine Learning, Model Preparation, Modelling and Evaluation Human learning versus machine learning, types of machine learning, applications of machine learning, tools for machine learning, Machine Learning Activities, Data structures for machine learning, Data Pre-processing, selecting a model, training a model, model representation and interpretability, evaluating performance of a model, improving performance of a model	25%
Unit II	Feature Engineering, Bayesian Concept Learning Introduction to feature engineering, feature transformation, feature subset selection, Importance of Bayesian methods, Bayes' theorem, concept learning through Bayes' theorem, Bayesian Belief Network	20%
Unit III	Supervised Learning – Classification, Regression Example of supervised learning, classification model, classification learning steps, common classification algorithms, example of regression, common regression algorithms,.	20%
Unit IV	Unsupervised Learning – Clustering, pattern finding using association rules Unsupervised learning versus supervised learning, applications of unsupervised learning, clustering and its types, Apriori algorithm for association rule learning	17%
Unit V	Neural Network Understanding the biological neuron, exploring artificial neuron, types of activation functions, early implementation of artificial neural network, architectures of neural network, learning process in artificial neural network, backpropagation, Overview of Deep Learning	18%

Desirable Topics:

Representation Learning, Active Learning, Instance-based learning, Ensemble Learning

4. Text Book:

1) Saikat Dutt, Subramanian Chandramouli, Amit Kumar Das, “Machine Learning”, Pearson Education

5. Reference Books:

- 1) Tom M Mitchell, “Machine Learning”, McGraw Hill
- 2) Anuradha Srinivasaraghavan, Vincy Joseph, “Machine Learning”, Wiley India



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- 3) Peter Harrington, "Machine Learning in Action", DreamTech
- 4) Henrik Brink, Joseph Richards, Mark Fetherolf, "Real-World Machine Learning", DreamTech
- 5) Christopher Bishop, "Pattern Recognition and Machine Learning"
- 6) Jiawei Han and Michelline Kamber, "Data Mining: Tools and Techniques", 3rd Edition.

6. Chapter wise Coverage from the Text Book:

Unit #	Chapter
I	Chapter 1: 1.1 to 1.8, Chapter 2: 2.1 to 2.6 and Chapter 3: 3.1 to 3.6
II	Chapter 4: 4.1 to 4.3, Chapter 6: 6.1 to 6.5
III	Chapter 7: 7.1 to 7.5 and Chapter 8: 8.1 to 8.3
IV	Chapter 9: 9.1 to 9.5
V	Chapter 10: 10.1 to 10.9

7. Accomplishment of the student after completing the course:

- 1) Student will be able to understand the concept of Machine learning and range of problems that could be solved by machine learning. They will be able to compare different types of learning algorithms and apply machine learning concepts in real life problems.

Practical List

1. Write a python code to implement **decision tree** for below given dataset. Identify the root node and all subpart or children of node and draw the tree.

Item no	Age	Income	Student	Credit Rating	Buys-Computer
1	Youth	High	No	Fair	No
2	Youth	High	No	Excellent	No
3	Middle	High	No	Fair	Yes
4	Senior	Medium	No	Fair	Yes
5	Senior	Low	Yes	Fair	Yes
6	Middle	Low	Yes	Excellent	No
7	Senior	Low	Yes	Excellent	Yes
8	Youth	Medium	No	Fair	No
9	Youth	Low	Yes	Fair	Yes
10	Senior	Medium	Yes	Fair	Yes
11	Youth	Medium	Yes	Excellent	Yes
12	Middle	Medium	No	Excellent	Yes
13	Middle	High	Yes	Fair	Yes
14	Senior	Medium	No	Excellent	No

2. Write a python code to implement **K-nearest neighbourhood** program for the given dataset. Assume that value of K=19.



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Item no	Outlook	Temp	Humidity	Windy	Play
1	Sunny	Hot	High	FALSE	No
2	Sunny	Hot	High	TRUE	No
3	Overcast	Hot	High	FALSE	Yes
4	Rainy	Mild	High	FALSE	Yes
5	Rainy	Cool	Normal	FALSE	Yes
6	Rainy	Cool	Normal	TRUE	No
7	Overcast	Cool	Normal	TRUE	Yes
8	Sunny	Mild	High	FALSE	No
9	Sunny	Cool	Normal	FALSE	Yes
10	Rainy	Mild	Normal	FALSE	Yes
11	Sunny	Mild	Normal	TRUE	Yes
12	Overcast	Mild	High	TRUE	Yes
13	Overcast	Hot	Normal	FALSE	Yes
14	Rainy	Mild	High	TRUE	No

3. Write a python code to implement Apriori algorithm, apply join and prune method and find frequent itemset

Sr#	Item no	Name
1	T1	Bread, butter, milk, soda
2	T2	Coke, egg, milk
3	T3	Bread, butter, egg
4	T4	Break, coke, jam
5	T5	Bread, butter
6	T6	Potato chips, soda
7	T7	Coke, fruit, juice
8	T8	Bread, coke, milk
9	T9	Coke, soda, jam, milk
10	T10	Bread, butter, egg, milk, soda
11	T11	Bread, milk
12	T12	Bread, jam

4. Write a python code to apply Naive Bayesian algorithm to classify that whether a person can buy computer or not based on given test data :

Item no	Age	Income	Student	Credit Rating	Buys-Computer
1	Youth	High	No	Fair	No
2	Youth	High	No	Excellent	No
3	Middle	High	No	Fair	Yes
4	Senior	Medium	No	Fair	Yes
5	Senior	Low	Yes	Fair	Yes
6	Middle	Low	Yes	Excellent	No
7	Senior	Low	Yes	Excellent	Yes



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8	Youth	Medium	No	Fair	No
9	Youth	Low	Yes	Fair	Yes
10	Senior	Medium	Yes	Fair	Yes
11	Youth	Medium	Yes	Excellent	Yes
12	Middle	Medium	No	Excellent	Yes
13	Middle	High	Yes	Fair	Yes
14	Senior	Medium	No	Excellent	No

Test Data

Age : Youth Income : LOW Student : No Credit Rating : Fair Buy Computer - ??

5. Write a python code to calculate gini index and draw the regression tree using **CART** algorithm for the below data set of ASCII characters:

511 975 511 975 496 966 480 967 450 981 420 993 376 1023 337 1053 297 1094 269
 1135 248 1177 241 1215 252 1245 280 1264 323 1270 373 1263 431 1238 492 1205
 550 1168 604 1126 648 1087 684 1056 710 1031 725 1013 725 1013 728 1025 719
 1053 707 1095 690 1150 673 1214 654 1288 636 1368 616 1448 595 1523 574 1595
 550 1656 529 1704 503 1731 484 1743 469 1734 463 1705 471 1661 493 1595 528
 1524 581 1442 645 1364 709 1294 776 1231 838 1186 747 921 755 903 757 882 744
 869 717 866 686 866 637 891 586 915 525 960 471 997 418 1045 379 1090 351 1132
 340 1168 347 1195 369 1209 409 1211 459 1202 514 1185 572 1162 632 1127 688
 1092 735 1053 777 1014 810 987 835 965 851 957 861 957 862 974 857 999 847 1043
 833 1097 816 1159 797 1225 776 1300 753 1377 731 1452 708 1521 685 1581 660
 1634 636 1674 611 1704 589 1716 568 1714 552 1704 539 1686 538 1657 538 1622
 558 1575 583 1531 622 1485 672 1437 728 1387

6. Given the below training dataset of petal size and flower type, predict flower type for petal of size 2.5 cm. using K-Nearest-Neighbor classification.

Petal Size	Flower Type
1	a
2	b
1	a
2	b
3	c
4	d
3	c
2	b
5	a

7. Consider the below training data and determine if jacket is to be worn when the temperature is 12-degree Celsius using Linear Regression Model.

Outside Temperature	Wear a Jacket
30°C	No
25°C	No
20°C	No



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15°C	Yes
10°C	Yes

8. Implement a python program that takes interest rate (x), finds the equation that best fits the data and is able to forecast out median home price for given interest rate using the data given below. (Use linear regression)

interest rate (%) (x)	Median home price (y)
10.3	\$183,800
10.3	\$183,200
10.1	\$174,900
9.3	\$173,500
8.4	\$172,900
7.3	\$173,200
8.4	\$173,200
7.9	\$169,700
7.6	\$174,500
7.6	\$177,900
6.9	\$188,100
7.4	\$203,200
8.1	\$230,200
7	\$258,200
6.5	\$309,800
5.8	\$329,800

9. Write a python code to predict profit of hotel chain given the population of the area (city) using the data at https://docs.google.com/spreadsheets/d/1Ks20skBgEefHFU36sFqVzozoFtz2EZE2rxB_IgXOrUg/edit?usp=sharing.
10. Write a python code to predict the price of house given square feet and number of bed rooms in the house for the dataset available at <https://docs.google.com/spreadsheets/d/1DHVK7gKo4TSyj7mFLwofHamj1S14SOZma2q51w1ZvyE/edit?usp=sharing>
11. Build a classification model in python that classifies if a student gets admission in a course or not given his last two examination scores for the dataset available at <https://docs.google.com/spreadsheets/d/1g0mjTUZ9Ado5prXA1UnAvNjmdzTrV0TzkFkIoU-Lpbk/edit?usp=sharing>
12. Build a multivariate logistic regression model to classify glass type of glass given different glass mixture features using the Glass Identification Dataset from UCI Machine Learning Repository.
13. Implement supervised machine learning algorithm (Classification – K Nearest Neighbourhood) in python to classify breast tumour data into malignant breast tumour or benign breast tumour (use breast tumour dataset) and obtain its accuracy level.
14. Implement supervised machine learning algorithm (Classification – K Nearest Neighbourhood) in python to classify iris data into setosa, virginica, versicolor using iris dataset and obtain its accuracy level.



