SCHEME & SYLLABUS

(Choice Based Credit System)

for

B. TECH.

in

COMPUTER SCIENCE and ENGINEERING

(w.e.f. Session 2018-19)

Program Code: CSE 301

DEPARTMENT OF COMPUTER SCIENCE and ENGINEERING

SCHOOL OF ENGINEERING

RIMT UNIVERSITY, MANDIGOBINDGARH, PUNJAB

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SECTION 1

Vision & Mission of the University

VISION

To become one of the most preferred learning places a centre of excellence to promote and nurture future leaders who would facilitate in desired change in the society

MISSION

- To impart teaching and learning through cutting edge technologies supported by the world class infrastructure

- To empower and transform young minds into capable leaders and responsible citizens of India instilled with high ethical and moral values

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 'B.Tech (CSE)' program are as follows

PE01 To be able to explore areas of research, application & innovation and make impact in different types of institutional settings such as corporate entities, government bodies, NGOs, inter-government organizations, & start-ups.

PEO2 To be able to design, and implement strategies to the organizational problems through data analysis tools, effectively deploy knowledge of business analytics, demonstrate critical thinking skills & make the intellectual connections between quantitative and qualitative tools, theories and context to solve the organizational problems

PEO3 To be able to work with, lead & engage big and small teams comprising diverse people in terms of gender, nationality, region, language, culture & beliefs. To understand stated and unstated differences of views, beliefs & customs in diverse & inter disciplinary team settings

PEO4 To be able to continuously learn and update one's knowledge, engage in lifelong learning habits and acquire latest knowledge to perform in current work settings

PEO5 To continuously strive for justice, ethics, equality, honesty, and integrity both in personal and professional pursuits.Able to understand and conduct in a way that is responsible and respectful.

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

PSO1 To enable the graduates of Computer Science & Engineering in using problem solving skills to develop, test and implement the effective computing solutions for a given specification to meet local and global market requirements.

PSO2 To facilitate the graduates of the Computer Science & Engineering with logical as well as practical knowledge to implement the suitable techniques/technologies for requirements using current generation software tools or automated systems.

PSO3 To groom the graduates of the Computer Science & Engineering to work in multicultural with multidisciplinary teams for sustainable development and pursue lifelong professional development in engineering.

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 'B.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, natural sciences and engineering sciences.

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.

PO9 Ability to function effectively as an individual and in a group with the capacity to be a leader or manager.

PO10 Ability to communicate effectively, not only with engineers, but also with the community at large.

PO11 Able to apply managerial skills for managing of projects and in multidisciplinary environments.

PO12 Able to recognize the need to undertake life-long learning, and possessing/acquiring the capacity to do so in the broadest context of technological change.

The following sections describe the requirements for earning a Bechelor's degree in B.Tech (CSE) and its break-down in terms of University Core courses, Program Core courses and electives at both the University and the Program levels.

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 • Sports, Yoga & Stress Management • Creative Arts • Universal Human Values • Lectures by Eminent People • Visits to local Areas • Familiarization to Dept./Branch & Innovations

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

S. No.	Semester	No. of Contact Hours	Marks	Credits
1.	I	31	900	25
2.	II	31	800	25
3	III	35	900	27
4	IV	35	900	25
5	V	35	1100	27
6	VI	31	1000	24
7	VII	31	800	23
8	VIII	-	500	16
	Total	229	6900	192

COURSE CATEGORY-WISE CREDIT DISTRIBUTION

S. No.	Category	Number of Credits	Percentage Weight age
1	University Core	8	4.2%
2	University Open	11	5.7%
3	Program Core	80	42.1%
4	Program Elective	6	3.1%
5	Program Specialization	NA	NIL
6	MOOCs	Upto3	Upto5%
7	Project / Research Projects	22	11.6%
8	Thesis/Dissertation	NA	NA
9	Training/Internships/Field Trips	2	1.1%
10	Professional Skills	1	.5%
11	Any Other(Fundamental)	62	32.6%
TOTAL CREDITS		**192**	**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 : B. Tech. (Computer Science and Engineering)   **Total Credits: 27**
Department : Department of Computer Science and Engineering   **Contact Hours: 35**
Year : 2nd Year / 3rd Semester

