# SCHEME & SYLLABUS

**(Choice Based Credit System)**

**for**

## M. TECH.

**in**

## COMPUTER SCIENCE and ENGINEERING

**(w.e.f. Session 2017-18)**

**Program Code: CSE 401**


**DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING**

**SCHOOL OF ENGINEERING**

**RIMT UNIVERSITY, MANDIGOBINDGARH, PUNJAB**

# TABLE OF CONTENTS


| S. No. | Content | Page No. |
|---|---|---|
| 1. | **Section 1**: Vision and Mission of the University | 2 |
| 2. | **Section 2**: Vision and Mission of the Department | 3 |
| 3. | **Section 3**: About the Program | 4 |
| 4. | **Section 4**: Program Educational Objectives (PEOs) , Program Outcomes (POs) and Program Specific Outcomes (PSOs) | 5-7 |
| 5. | **Section 5**: Curriculum / Scheme with Examination Scheme/ Course category-wise credit distribution | 8-22 |
| 6. | **Section 6**: Detailed Syllabus with Course Outcomes | 23-124 |

SECTION 1

# Vision & Mission of the University

**VISION**

- To contribute to the society through excellence in knowledge-based education utilizing the potential of computer science and engineering with a deep passion for wisdom, culture and values.

**MISSION**

1. To provide quality education to meet the need of profession and society.

2. Provide a learning ambience to enhance innovations, problem solving skills, leadership qualities, team-spirit and ethical responsibilities.

3. Provide exposure of latest tools and technologies in the area of computer science and engineering

SECTION 2

# Vision and Mission of the Department

**VISION**

- To contribute to the society through excellence in scientific and technical education and research.
- To contribute the country by providing globally competent Computer Engineers capable of working in an inter-disciplinary environment which foster spirits of innovation, entrepreneurship and leadership.
- To support industry for growth, being the valuable resource for them, and remain a role model for others in the field of Computer Engineering.

**MISSION**

- To provide a high-quality educational experience for undergraduate and graduate students that enables them to become leaders in their chosen professions and to make them globally competitive Computer engineers.
- To create, explore, and develop innovations in engineering and science through undergraduate and graduate research.
- To develop linkages with world class R&D organizations and educational institutions in India and abroad for excellence in teaching, research and consultancy practices.

SECTION 4

# Programme Educational Objectives, Programme Specific Outcomes and Programme Outcomes

The PEOs are broad statements that describe the career and professional accomplishments that the program is preparing its graduates to achieve in four years subsequent to receiving the degree. The PEOs of the 'M.Tech (CSE)' program are as follows

PEO1: To provide a solid foundation in various streams of Computer Science & Engineering

PEO2: Enrich the learners to exhibit research skills and knowledge to further their career.

PEO3: Exhibit Professionalism, ethical approach, communication skills, team work on multidisciplinary projects and adapt to modern trends by engaging in lifelong learning.

PEO4: Develop experimental setup for modelling of engineering problems.

**Programme Specific Objectives** (PSOs) are **specific statements** that describe the professional career accomplishments that the program is designed for. The PSO's of the 'M.Tech. (CSE)' are as follows:

PSO1: Design software systems, components, or processes to meet identified needs within economic, environmental and social constraints & make them employable in product-oriented Industry.

PSO2: Ability to apply mathematical foundations and algorithmic principles for modeling and simulation of engineering problems.

PSO3: Use research based knowledge and tools for the analysis and interpretation of data to synthesize information for obtaining valid conclusions.

**Programme Outcomes** (POs) are **attributes of the post-graduates** of the programme that are indicative of the graduates' ability and competence to work as a business professional upon post-graduation. Program Outcomes are statements that describe what students are expected to know or be able to do by the time of graduation. They must relate to knowledge and skills that the students acquire from the programme. The achievement of all outcomes indicates that the student is well prepared to achieve the program educational objectives down the road. POs designed for 'M.Tech. (CSE) ' are as follows:

**PO1** Ability to apply knowledge of mathematics, science and engineering fundamentals to the solution of complex engineering problems.

**PO2** Able to identify, formulate and analyse complex engineering problems to obtain valid conclusions using principles of mathematics, engineering sciences & programming skills.

**PO3** Ability to design solutions of complex engineering problems as well as can design system processes that meet the specified needs with the appropriate consideration for societal and environmental considerations.

**PO4** Able to use research-based knowledge and research methods including design, analysis and interpretation of data to provide valid conclusions.

**PO5** Able to use modern IT tools to complex engineering activities with an understanding of the limitations.

**PO6** Understanding of the social, cultural, global and environmental responsibilities of a professional engineer.

**PO7** Understanding of impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of and need for sustainable development.

**PO8** Understanding of professional and ethical responsibilities and commitment to them.

SECTION 5

# Curriculum / Scheme with Examination Grading Scheme

## INDUCTION PROGRAM

| **Induction Program (Mandatory)** | |
|---|---|
| Duration | 03 weeks |
| Frequency | Induction program for students to be offered right at the start of the first year |
| Activities | • Physical Activity<br>• Sports, Yoga & Stress Management<br>• Creative Arts<br>• Universal Human Values<br>• Lectures by Eminent People<br>• Visits to local Areas<br>• Familiarization to Dept./Branch & Innovations |

## SEMESTER WISE SUMMARY OF THE PROGRAMME: M.TECH. (COMPUTER SCIENCE AND ENGINEERING)

| S. No. | Semester | No. of Contact Hours | Marks | Credits |
|---|---|---|---|---|
| 1. | I | 16 | 500 | 16 |
| 2. | II | 20 | 500 | 18 |
| 3 | III | 21 | 500 | 26 |
| 4 | IV | 0 | 100 | 20 |
| | **Total** | **57** | **1600** | **80** |

# COURSE CATEGORY-WISE CREDIT DISTRIBUTION

| S.N. | CATEGORY | NUMBER OF CREDITS | PERCENTAGE WEIGHTAGE |
|---|---|---|---|
| 1 | **University Core** | 6 | 7.5 % |
| 2 | **University Open** | NIL | NIL |
| 3 | **Program Core** | 22 | 27.5 % |
| 4 | **Program Elective** | 12 | 15 % |
| 5 | **Program Specialization** | NA | NIL |
| 6 | **MOOCs** | 6 | 7.5 % |
| 7 | **Project / Research Projects** | 14 | 17.5% |
| 8 | **Thesis/Dissertation** | 20 | 25 % |
| 9 | **Training/Internships/Field Trips** | NA | NIL |
| 10 | **Professional Skills** | NA | NIL |
| 11 | **Any Other (Fundamental Courses & Basic Sciences)** | NIL | NIL |
| **TOTAL CREDITS** | | **80** | **100 %** |

# EXAMINATION GRADING SCHEME

| Marks Percentage Range | Grade | Grade Point | Qualitative Meaning |
|---|---|---|---|
| 80-100 | O | 10 | Outstanding |
| 70-79 | A+ | 9 | Excellent |
| 60-69 | A | 8 | Very Good |
| 55-59 | B | 7 | Good |
| 50-54 | B | 6 | Above Average |
| 45-49 | C | 5 | Average |
| 40-44 | P | 4 | Fail |
| 0-39 | F | 0 | Fail |
| ABSENT | AB | 0 | Fail |

**Percentage Calculation: CGPA *10**

| | | |
|---|---|---|
| **Program Code** | **:** | **M. Tech. Regular (Computer Science & Engineering)** |
| **Department** | **:** | **Department of Computer science & Engineering** |
| **Sem** | **:** | **1st** |

| **Teaching Scheme** | | | | | **Contact Hours/Week** | | | **Exam Duration (Hrs)** | | **Relative Weights (%)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S. No** | **Subject Code** | **Course Title** | **Subject Area** | **Credits** | **L** | **T** | **P** | **Theory** | **Practical** | **CWA** | **LWA** | **MTE** | **ETE** | **Total** |
| | | | | | | | | | | | | | | |
| **1** | MTCS-101 | Operation research and Methodology | Computer Science | 4 | 3 | 1 | - | 3 | - | 16 | - | 24 | 60 | 100 |
| **2** | MTCS-102 | Advance Computer Networks | Computer Science | 4 | 3 | 1 | - | 3 | - | 16 | - | 24 | 60 | 100 |
| **3** | MTCS-103 | Advance Database System | Computer Science | 4 | 3 | 1 | - | 3 | - | 16 | - | 24 | 60 | 100 |
| **4** | MTCS-104 | Lab-I (Advance Database System) | Computer Science | 2 | - | - | 4 | 0 | 2 | - | 100 | - | - | 100 |
| **5** | MTCS-181 | Seminar | Computer Science | 2 | - | - | - | 2 | - | - | 100 | | | 100 |
| | | **Total** | | **16** | **9** | **3** | **4** | **11** | **2** | **48** | **200** | **72** | **180** | **500** |