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15. Implement supervised machine learning algorithm (Classification – Support Vector Machine) in python to classify breast tumour data into malignant breast tumour or benign breast tumour (use breast tumour dataset) and obtain its accuracy level.
16. Write a python program to build an email spam classifier using support vector machines for the Spam base dataset from UCI machine learning repository.
17. Implement unsupervised machine learning algorithm (Clustering – K Means) in python on Titanic dataset to cluster data (use Titanic dataset) by removing the class label.
18. Implement unsupervised machine learning algorithm (Clustering – K Means) in python on Breast Tumour dataset to cluster data (use Breast Tumour dataset) by removing the class label.
19. Implement unsupervised machine learning algorithm (Clustering – Hierarchical) in python on Titanic dataset to cluster data (use Titanic dataset).
20. Implement Apriori algorithm in python to find rules which explain association between different products for given transactions at a retail store. (The data is available at <https://drive.google.com/file/d/1NUXoptUIHY8z4KcFKpFA6sQN5KnWzk3p/view?usp=sharing>)
21. Implement text classification using neural network in python/R on Twenty Newsgroup dataset from UCI machine learning repository.
22. Implement supervised machine learning algorithm (Classification - Naïve Bayes algorithm) in python/R on Pima Indians Diabetes dataset and obtain its accuracy level.
23. classification and prediction algorithms on UCI dataset using Python's scikit-learn library

Desirable Practical Lists

1. For the sentiment analysis dataset given in link https://drive.google.com/file/d/1x6H7_KJjkbDrpgZFS7I2wjsZsILeSJ4S/view?usp=sharing, implement the following in python,
 - a. Clean and pre-process the dataset by removing URL, removing HTML tags, handling negation words which are split into two parts, converting the words to lower cases, removing all non-letter characters
 - b. Split the dataset into training and testing set
 - c. Implement feature extraction technique (to convert textual data to the numeric form)
 - d. Build the classification model using Logistic Regression that classifies if a given sentiment text is positive or negative
 - e. Obtain the accuracy score of the built model.
2. Implement a content based recommender system in python that recommends movies that are similar to a particular movie using movielens-20m-dataset available at <https://kaggle.com>.

The practical exercises should be performed in python.

References:

- 1) Peter Harrington, “Machine Learning in Action”, DreamTech
- 2) Michael Bowles, “Machine Learning in Python”, Wiley
- 3) Gavin Hackeling, Mastering Machine Learning with scikit-learn, Packt
- 4) Giuseppe Bonaccorso, Machine Learning Algorithms - Second Edition, Packt



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Software Engineering (SE)

Subject Code: 4659303

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1. Learning Objectives:

- To understand the concepts of software Engineering
- To understand how to Select and apply Appropriate Process Model to All Stages of Software Development Life Cycle (SDLC)
- To understand how to manage user's Requirement
- To understand how to Analyze, Design, Build and test software
- To understand agile methodology.

2. Prerequisites: Systems & Object Oriented Design Methodologies

3. Contents:

Unit	Chapter Details	Weightage Percentage
Unit I	Introduction to Software Engineering & Process Models Software Engineering, Software Process Process Models – Waterfall, Incremental, Evolutionary Process Model – Prototype, Spiral and concurrent Development Model Agile Process; Extreme Programming (XP); Brief Overview of Other Agile Process Models: Adaptive Software Development, Scrum	10%
Unit II	Requirement Engineering Requirements Engineering; Groundwork for Understanding of Software Requirements; Overview of Eliciting Requirements, Developing Use Cases, Building the Requirements Model; Negotiating Requirements; Validating Requirements; Requirement Modelling Strategies; Overview of Flow-Oriented Modelling, Behavioural Modelling;	20%
Unit III	Design Concepts Design Concepts, Design Model; Architectural Styles, Architectural Design, Assessing Alternative architectural Designs, Architectural mapping Using Data Flow User Interface Design: Golden Rules of User Interface Design; User Interface Analysis and Design; Interface Analysis; Interface Design steps	20%
Unit IV	Software Testing Software; Test Strategies for Object Oriented Software; Test Strategies for WebApps; System Testing; Debugging;	10%



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	<p>Software Testing Fundamentals; White-Box Testing; Basic Path Testing; Control Structure Testing; Black-Box Testing;</p> <p>Case Study: Prepare Test Cases for Online Shopping Application</p>	
Unit V (*)	<p>Introduction to Agile Methodology</p> <p>Agile Principles: 12 principles of Agile software, The customer is always right, Delivering the project, Communicating and working together, Project execution - Moving the project Along, Constantly Improving the Project and the Team, Agile Project: Bringing all the principles Together</p> <p>Scrum and Self organizing Teams: The rules of Scrum, Everyone on a Scrum Team Owns Project, The whole team uses the daily Scrum, Sprints, planning and retrospectives</p> <p>Scrum Planning and collective commitment: User stories, Velocity and Accepted Scrum Practices, Scrum Values revisited.</p> <p>Case study: For any Application (e.g. Payroll, Online Shopping etc.), create Agile documents using SCRUM.</p> <p>i) Agile Project Charter ii) Agile Roadmap / Schedule iii) Agile Project Plan iv) Agile User Story (Minimum 3 Tasks) v) Agile Release Plan vi) Agile Sprint Backlog vii) Agile Test Plan viii) Earned-value and burn charts</p>	20%
Unit VI (*)	<p>HIGH LEVEL DESIGN</p> <p>Overview: What to specify: Security, Hardware (External) , User Interface, Internal Interfaces, External Interfaces, Architecture, Reports, Other Outputs, Database (Audit trails, User Access, Database Maintenance), Configuration Data, Data Flows and States, Training, UML Diagrams (Structure Diagram, Behavior Diagrams (Use case, Activity, State Diagram), Interaction Diagrams, Sequence Diagram, Communication Diagram, Timing Diagram, Interaction Overview Diagram</p> <p>Case study: For any application (e.g. Payroll, Online Shopping etc.) System, create</p> <p>i) Data Flow Diagram (0 Level) ii) UML Diagrams : Use Case Diagram, Activity Diagram, Sequence Diagram, Class Diagram</p>	20%

(*) Only application / case study to be asked in theory exam from Unit 5 and 6



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Subject Code: 4659303

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Desirable Topics:

i) Reference for Case Study of SRS:

- Chapter 3 of Pankaj Jalote, “Software Engineering – A Precise Approach”, Wiley India
- Chandramouli Subramanian, , Saikat Dutt., Chandramouli Seetharaman, B G Geetha, Software Engineering, Pearson

ii) Agile Methodology XP, Lean and Kanban

iii) Project Estimation and Scheduling

4. Text Book:

- 1) Roger S. Pressman, “Software Engineering – A Practitioner’s Approach”, 7th Edition, McGraw Hill Publications
- 2) Andrew Stellman, Greene Jennifer, Beginning Agile, O'Reilly
- 3) Rods Stephen, Beginning Software Engineering, WROX

5. Reference Books:

- 1) Sommerville, “Software Engineering”, 8th Edition, Pearson Education
- 2) Chandramouli Subramanian, , Saikat Dutt., Chandramouli Seetharaman, B G Geetha, Software Engineering, Pearson
- 3) Waman S. Jawadekar, “Software Engineering – Principles and Practices”, TMGH Publication
- 4) Pankaj Jalote, “Software Engineering – A Precise Approach”, Wiley India
- 5) Waman S. Jawadekar, “Software Engineering – A Primer”, TMGH Publication
- 6) M G Limaye, Software Testing, Tata McGraw-Hill Education, 2009

6. Chapter wise Coverage from Main Reference Book(s):

Unit No.	Text Books	Topics/Subtopics
I	Book-1	Chapter : 1.3,1.4, 2.1 to 2.3, 3.3, 3.4, 3.5.1 ,3.5.2
II	Book-1	Ch-5, 7.1 to 7.3
III	Book-1	Ch-8.3, 8.4, 9.1.1, 9.3,9.4,9.5, 9.6, 11.1 to 11.4
IV	Book-1	Ch-17, 18.1 to 18.6,
V	Book-2	Chapter 3,4,5
VI	Book-3	Chapter 5 (Overview)

7. Accomplishments of the student after completing the course:

- Students will understand a high-level overview of the software development process.
- Student will understand various process models available for software engineering, activities of software engineering like software requirements, software design, software construction, software management, and software quality etc.
- Student will understand agile methodology.