S. No	Subject Code	Course Title	Subject Area	Credits	Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
					L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	BTCS-2302	Mathematics-III	B	4	3	2	-	3	-	16	-	24	60	-	100
2	BTCS-2303	Digital circuits & logic design	ES	4	3	2	-	3	-	16	-	24	60	-	100
3	BTCS-2304	Data structures	C	4	3	2	-	3	-	16	-	24	60	-	100
4	BTCS-2305	Object oriented programming using C++	C	4	3	2	-	3	-	16	-	24	60	-	100
5	BTCS-23AAA	Open Elective -I	EL	4	3	2	-	3	-	16	-	24	60	-	100
6	BTCS-2306	Data Structures Lab	C	2	-	-	4	-	-	-	60	-	-	40	100
7	BTCS-2307	Digital circuits & logic design Lab	ES	1	-	-	2	-	-	-	60	-	-	40	100
8	BTCS-2308	Object oriented programming using C++ Lab	C	2	-	-	4	-	-	-	60	-	-	40	100
9	BTCS-2309	Institutional Training	IS	2	-	-		-	-	-	100	-	-	-	100
Total				27	15	10	10	-	-	-	-	-	-	-	900

 # The marks will be awarded on the basis of 04 weeks Institutional Practical training conducted after 2nd semester

	Course Code	Course Title
	BTCS-2311	Big Data Analytics
	BTCS-2312	Digital and Cyber Forensics
	BTCS-2313	Fundamentals of Mainframe & Skills
	BTCS-2310	Neural Network and Fuzzy logic
Open Elective - I	BTME-2305	Manufacturing Process
	AECN-3103	Agriculture Marketing, Trade and Prices
	BTEE-2305	Electrical Measuring Instruments
	AEXT	Agriculture Heritage
	BTCS-2301	Computer Architecture
	BTEC-2305	Electronics Measurement & Instrumentations

Program : B. Tech. (Computer Science and Engineering)   **Total Credits: 25**
Department : Department of Computer Science and Engineering   **Contact Hours: 35**
Year : 2nd Year / 4th Semester

S. No	Subject Code	Course Title	Subject Area	Credits	L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	Total
		Teaching Scheme			**Contact Hours/Week**			**Exam Duration (Hrs)**		**Relative Weights (%)**					
1	BTCS-2401	Operating Systems	C	4	3	2	-	3	-	16	-	24	60	-	100
2	BTCS-2402	Discrete Structures	B	4	3	2	-	3	-	16	-	24	60	-	100
3	BTCS-2403	Computer Networks-I	C	4	3	2	-	3	-	16	-	24	60	-	100
4	BTCS-2404	Microprocessor& Assembly Language Programming.	ES	4	3	2	-	3	-	16	-	24	60	-	100
5	BTCS-2405	Database Management Systems	C	4	3	2	-	3	-	16	-	24	60	-	100
6	BTCS-2406	Operating System Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
7	BTCS-2407	Computer Networks-I Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
8	BTCS-2408	Database Management System Lab	C	2	-	-	4	-	-	-	60	-	-	40	100
9	BTCS-2409	Microprocessor& Assembly Language Programming Lab	ES	1			2				60			40	100
Total				25	15	10	10	-	-		-	-	-	-	900

Program : B. Tech. (Computer Science and Engineering) **Total Credits: 27**
Department : Department of Computer Science and Engineering **Contact Hours: 35**
Year : 3rd Year / 5th Semester

S. No	Subject Code	Course Title	Subject Area	Credits	Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
					L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	BTCS-3501	Computer Networks –II	C	4	3	2	-	3	-	16	-	24	60	-	100
2	BTCS-3502	Relational Database Management System II	C	4	3	2	-	3	-	16	-	24	60	-	100
3	BTCS-3503	Design and Analysis of Algorithms	C	4	3	2	-	3	-	16	-	24	60	-	100
4	BTCS-3504	Computer Graphics	C	4	3	2	-	3	-	16	-	24	60	-	100
5	BTCS-35BBB	Open Elective - II	EL	4	3	2	-	3	-	16	-	24	60	-	100
6	BTCS-3506	Computer Networks –II Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
7	BTCS-3507	Relational Database Management System II Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
8	BTCS-3508	Computer Graphics Lab	ES	1	-	-	2	-	-	-	60	-	-	40	100
9	BTCS-3509	Design and Analysis of Algorithms LAB	C	1			2				60			40	100
10	BTPD-3521	Personality Development-I	H	1	-	-	2	-	-	-	100	-	-	-	100
11	BTCS-3510	Industrial Training*	P	2	-	-		-	-	-	60	-	-	40	100