1. CWA: Class Work Assessment
2. LWA: Lab Work Assessment
3. MTE: Mid Term Examination
4. ETE: End Term Examination

| | | |
|---|---|---|
| **Program Code** | **:** | **M. Tech. Regular (Computer Science & Engineering)** |
| **Department** | **:** | **Department of Computer science & Engineering** |
| **Sem** | **:** | **2nd** |

| **Teaching Scheme** | | | | | **Contact Hours/Week** | | | **Exam Duration (Hrs)** | | **Relative Weights (%)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S. No** | **Subject Code** | **Course Title** | **Subject Area** | **Credits** | **L** | **T** | **P** | **Theory** | **Practical** | **CWA** | **LWA** | **MTE** | **ETE** | **Total** |
| | | | | | | | | | | | | | | |
| **1** | MTCS-105 | Advance Software Engineering | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| **2** | MTCS-106 | Digital Image Processing | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| **3** | **Department Elective – I** | | | | | | | | | | | | | |
| | MTCS-140 | Information Security | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| | MTCS-141 | Distributed System | Computer Science | | | | | | | | | | | |
| | MTCS-142 | Cryptography & Network Security | Computer Science | | | | | | | | | | | |
| **4** | **Department Elective – II** | | | | | | | | | | | | | |
| | MTCS-143 | Web Mining | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| | MTCS-144 | Data Ware Housing & Data Mining | Computer Science | | | | | | | | | | | |
| | MTCS-145 | Information Retrieval | Computer Science | | | | | | | | | | | |
| **5.** | MTCS-107 | Advance Software Engineering (Lab) | Computer Science | 2 | - | - | 4 | 0 | 2 | - | 100 | | | 100 |
| | | **Total** | | **18** | **12** | **4** | **4** | **12** | **2** | **64** | **100** | **96** | **240** | **500** |

| | | |
|---|---|---|
| **Program Code** | **:** | **M. Tech. Regular (Computer Science & Engineering)** |
| **Department** | **:** | **Department of Computer science & Engineering** |
| **Sem** | **:** | **3rd** |

| **Teaching Scheme** | | | | | **Contact Hours/Week** | | | **Exam Duration (Hrs.)** | | **Relative Weights (%)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S. No** | **Subject Code** | **Course Title** | **Subject Area** | **Credits** | **L** | **T** | **P** | **Theory** | **Practical** | **CWA** | **LWA** | **MTE** | **ETE** | **Total** |
| | | | | | | | | | | | | | | |
| **1** | MTCS-108 | Soft Computing | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| **2** | **Department Elective – III** | | | | | | | | | | | | | |
| | MTCS-146 | Software Testing and Validation | Computer Science | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| | MTCS-147 | Software Engineering Concepts and Methodology | Computer Science | | | | | | | | | | | |
| | MTCS-148 | Business Intelligence and Applications | Computer Science | | | | | | | | | | | |
| **3** | **Open Elective – I** | | | | | | | | | | | | | |
| | MTCS-149 | Big Data | | 4 | 3 | 1 | | 3 | - | 16 | - | 24 | 60 | 100 |
| | MTCS-150 | Natural Language Processing | | | | | | | | | | | | |
| | MTCS-151 | Cloud Computing | | | | | | | | | | | | |
| **4** | MTCS-182 | Pre-Thesis Seminar | | 4 | - | - | - | 0 | - | - | 100 | - | - | |
| **5** | MTCS-183 | Project | | 10 | - | - | - | 0 | - | - | 60 | - | 40 | |
| | | **Total** | | **26** | **9** | **3** | | **9** | | **48** | **160** | **72** | **220** | |
| | | | | | | | | | | | | | | |

| | | |
|---|---|---|
| **Program Code** | **:** | **M. Tech. Regular (Computer Science & Engineering)** |
| **Department** | **:** | **Department of Computer science & Engineering** |
| **Sem** | **:** | **4th** |

| **Teaching Scheme** | | | | | **Contact Hours/Week** | | | **Exam Duration (Hrs.)** | | **Relative Weights (%)** | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **S. No** | **Subject Code** | **Course Title** | **Subject Area** | **Credits** | **L** | **T** | **P** | **Theory** | **Practical** | **CWA** | **LWA** | **MTE** | **ETE** | **Total** |
| | | | | | | | | | | | | | | |
| **1** | MTCS-190 | DISSERTATION | Computer Science | 20 | | | | | | | | | 100 | 100 |
| | | **Total** | | **20** | | | **-** | | | | | | | **100** |

1. CWA: Class Work Assessment
2. LWA: Lab Work Assessment
3. MTE: Mid Term Examination
4. ETE: End Term Examination

**RIMT UNIVERSITY**

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-101** Course Title: **Operation Research and Methodology**

2. Contact Hours: **32** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** **0** **4** 6. Semester **1**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: After Studying this subject you should be able to: Understand the meaning, purpose, and tools of Operations Research, Describe the history of Operations Research, Describe the Stages of O.R, Explain the Applications of Operations Research.

10.Outcomes:

| | |
|---|---|
| MTCS-101.1 | Formulate research problem |
| MTCS-101.2 | Analyze literature review and find research gaps to finalize research objectives. |
| MTCS-101.3 | Identify the need of ethics in research. |
| MTCS-101.4 | Identify the need of IPR of research projects for economic growth and social benefits. |
| MTCS-101.5 | Apply basic data analytics techniques: probability distribution, linear regression, ANOVA |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit - I**<br>**Identifying And Defining Research Problem:** Locating, Analyzing, stating and evaluating problem, technique in defining a problem.<br>**Reviewing Literature:** Need, Sources-Primary and Secondary, Purposes/scope of Review, Steps in conducting review. | 8 |
| 2. | **Unit - II**<br>**Method of Research:** Research designs: Research design in case of exploratory research studies, research design in case of descriptive studies, Experimental Research and case study.<br>**Procedure for Writing A Research Proposal:** Purpose, types and components of research | 8 |
| 3. | **Unit - III**<br>**Procedure for Writing A Research Report And Research Paper:** Audiences and types of research reports, Format of Research report and journal. Strategies for evaluating research, disseminating and utilizing research- An Overview, Guidelines for writing research paper.<br>**Probability Distributions:**<br>Discrete probability distribution, Continuous uniform distribution, Normal distribution, Areas under the normal curve, t-distribution, F-distribution, Chi-square distribution. | 8 |
| 4. | **Unit - IV**<br>**Sample Estimation Problems:**<br>Point estimation, Interval estimation, the estimation of mean, the estimation of Variances, Estimation of proportions.<br>**Hypothesis:**<br>Basic concepts concerning testing of hypothesis, procedure for hypothesis testing, important parametric tests: z-test, t-test, chi-squared test, F-test. | 8 |
| | **Total** | **32** |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Probability and Statistics for Engineers and scientists Walpole, Myers, Myers and Ye, 9th edition Pearson Education | 2012 |
| 2 | C.R. Kothari, Research methodology- methods and techniques, New Age International publisher. | 2014 |

| | | |
|---|---|---|
| | | |
| 3. | Adrian Wallwork English for writing research papers, Springer | 2011 |
| 4. | Charles X Ling, Quang Yang, Crafting your research Future , Morgan & claypool Publishers, | 2012 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-102** Course Title: **Advance Computer Networks**

2. Contact Hours: **32** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester: **1**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: This course aims to provide advanced background on relevant computer networking topics to have a comprehensive and deep knowledge in computer networks.

10. Outcomes:

| | |
|---|---|
| MTCS-102.1 | Understand advanced concepts and next generation networks |
| MTCS-102.2 | Analyze TCP/IP variants, network Algorithm's, Protocols and their functionalities |
| MTCS-102.3 | Compare the available solution and apply the knowledge to fix the issues at various layers related to networking |
| MTCS-102.4 | Evaluate the performance of various network algorithms and protocols for effective and efficient networking. |
| MTCS-102.5 | Develop the network with the knowledge of subnetting, networking, supernetting and addresses. |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit - I**<br>Computer networks and layered architecture, Asynchronous Transfer Mode- ATM layered model, switching and switching fabrics, network layer in ATM, QOS, LAN emulation. | 8 |

| | | |
|---|---|---|
| | **Transport Layer-**Elements of transport protocols; Internet transport protocols: TCP and UDP, TCP connection management, congestion control. | |
| 2. | **Unit - II**<br>**Application Layer-**Network application architectures: Client-server, P2P and hybrid;<br>**Application layer protocols:** DNS, FTP, TFTP, TELNET, HTTP and WWW, SMTP and electronic mail; Network management and SNMP.<br>**Adhoc and Cellular networks-** Features, advantages and applications, Adhoc versus Cellular networks, Network architecture,<br>**Protocols:** MAC protocols, Routing protocols, Technologies. | 8 |
| 3. | **Unit - III**<br>**Wireless Communication Systems-** Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA.<br>**Wireless and Mobile Networks-**Wireless links and network characteristics, wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks. | 9 |
| 4. | **Unit - III**<br>**Introduction to Network Security-** Cryptography, symmetric and public-key algorithms, digital signatures, communication security, and authentication protocols, E-mail security, PGP and PEM. | 7 |
| **Total** | | **32** |

11. Suggested Books:

| Sr. No | Name of Books/ Authors | Year of Publication |
|---|---|---|
| 1 | Forouzan, B. A., "Data Communication and Networking", 3rd Ed., Tata McGraw-Hill, 5th edition | 2016 |
| 2 | Tanenbaum, A. S., "Computer Networks", 4th Ed., Pearson Education | 2002 |
| 3 | Stallings, W., "Network Security and Cryptography", 4th Ed., Prentice-Hall of India, 6th edition | 2013 |
| 4 | Theodore S. Rappaport, Wireless Communication: Principles and Practices (2ndEdition), Pearson Education | 2001 |

**Instructions for Question Paper:**The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-103** Course Title: **Advanced Database System**

2. Contact Hours: **32** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **1st**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: Introduce basic concepts and major techniques in DBMS implementations. These include concepts and techniques for data storage, query processing, and transaction management.