8. Suggested case studies for Unit 6:

Prepare Data Flow Diagram (0 Level) and ii) UML Diagrams (Use Case Diagram, Activity Diagram, Sequence Diagram, and Class Diagram) for following definitions:

1. Consider a book store in a shopping mall. The customer selects the books from racks to purchase. Prepare a sequence diagram for bookstore checkout system. The customer brings selected books to cashier. The cashier scans each item with checkout system to prepare an order.
2. Consider an Online shopping web site, where customer selects the items and adds into cart. At the customer will proceed for payments. Prepare a Use case, Activity and sequence diagram for online shopping checkout system. The customer brings selected books to cashier. The cashier scans each item with checkout system to prepare an order.
3. The case study 'Online Mobile Recharge' gives us the information about all the mobile service providers. This application provides us the complete information regarding any mobile service provider in terms of their plans, options, benefits, etc. Suppose, any Airtel customer wants to have the information of all the schemes and services provided by the company, he/she can have the information and according to his convenience he can recharge the mobile from the same application. The major advantage of this proposed system is to have the recharging facility of any service provider under same roof.
4. In tour management system, System will check whether the customer is existing or new. New user will enter his personal and tour details for reservation. This login information could be used for further transactions. When customer is satisfied with tour package he/she would request for reservation of tour. Personal details of new customer is stored in cust_info while the details regarding the tour selected by particular customer is stored in tour_info and the details regarding it would be restructured in Tour Information System. Existing customer can update his/her personal details in cust_info and cancel reservation for tour from tour_info and changes regarding it are also reflected in Tour Information System. After confirming the tour package the customer will make payment either online or through staff by personally going at the office. Customer can make payment by cash, credit card or by cheque. System checks for the validity of staff. Once the payment is done by customer, valid staff will make Ticket Reservation System. Reserved customer will be able to view details about reservation by providing login information from cust_info and tour_info system. Administrator can add, delete or modify tour schemes from Tour Information System.
5. "Railway Reservation System is a system used for booking tickets over internet. Any Customer Can book tickets for different trains. Customer can book a ticket only if the tickets are available. Customer searches for the availability of tickets then if the tickets are available he books the tickets by initially filling details in a form. Tickets can be booked in two ways by i-ticket or by e-ticket booking. In case of i-ticket booking customer can book the tickets online and the tickets are couriered to Particular customer at their address. But in case of e-ticket booking and cancelling. Tickets are booked and cancelled online sitting at the home and customer himself has to take print of the ticket but in both the cases amount for tickets are deducted from customers account. For cancellation of ticket the customer has to go at reservation office than fill cancellation form and ask the clerk to cancel the ticket than the refund is transferred to customer account. After booking ticket the customer has to checkout by paying fare amount to clerk".



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Software Engineering (SE)

Subject Code: 4659303

With effective
from academic
year 2018-19

6. The **University** runs various diploma, graduation and post-graduation courses such as DE, Dpharm, BE, MBA. MCA, ME, Mpharm etc. The courses follows semester patterns and under each course various subjects are taught. Students seek admissions to these courses and if found eligible, the student is enrolled for the requested course. There are several faculty members in the university who teach the various subjects of these courses. The subject teacher conducts semester examinations for the concerned subject at the end of the semester and the student's performance is recorded. Even if a student is unable to pass a subject, he is promoted to the next semester but has to reappear for the subject examination again and clear his backlog.
7. Others:
 - a) Facebook Application.
 - b) WhatsApp Application.
 - c) Library Management System
 - d) Online Quiz System
 - e) ATM System

PS: Above is a suggestive list. You may select any other relevant Application.

GTUQuestionPapers.com



1. Learning Objectives:

- To be able to develop Project using Emerging Framework
- To solve industrial (or society or research) problems
- To plan, schedule, and monitor the software project
- Development, coding, and testing of a large project cohesively
- Documentation of project

2. Prerequisites: Programming Language, Basic Concepts of Software Engineering, RDBMS

3. Suggested Frameworks : IONIC / Xamarin / DJANGO

4. Guidelines for Project using Framework

- It is recommended that the team should be of 2-3 students.
- The project should be free from plagiarism of any kind.
- Project must have proper documentation.
- It is mandatory that the project should be developed using One of the above mentioned framework on Linux or Windows Platform. Linux is the preferred platform.
- This may not be a live project.
- Coding standards should be followed meticulously. At the minimum, the code should be self documented, modular, and should use the meaningful naming convention.
- It is advisable that object-oriented methodology is used with reusability of classes and code, etc.
- The output reports must include MIS reports, if applicable.
- The documentation should include a chapter on “Learning during Project Work”, i.e. “Experience of Journey during Project Duration”.
- Student may be asked to write the code related to the project during examination.
- Mentor/ Internal guides (i.e. the faculty members) must devote time, allocated as per the time table to guide the students for the project. The time allocation will be in accordance with the teaching scheme for 5th semester project.

5. Documentation:

- The project has to be well-documented in the form of a Project Report (at least 50 pages comprising of the relevant description of the project including design, data dictionary, source code, screenshots, etc.).
- Format : The Project report Print out should be taken on both the side of page with single line spacing. Use Times New Roman of size 10 for normal text. A typical Table of content will be as follows.

TABLE OF CONTENTS

1. Introduction

1.1. Existing System

1.2. Need for the New System

1.3. Objective of the New System

1.4. Problem Definition

1.5. Core Components

1.6. Project Profile

1.7. Assumptions and Constraints

1.8. Advantages and Limitations of the Proposed System



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Software Project-III (SP-III)

Subject Code: 4659304

With effective
from academic
year 2018-19

2. Requirement Determination & Analysis
 - 2.1. Requirement Determination
 - 2.2. Targeted Users
3. System Design
 - 3.1. Use Case Diagram
 - 3.2. Class Diagram
 - 3.3. Interaction Diagram
 - 3.4. Activity Diagram
 - 3.5. Data Dictionary
4. Development
 - 4.1. Coding Standards
5. Agile Documentation
 - 5.1 Agile Project Charter
 - 5.2 Agile Roadmap / Schedule
 - 5.3 Agile Project Plan
 - 5.4 Agile User Story (Minimum 3 Tasks)
 - 5.5 Agile Release Plan
 - 5.6 Agile Sprint Backlog
 - 5.7 Agile Test Plan
 - 5.8 Earned-value and burn charts
6. Proposed Enhancements
7. Conclusion
8. Bibliography

6. Knowledge about the following is expected to be demonstrated.

- The objective of the Project Development is to make students aware about the industry based process and workings using Framework. As a result, Project must meet with the industry standards.
- Proper knowledge about the purpose of the application.
- Use of justifiable application for group of 2-3 members.
- Project must include features like MIS Reports, Advance Search, File based processing etc.

7. Evaluation

Sr. No	Particulars	Weightage
1	Project	30%
2	Documentation	20%
3	Code Changes	25%
4	VIVA	25%

Web References:

- 1) ionicframework.com/docs
- 2) <https://visualstudio.microsoft.com/xamarin/>
- 3) <https://github.com/xamarin>
- 4) <https://www.djangoproject.com/>
- 5) <https://www.djangoproject.com/>



1. Learning Objectives:

- To understand the Spring framework.
- To understand Spring container, Modules, Dependency Injection and aspect oriented programming.
- To understand how to design and develop application using Spring.

2. Prerequisites: Basics of JAVA Programming, Exposure to J2EE Technology.

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Introduction to Spring: What is Spring?, Initializing a Spring application (Initializing a Spring project with Spring Tool Suite, Examining the Spring project structure), Writing a Spring application (Handling web requests, Defining the view, Testing the controller, Building and running the application, Getting to know Spring Boot DevTools), The core Spring Framework (Spring Boot, Spring Data, Spring Security, Spring Integration and Spring Batch, Spring Cloud) Developing Application: Displaying information(Establishing the domain, Creating a controller class, Designing the view), Processing form submission, Validating form input (Declaring validation rules, Performing validation at form binding, Displaying validation errors), Working with view controllers, Choosing a view template library	10%
Unit II	Working with Data: Reading and writing data with JDBC (Adapting the domain for persistence, Working with JdbcTemplate, Defining a schema and preloading data, Inserting data), Persisting data with Spring Data JPA(Adding Spring Data JPA to the project, Annotating the domain as entities, Declaring JPA repositories, Customizing JPA repositories)	15%
Unit III	Securing Spring Enabling Spring Security, Configuring Spring Security(In-memory user store, JDBC-based user store, LDAP-backed user store, Customizing user, authentication), Securing web requests (Securing requests, Creating a custom login page, Logging out, Preventing cross-site request forgery), Knowing your user Fine-tuning autoconfiguration (Understanding Spring's environment abstraction, Configuring a data source, Configuring	15%



	the embedded server, Configuring logging, Using special property values), Creating your own configuration properties(Defining configuration properties holder , Declaring configuration property metadata), Configuring with profiles(Defining profile-specific properties, Activating profiles, Conditionally creating beans with profiles)	
Unit IV	Advanced Spring Creating REST services:Writing RESTful controllers(Retrieving data from the server,Sending data to the server, Updating data on the server,Deleting data from the server),Enabling hypermedia (Adding hyperlinks,Creating resource assemblers, Naming embedded relationships), Enabling data-backed services (Adjusting resource paths and relation names,Paging and sorting, Adding custom endpoints, Adding custom hyperlinks to Spring Data endpoints) Consuming REST services: Consuming REST endpoints with RestTemplate(GETting resources, PUTting resources, DELETEing resources, POSTing resource data), Navigating REST APIs with Traverson Sending messages with JMS (Setting up JMS, Sending messages with JmsTemplate, Receiving JMS messages), Working with RabbitMQ and AMQP (Adding RabbitMQ to Spring, Sending messages with RabbitTemplate,Receiving message from RabbitMQ), Messaging with Kafka(Setting up Spring for Kafka messaging, Sending messages with KafkaTemplate, Writing Kafka listeners) Declaring a simple integration flow(Defining integration flows with XML,Configuring integration flows in Java, Using Spring Integration’s DSL configuration), Surveying the Spring Integration landscape(Message channels, Filters, Transformers, Routers, Splitters, Service activators,Gateways , Channel adapters, Endpoint Modules), Creating an email integration flow	30%
Unit V	Reactive Spring Understanding reactive programming: Defining Reactive Streams, Getting started with Reactor(Diagramming reactive flows, Adding Reactor Dependencies), Applying common reactive operations(Creating reactive types, Combining reactive types, Transforming and filtering reactive streams, Performing logic operations on reactive types) Developing reactive APIs: Working with Spring WebFlux (Introducing Spring WebFlux, Writing reactive controllers), Defining functional request handlers, Testing reactive controllers (Testing GET requests, Testing POST requests, Testing with a live	30%