Total		27	15	10	10	-	-	-	-	-	-	-	1100

	Course Code	Course Title
	BTCS-3505	Computer Peripherals & Interfaces
	BTCS-3511	Linux on Mainframes
	APBG3105	Intellectual Property Rights
	BTME-3505	Industrial Automation and Robotics
Open Elective - II	BTME-3503	Mechanical Measurement & Metrology
	BTEE-3503	Generation of Electrical Power
	BTEC-3503	Antenna & Wave Propagation
	BTEC-3510	Cognitive Radio
	AENV	Environmental Studies and Disaster Management

Program : **B. Tech. (Computer Science and Engineering)**   **Total Credits: 24**
Department : **Department of Computer Science and Engineering**   **Contact Hours: 31**
Year : **3rd Year / 6th Semester**

S. No	Subject Code	Course Title	Subject Area	Credits	Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
					L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	BTCS-3601	Simulation and Modeling	C	4	3	2	-	3	-	16	-	24	60	-	100
2	BTCS-3602	Compiler Design	C	4	3	2	-	3	-	16	-	24	60	-	100
3	BTCS-3603	Software Engineering	C	4	3	2	-	3	-	16	-	24	60	-	100
4	BTCS-3604	Web Technologies	C	4	3	2	-	3	-	16	-	24	60	-	100
5	BTCS-36XXX	Departmental Elective-I	EL	3	3	-	-	3	-	16	-	24	60	-	100
6	BTCS-3605	Simulation and Modeling Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
7	BTCS-3606	Software Engineering Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
8	BTCS-3607	Web Technologies Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
9	BTPD-3621	Personality Development-II	H	1	-	-	2	-	-	-	100	-	-	-	100
10	BTCS-3608	Major Project Synopsis Seminar	P	1	-	-		-	-	-	100	-	-	-	100
Total				24	15	8	8	-	-	-	-	-	-	-	1000

	Course Code	Course Title
Department Elective - I	BTCS 3611	Digital image Processing
	BTCS 3612	Mobile Applications Development
	BTCS 3613	Expert Systems
	BTCS-3614	Mainframe DBMS(DB2)
	BTCS-3615	IoT And Applications
	BTCS-3616	Development Automation
	BTCS-3617	Cyber Crime Investigation & Digital Forensics
	BTCS-3618	Robotics

Program : B. Tech. (Computer Science and Engineering)   **Total Credits: 23**
Department : Department of Computer Science and Engineering   **Contact Hours: 31**
Year : 4th Year / 7th Semester

S. No	Subject Code	Course Title	Subject Area	Credits	Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
					L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	BTCS-4701	Artificial Intelligence	C	4	3	2	-	3	-	16	-	24	60	-	100
2	BTCS-4702	Theory of Computation	C	4	3	2	-	3	-	16	-	24	60	-	100
3	BTCS-4703	Java Programming	C	4	3	2	-	3	-	16	-	24	60	-	100
4	BTCS-47YYY	Departmental Elective-II	EL	3	3	-	-	3	-	16	-	24	60	-	100
5	BTCS-47CCC	Open Elective -III	EL	3	3	-	-	3	-	16	-	24	60	-	100
6	BTCS-4704	Artificial Intelligence Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
7	BTCS-4705	Java Programming Lab	C	1	-	-	2	-	-	-	60	-	-	40	100
8	BTCS-4706	Major Project	P	3	-	-	6	-	-	-	60	-	-	40	100
Total				23	15	6	10	-	-	-	-	-	-	-	800

	Course Code	Course Title
	BTCS 4714	Software Testing and Quality Assurance
Department Elective - II	BTCS 4715	Introduction of Business System
	BTCS 4716	Wireless Sensor Networks
	BTCS 4718	Build & Release Management
	BTCS 4719	Distributed Processing using HADOOP
	BTCS 4720	Intrusion Detection & Prevention System
	APBG3105	Intellectual Property Rights
	BTME-3505	Industrial Automation and Robotics
	BTME-3503	Mechanical Measurement & Metrology
	BTEE-3503	Generation of Electrical Power
Open Elective - III	BTEC-3503	Antenna & Wave Propagation
	BTEC-3510	Cognitive Radio
	AENV	Environmental Studies and Disaster Management
	BTCS-3505	Computer Peripherals & Interfaces
	BTCS-3511	Linux on Mainframes
	BTCS-4728	Machine Learning

Program : B. Tech. (Computer Science and Engineering)   **Total Credits: 16**
Department : Department of Computer Science and Engineering   **Contact Hours: 00**
Year : 4th Year / 8th Semester