10. Outcomes:

| | |
|---|---|
| MTCS-103.1 | Design and implement Web database systems by satisfying the requirements and constraints |
| MTCS-103.2 | Apply the principles and practice of designing and implementing advanced databases |
| MTCS-103.3 | Analyse the features of embedded database and distributed database |
| MTCS-103.4 | Develop next generation databases such as cloud databases and column store database |
| MTCS-103.5 | Evaluate how to leverage data relationships using graph databases and designing multimedia databases |
| MTCS-103.6 | Identify issues in the performance of database systems and manage database recovery. |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit - I**<br>**Data Base Analysis and Design Techniques:** Review of basic Database Concepts, Database Design Methodologies. ER Modeling: Specialization, Generalization, Aggregation, Normalization Theory.<br>**Database Implementation using UML:** Introduction to UML, Structure diagrams, behavioral diagrams, object oriented analysis, class diagram. | 8 |
| 2. | **Unit - II**<br>**Advanced Transaction Processing and Concurrency Control:** Transaction Concepts, Concurrency Control: Locking Methods, Time-stamping Methods, Optimistic Methods for Concurrency Control, Concurrency Control in Distributed Systems.<br>**Query Compiler:** Introduction, parsing, generating logical query plan from parse tree.<br>**Query Processing:** Physical-Query-plan Operators. Operations: selection, sorting, join, project, set. | 8 |
| 3. | **Unit - III**<br>**Query Evaluation:** Introduction, Approaches to QE, Transformation of relational expressions in Query optimization, heuristic optimization, cost estimation for various operations, transformation rule.<br>**Distributed Database** Centralized DBMS and Distributed DBMS, functions and architecture of a DDBMS, Distributed data storage, Transparency issues in DDBMS, Query Processing DDBMS, Distributed Transaction Management and Protocols, Distributed Concurrency Control and Deadlock Management. | 7 |
| 4. | **Unit - IV**<br>**Object Oriented Database** Limitations of RDBMS, Need of Complex Data type, Data Definition, ODBMS Fundamentals, issues in OODBMS, Object-oriented database design. Comparison of ORDBMS and OODBMS.<br>**Emerging Database Models, Technologies and Applications** Multimedia database-Emergence, difference from other data types, structure, deductive databases, GIS and spatial databases, Knowledge database, Information Visualization, Wireless Networks and databases, Personal database, Digital libraries, web databases, case studies. | 9 |
| | **Total** | **32** |

12. Suggested Books:

| Sr. No | Name of Books/ Authors | Year of Publication |
|---|---|---|
| 1 | Advanced database management system by RiniChkrabarti and ShibhadraDasgupta, Dreamtech. | 2014 |
| 2 | Distributed Databases by Ozsu and Valduriez , Pearson Education. | 1999 |
| 3 | Fundamentals of Database Systems by RamezElmasri, ShamkantNavathe, 7th Edition Pearson Education | 2016 |
| 4 | Database System Concepts by Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 6th edition reprint Tata McGraw-Hill | 2017 |

**Instructions for Question Paper:** The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-104** Course Title: **Lab-I (Advance Database System)**

2. Contact Hours: **16** **L: 0** **T: 0** **P: 4**

3. Examination Duration (Hrs.): - **Theory** | **0** | **0** | **Practical** | **0** | **2**

4. Relative Weight**:** **CWA** - | | **LWA** | 100 | **MTE** | - | **ETE** | - | **EPE** | -

5. Credits**:** | **0** | **2** | 6. Semester **1**

7. Objective: Introduce basic concepts and major techniques in DBMS implementations. These include concepts and techniques for data storage, query processing, and transaction management.

**8.** Outcomes:

| | |
|---|---|
| MTCS-104.1 | Design and build a simple relational database system and demonstrate competence with the fundamentals tasks involved with modelling, designing and implementing a database. |
| MTCS-104.2 | Apply PL/SQL for processing databases. |
| MTCS-104.3 | Comparison between relational and non-relational (NoSQL) databases and the configuration of NoSQL Databases. |
| MTCS-104.4 | Understand the basic storage architecture of distributed file systems. |
| MTCS-104.5 | Design and deployment of NoSQL databases with real time requirements. |

## LAB-I (ADVANCE DATABASE SYSTEM)

The Students are required to implement the applications based on

1. Fuzzy databases
2. Expert databases
3. Object-oriented Databases
4. Distributed databases
5. Library management system
6. Crop management system
7. On-line sharing of computer systems
8. Highway systems
9. Hospital management system
10. Hotel management system
11. University management system
12. Inventory control
13. Railway management system
14. Any other similar database system

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-105** Course Title: **Advance Software Engineering**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: In this course the student will learn about some of the most advanced topics on Software Engineering. The objective of this course is to teach students the methodology to design and write secure code applying the Secure Software Engineering life Cycle.

10. Outcomes:

| | |
|---|---|
| MTCS-105.1 | A general understanding of software engineering, process and software process models. |
| MTCS-105.2 | Interprets minimum requirements, types of requirements for the development of application. |
| MTCS-105.3 | Describes various system models for business processes and understanding the existing system. |
| MTCS-105.4 | Develops and maintains efficient reliable software solutions by creating a blue print for further development |
| MTCS-105.5 | Constructs SW engineering testing and risk strategies, and develops their appropriate applications. |
| MTCS-105.6 | Develops critical thinking and evaluate assumptions and argument. |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>**Software Project Management:** Software Project Planning and its characteristics, Types of metrics, Effort Estimation- FP, LOC, FP vs. LOC, Schedule & Cost Estimation Models- Activity Networks-PERT/CPM, COCOMO-I, COCOMO-II, Risk Assessment- Probability Matrix, Risk Management. Agile Methodology- Scrum and XP. | 8 |
| 2. | **Unit-II**<br>**Formal Methods:** Basic concepts, mathematical preliminaries, applying mathematical notions for formal specification, Formal specification languages, using Z to represent an example software component, the ten commandments of formal methods, Formal methods- the road ahead. | 6 |
| 3. | **Unit-III**<br>**Component-Based Software Engineering:** CBSE process, Domain engineering, Component based development, Classifying and retrieving components and economics of CBSE. Client/Server Software Engineering: Structure of client/server systems, Software engineering for Client/Server systems, Analysis modelling issues, Design for Client/Server systems, testing issues<br>**Web Engineering:** Attributes Of web-based applications, the Web E process, a framework for WebE. Formulating, Analysing web-based systems, design and testing for web-based applications, Management issues. | 13 |
| 4. | **Unit-IV**<br>**Reengineering:** Business process reengineering, Software reengineering, Reverse reengineering, Restructuring, Forward reengineering, economics of reengineering.<br>**Software Quality:** CASE tools, metrics, Standards, Certification and Assessment. TQM, Bootstrap methodology, The SPICE project, ISO-IEC 15504, Six Sigma Concept for Software Quality.<br>**Computer-Aided Software Engineering:** Building Blocks for CASE, taxonomy Of CASE tools, integrated CASE environments, Integration architecture, and CASE repository. | 13 |
| | **Total** | **40** |

12. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Software Engineering a Practitioners Approach, Roger S. Pressman, | 2014 |

| | | |
|---|---|---|
| | McGraw-Hill 8thEdition | |
| 2. | Formal Specification and Documentation testing - A Case Study Approach, J.Bowan, International Thomson Computer Press, | 2003 |
| 3. | Software Engineering for Embedded Systems: Methods, Practical and Applications, Robert Oshana, Mark Kraeling, Newnes Publisher, 2013 | 2013 |
| 4. | Software Engineering Principles and Practice, Hans Van Vliet, Yded, | 2015 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-106** Course Title: **Digital Image Processing**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: Understand differences between computer vision and image processing. Know the basic components of an image processing system. Understand the basics of the human visual system as they relate to image processing; including spatial frequency resolution and brightness adaption.