	<p>server), Consuming REST APIs reactively (GETting resources, Sending resources, Deleting resources, Handling errors, Exchanging requests), Securing reactive web APIs (Configuring reactive web security, Configuring a reactive, user details service)</p> <p>Persisting data reactively: Understanding Spring Data’s reactive story (Spring Data reactive distilled, Converting between reactive and non-reactive types, Developing reactive repositories), Working with reactive Cassandra repositories, Enabling Spring Data Cassandra, Understanding Cassandra data modeling, Mapping domain types for Cassandra persistence, Writing reactive Cassandra repositories, Writing reactive MongoDB repositories (Enabling Spring Data MongoDB, Mapping domain types to documents, Writing reactive MongoDB repository interfaces)</p>	
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4. Text Book:

- 1) Craig Walls, “Spring in Action”, Fifth Edition, Manning, ISBN 9781617294945

5. Reference Books:

- 1) Santosh Kumar K., “Spring and Hibernate”, Tata McGraw-Hill Publishing, 2009, ISBN 978-0070680111
- 2) Paul Tepper Fisher and Brian D. Murphy, “Spring persistence with Hibernate”, Apress, 2010, ISBN 978-1-4302-2632-1
- 3) Amritendu De, “Spring 4 and Hibernate 4: Agile Java Design and Development”, McGraw-Hill Education, 2015, ISBN: 9780071845113
- 4) Chris Schaefer, Clarence Ho, and Rob Harrop, Pro Spring. Apress

6. Chapter wise Coverage from Text Book(s):

Unit No.	Text Books	Topics/Subtopics
I	Book-1	Chapter : 1,2
II	Book-1	Chapter : 3
III	Book-1	Chapter : 4,5
IV	Book-1	Chapter : 6,7,8,9
V	Book-1	Chapter : 10,11,12

7. Accomplishments of the student after completing the course:

- Students will understand Spring framework.
- Student will understand how to design and develop web application using Spring.



8. Laboratory Exercises

A. General Guidelines

- Group: 2-3 Person.
- The project should be free from plagiarism of any kind.
- It is mandatory that the project should be developed using Spring 3 or later version on Linux or Windows Platform.
- This may not be a live project

B. Expected Outcome

- The objective of the Web Application Development using Spring is to make students aware about the industry based process and workings. As a result, Project must meet with the industry standards.
- There will not be any compulsion to prepare a project report for the students but an application should be demonstrated, so that evaluator may get the detail about the Project developed and can evaluate the students as per the evaluation criteria.

C. Evaluation

Sr. No.	Particulars	Weightage
1	Project	40%
2	Code Changes	40%
3	VIVA	20%



1. Learning Objectives:

- To be able to understand various techniques of Big Data Analytics
- To understand how to explore and communicate data using data visualization techniques

2. Prerequisites: Knowledge of R/Python and Database concepts

3. Recommended content knowledge

Sr. No.	Course Content	Weightage
1	<p>Introduction Big Data Overview, BI versus Data Science, Current analytical architecture, Drivers of Big Data, Emerging Big Data Ecosystem and a New Approach to Analytics, Key Roles for the New Big Data Ecosystem, Examples of Big Data Analytics</p> <p>Data Analytics Life Cycle Overview, Phases (Discovery, Data Preparation, Model Planning, Mode Building, Communicate Results, Operationalize)</p> <p>Case Study: Global Innovation Network and Analysis (GINA)</p>	15%
2	<p>Mining Relationships Among Records</p> <p>Association Rules : Discovering Association rules in transaction Databases, Generating Candidate Rules, The apriori algorithm, Selecting strong rules, Data Formats, The process of Rule selection, Interpreting results, Rules and chance</p> <p>Collaborating Filtering: Data and Format, User based collaborative filtering "People like you", Item-based Collaborative Filtering, Advantages and weaknesses of Collaborative filtering, Collaborative filtering vs Association Rules</p> <p>Cluster Analysis: Introduction, measuring distance between two records, Measuring distances between two clusters, Hierarchical (Agglomerative) Clustering, Non-Hierarchical Clustering: The k-Means Algorithm</p>	25%
3	<p>Forecasting Time Series</p> <p>Handling Time Series: Introduction, Descriptive vs. Predictive Modeling, Popular Forecasting Methods in Business, Time Series Components, Data-Partitioning and Performance Evaluation</p> <p>Regression-Based Forecasting : A Model with Trend, A Model with Seasonality, A Model with Trend and Seasonality, Autocorrelation and ARIMA Models</p> <p>Smoothing Methods: Introduction, Moving Average, Simple Exponential Smoothing, Advanced Exponential Smoothing</p>	25%



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Big Data Analytics (BDA)

Subject Code: 4659306

With effective
from academic
year 2018-19

4	Social Network Analysis Introduction, Directed vs. Undirected Networks, Visualizing and Analyzing Networks, Social Data Metrics and Taxonomy, Using Network Metrics in Prediction and Classification, Collecting Social Network Data with R, Advantages and Disadvantages	15%
5	Text Mining Introduction, The Tabular Representation of Text: Term-Document Matrix and “Bag-of-Words” , Bag-of-Words vs. Meaning Extraction at Document Level, Preprocessing the Text, Implementing Data Mining Methods , Example: Online Discussions on Autos and Electronics	20%

4. Main Reference Books:

1. EMC Education Services, Data Science and Big Data Analytics, WILEY
2. Galit Shmueli, Peter C Bruce, Inbal Yahav, Nitin R Patel, Kenneth C, Linchtendahl Jr, Data Mining for Business Analytics- concepts, techniques and Application in R, WILEY

5. Recommended Book(s):

1. Glenn J Myatt, Wayne P Johnson, Making Sense of Data I: A Practical Guide to Exploratory Data Analysis and Data Mining, Wiley, 2nd Edition
2. Anand Rajaraman and Jeffrey David Ullman, “Mining of Massive Datasets”, Cambridge University Press (Wiley India) , 2nd Edition
3. Mehmed Kantardzic, Data Mining: Concepts, Models, Methods and Algorithms, Wiley-IEEE, 2nd Edition
4. Field Cady, 'The Data Science Handbook The Data Science Handbook', Wiley Publication ISBN-13: 978-8126573332
5. Han, J., Kamber, M., Pei, J. Data mining concepts and techniques. Morgan Kaufmann, 2011
6. Michael Berthold, David J. Hand, Intelligent Data Analysis, Springer, 2007
7. Vincent Granville, Developing Analytic Talent: Becoming a Data Scientist, wiley, 2014
8. John W. Foreman (Author), Data Smart: Using Data Science to Transform Information into Insight, WILEY

6. Chapter wise Coverage from Main Book(s):

Unit#	Book#	Topics
1	1	Chapter 1,2
2	2	Chapter 14,15
3	2	Chapter 16, 17,18
4	2	Chapter 19
5	2	Chapter 20



7. Suggested Practical

Tool: Python, Libraries of Python like Pandas, Sci-kit Learn etc., R (R Studio and required packages)

Part 1: Data Pre-processing:

Dataset:<https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/>

1. Download loan data set (<https://www.analyticsvidhya.com/blog/2016/07/practical-guide-data-preprocessing-python-scikit-learn/>) and perform following operations
 - i. Write program to read dataset (Text,CSV,JSON,XML)
 - ii. Performing Data Cleaning
 - a. Handling Missing Data
 - b. Removing Null data
 - c. Rescaling Data
 - iii. Dimensionality Reduction
 - iv. Encoding Data
 - v. Feature Selection
 - vi. Implement Principle Component Analysis,
2. Use Loan data (above) and Fit KNN model to find out accuracy of model for prediction of loan.
3. Write a python code to predict profit of hotel chain given the population of the area (city) using the data at https://docs.google.com/spreadsheets/d/1Ks20skBgEefHFU36sFqVzozoFtz2EZE2rxB_IgXOrUg/edit?usp=sharing.
4. Write a python code to predict the price of house given square feet and number of bed rooms in the house for the dataset available at <https://docs.google.com/spreadsheets/d/1DHVK7gKo4TSyj7mFLwofHamj1SI4SOZma2q51w1ZvyE/edit?usp=sharing>

Part 2: Mining Relationships among Records

5. Implement Apriori algorithm in python to find rules which explain association between different products for given transactions at a retail store. (The data is available at <https://drive.google.com/file/d/1NUXoptUIHY8z4KcFKpFA6sQN5KnWzk3p/view?usp=sharing>)
6. Implement text classification using neural network in python/R on Twenty Newsgroup dataset from UCI machine learning repository.
7. Generating Association rule mining e.g "Sythentic Data on Purchase of Phone faceplate"
 - a. Recommender algorithms: Generating rules for Similar Book Purchases
8. Collaborative Filtering (use movielens dataset):
 - a. Find similar items by using a similarity metric
 - b. For a user, recommend the items most similar to the items (s)he already likes

Part 3: Implement Clustering

9. Implement clustering algorithm for grouping news articles.



10. Implement unsupervised machine learning algorithm (Clustering – K Means) in python on Titanic dataset to cluster data (use Titanic dataset) by removing the class label.
11. Implement unsupervised machine learning algorithm (Clustering – K Means) in python on Breast Tumour dataset to cluster data (use Breast Tumour dataset) by removing the class label.
12. Implement unsupervised machine learning algorithm (Clustering – Hierarchical) in python on Titanic dataset to cluster data (use Titanic dataset).