S. No	Subject Code	Course Title	Subject Area	Credits	Contact Hours/Week			Exam Duration (Hrs)		Relative Weights (%)					Total
					L	T	P	Theory	Practical	CWA	LWA	MTE	ETE	EPE	
1	BTCS-4801	Industrial Training	P	8	-	-	-	-	-	-	150	-	-	100	250
2	BTCS-4802	Software Training	P	8	-	-	-	-	-	-	150	-	-	100	250
Total				16	-	-	-	-	-	-	-	-	-	-	500

*The marks will be awarded on the basis of 06 months industrial training conducted in 8th semester

SECTION 6

Detailed Syllabus with Course Outcomes

SYLLABUS

SEMESTER-III

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Name of Department**:**   **Computer Science and Engineering**

1.Subject Code**: BTCS-2302**   Course Title:**Mathematics-III**

2.Contact Hours: **40**   **L: 3   T: 2   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 teach computer based Engineering Mathematics to students. After this course the student will be able to solve complex computer oriented problems.

10. Course Outcomes:

CO1	Understand the concept of partial differentiation and their applications and the concept Asymptotes of, Curvature & Curve Tracing.
CO2	Apply the techniques of multiple integral.
CO3	Apply concepts of vector calculus
CO4	Compute various matrices by applying the concepts of linear algebra.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Fourier series:** Periodic Functions, Euler's Formula. Even and odd Functions, Half range expansions, Fourier series of different waveforms	4
2	**Laplace transformations:** Laplace transforms of various standard functions, properties of Laplace transform.	6
3	**Partial Differential Equations:** Formation of Partial Differential Equations, linear Partial Differential Equations, Homogeneous Partial Differential Equations with constant coefficients.	11

4	**Functions of complex variables:** Limits, continuity and derivatives of the function of complex variables, Analytic function, Cauchy- Riemann equations, conjugate functions	8
5	**Linear Systems and Eigen- Values**: Gauss – elimination method, gauss- Jordan method, Gauss- Seidel iteration method, Rayleigh's Power method for Eigen values and Eigenvectors.	4
6	**Differential Equations:** Solutions of Initial values problems using Eulers, modified Eulers method and Runge- kutta (upto fourth order) methods.	7
7	**Probability distribution:** Binomial, Poisson and Normal distribution.	4
8	**Sampling Distribution & testing of Hypothesis**: Sampling, Distribution of means and variance, ChiSquare distribution, t- distribution, F- distribution. General concepts of hypothesis, Testing a statistical Hypothesis, One and two tailed tests, critical region, Confidence interval estimation. Single and two sample tests on proportion, mean and variance.	5

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	E. Kreyszig," Advanced Engineering Mathematics", 5th Edition, Wiley Enstern 1985.	1985
2	P. E. Danko, A. G. Popov, T. Y. A. Kaznevnikova, " Higher Mathematics in Problems and Exercise", Part 2, Mir Publishers, 1983.	1983
3	Bali, N. P., "A Text Book on Engineering Mathematics", Luxmi Pub., New Delhi	1986
4	Peter V.O'Neil," Advanced Engineering Mathematics", Cengage Learning	1998

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

1.Subject Code**: BTCS-2303**   Course Title:**Digital Circuits & Logic Design**

2.Contact Hours: **40**   **L: 3   T: 2   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:To teach operation on digital circuits and design various logics. After this course the student will be able to solve complex computer oriented problems.

10. Course Outcome:

CO1	Apply the knowledge of various electronic Devices and its operations
CO2	Analyse the problem to select suitable electronic device like amplifiers, oscillators, multiplexers, etc.
CO3	Design the solutions related to computations through electronic circuits and devices.
CO4	Apply the knowledge about electronics on the computation related requirements like ROM, RAM, etc.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Number Systems**: Binary, Octal, Decimal, Hexadecimal. Number base conversions, 1's, 2's, rth's complements, signed Binary numbers. Binary Arithmetic, Binary codes: Weighted BCD, Gray code, Excess 3 code, ASCII – conversion from one code to another.	5
2	**Boolean Algebra:** Boolean postulates and laws–De-Morgan'sTheorem, Principle of Duality, Boolean expression –	**5**