10. Outcomes:

| | |
|---|---|
| MTCS-106.1 | Understand the need for image transforms different types of image transforms and their properties. |
| MTCS-106.2 | Develop any image processing application. |
| MTCS-106.3 | Understand the rapid advances in Machine vision. |
| MTCS-106.4 | Learn different techniques employed for the enhancement of images. |
| MTCS-106.5 | Learn different causes for image degradation and overview of image restoration techniques. |

11. Details of the Course:

| Sr. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>**Introduction:** Digital Image Representation, Fundamental Steps in Image Processing, Elements of a Digital Image Processing System. | 5 |

| | | |
|---|---|---|
| | **Digital Image Fundamentals:** Elements of Visual Perception, A Simple Image Model, Sampling and Quantization, Some Basic Relationships between Pixels, | |
| 2. | **Unit-II**<br>**Image Enhancement in Spatial Domain and Frequency Domain:** Spatial Domain Methods, Simple Intensity Transformations, Histogram Processing, Image Subtraction, Image Averaging, Smoothing Filters, Sharpening Filters, Lowpass Filtering, High pass Filtering. Introduction to the Fourier Transform, The Discrete Fourier Transform, FFT – DCT. Frequency Domain Methods and Smoothing Filters, Sharpening Filters in frequency domain.<br>**Image Restoration:** Degradations Model - Definitions, Degradation Model for Continuous Functions, Noise Models, Weiner filtering, Inverse filtering. | 12 |
| 3. | **Unit-III**<br>**Color Image processing:** Color Image-Processing Fundamentals, RGB Models, HSI Models, Relationship Between Different Models. Color Image Processing. **Image Compression:** Fundamentals – Coding Redundancy, Interpixel Redundancy, Psycho visual Redundancy, Fidelity Criteria. Image Compression Models, Loss Less- Variable-Length, Huffman, Arithmetic Coding - Bit-Plane Coding, Loss Less Predictive Coding, Lossy Transform (DCT) Based Coding, JPEG Standard - Sub Band Coding. | 11 |
| 4. | **Unit-IV**<br>**Morphology and Image Segmentation**-Dilation, Erosion, Opening and Closing. Hit and Miss Algorithms Feature Analysis. Edge Detection - Line Detection - Curve Detection, region based segmentation, threshold based segmentation. **Representation and Object Recognition:** - Edge Linking and Boundary Extraction, Boundary Representation, Region Representation and Object recognition methods | 12 |
| | **Total** | **40** |

10. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Rafael. C. Gonzalez & Richard E.Woods.- Digital Image Processing, 4/e Pearson Education, New Delhi. | 2018 |
| 2. | W.K.Pratt.-Digital Image Processing ,3/e Edn., John Wiley & sons, Inc. | 2006 |
| 3. | M. Sonka et.al Image Processing, Analysis and Machine Vision, 2/e, Thomson, Learning, India Edition. | 2007 |
| 4. | Digital Image Processing, Kenneth R Castleman, Pearson Education. | 1995 |
| 5. | Digital Image Processing, S. Jayaraman, S. Esakkirajan, T. Veerakumar, McGraw Hill Education. | 2009 |

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-176** Course Title: **Expert System**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: Provide you with understanding of the role of Artificial Intelligence, Expert Systems and Decision Models in managerial decision-making. Develop abilities to apply, build and modify decision models to solve real problems

10. Outcomes:

| | |
|---|---|
| MTCS-176.1 | Ability to design and develop expert system using Machine Learning |
| MTCS-176.2 | Ability to design and develop expert system using Fuzzy Logic |
| MTCS-176.3 | Ability to design and develop expert system using Deep Learning. |
| MTCS-176.4 | Ability to design and develop Hybrid expert system for real world problems. |

11. Details of the Course:

| Sr. No | Content | Contact Hrs |
|---|---|---|
| 1 | **Unit – I**<br><br>**Introduction:** Introduction to Expert System, Definitions, Importance of Expert System, characteristics features of Expert System, Applications of Expert System, Different categories of Expert Systems, Rule Based | 10 |

| | | |
|---|---|---|
| | System Architecture, and Neural Network Architecture.<br><br>**Knowledge Representations:** Components of a Knowledge in Expert system, OAV Triplets, Semantic Networks, Frames Representation via Logic Statements, Production Systems, Clause, Properties Rule properties, Rule Conversions, Multiple Conclusions, Neural Networks via Rule Based System | |
| 2 | **Unit – II**<br><br>**Knowledge Acquisition:** Introduction Knowledge Acquisition and domain Expert, Selection of the domain, Selection of the Knowledge Engineers, Selection of the Expert, Meetings and Plans, Organization of Meetings, Documentation, Multiple domain Experts, Knowledge Acquisition -An Example, Knowledge Acquisition using Rule induction, Generating Rules from Trees, ID3 algorithm for Rule Generation<br><br>**Design of Expert System:** Introduction, Selecting the appropriate Problem, Stages in the Developing Expert System, Errors in Development stages, Software Engineering and Expert Systems, The Expert System Life Cycle, Expert System Design Examples- Certainty factors, Decision tress. | 10 |
| 3 | **Unit – III**<br><br>**Inference Engine:** Inference Engine, Insight of Inference Engine, Search Strategies, Forward Chaining Algorithm, Algorithms for forward Chaining- Baseline Version, Backward Chaining Algorithm, Algorithms for Back word Chaining-Baseline Version, Mixed Modes of Chaining, Work sheets for Forward and Back word Chaining | 10 |
| 4 | **Unit – IV**<br><br>**Reasoning Under Uncertainty**: Uncertainty, Types of Error, Error and Induction, Classic Probability, Temporal Reasoning and Morcov Chines, TMS,Fuzzy Logic and Natural Languages computations, Probabilistic Reasoning, probabilistic Networks, Bayesian Networks. Use of Probability and Fuzzy logic in Expert System, Rule Induction by Machine Learning, Overview of Expert System Tools. | 10 |

12.Suggested Books

| Sr. No | Name of Book | Year |
|---|---|---|
| 1 | Expert System principals and Programming-Giarratano.Rilev.2003 | 2003 |
| 2 | Introduction to Expert SystemsV-James P.Iginizo.Mc.Graw-Hill.inc | 2012 |

| | | |
|---|---|---|
| 3 | Introduction to Expert Systems Peter Jackson, Addison Wesley Publishing Company | 2012 |
| 4 | Introduction to artificial Intelligence & Expert System- Pan W.patterson.PHI | 2014 |

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1. Subject Code**: MTCS-140** Course Title: **Information Security**

2.Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: To learn the ability to understand Information Security concepts, their architecture, tools and protocols used.

10. Outcomes:

| | |
|---|---|
| MTCS-140.1 | Define what information is appreciate the value of information to the modern Organisation |
| MTCS-140.2 | Understand the CIA triad of Confidentiality, Integrity and Availability |
| MTCS-140.3 | Appreciate the difficulties that arise when valuable information needs to be shared |
| MTCS-140.4 | Identify the five leading-edge resources that have up-to-date information on information security. |

11. Details of Course:

| S.No | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>**Overview:** Computer Security Concepts, Requirements, Architecture, Trends, Strategy, Edge/boundary Security: Firewalls, Intrusion Detection, Intrusion Prevention systems, Honeypots. **User Authentication**: Password, Password-based authentication, token based authentication, Biometric authentication, Remote User authentication | 9 |
| 2. | **Unit-II** | 14 |

| | | |
|---|---|---|
| | **Access Control:** Principles, Access Rights, Discretionary Access Control, Unix File Access Control, Role Based Access Control Internet Authentication Applications: Kerberos, X.509, PKI, Federated Identity Management. **Cryptographic Tools:** Confidentiality with symmetric encryption, Message Authentication & Hash Functions, Digital Signatures, Random and pseudorandom Numbers. Symmetric Encryption and Message Confidentiality: DES, AES, Stream Ciphers, Cipher Block Modes of Operation, Key Distribution. | |
| 3. | **Unit-III**<br><br>**Internet Security Protocols:** SSL, TLS, IPSEC, S/ MIME.<br>**Database Security:** The Need for Database Security, Database Management Systems, Relational Databases, Database Access Control, Inference, Statistical Databases, Database Encryption, Cloud Security | 10 |
| 4. | **Unit-IV**<br><br>**Malicious Software:** Types of Malicious Software (Malware), Propagation– Infected Content– Viruses, Propagation–Vulnerability Exploit–Worms, Propagation–Social Engineering–SPAM Email, Trojans, Payload–System Corruption, Payload–Attack Agent–Zombie, Bots, Payload– Information Theft–Keyloggers, Phishing, Spyware, Payload–Stealthing–Backdoors, Rootkits. | 7 |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1 | Computer Security: Principles and Practice, William Stalling & Lawrie Brown, 4th Edition, Pearson | 2018 |
| 2 | Chuck Easttom, "Computer Security Fundamentals" Pearson | 2011 |
| 3 | M. Stamp, "Information Security: Principles and Practice," 2nd Edition, Wiley. | 2011 |
| 4 | M. E. Whitman and H. J. Mattord, "Principles of Information Security," 4th Edition. | 2011 |
| 5 | M. Bishop, "Computer Security: Art and Science," Addison Wesley. | 2002 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-141** Course Title: **Distributed System**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester: **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: To study the various types of distributed systems, Models and various it's various features. To give the introduction of Inter-process communication and other features. Also, the details of distributed file systems. To give the students an introduction of various services like name services, name system etc., and distributed transaction features.