Part 4: Various types of Text Analysis

13. For the sentiment analysis dataset given in link https://drive.google.com/file/d/1x6H7_KJjkbDrpgZFS7I2wjsZsILeSJ4S/view?usp=sharing, implement the following in python,
 - b. Clean and pre-process the dataset by removing URL, removing HTML tags, handling negation words which are split into two parts, converting the words to lower cases, removing all non-letter characters
 - c. Split the dataset into training and testing set
 - d. Implement feature extraction technique (to convert textual data to the numeric form)
 - e. Build the classification model using Logistic Regression that classifies if a given sentiment text is positive or negative
 - f. Obtain the accuracy score of the built model.
14. Implement a content based recommender system in python that recommends movies that are similar to a particular movie using movielens-20m-dataset available at <https://kaggle.com>.

Part 5: Advanced Data Visualization

15. Write a program to plot Chi square distribution
16. Write a program to plot Normal distribution
17. Write a program to plot Poisson distribution
18. Write a program to plot T distribution
19. Write a program to plot Binomial Distribution
20. Write a program to plot Central limit theorem
21. Write a program to plot Uniform distribution

Part 6: Text pre-processing using Python

Tools: NLTK (<http://www.nltk.org/>) sci-kitlearn etc.

22. Removing stop words (the most common words in a language like “the”, “a”, “on” etc.)
23. Write a python code to perform spell check (edit distance algorithm)
24. Write a python code for finding the root words (Stemming algorithm : A stemming algorithm reduces the words "fishing", "fished", and "fisher" to the root word, "fish)
25. Write a python code to implement Tokenized algorithm for text processing
26. Write a python code Part of speech (PoS) tagging

Part 7. Desirable:

Abstractive/ Extractive text Summarization (single document, multi document)
Time series algorithm



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester
Subject Name: Application Development using LARAVEL (ADL)
Subject Code: 4659307

With effective
from academic
year 2018-19

1. Learning Objectives:

- To understand the LARAVEL framework
- To understand how to Implement LARAVEL
- To understand how to design and develop responsive web application using LARAVEL

2. Prerequisites: HTML, CSS and Basics of PHP

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Introduction to LARAVEL Why Use a Framework? A Short History of Web and PHP Frameworks, What's So Special About Laravel?, How It Works, Why Laravel? Setting Up a Laravel Development Environment: System Requirements, Composer, Local Development Environments, Creating a New Laravel Project, Laravel's Directory Structure, Configuration An Introduction to Artisan, Basic Artisan commands, Writing custom artisan commands, calling artisan commands in Normal code, Tinker	15%
Unit II	LARAVEL Basics Router and Controllers: Route Definitions, Route Groups, Views, Controllers, Route Model Binding, Route Caching, Form Method Spoofing, CSRF Protection, Redirects, Aborting the Request, Custom Responses Blade Template : Echoing Data, Control Structures (Conditionals, Loops, Or), Template Inheritance, View Composers and Service Injection, Custom Blade Directives Front End Components: Elixir, Pagination, Message Bags, String Helpers, Pluralization and localization	25%
Unit III	Collecting and Validating User Data Injecting a Request Object, Route Data, Uploaded Files, Validation, Form Requests, Eloquent Model Mass Assignment, {{ versus {!! Auth Controller Database Eloquent: configuration, Migration, Seeding, Query Builder, Introduction to Eloquent, Eloquent Events User Authentication and Authorization : The User Model and	30%



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester
Subject Name: Application Development using LARAVEL (ADL)
Subject Code: 4659307

With effective
from academic
year 2018-19

	Migration, Using the auth() Global Helper and the Auth Facade	
Unit IV	Advanced LARAVEL Request and Response: Laravel's Request Lifecycle, The Request Object, The Response Object, Laravel and Middleware Writing APIs : The Basics of REST - Like JSON APIs, Controller Organization and JSON Returns, Reading and Sending Headers, Eloquent Pagination, Sorting and Filtering, Transforming Results	15%
Unit V	Mail , Notifications Storage and Retrieval: Basic File Uploads and Manipulation, Sessions, Cache, Cookies, Full-Text Search with Laravel Scout	15%

Desirable Topics:

- 1) GitHub - akaunting/akaunting: Free and Online Accounting Software
(url: <https://github.com/akaunting/akaunting>)

4. Text Book:

- 1) Matt Stauffer, "LARAVEL Up and Running, A framework for building modern PHP Apps", O'REILLY , 3rd Indian Reprint (ISBN: 978-93-5213-485-4)

5. Reference Books:

- 1) Martin Bean, "Laravel 5 Essentials", Packet Publishing, ISBN 978-1-78528-301-7
- 2) Fernando Monteiro, "Hands-On Full-Stack Web Development with Angular 6 and Laravel 5 ", Packt Publishing, ISBN 9781788833912
- 3) Web Technologies : HTML,CSS3, JAVASCRIPT, jQUERY,AJAX, PHP,XML, MVC and LARAVEL), Black Book, 2018, Dreamtech , ISBN 9789386052490

Webliography:

- 1) Online Laravel 5.2 Documentation (<https://laravel.com/docs/5.7>)
- 2) Nathan Wu, Learning Laravel 5 Cookbook (<https://learninglaravel.net/laravelbook>)
- 3) <https://laravel-news.com/category/laravel-tutorials>
- 4) <https://laravel.com>

6. Chapter wise Coverage from Text Book(s) :

Unit	Text Books	Topics
I	Book-1	Chapter : 1,2,7
II	Book-1	Chapter : 3,4,5
III	Book-1	Chapter : 6,8, Chapter : 9 (page 197 to 205)
IV	Book-1	Chapter : 10,13(Page 283 to 295)
V	Book-1	Chapter : 14(Page 318 to 331)



7. Accomplishments of the student after completing the course:

- Students will understand LARAVEL framework.
- Student will understand how to design and develop responsive web application using LARAVEL.

8. Laboratory Exercises

A. General Guidelines

- Group: 2-3 Person.
- The project should be free from plagiarism of any kind.
- It is mandatory that the project should be developed using LARAVEL 5.6 or later version on Linux or Windows Platform.
- This may not be a live project
- Use any database for storing data.

B. Expected Outcome

- The objective of the LARAVEL Project Development is to make students aware about the industry based process and workings. As a result, Project must meet with the industry standards.
- There will not be any compulsion to prepare a project report for the students but an application should be demonstrated, so that evaluator may get the detail about the Project and can evaluate the students as per the evaluation criteria.

C. Evaluation

Sr. No.	Particulars	Weightage
1	Project	40%
2	Code Changes	40%
3	VIVA	20%



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Advanced Networking (AN)

Subject Code: 4659308

With effective
from academic
year 2019

1. Learning Objectives:

- Develop strong analysis, design, implementation, testing and troubleshooting skills in students regarding TCP/IP based networks and services as relevant to the computer networking needs of the IT industry.
- Establish a strong conceptual foundation of the TCP/IP protocol stack, services and related tools/technologies so as to facilitate the development of the above mentioned skills.
- Design and implement customized TCP/IP based application layer services.
- To familiarize with security and performance issues in TCP/IP networks
- To familiarize with Wireless Networks, WiFi and Mobile Networks, Browser Networking,XMLHttpRequest and Server-Sent Events (SSE) and WebSocket and WebRTC
- Create a strong conceptual foundation and offer maximum possible development of required theoretical and practical skills for students aspiring to make a career in Computer Networking like Network Designer, Network administrator, etc.
- To learn how to listen to local network traffic and analyze different protocols.

2. Prerequisites:

Digital Data communication concepts, Layered architecture as per OSI and TCP/IP model, Functionality of all layers in the OSI and TCP/IP model, Concepts of LAN, WAN, Internet, HTTP, Ethernet, General concepts in routing and basic routing algorithms like Dijkstra's shortest path, distance vector routing, link state routing, etc., Overview of popular application layer services like HTTP, DNS, FTP etc.

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Primer on Latency and Bandwidth, Building Blocks of TCP and UDP and Transport Layer Security (TLS). Speed Is a Feature, Components of Latency, Speed of Light and Propagation Latency, Last-Mile Latency, Bandwidth, Delivering Higher Bandwidth and Lower Latencies, TCP Three Way Handshaking, Congestion Avoidance and Control, Bandwidth Delay Product, Optimization for TCP,UDP and Network Address Translator, NAT Traversal, STUN, TURN and ICE. TLS Handshake, TLS Session Resumption, Chain of Trust and Certificate Authorities, Certificate Revocation, TLS Record Protocol and Optimizing for TLS	30 %
Unit II	Wireless Networks, WiFi Ubiquitous Connectivity, Types of Wireless Networks, Performance Fundamentals of Wireless Networks, From Ethernet to a Wireless LAN, WiFi Standards and Features, Measuring and Optimizing WiFi Performance, Optimizing for WiFi Networks.	10 %
Unit III	Browser Networking, XMLHttpRequest and Server-Sent Events (SSE) Primer on Browser Networking, XMLHttpRequest: Brief History of XHR, Cross-Origin Resource Sharing (CORS), Downloading and	30 %



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	uploading Data with XHR, Monitoring Download and Upload Progress, Streaming Data with XHR, Server-Sent Events (SSE): EventSource API and Event Stream Protocol.	
Unit IV	WebSocket and WebRTC Introduction to WebSocket, WebSocket API, WebSocket Protocol, WebSocket Use Cases and Performance, WebRTC: Standards and Development of WebRTC, Audio and Video Engines, Real-Time Network Transports, Establishing a Peer-to-Peer Connection, Delivering Media and Application Data, DataChannel, WebRTC Use Cases and Performance.	30 %

4. Text Book:

- 1) Ilya Grigorik, “High-Performance Browser Networking”, 2013: First Edition, O’Reilly
E-book book also available <https://hpbn.co/>

5. Reference Books:

- 1) Douglas E. Comer, “Internetworking with TCP/IP - (Vol. 1) Principles, Protocols, and Architecture”, 6th Edition, Prentice Hall of India (PHI) Publishers.
- 2) Behrouz A. Forouzan, “TCP/IP Protocol Suite”, 4th Edition, McGraw-Hill
- 3) W. Richard Stevens, G. Gabrani, “TCP/IP- Illustrated, Vol. 1 (The Protocols)”, Pearson Publishers.
- 4) Chris Sanders, “Practical Packet Analysis using Wireshark to solve real world problems”, No Starch Press, Inc.