10. Outcomes:

| | |
|---|---|
| MTCS-141.1 | understanding of the concepts that underlie distributed computing systems |
| MTCS-141.2 | Define key mechanisms and analyze different models for distributed systems. |
| MTCS-141.3 | Correlate the different types of file system naming and messaging services which are used by different client processes. |
| MTCS-141.4 | Compare the concurrency control mechanisms in distributed transactional environment. |
| MTCS-141.5 | Outline the need for mutual exclusion and election algorithms in distributed systems |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **UNIT-I**<br>**Characterization of Distributed Systems:** Introduction, System models –Architectural and fundamental models with examples.<br>**Operating System Support:** Operating System layer, Protection, processes and threads, operating system architecture. | 6 |
| 2. | **UNIT-II**<br>**Interprocess communication:** API for internet protocol, Marshalling, Client server communication and group communication.<br>**Distributed objects and remote invocation**: communication between Distributed objects, RPC and characteristics. | 7 |
| 3. | **UNIT-III**<br>**Distributed File System**: File service architecture, network file system, Sun network file system, Andrew file system.<br>Case Study: Unix<br>**Name services:** Name services and domain name system, directory and discovery services.<br>Case Study: Global Name service | 10 |
| 4. | **UNIT-IV**<br>**Transaction and concurrency control:** transactions, nested transactions, Locks, optimistic concurrency control, time stamp ordering, Comparison of methods for concurrency control<br>**Distributed transaction:** Flat and nested distributed transactions. Atomic Commit protocol, Distributed dead locks.<br>**Distributed Multimedia systems**: characteristics of multimedia, multimedia data. Quality of service management, resource management, stream adaptation.<br>Case study; Tiger video file server. | 17 |
| | **Total** | 40 |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1 | A.S. Tanenbaum, Modern operating Systems, Prentience Hall, 3rd Edition. | 2015 |
| 2. | Seema Shah, et. al. Distributed Systems. | 2011 |
| 3. | G. Coulouis, et al. Distributed Systems: Concepts and design, Pearson Education Asia. | 2004 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-142** Course Title: **Cryptography and Network Security**

2. Contact Hours: **32** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** **0** **4** 6. Semester: **2**

7. Pre-requisite:

8.Subject Area: **Departmental Course (DC)**

9.Objective: The main objective of this course is to make student able to understand the basic concepts, services, threats and principles in network security, various security services and mechanisms in the network protocol stack.

10. Outcomes:

| | |
|---|---|
| MTCS-142.1 | Classify the symmetric encryption techniques. |
| MTCS-142.2 | Illustrate various Public key cryptographic techniques |
| MTCS-142.3 | Evaluate the authentication and hash algorithms. |
| MTCS-142.4 | Discuss authentication applications. |
| MTCS-142.5 | Basic concepts of system level security. |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **UNIT-I**<br><br>Security trends, Attacks and services, Classical crypto systems, Different types of ciphers, LFSR sequences, Basic Number theory, Congruences, Chinese Remainder theorem, Modular exponentiation, Fermat and Euler's | 8 |

| | | |
|---|---|---|
| | theorem, Legendre and Jacobi symbols, Finite fields, continued fractions. | |
| 2. | **UNIT-II**<br><br>Simple DES, Differential crypto analysis, DES – Modes of operation, Triple DES, AES, RC4, RSA, Attacks – Primality test – factoring. | 6 |
| 3. | **UNIT-III**<br><br>Discrete Logarithms, Computing discrete logs, Diffie-Hellman key exchange, ElGamal Public key cryptosystems, Hash functions, Secure Hash, Birthday attacks, MD5, Digital signatures, RSA, ElGamal DSA. | 8 |
| 4. | **UNIT-IV**<br><br>Authentication applications – Kerberos, X.509, PKI – Electronic Mail security – PGP, S/MIME – IP security – Web Security – SSL, TLS, SET. Intruders, Malicious software, viruses and related threats, Firewalls, Security Standards. | 10 |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Wade Trappe, Lawrence C Washington, "Introduction to Cryptography with coding theory", 2nd ed, Pearson. | 2007 |
| 2. | William Stallings, "Cryptography and Network Security Principles and Practices", Pearson/PHI, 4th ed. | 2006 |
| 3. | W. Mao, "Modern Cryptography – Theory and Practice", Pearson Education, Second Edition. | 2007 |
| 4. | Charles P. Pfleeger, Shari Lawrence Pfleeger – Security in computing Third Edition –Prentice Hall of India. | 2006 |
| 5. | Behrouz Forouzan, Cryptography & Network Security, McGraw-Hill, 2nd ed. | 2011 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-143** Course title: **Web Mining**

2. Contact Hours: **40** **L:** 3 **T:** 1 **P:** 0

3. Examination Duration (Hrs.): **Theory** 0 3 **Practical** 0 0

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** 0 4 6. Semester 2

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: Web Mining is one of the main activities in the complex process of Knowledge Discovery in Databases (KDD).The course deals with the fundamentals of this subject, by focusing on the most important algorithmic techniques.

10. Outcomes:

| | |
|---|---|
| MTCS-143.1 | Have the ability to describe key areas such as OLAP (that stands for On Line Analytical Processing) Design, Data Warehousing (DW) and Data Mining (DM) and various tasks in Data preprocessing |
| MTCS-143.2 | Have the ability to provide an overview of most common tasks and application areas of data warehousing and classification |
| MTCS-143.3 | Have the ability to provide an overview of Association and Cluster Analysis |
| MTCS-143.4 | Grasp the idea and implementation of most common techniques used in Data mining and Warehousing |
| MTCS-143.5 | Fully appreciate the necessary background and skills to turn available data into valuable and useful information |

11. Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **UNIT-I**<br>**Data mining Overview and Advanced Pattern Mining**<br>Data mining tasks – mining frequent patterns, associations and correlations, classification and regression for predictive analysis, cluster analysis, outlier analysis; advanced pattern mining in multilevel, multidimensional space – mining multilevel associations, mining multidimensional associations, mining quantitative association rules, mining rare patterns and negative patterns. | 9 |
| 2. | **UNIT-II**<br>**Advance Classification**<br>Classification by back propagation, support vector machines, classification using frequent patterns, other classification methods – genetic algorithms, roughest approach, fuzz>set approach;<br>**Advance Clustering**<br>Density - based methods –DBSCAN, OPTICS, DENCLUE; Grid-Based methods – STING, CLIQUE; Exception – maximization algorithm; clustering High- Dimensional Data; Clustering Graph and Network Data. | 17 |
| 3. | **UNIT-III**<br>**Web and Text Mining**<br>Introduction, web mining, web content mining, web structure mining, we usage mining, Text mining – unstructured text, episode rule discovery for texts, hierarchy of categories, text clustering. | 7 |
| 4. | **UNIT-IV**<br>**Temporal and Spatial Data Mining**<br>Introduction; Temporal Data Mining – Temporal Association Rules, Sequence Mining, GSP algorithm, SPADE, SPIRIT Episode Discovery, Time Series Analysis, Spatial Mining – Spatial Mining Tasks, Spatial Clustering. Data Mining Applications. | 7 |
| | **Total** | **40** |

11. Suggested Books

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Data Mining Concepts and Techniques, Jiawei Hang Micheline Kamber, Jian pei, Morgan, Kaufmannn. | 2011 |
| 2. | Data Mining Techniques – Arun K pujari, Universities Press. | 2011 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-144** Course Title: **Data Ware Housing & Data Mining**

2. Contact Hours: **38** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester **2**

7. Pre-requisite:
8. Subject Area: **Departmental Course (DC)**

9. Objective: To learn the ability to understand Data warehousing concepts, various models used for analyzing and exploring the data. To learn the ability to understand Data Mining Concepts and web mining.

10. Outcomes:

| | |
|---|---|
| MTCS-144.1 | Understand the data Warehouses, Operational Data Stores (ODS) and OLAP characteristics |
| MTCS-144.2 | Classify the kinds of data, functionalities, issues in data mining, similarity and dissimilarity measures and illustrate various preprocessing, Visualization techniques for Data analysis. |
| MTCS-144.3 | Analyze the frequent patterns using association analysis algorithms like apriori, FP-growth etc |
| MTCS-144.4 | CO3 Build Classification model using Decision tree, Naive Bayes, Rule based, support vector machines and evaluate the performance of a classifier |
| MTCS-144.5 | Create cluster using different cluster analysis methods |

11. Details of Course:

| S.No | Contents | Contact Hours |
|---|---|---|
| 1. | **UNIT-I**<br><br>**Data warehousing:** Introduction, ETL, Data warehouses– design guidelines for data warehouse implementation, Multidimensional Models; OLAP-introduction, Characteristics, Architecture, Multidimensional view and data cube, Data cube operations, data cube computation.<br><br>**Review of the Basic Data Analytic Methods using R**: Introduction to R – look at the data, Analyzing and Exploring the Data, Statistics for Model Building and Evaluation. | 13 |
| 2. | **UNIT-II**<br><br>**Data mining:** Introduction, association rules mining, Naive algorithm, Apriori algorithm, direct hashing and pruning (DHP), Dynamic Item set counting (DIC), Mining frequent pattern without candidate generation (FP, growth), performance evaluation of algorithms, | 7 |
| 3. | **UNIT-III**<br><br>**Classification:** Introduction, decision tree, tree induction algorithms – split algorithm based on information theory, split algorithm based on Gini index; naïve Bayes method; estimating predictive accuracy of classification method.<br><br>**Cluster analysis:** Introduction, partitional methods, hierarchical methods, density based methods, dealing with large databases, cluster software; | 8 |
| 4. | **UNIT-IV**<br><br>**Search engines:** Characteristics of Search engines, Search Engine Functionality, Search Engine Architecture, Ranking of web pages, The search engine history, Enterprise Search, Enterprise Search Engine Software.<br><br>**Web data mining:** Web Terminology and Characteristics, Locality and Hierarchy in the web, Web Content Mining, Web Usage Mining, Web Structure Mining, Web mining Software. | 10 |