6. Chapter wise Coverage from the Text Book:

Unit No.	Text Books	Topics/Subtopics
1	Book-1	Chapter 1 to Chapter 4
2	Book-1	Chapter 5, Chapter 6
3	Book-1	Chapter 14 to Chapter 16
4	Book-1	Chapter 17 to Chapter 18

7. Accomplishment of the student after completing the course:

- 1) Have thorough understanding of TCP/IP based systems, services and related tools and technologies
- 2) Be fluent in design and developing TCP/IP socket based networking solutions
- 3) Effectively use available OS commands/utilities as well as popular third party tools for TCP/IP networking depending upon the needs
- 4) Be geared to adapt to more sophisticated networking related packages and hence develop relatively complex applications more reliably and faster.



1. Download Wireshark is a network packet analyzer from its official webpage <https://www.wireshark.org/>
2. Install Wireshark under Windows/Linux/MAC/Solaris platform
3. Wireshark Installation, understanding the Wireshark Environment / Menu System, to start and stop live capture of traffic from given wired ethernet network interface, capturing options, store captured data in different supported file formats, to open already stored captured data file.
4. Analyze Transmission Control Protocol (TCP) Traffic
Established of TCP Connections, Termination of TCP Connections, How TCP Tracks Packets Sequentially, Review the Trace File: Packet Loss Detected by the Receiver – Fast Recovery, Packet Loss Detected by the Sender – RTO Timeout, Improve Packet Loss Recovery with Selective Acknowledgments, TCP Flow Control, The TCP Window Size > Zero Can Still Stop Data Transfer
5. Analyze User Datagram Protocol (UDP) Traffic : Normal UDP Traffic, UDP Problems, Dissect the UDP Packet Structure, Filter on UDP Traffic
6. Analyze IEEE 802.11 (WLAN) : Wireless LANs (WLANs) Traffic, Signal Strength and Interference, Capture WLAN Traffic, Monitor Mode vs. Promiscuous Mode, 802.11 Traffic Basics like Data Frame, Management Frame and Control Frames etc., Normal 802.11 Communications, Dissect the 802.11 Frame Structure, Filter on All WLAN Traffic, Frame Control Types and Subtypes
7. Capture Wi-Fi and Bluetooth Traffic and Interpret/ Analyze the corresponding header and payload using Wireless Traffic Sniffing tools like WireShark-USB/AirCrackng/Kismet, etc.
8. Write a java socket program for implementation of echo (Algorithms: Client Side: Create a socket which binds the IP address of server and the port address to acquire service, After establishing connection send a data to server, Receive and print the same data from server, Close the socket and End the program, Server Side: Create a server socket to activate the port address, Create a socket for the server socket which accepts the connection, After establishing connection receive the data from client, Print and send the same data to client, Close the socket and End the program).
9. Write a java client-server application for chat using TCP/IP (Algorithms: Client Side: Start writing the program, include all necessary package in java, create a socket in client to server, client establishes a connection to the server, client accept the connection and to send the data from client to server, client communicates the server to send the end of the message and Stop the program, Server Side: Include all necessary package in java, create a socket in server to client, server establishes a connection to the client, server accept the connection and to send the data from server to client and vice versa, server communicate the client to send the end of the message and Stop the program).
10. Write a java program to Perform File Transfer in Client & Server Using TCP/IP (Algorithms: Client Side: Establish a connection between the Client and Server, Socketss=new Socket(InetAddress.getLocalHost(),1100), Implement a client that can send two requests (i) To get a file from the server (ii) To put or send a file to the server, After getting approval from the server ,the client either get file from the server or send, file to the server, Server Side: Implement a server socket that listens to a particular port number, Server reads the filename and sends the data stored in the file for the 'get' request, reads the data from the input stream and writes it to a file in the server for the 'put' instruction, Exit upon client's request and Stop.



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11. Write a java program to implement simple client-server application using UDP (Algorithms: Client Side: Create a datagram socket with server's IP address, Create datagram packets with data, data length and the port address, Send the datagram packets to server through datagram sockets, Receive the datagram packets from server through datagram sockets and Close the socket, Server Side: Create a datagram socket with port address, Create datagram packets with data, data length and the port address, Send the datagram packets to client through datagram sockets, Receive the datagram packets from client through datagram sockets and Close the socket.
12. Implement real-time video streaming and data exchange using Web RTC (i) Get video from your webcam (ii) Stream video with RTCPeerConnection (iii) Stream data with RTCDataChannel (iv) Set up a signaling service to exchange messages (v) Combine peer connection and signalling and (vi) Take a photo and share it via a data channel. Download the sample source code and Learn Step by Step:
<https://codelabs.developers.google.com/codelabs/webrtc-web/#9>
The practical examination exercises would be based on lab exercises above list except Lab # 12. For Lab # 12 a documentation/report/file should be maintained.

References:

<https://www.wireshark.org/>

<https://www.wireshark.org/download/docs/user-guide.pdf>

<https://www.aircrack-ng.org/>

<https://www.kismetwireless.net/>

<https://webrtc.org/>



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Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Image Processing (IP)

Subject Code: 4659309

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1. Learning Objectives:

- To understand basic concepts and methodologies for digital image processing
- To develop a foundation that can be used as the basis for further study and research in this field.
- To provide understanding of the different types of image representations, enhancing image characteristics, image filtering, and reducing the effects of noise and blurring in an image.
- To understand image processing needed for extracting information from an image.

2. **Prerequisites:** Knowledge of Computer Graphics is desirable.

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Introduction to Digital Image Processing and Fundamental Introduction: What is Digital Image Processing? Fundamental steps in Digital Image processing, Components of Image Processing system Digital Image Fundamentals- Some basic relationships like Neighbours, Connectivity, and Distance Measures between pixels. Overview of mathematical tools used in digital image processing	10%
Unit II	Transformations, Histogram Processing and Spatial Filtering Image Enhancement in the spatial domain: Background, Some basic Gray Level Transformations, Histogram Processing, Fundamentals of spatial filtering, Smoothing and Sharpening Spatial Filters Filtering in the frequency Domain: Background, Introduction to Fourier Transform (FT) and frequency domain, Computing and Visualizing the Discrete Fourier Transform (DFT) of one variable, Extension to functions of two variables - 2D DFT, Image Smoothing and Sharpening Using Frequency Domain Filters	30%
Unit III	Image Restoration Image Restoration: A model of the Image Degradation/Restoration process, Noise Models, Restoration in the presence of noise only - Spatial filtering	15%
Unit IV	Morphological Image Processing Morphology: Dilation, Erosion, Opening and Closing, The Hit-or-Miss Transformation, Morphological Algorithms: Boundary Extraction, Region filling, Extraction of connected components, Convex Hull, Thinning, Thickening, Skeletons, Pruning, Morphological reconstruction	20%
Unit V	Image Segmentation and Object Recognition Image Segmentation: Fundamentals, Point, Line and Edge Detection, Region Based Segmentation Object Recognition : Pattern and Pattern Classes, Recognition Based on Decision Theoretic Methods- Matching, Optimal Statistical Classifier, Neural Networks, Object recognition based on structural methods – Matching Shape Numbers	25%



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4. Text Book:

- 1) Richard E Woods, Rafael C Gonzalez , “Digital Image Processing”, Pearson, 3rd Edition

5. Reference Books:

- 1) Anil K. Jain, “Fundamentals of Digital Image Processing”, Prentice-Hall India, 1989
- 2) B. Chanda and D. Datta Majumder, “Digital Image Processing and Analysis”, Prentice-Hall India, 2nd edition (October 30, 2011)
- 3) Madhuri A. Joshi, “Digital Image Processing”, Prentice-Hall India, 2006

6. Chapter wise Coverage from the Text Book:

Unit #	Chapter
I	Chapter 1: 1.1, 1.4,1.5 Chapter 2: 2.5, 2.6
II	Chapter 3: 3.1, 3.2, 3.4, 3.5, 3.6 Chapter 4 : 4.1,4.2,4.4,4.5,4.8,4.9
III	Chapter 5: 5.1 ,5.2,5.3
IV	Chapter 9: 9.1,9.2,9.3,9.4, 9.5
V	Chapter 10: 10.1, 10.2, 10.4 Chapter 12: 12.1, 12.2, 12.3.1

7. Accomplishment of the student after completing the course:

- 1) Understanding of the principals the Digital Image Processing and terminology used to describe features of images.
- 2) Understanding of the mathematical foundations for digital manipulation of images; image acquisition; pre-processing; segmentation; Fourier domain processing.
- 3) Be able to write programs for implementing image processing tasks.
- 4) Learn and understand the Image Enhancement techniques.
- 5) Learn and understand Image Segmentation and Recognition concepts.



Practical List

Objective:

Learning the use of Python and OpenCV to implement basic image processing algorithms and to build and execute image processing based projects to solve real life problems

Prerequisites: Knowledge of OpenCV and Python

Lab Experiments:

1. Getting started with images
 - a. Learn to load an image, display it and save it back
2. Drawing functions in OpenCV
 - a. Draw lines, rectangles, ellipses, circles, ellipses, polygons, adding text to images
3. Perform Basic operations on images
Read and edit pixel values, working with image -other basic operations.
4. Perform Arithmetic operations on images
5. For a sample images change images between different color spaces
6. Showing images in an OpenCV window
Read, write, view images and conversion between different formats.
7. Write code to perform following:
 - o Loads 2 images (Image 1 say I1 and Image 2 say I2)
 - o Computes the pixel-wise difference between the two images
 - o Computes an output image where each pixel of coordinates (x,y) contains the absolute difference of the corresponding pixels on I1 and I2
 - o $Out(x,y) = abs(I1(x,y) - I2(x,y))$
 - o Displays output image in a window
8. Write code to change brightness of the colour image and show negative of an image.
9. Histograms-1: Find, Plot, Analyze
Find and draw contours
10. Histograms-2: Histogram Equalization
Equalize histograms to get better contrast for images
11. Histograms-3: 2-D Histograms
Find and plot 2-D histograms
12. Apply different Geometric transformations to images like rotation, translation, crop
13. Apply various Scaling operations on the image – resize, down size & upsize (preserve aspect ratio) , resize only width, resize only height, resize to fixed height and width
14. Convert images to binary images using global thresholding, adaptive thresholding, Otsu's binarization.
15. Blur the images, filter the images with custom kernels.
16. Find the Fourier Transform of images using OpenCV using the FFT functions available in Numpy.
17. OpenCV provides variations to remove Noise
 - cv2.fastNlMeansDenoising()—works with a single grayscale images
 - cv2.fastNlMeansDenoisingColored()—works with a color image.Use these functions to denoise grayscale and colour images.
18. Do you have an old degraded photo with many black spots and strokes on it? Take it. Try to restore it with a technique called image inpainting.
19. Perform Morphological Transformations - Erosion, Dilation, and Opening, Closing on a sample image.



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20. Find Image Gradients.
21. Find edges with Canny Edge Detection.
22. Apply Hough Line Transform to Detect lines in an image.
23. Apply Hough Circle Transform to Detect circle in an image.
24. Apply Watershed Algorithm and k-means algorithm for Image Segmentation.
25. Search for an object in an image using Template Matching.
26. Detect QR code.
27. Detect text in natural scenes.

References:

- 1) Alexey Spizhevoy, Aleksadr Rybnikov, "OpenCV3 Computer Vision with Python Cookbook", Packt Publishing Ltd., 2018
- 2) https://opencv-python-tutroals.readthedocs.io/en/latest/py_tutorials/py_imgproc/py_colorspaces/py_colorspaces.html
- 3) OpenCV-Python Tutorials Documentation Release 1 , Alexander Mordvintsev & Abid K, Nov 05, 2017, <https://media.readthedocs.org/pdf/opencv-python-tutroals/latest/opencv-python-tutroals.pdf>
- 4) <https://codewords.recurse.com/issues/six/image-processing-101>
- 5) <https://pythonprogramming.net/image-operations-python-opencv-tutorial/>
- 6) http://www.imageprocessingplace.com/root_files_V3/image_databases.htm (to obtain sample images)



1. Learning Objectives:

- To get a basic understanding of Operation Research Techniques for optimum utilization of constrained resources in wide range of areas including industry, business, commerce, administration, management, service supply, maintenance, agriculture, medicines and healthcare, defense etc.
- For a given problem statement, students will be able to develop ability to
 - Classify the class of problem (LPP or Transportation or Assignment ... etc),
 - Formulate the appropriate OR model,
 - Find the solution, and
 - Interpret the results

NOTE: Mathematical derivations are not included for any topic identified.

2. Prerequisites: Basic knowledge of Mathematics and Probability Distributions

3. Contents:

Unit	Chapter Details	Weightage Percentage
Unit I	Basics of Operations Research, Transportation Problem & Assignment Problem (a) Basics of Operation Research Introduction, definitions, features, advantages and applications (b) Transportation problem (T.P.) Formulation of a T.P., Methods to find initial basic feasible solution: NorthWest corner rule, Least cost cell entry method, Vogel's Approximation method, Test of optimality for finding an optimum solution – MODI method. Variations of Transportation Problems (c) Assignment problem (A.P.) Formulation of an Assignment Problem, Method to find an optimum solution - Hungarian Assignment Method, Variations of assignment problem	20%
Unit II	Management of Inventory and Replacement (a) Management of Inventory Introduction and terminology of the inventory management problem including Objective(s) and Constraints; Single Item Inventory Control without Shortages Model –I: EOQ model with constant rate of demand Model – II: EOQ model with different rates of demand. (b) Management of Replacement Definition, replacement of items that deteriorates, replacement of item that fails completely	15%
Unit III	(a) Theory of Games Introduction, Two-Person Zero Sum game, Pure strategies (Minimax & Maximin principles) Games with Saddle Point, Rules to determine Saddle Point, Mixed Strategies, Rules of Dominance, Solution methods games without Saddle Point	25%



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Subject Name: Operations Research (OR)

Subject Code: 4659310

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	<p>(b) Queuing Theory Introduction, Queuing system and problem, transient and steady states, traffic intensity, probability distributions in queuing systems, single service queuing model(s).</p> <p>(c) Simulation Introduction, applications, Monte-Carlo Method, Simulation using Computers, Simulation of Inventory Problems, Queuing Problems, Investment problems</p>	
Unit IV	<p>Project Management and Scheduling</p> <p>(a) Project Management (CPM & PERT) Network concepts, components, rules for network construction, critical path method (CPM) and Project evaluation and Review Techniques (PERT)</p> <p>(b) Production Scheduling (Job Sequencing) Introduction, Johnson's algorithm for N jobs on 2 machines, Johnson's algorithm for N jobs on M machines</p>	20%
Unit V	<p>Linear Programming Problem (L.P.P.) Linear Programming Problem (L.P.P.), Formulation of a L.P.P. with its components: objective function and constraints, optimal solution, slack, surplus and artificial variables, Graphical method, Simplex method, Big-M method, Primal & Dual problem definition</p>	20%

Desirable Topic: Decision Theory (EMV criteria, EVPI, EPPI), Max-min principle, Minmax principle, Hurwitz's principle, Laplace principle (Chapter 11 from Main Text Book)

4. Text Book:

1. J. K. Sharma, "Operations Research – Theory and Application", 4th Edition, Macmillan Publishers India Ltd.

5. Reference Books:

1. Kanti Swarup, Gupta P.K., Man Mohan, "Operations Research", Sultan Chand & Sons, New Delhi
2. Shah, Gor, Soni, "Operations Research", PHI
3. V. K. Kapur, "Operations Research – Problems & Solutions", Sultan Chand & Sons, New Delhi

6. Chapter wise Coverage from Main Reference Book(s):

Unit No.	Text Books	Topics/Subtopics
1	Basics of Operation Research	Ch – 1 (1.1 to 1.5, 1.10, 1.13)
	Transportation Problem	Ch – 9 (9.1 to 9.5)
	Assignment Problem	Ch – 10 (10.1 to 10.4)



2	Inventory Management	Ch – 14 (14.1 to 14.7)
	Replacement	Ch – 17 (17.1 to 17.4)
3	Game theory	Ch. 12 (12.1 to 12.6)
	Queuing theory	Ch. 16 (16.1 to 16.6)
	Simulation	Ch – 19 (19.1 to 19.12)
4	Project Management (CPM and PERT)	Ch – 13 (13.1 to 13.6)
	Job Sequencing	Ch – 20 (20.1 to 20.3, 20.5)
5	Basics of Linear Programming	Ch – 2 (2.1, 2.2,2.3,2.4, 2.6,2.7, 2.8)
	Graphical Method of LPP	Ch – 3 (3.1, 3.2, 3.3.1 to 3.3.3, 3.4)
	Simplex Method of LPP	Ch. 4 (4.1 to 4.6)
	Duality in LPP	Ch. 5 (5.1 and 5.2)

7. Accomplishments of the student after completing the course:

- Ability to classify and formulate Operation Research problems.
- Ability to design and construct suitable optimization models and to find solution of real life problems from diverse fields.
- Ability to interpret results.

8. Practical List

Tools: R /R Studio

1. A company is involved in the production of two items (X and Y). The resources need to produce X and Y are twofold, namely machine time for automatic processing and craftsman time for hand finishing. The table below gives the number of minutes required for each item:

Machine time Craftsman time

Item X 13 20

Y 19 29

The company has 40 hours of machine time available in the next working week but only 35 hours of craftsman time. Machine time is costed at £10 per hour worked and craftsman time is costed at £2 per hour worked. Both machine and craftsman idle times incur no costs. The revenue received for each item produced (all production is sold) is £20 for X and £30 for Y.

The company has a specific contract to produce 10 items of X per week for a particular customer.