11. Suggested Books:

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1 | Carlo Vercellis, Business Intelligence: Data mining and Optimization for Decision Making, WILEY. | 2009 |
| 2 | Han J., Kamber M. and Pei J. , bData mining concepts and techniques, | 2011 |

| | | |
|---|---|---|
| | Morgan Kaufmann Publishers (2011) 3rd ed. | |
| 3 | Pudi V., Krishana P.R., Data Mining, Oxford University press, 1st edition | 2009 |
| 4 | Adriaans P., Zantinge D., Data mining, Pearsoneducation press 1st edition | 1996 |
| 5 | Pooniah P. , Data Warehousing Fundamentals, Willey interscience Publication, 1st edition | 2001 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-145** Course Title: **Information Retrieval**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** | **0** | **4** | 6. Semester **2**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: In this course, you will learn the underlying technologies of these and other powerful tools for accessing and mining text Information. You will be able to learn the basic principles and algorithms for information retrieval as well as obtain hands-on experience with using existing information retrieval toolkits to set up your own search engines and improving their search accuracy.
10. Outcomes: Student will be able to :

| | |
|---|---|
| MTCS-145.1 | Describe the objectives of information retrieval systems. |
| MTCS-145.2 | Describe models like vector-space, probabilistic and language models to identify the similarity of query and document. |
| MTCS-145.3 | Implement clustering algorithms like hierarchical agglomerative clustering and k-means algorithm. |
| MTCS-145.4 | Understand relevance feedback in vector space model and probabilistic model. |
| MTCS-145.5 | Illustrate how N-grams are used for detection and correction of spelling errors. |
| MTCS-145.6 | Design the method to build inverted index. |
| MTCS-145.6 | Describe the objectives of information retrieval systems. |

11. Details of the Course:

| SNO. | CONTENTS | CONTACT HOURS |
|---|---|---|
| 1 | **UNIT-I**<br>**Introduction to information retrieval** Mathematical basics<br>Vector spaces and similarity, Probabilities and Statistics<br>**Text Analysis and Preprocessing** Document processing, stemming, String matching, Basic NLP tasks – POS tagging, shallow parsing | 11 |
| 2 | **UNIT-I**<br>**Overview of text retrieval systems:** System architecture, Boolean models, Inverted Indexes, Document ranking, IR Evaluation<br>**Retrieval models and implementation: Vector Space Models**<br>Vector space models, TF-IDF weighting, Retrieval axioms, Implementation issues. | 12 |
| 3 | **UNIT-I**<br>**Probabilistic models; statistical language models** Okapi/BM25, Language models, KL-divergence, Smoothing;<br>**Query expansion and feedback** Query reformulation; Relevance feedback, Pseudo-relevance feedback, Language model based feedback | 11 |
| 4 | **UNIT-I**<br>**Web Search Engines**, Models of the Web, Web crawling, Static ranking, PageRank, HITS, Query log analysis, Adversarial IR | 6 |

11. Suggested Books:

| SNO. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Introduction to information retrieval Christopher D. Manning, Hinrich Schütze, and Prabhakar Raghavan | 2008 |
| 2. | Modern Information Retrieval | 1999 |
| 3. | Search Engines: Information Retrieval in Practice Donald Metzler, | 2010 |

| | | |
|---|---|---|
| | Trevor Strohman, and W. Bruce Croft | |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-107** Course Title: **Advance Software Engineering (Lab)**

2. Contact Hours: **16** **L: 0** **T: 0** **P: 4**

3. Examination Duration (Hrs.): **Theory** **0** **0** **Practical** **0** **2**

4. Relative Weight**:** **CWA** - **LWA** 100 **MTE** - **ETE** - **EPE**

5. Credits**:** **0** **2** 6. Semester **2**

7. Objectives: In this course the student will learn about some of the most advanced topics on Software Engineering. The objective of this course is to teach students the methodology to design and write secure code applying the Secure Software Engineering life Cycle.

8. Course Outcomes:

| | |
|---|---|
| CO1 | Demonstrate knowledge of the wider software engineering context, software engineering processes and their applicability. |
| CO2 | Understand a problem domain and to elicit, analyze, and specify the requirements of a software system solution. |
| CO3 | Describe and formulate test cases to perform different levels of testing. |
| CO4 | Identify and outline specific components of a software design that can be targeted for reuse. |
| CO5 | Analyze the engineering problems encountered in system and software development |

## LAB-2 (ADVANCE SOFTWARE ENGINEERING)

Course Outcomes:

| | |
|---|---|
| MTCS-107.1 | Analyze and prepare SRS document and design document. |
| MTCS-107.2 | Analyze the data flow with the entities and their relationship to develop DFD model of the project. |
| MTCS-107.3 | Use Case model to capture the functional requirements of a any problem |
| MTCS-107.4 | Design the dynamic view of an application by identifying the objects and the interaction between them |
| MTCS-107.5 | Design the static view of an application by identifying the classes and the relationship between them. |

The Students are required to implement the applications based on

1. Fuzzy databases
2. Expert databases
3. Object-oriented Databases
4. Distributed databases
5. Library management system
6. Crop management system
7. On-line sharing of computer systems
8. Highway systems
9. Hospital management system
10. Hotel management system
11. University management system
12. Inventory control
13. Railway management system
14. Any other similar database system

# RIMT UNIVERSITY

NAME OF DEPT.: **Computer Science and Engineering**

1. Subject Code: **MTCS-108** Course Title: **Soft Computing**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0** |

4. Relative Weight: **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits: | **0** | **4** | 6. Semester: | **3** |

7. Subject Area: **Departmental Course (DC)**
8. Objective: The Objective of this course is to teach basic neural networks, fuzzy systems, Genetic Algorithms and optimization algorithms concepts and their relations.
9. Course Outcome:

| | |
|---|---|
| MTCS-108.1 | Understand the concepts of Neuro, Fuzzy and Soft Computing and understand the Input Space partitioning and Fuzzy Modeling. |
| MTCS-108.2 | To understand the concepts of Genetic Algorithm and understand the Working Principle, Procedure of GA. |
| MTCS-108.3 | Analyse the concept of Derivative-based Optimization and Simulated Annealing, Random Search, Downhill Simplex Search and their application development. |
| MTCS-108.4 | Apply the concept of Supervised Learning Neural Networks and Unsupervised Learning Neural Networks their application in the field of computer science to solve problems |
| MTCS-108.5 | Design Neuro Fuzzy Modeling using Methods that Cross-fertilize ANFIS and RBFN and Framework Neuron Functions for Adaptive Networks, Neuro Fuzzy Spectrum. |

10. Details of the Course:

| Sr. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>Soft Computing: Introduction of soft computing, soft computing vs. hard computing, various types of soft computing techniques, applications of soft computing. | 5 |
| 2. | **Unit-II**<br>Fuzzy Logic: Fuzzy set versus crisp set, basic concepts of fuzzy sets, membership functions, basic operations on fuzzy sets and its properties. Fuzzy relations versus Crisp relation. Fuzzy rule base system: Fuzzy propositions, fuzzy rules, fuzzy reasoning, Fuzzy Inference Systems (FIS) – Fuzzification and Defuzzification, fuzzy decision making & Applications of fuzzy logic. | 10 |
| 3. | **Unit-III**<br>Structure and Function of a Single Neuron: Biological neuron, artificial neuron, definition of ANN and its applications. Neural Network architecture: Single layer and multilayer feed forward networks and recurrent networks. Learning rules and equations: Perceptron, Hebb's, Delta, winner take all and out-star learning rules. Supervised and Unsupervised Networks. | 10 |
| 4. | **Unit-IV**<br>Genetic Algorithm: Fundamentals, basic concepts, working principle, encoding, fitness function, reproduction, Genetic modeling: selection operator, cross over, mutation operator, Stopping Condition and GA flow, Constraints in GA, Applications of GA, Classification of GA. Hybrid Soft Computing Techniques: An Introduction, Neuro-Fuzzy Hybrid Systems, Genetic Neuro-Hybrid systems, Genetic fuzzy Hybrid and fuzzy genetic hybrid systems. | 15 |
| | **Total** | **40** |

| S.NO | Name of Books |
|---|---|
| 1 | S. Rajasekaran & G.A. Vijayalakshmi Pai, 'Neural Networks, Fuzzy Logic & Genetic Algorithms, Synthesis & applications', 1st Edn., PHI Publication, 2003. |
| 2 | S.N. Sivanandam& S.N. Deepa, 'Principles of Soft Computing', 2nd Edn., Wiley Publications, 2008. |
| 3 | Michael Negnevitsky, 'Artificial Intelligence', 2nd Edn., Pearson Education, New Delhi, 2008. |
| 4 | Timothy J. Ross, 'Fuzzy Logic with Engineering Applications', 3rd Edn., Wiley, 2011. |
| 5 | Bose, 'Neural Network fundamental with Graph, Algoithm & Application', TMH, 2004. |
| 6 | Kosko, 'Neural Network & Fuzzy System', 1st Edn., PHI Publication, 2009. |

| | |
|---|---|
| 7 | Klir & Yuan, 'Fuzzy sets & Fuzzy Logic: Theory & Application', PHI, 1995 |
| 8 | Hagen, 'Neural Network Design', 2nd Edn., Cengage COURSE, 2008. |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-146** Course Title: **Software Testing and Validation**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** **0** **4** 6. Semester **3**