- Formulate the problem of deciding how much to produce per week as a linear program.
 - Solve this linear program graphically
2. Solve using the Simplex method the following problem:
Maximize $Z = f(x,y) = 3x + 2y$
subject to: $2x + y \leq 18$



$$\begin{aligned} 2x + 3y &\leq 42 \\ 3x + y &\leq 24 \\ x \geq 0, y &\geq 0 \end{aligned}$$

3. Solve using the Simplex method the following problem:
Maximize $p = 2x - 3y + z$ Objective function
subject to $x + y + z \leq 10$
 $4x - 3y + z \leq 3$
 $2x + y - z \leq 10$
 $x \geq 0, y \geq 0, z \geq 0$
4. Develop a generalized program to solve optimized **Transportation problem**. First develop the program for a balanced problem, make a copy of that program and then modify to take care of unbalanced problem. Ask number of sources and destinations and the costs of transportation from every source to every destination. Show allocation at every step, final allocation and total transportation cost.
5. Develop a generalized program to solve optimized **Assignment problem**. First develop the program for a balanced problem, make a copy of that program and then modify to take care of unbalanced problem. Ask number of sources and destinations and the costs of transportation from every source to every destination. Show allocation at every step, final allocation and total transportation cost.
6. A certain item costs Rs. 75 per tonne. The requirement is 8,000 tonnes per year and each time the stock is replenished there is a set – up cost of Rs. 600. The cost of carrying inventory has been estimated at 12.8 per cent of the value of the stock per year. Find out the optimal order quantity, number of orders required to be placed in a year, number of days between two successive orders and total variable inventory cost. Assume 360 days in a year.
7. A television repairman finds that the time spent on repairing each TV has an exponential distribution with a mean of 15 minutes. He repairs the sets in the order in which they arrive.
The arrival of sets follows a Poisson distribution approximately with an average rate of 16 per 8 hour day. Find out for how many hours would the repairman be busy in a day, what is the average number of TV sets in the system and the average waiting time of a TV set in the system.
8. There are 5 workers and their work time to complete their jobs on different machines are given below. Develop a program to solve **Assignment problem** for minimum solution

	Machine 1	Machine 2	Machine 3	Machine 4	Machine 5
Worker 1	8	5	7	7	8
Worker 2	9	5	6	7	8
Worker 3	6	8	5	6	9
Worker 4	8	10	7	6	5
Worker 5	4	6	5	6	4

9. There are 5 salesman and each of them can work on any one of 5 districts. Table below shows average revenue generated by each of them. Develop a program to solve **Assignment problem** for maximization.



	District 1	District 2	District 3	District 4	District 5
Salesman 1	250	198	206	220	210
Salesman 2	240	220	196	208	212
Salesman 3	260	240	198	220	220
Salesman 4	240	250	194	208	200
Salesman 5	240	220	198	200	204

10. A television repairman finds that the time spent on his jobs has an exponential distribution with mean of 30 minutes. If he repairs sets in the order in which they came in, and if the arrival of sets follows a Poisson distribution approximately with an average rate of 10 per 8-hour day, what is the repairman's expected idle time each day? How many jobs are ahead of the average set just brought in?
11. On an average 96 patients per 24-hour day require the service of an emergency clinic. Also on an average, a patient requires 10 minutes of active attention. Assume that the facility can handle only one emergency at a time. Suppose that it costs the clinic Rs 100 per patient treated to obtain an average servicing time of 10 minutes, and that each minutes of decrease in this average time would cost Rs. 10 per patient treated. How much would have to be budgeted by the clinic to decrease the average size of the queue from one and one-third patients to half patient.
12. Students arrive at the head office according to a Poisson input process with a mean rate of 40 per hour. The time required to serve a student has an exponential distribution with a mean of 50 per hour. Assume that the students are served by a single individual, find the average waiting time of a student.
13. Develop a program to Find Critical Path, completion time, float time for following activity table.
- | Activity | Duration |
|----------|----------|
| 1-2 | 6 |
| 1-3 | 8 |
| 2-4 | 3 |
| 2-5 | 5 |
| 3-5 | 9 |
| 4-5 | 6 |
| 5-6 | 8 |

Desirable:

14. Develop a generalized **sequencing** program for n jobs and m machines. First develop a program for n jobs two machines, make a copy and then make it general for n jobs m machines. Show the sequence after every iteration, final sequence, total elapsed time and idle times for every machine



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Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Web Data Management (WDM)

Subject Code: 4659311

With effective
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year 2018-19

1. Learning Objectives:

- To understand data models, syntax, query languages, schemas, query analysis, type-checking, publishing, indexes, and storage methods for semi structured data represented in XML.

2. Prerequisites:

- Database Programming, Database Management Systems

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Introduction: Modelling Web Data Database Technology and Web Applications, Semi structured data, Web Data Management with XML, XML and syntax, XML Data Model, XLink and XPointer	20 %
Unit II	XPath and XQuery Regular Path Expressions, XPath Basics, XPath Steps and expressions, path evaluations, axes, node tests, predicates, XQuery Syntax, Flwor, expression, advanced features, Xupdate	20 %
Unit III	Typing Automata on ranked trees, unranked trees, XML schema, other schema languages, Graph Semi structured data, graph bisimulation, data guides, XML query evaluation, XML identifiers, XML evaluation technique.	20 %
Unit IV	Ontologies, Querying and Data Integration RDF, RDF Schema, OWL, Description Logic, Querying data through ontologies, Querying RDF data, querying through RDFS, Answering queries though DL, Global-as-view (GAV) and Local-as-view (LAV) mediation, Ontology based mediation, Peer-to-peer data management Systems	20 %
Unit V	Building Web scale applications Web search, web crawlers, web information retrieval, Web graph mining and current topics in web search, Distributed systems, failure management, Required properties of a distributed system, P2P networks, Hash-based structures, distributed indexing, Distributed computing with MapReduce	20 %

4. Text Book:

- 1) S. Abiteboul, I. Manolescu, P. Rigaux, M. Rousset and P. Senellart, Web Data Management, Cambridge University Press, 2012

5. Reference Books:

- 1) S. Abiteboul, P. Buneman and D. Suciu, Data on the Web: From Relational to Semistructured Data to XML, Morgan Kaufman Publisher
- 2) Research papers and W3C web site



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Subject Name: Web Data Management (WDM)

Subject Code: 4659311

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6. Accomplishment of the student after completing the course:

- 1) Have thorough understanding about state of the art in designing and building web applications and services, largely focusing on issues and challenges that revolve around the management and processing of web data.
- 2) Students will be able to use (i) current web technologies to develop dynamic web sites (ii) develop web sites that use dynamic content generated from a database

GTUQuestionPapers.com



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Syllabus for Master of Computer Applications, 5th Semester

Subject Name: Wireless Communication & Mobile Computing (WCMC)

Subject Code: 4659312

With effective
from academic
year 2018-19

1. Learning Objectives:

- To acquire conceptual knowledge of Mobile Computing, OS and its Architecture.
- To familiarize with the RFID, GSM, GPRS Technology.
- To familiarize with the WAP Protocol.

2. Prerequisites:

- Overview of Basic Networking, its protocol suite, Data Communications, Overview of Database and Distributed Systems.

3. Course Contents:

Unit	Course Content	Weightage Percentage
Unit I	Mobile Computing Introduction History of Wireless Communications, Types, propagation modes Wireless network architecture, Applications, Security, Concerns and Standards, Benefits, Future. Evolution of mobile computing, Needs of mobile users, SOC and AOC client, Mobile computing OS, Architecture for mobile computing, Three tier architecture, design considerations for mobile computing, mobile computing Through internet, making existing applications Mobile-Enabled.	20 %
Unit II	Mobile Technologies Bluetooth, Radio frequency identification (RFID), Wireless Broadband, MobileIP: Introduction, Advertisement, Registration, TCP connections, two level addressing, abstract mobility management model, performance issue, routing in mobile host, Adhoc networks, Mobile transport layer: Indirect TCP, Snooping TCP, Mobile TCP, Time out freezing, Selective retransmission, transaction Oriented TCPIpv6, Global system for mobile communication, GSM architecture, GSM entities, call routing in GSM, PLMN interface, GSM addresses and identifiers, network aspects in GSM, GSM frequency allocation, authentication and security, Short message services, Mobile computing over SMS, SMS, value added services accessing the SMS bearer.	30%
Unit III	General packet radio service(GPRS): GPRS and packet data network, GPRS network architecture, GPRS network operation, data services in GPRS, Applications of GPRS, Billing and charging in GPRS.	20 %
Unit IV	Wireless Application Protocol(WAP): Introduction to WebSocket, WebSocket API, WAP, MMS, GPRS application CDMA and 3G Spread-spectrum Technology, CDMA versus GSM, Wireless data, third generation networks, applications in 3G Wireless LAN, Wireless LAN advantages, IEEE802.11 standard Wireless LAN architecture, Mobility in Wireless LAN, Deploying Wireless LAN, Mobile adhoc networks and sensor networks, wireless LAN security, W iFi v/s 3G Voice over Internet protocol and convergence, Voice over IP, H.323 framework for	30%



GUJARAT TECHNOLOGICAL UNIVERSITY

Syllabus for Master of Computer Applications, 5th Semester

Subject Name: **Wireless Communication & Mobile Computing (WCMC)**

Subject Code: **4659312**

With effective
from academic
year 2018-19

	voice over IP,SIP, comparison between H.323 ad SIP, Real time protocols, convergence technologies, call routing, call routing, voice over IP applications, IMS, Mobile VoIP, Security issues in mobile Information security, security techniques and algorithms, security framework for mobile environment.	
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4. Text Book:

- 1) Mobile Computing , Asoke K Telukder, Roopa R Yavagal, TMH
- 2) The complete reference J2ME, TMH
- 3) Programming for Mobile and Remote Computers, G. T. Thampi, dreamtech
- 4) Handbook of Wireless Networks and Mobile Computing, Ivan Stojmenovic ,Wiley

5. Reference Books:

- 1) Principles of Mobile Computing, - Hansmann, Merk, Nicklous and Stober, Springer
- 2) Mobile Communications, Jochen Schiller, Pearson
- 3) Mobile Computing, Raj Kamal, Oxford
- 4) Mobile Computing, Wandra & Wandra, Akshat Pub.
- 5) Android Wireless Application Development, Shane Conder, Lauren Darcey, Pearson
- 6) Professional Android 2 Application development, Reto Meier, Wrox, Wiley India

6. Accomplishment of the student after completing the course:

- 1) Have thorough understanding about state of the art in Mobile Technologies, General packet radio service and Wireless Application Protocol.