7. Pre-requisite:
8. Subject Area: **Departmental Course (DC)**
9. Objective: Software Testing is a critical element of software quality assurance and represents the ultimate review of a system's source code with the intent of discovering bugs. Presents theory and practice of software testing. Covers structural testing including such topics as syntax testing, mutation testing, tools for software testing, testing specifications, black-box and white-box testing, code inspections, metrics, usability testing, testing documentation, website testing, security testing, beta testing, quality assurance, and software safety.
10. Outcomes:

| | |
|---|---|
| MTCS-146.1 | Understand the functional and system testing methods. |
| MTCS-146.2 | Analyze the different characteristics of structural testing methods |
| MTCS-146.3 | Demonstrate the integration testing which aims to uncover interaction and compatibility problems as early as possible. |
| MTCS-146.4 | Deploy different software testing techniques and strategies and be able to apply specific(automated) unit testing method to the projects. |

11. Details of the Course:

| SNO. | CONTENTS | CONTACT HOURS |
|---|---|---|
| 1 | **Unit-I**<br>Introduction to Software Testing, Software Safety, Software Testing | 10 |

| | | |
|---|---|---|
| | Realities Testing Software Specifications | |
| 2 | **Unit-II**<br>White-box Testing (Part 1: Control-flow Testing) Testing Tools, White-box Testing (Part 2: Data-flow Testing) Testing Tools | 12 |
| 3 | **Unit-III**<br>Website Testing, Usability Testing Website Validation (Case Study): Revealing Design Treasures from the Amazon (Jared Spool), Genetic Algorithms Other Resources on Genetic Algorithms | 12 |
| 4 | **Unit-IV**<br>Code Inspections, Testing the Documentation, Software Metrics, Testing for Security | 6 |

11. Suggested Books:

| SNO. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Software Quality Approaches: Testing, Verification, and Validation: Software Best Practice 1 Michael Haug (Editor), Eric W. Olsen (Editor), Luisa Consolini (Editor) | 2001 |
| 2. | Software Quality Engineering: Testing, Quality Assurance and Quantifiable Improvement Jeff Tian | 2006 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-147** Course Title: **Software Engineering Concepts and Methodology**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** **0** **4** 6. Semester **3**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: In this course the student will learn about some of the most advanced topics on Software Engineering. The objective of this course is to teach students the methodology to design and write secure code applying the Secure Software Engineering life Cycle.

10. Outcomes

| | |
|---|---|
| MTCS-147.1 | To acquire Basic knowledge and understanding of the analysis and design of complex systems, |
| MTCS-147.2 | Ability to apply software engineering principles and techniques |
| MTCS-147.3 | To produce efficient, reliable, robust and cost-effective software solutions |
| MTCS-147.4 | Ability to develop, maintain and evaluate large-scale software systems |
| MTCS-147.5 | To manage time, processes and resources effectively by prioritising competing demands to achieve personal and team goals |

Details of the Course:

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1 | **Unit-I**<br>**Project Management:** The management spectrum, The People; stakeholders, software team, Agile teams, coordination and communication issues, the product; problem decomposition, the process; modeling the product and process, process decomposition, The W5 HH principle, RAD model, Metrics for process and projects, software measurements. Agile Methodology- Scrum and XP. Cleanroom Software | 12 |

| | | |
|---|---|---|
| | Engineering: The cleanroom approach, Functional specification, Cleanroom design and testing. | |
| 2 | **Unit-II**<br>**Formal Methods:** Basic concepts, mathematical preliminaries, Applying mathematical notions for formal specification, Formal specification languages, Z specification Language, Formal methods- the road ahead, **Reengineering:** Business process reengineering, Software reengineering, Reverse reengineering, Restructuring, Forward reengineering, economics of reengineering. | 12 |
| 3. | **Unit-III**<br>**Component-Based Software Engineering:** Engineering of component - based systems, CBSE process, Domain engineering, Component-based development, Classifying and retrieving components and economics of CBSE. Computer-Aided Software Engineering: Building Blocks for CASE, taxonomy of CASE tools, integrated CASE environments, Integration architecture, and CASE repository | 10 |
| 4 | **Unit-IV**<br>**Software Testing:** Testing, Verification and Validation, Test Strategies for Conventional and Object Oriented Software, Unit Testing, Integration Testing, Validation Testing, Alpha and Beta Testing, System Testing, Recovery Testing, Security Testing, Stress Testing, Performance Testing, Metrics for Source Code, Metrics for Testing, Debugging Process, Debugging Strategies. | 6 |
| | **Total** | **40** |

11. Suggested Books

| Sl. No. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Roger S. Pressman, Software Engineering a Practitioners Approach, McGraw-Hill, 8th Ed., | 2016 |
| 2. | Sommerville, Software Engineering, Pearson, 7th Ed., | 2005 |
| 3. | J. Bowan, Formal Specification and Documentation testing - A Case Study Approach, International Thomson Computer Press | 2003 |
| 4. | James S. Peters, Witold Pedrycz, Software engineering an engineering approach, Wiley India, | 2011 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-148**

Course Title: **Business Intelligence and Application**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** | **0** | **4** | 6. Semester **3**

7. **Pre-requisite**:
8. **Subject Area**: **Departmental Course (DC)**

9. **Objectives:**

- To Implement the key elements of a successful business intelligence (BI) program
- To Apply a BI meta model that turns outcomes into actions
- To Extract and transform data from an operational data to a data business data
- To Exploit business analytics and performance measurement tools

10. Outcomes:

| | |
|---|---|
| MTCS-148.1 | Understanding the concepts and components of Business Intelligence (BI). |
| MTCS-148.2 | To evaluate use of BI for supporting decision making in an organisation. |
| MTCS-148.3 | Understand and use the technologies and tools that make up BI (e.g. Data warehousing, Data reporting and use of Online analytical processing (OLAP)) |
| MTCS-148.4 | Understand and design the technological architecture that underpins BI systems |

11. **Details of the Course:**

| Sl. No | Content | Contact Hours |
|---|---|---|
| 1 | **Unit-I**<br>Development Steps, BI Definitions, BI Decision Support Initiatives, Development Approaches, Parallel Development Tracks, BI Project Team Structure, Business Justification, Business Divers, Business Analysis Issues, Cost – Benefit Analysis, Risk Assessment, Business Case Assessment Activities, Roles Involved In These Activities, Risks Of Not Performing Step, Hardware, Middleware, DBMS Platform, Non Technical Infrastructure Evaluation | 10 |
| 2 | **Unit-II** | 8 |

| | | |
|---|---|---|
| | Managing The BI Project, Defining And Planning The BI Project, Project Planning Activities, Roles And Risks Involved In These Activities, General Business Requirement, Project Specific Requirements, Interviewing Process | |
| 3 | **Unit-III**<br>Differences in Database Design Philosophies, Logical Database Design, Physical Database Design, Activities, Roles And Risks Involved In These Activities, Incremental Rollout, Security Management, Database Backup And Recovery | 8 |
| 4 | **Unit-IV**<br>Growth Management, Application Release Concept, Post Implementation Reviews, Release Evaluation Activities, The Information Asset and Data Valuation, Actionable Knowledge – ROI, BI Applications, The Intelligence Dashboard**.** Business View of Information Technology Applications: Business Enterprise excellence, Key purpose of using IT, Type of digital data, basics f enterprise reporting, BI road ahead. | 14 |

11. Suggested Books.

| Sl. No | Name of Books / Authors | Publication Year |
|---|---|---|
| 1. | Larissa T Moss and Shaku Atre – Business Intelligence Roadmap: The Complete Project Lifecycle for Decision Support Applications, Addison Wesley Information Technology Series, 2003. | 2003 |
| 2. | R N Prasad, Seema Acharya – Fundamentals of Business Analytics 2nd edition, Wiley India. | 2016 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-149** Course Title: **Big Data**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** - **MTE** 24 **ETE** 60 **EPE** -

5. Credits**:** **0** **4** 6. Semester **3**

**7. Pre-requisite**:

**8. Subject Area**: **Departmental Course (DC)**

| Sl. No. | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>**Introduction:** Velocity, Variety, Veracity; Drivers for Big Data, Sophisticated Consumers, Automation, Monetization, Big Data Analytics Applications: Social Media Command Center, Product Knowledge Hub, Infrastructure and Operations Studies, Product Selection, Design and Engineering, Location-Based Services, Online Advertising, Risk Management | 9 |
| 2. | **Unit II**<br>**Architecture Components:** Massively Parallel Processing (MPP) Platforms, Unstructured Data Analytics and Reporting: Search and Count, Context-Sensitive and Domain-Specific Searches, Categories and Ontology, Qualitative Comparisons, Data Privacy Protection, Real-Time Adaptive Analytics and Decision Engines | 8 |
| 3. | **Unit-III**<br>**Analysis of data at Rest**- Hadoop analytics: Limitations of existing distributing systems, Hadoop Approach, Hadoop Architecture, Distributed file system: HDFS and GPFS, Internals of Hadoop MR engine, Need for High level language- JAQL and PIG | 7 |
| 4. | **Unit-IV**<br>**Mining Data Streams:** Stream Data Mode l and Management Stream Source, Stream Queries, and issues, Sampling Data in a Stream, Filtering | 16 |

| | | |
|---|---|---|
| | Streams, Counting Distinct Elements in a Stream, Estimating Moments, Counting Ones in a Window, Decaying Windows Link Analysis**:** Page Ranking in web search engines, Efficient Computation of PageRank using MapReduce and other approaches, Topic-Sensitive PageRank, Link Spam, Hubs and Authorities | |
| | **Total** | 40 |

**9. Objectives:**

- Introduce students the concept and challenge of big data (3 V's: volume, velocity, and variety).
- Teach students in applying skills and tools to manage and analyze the big data.

10. Outcomes:

| | |
|---|---|
| MTCS-149.1 | To handle the big data issues and implementation in various application in theindustry. |
| MTCS-149.2 | To understand the machine learning based modelling techniques and its implementation. |
| MTCS-149.3 | To understand and implement the classification-based model such as decision tree, and Bayesian. |
| MTCS-149.4 | To check the model validity and its performance based on performance metrics and understand the data collection and visualization. |
| MTCS-149.5 | To create chart based pictorial presentation of data with animation. |

11. Details of the Course:

11. Suggested Books

| S. No | Name of Book / Author | Publication year |
|---|---|---|
| 1 | Big Data Analytics:Disruptive Technologies for Changing the Game, Dr. Arvind Sathi,, First Edition October 2012, IBM Corporation . | 2012 |
| 2 | Mining of Massive Datasets, Anand Rajarama, Jure Leskovec, Jeffrey D. Ullman.E-book, 2013 | 2013 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1.Subject Code**: MTCS-150** Course Title: **Natural Language Processing**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** | **0** | **3** | **Practical** | **0** | **0** |

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** | **0** | **4** | 6. Semester: **3**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Objective: This course provides an introduction to the field of Natural Language Processing. It includes relevant background material in Linguistics, Mathematics, Probabilities, and Computer Science. Some of the topics covered in the class are Text Similarity, Part of Speech Tagging, Parsing, Semantics, Question Answering, Sentiment Analysis, and Text Summarization

10. Outcomes:

| | |
|---|---|
| MTCS-150.1 | Basics of text components and text processing. |
| MTCS-150.2 | To differentiate among different techniques while considering different plus andminus of each technique. |
| MTCS-150.3 | To classify text, reduce Dimensionality, use different Topic Modelling Approaches and Algorithms. |
| MTCS-150.4 | Ability to understand the advanced processor architecture and concept ofRTOS. |
| MTCS-150.5 | Analyze text data from different real-world situations. |

11. Details of the Course:

| SNO. | CONTENTS | CONTACT HOURS |
|---|---|---|
| 1 | **Unit-I**<br>**Introduction;** what is Natural Language Processing, hands-on demonstrations. Ambiguity and uncertainty in language. The Turing test. Regular Expressions: Chomsky hierarchy, regular languages, and their limitations. Finite-state automata. Practical regular expressions for finding and counting language phenomena. A little morphology. | 6 |
| 3 | **Unit-II**<br>**Programming in Python**<br>An introduction to programming in Python. Why Python? Variables, numbers, strings, arrays, dictionaries, conditionals, iteration. The NLTK (Natural Language Toolkit), with demonstrations.<br>**String Edit Distance and Alignment Key algorithmic tool:** dynamic programming, first a simple example, then its use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation. String Edit Distance and Alignment Key algorithmic tool: dynamic programming, first a simple example, then its use in optimal alignment of sequences. String edit operations, edit distance, and examples of use in spelling correction, and machine translation | 9 |
| 3 | **Unit-III**<br>**Context Free Grammars** Constituency, CFG definition, use and limitations. Chomsky Normal Form. Top-down parsing, bottom-up parsing, and the problems with each. The desirability of combining evidence from both directions.<br>**Non-probabilistic Parsing** Efficient CFG parsing with CYK, another dynamic programming algorithm. Also, perhaps, the Earley parser. | 12 |

| | | |
|---|---|---|
| | Designing a little grammar, and parsing with it on some test data.<br><br>**Probability** Introduction to probability theory--the backbone of modern natural language processing. Events, and counting. Joint and conditional probability, marginal, independence, Bayes rule, combining evidence. Examples of applications in natural language. | |
| 4. | **Unit-IV**<br>**Information Theory** What is information? Measuring it in bits. The "noisy channel model." The "Shannon game"--motivated by language! Entropy, cross-entropy, information gain. Its application to some language phenomena.<br><br>**Language modeling and Naive Bayes** Probabilistic language modeling and its applications. Markov models. N-grams. Estimating the probability of a word, and smoothing. Generative models of language. Their application to building an automatically-trained email spam filter, and automatically determining the language (English, French, German, Dutch, Finnish, Klingon?).<br><br>**Part of Speech Tagging and Hidden Markov Models** The concept of parts-of-speech, examples, usage. The Penn Treebank and Brown Corpus. Probabilistic (weighted) finite state automata. Hidden Markov models (HMMs), definition and use. **Unsupervised Language Discovery** Automatically discovering verb sub categorization | 13 |

11. Suggested Books:

| SNO. | Name of Books / Authors | Year of Publication |
|---|---|---|
| 1. | Speech and Language Processing Daniel Jurafsky, James H. Martin | 2000 |
| 2. | Foundations of Statistical Natural Language Processing Christopher D. Manning, Hinrich Schütze | 1999 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.

# RIMT UNIVERSITY

NAME OF DEPT.**:** **Computer Science and Engineering**

1. Subject Code**: MTCS-151** Course Title: **Cloud Computing**

2. Contact Hours: **40** **L: 3** **T: 1** **P: 0**

3. Examination Duration (Hrs.): **Theory** **0** **3** **Practical** **0** **0**

4. Relative Weight**:** **CWA** 16 **LWA** **MTE** 24 **ETE** 60 **EPE**

5. Credits**:** **0** **4** 6. Semester: **3**

7. Pre-requisite:

8. Subject Area: **Departmental Course (DC)**

9. Course Objectives:

| | |
|---|---|
| MTCS-151.1 | Understand the core concepts of the cloud computing paradigm: how and why this paradigm shift came about, the characteristics, advantages and challenges brought about by the various models and services in cloud computing. |
| MTCS-151.2 | Apply fundamental concepts in cloud infrastructures to understand the tradeoffs in power, efficiency and cost, and then study how to leverage and manage single and multiple data centers to build and deploy cloud applications that are resilient, elastic and cost-efficient |
| MTCS-151.3 | Discuss system, network and storage virtualization and outline their role in enabling the cloud computing system model. |
| MTCS-151.4 | Analyze various cloud managing mechanisms and cloud fundamental architectures |

11. Details of the Course:

| SI.No | Contents | Contact Hours |
|---|---|---|
| 1. | **Unit-I**<br>**Introduction and Evolution of Computing Paradigms:** Overview of Existing Hosting Platforms, Cluster Computing, Grid Computing, Utility Computing, Autonomic Computing, mesh, Introduction to Cloud Computing, Cloud Computing history and evolution, practical applications of cloud computing for various industries, economics and benefits of cloud computing. Cloud Issues and Challenges: Cloud computing issues and challenges like Security, Elasticity, Resource management and scheduling, QoS (Quality of Service) and Resource Allocation, Cost Management, Big Data. | 13 |
| 2. | **Unit-II**<br>**Data Center**: Classic Data Center, Virtualized Data Center (Compute, Storage, Networking and Application) , Business Continuity in VDC **Cloud Computing Architecture:** Cloud Architecture model, Types of Clouds: Public Private & Hybrid Clouds, Cloud based services: Iaas, PaaS and SaaS. | 8 |
| 3. | **Unit-III**<br>**Classification of Cloud Implementations:** Amazon Web Services, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), Google AppEngine - PaaS, Windows Azure, Aneka, A Comparison of Cloud Computing Platforms . Classification of Cloud Implementations: Amazon Web Services, The Elastic Compute Cloud (EC2), The Simple Storage Service (S3), The Simple Queuing Services (SQS), Google AppEngine - PaaS, Windows Azure, Aneka, A Comparison of Cloud Computing Platforms . **Virtualization:** Virtualization, Advantages and disadvantages of Virtualization, Types of Virtualization: Resource Virtualization i.e. Server, Storage and Network virtualization, Migration of processes, VMware vCloud – IaaS | 14 |
| 4. | **Unit-IV**<br>**Cloud based Data Storage:** Introduction to Map Reduce for Simplified data processing on Large clusters, Design of data applications based on Map Reduce in Apache Hadoop, Task Partitioning, Data partitioning, Data Synchronization, Distributed File system, Data Replication , Shared access to weakly consistent to data stores, introduction to Python. | 5 |
| | **Total** | 40 |

11. Suggested Books

| SI.NO | Name of Books/Authors | Year of Publication |
|---|---|---|
| 1 | Raj Kumar Buyya, James Broberg, AndrezeiM.Goscinski, Cloud Computing: Principles and paradigms. | 2011 |
| 2 | Michael Miller, Cloud Computing, Que Publishing. | 2008 |
| 3 | Cloud Computing: A practical Approach Anthony Velte, Toby Velte and Robert Elsenpeter by Tata McGrawHill. | |
| 4 | Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies. | 2009 |

**Instructions for Question Paper:**

The question paper consists of two sections A, & B. Each section contains 4 questions. Students will attempt any five questions from both the sections. At least two questions from each section must be attempted. All questions carry equal marks.