	Boolean function, Minimization of Boolean expressions – Sum of Products (SOP), Product of Sums (POS), Minterm, Maxterm, Canonical forms, Conversion between canonical forms, Karnaugh map N Minimization, Quine-McCluskey method - Don't care conditions.	
3	**Logic GATES:** AND, OR, NOT, NAND, NOR, Exclusive-OR and Exclusive-NOR. Implementations ofLogic Functions using gates, NAND-NOR implementations. Study of logic families like RTL, DTL, DCTL, TTL, MOS, CMOS, ECL and their characteristics.	4
4	**Combinational Circuits:** Design procedure–Adders, Subtractors, Serial adder/ Subtractor, Parallel adder/Subtractor Carry look ahead adder, BCD adder, Magnitude Comparator, Multiplexer/Demultiplexer, encoder/decoder, parity checker, code converters. Implementation of combinational logic using MUX.	5
5	**Sequential Circuits:** Flip flops SR, JK, T, D and Master slave, Excitation table, Edge triggering, Level Triggering, Realization of one flip flop using other flip flops. Asynchronous/Ripple counters, Synchronous counters, Modulo-n counter, Ring Counters. Classification of sequential circuits-Moore and Mealy, Design of Synchronous counters: state diagram, Circuit implementation. Shift registers.	4
6	**Memory Devices:** Classification of memories, RAM organization, Write operation, Read operation, Memorycycle. Static RAM Cell-Bipolar, RAM cell, MOSFET RAM cell, Dynamic RAM cell. ROM organization, PROM, EPROM, EEPROM, Field Programmable Gate Arrays (FPGA).	4
7	**Signal Conversions:** Analog & Digital signals. A/D and D/A conversion techniques (Weighted type, R-2R Ladder type, Counter Type, Dual Slope type, Successive Approximation type).	4

12. Suggested Books:

SNO.	Name of Books / Authors
1	Morris Mano, **Digital Design**, Prentice Hall of India Pvt. Ltd
2	Thomas L. Floyd, **Digital Fundamentals**, Pearson Education, Inc, New Delhi, 2003

3	R.P.Jain, Modern **Digital Electronics**, 3 ed., Tata McGraw–Hill publishing company limited, New Delhi, 2003.
4	Donald P.Leach and Albert Paul Malvino, **Digital Principles and Applications**, 5 ed., Tata McGraw Hill Publishing Company

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

1.Subject Code**:** **BTCS-2304**   Course Title: **Data Structures**

2.Contact Hours: **40**   **L: 3**   **T: 2**   **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: To learn the concepts of data structure and algorithms and its implementation. The course has the main ingredients required for a computer science graduate and has all the necessary topics for assessment of data structures and algorithms.
10. Course Outcome:

CO1	Define data structure and demonstrate the complexity of data structure.
CO2	Analyse the various sorting and searching algorithms with the help of arrays and linked lists
CO3	Distinguish between applications of stack and queues.
CO4	Develop the solution for organizing data in graph and tree data structures

11.Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Introduction**: Data Structures and data types, Efficient use of memory,	5

	Recursion, operations on data structures, time and space complexity of algorithms, Asymptotic Notations.	
2	**Arrays**: Linear and multi-dimensional arrays and their representation in memory, operations on arrays, sparse matrices and their storage.	5
3	**Linked Lists**: Singly linked lists, operations on link list, linked stacks and queues, polynomial addition, sparse matrices, doubly linked lists and dynamic storage management, circular linked list.	5
4	**Stacks and Queues**: Concepts of stack and queues, memory representations, operations on stacks and queues, application of stacks such as parenthesis checker, evaluation of postfix expressions, conversion from infix to postfix representation, implementing recursive functions, deque, priority queue, applications of queues. Garbage collection	6
5	**Trees**: Basic terminology, sequential and linked representations of trees, traversing a binary tree using recursive and non-recursive procedures, inserting a node, deleting a node, brief introduction to threaded binary trees, AVL trees and B-trees. Representing a heap in memory, operations on heaps, application of heap in implementing priority queue and heap sort algorithm.	5
6	**Graphs:** Basic terminologies, representation of graphs (adjacency matrix, adjacency list), traversal of a graph (breadth-first search and depth-first search), and applications of graphs. Dijkstra's algorithm for shortest path, Minimal Spanning tree.	5
7	**Hashing & Hash Tables:** Comparing direct address tables with hash tables, hash functions, concept of collision and its resolution using open addressing and separate chaining, double hashing, rehashing	4
8	**Searching & Sorting**: Searching an element using linear search and binary search techniques, Sorting arrays using bubble sort, selection sort, insertion sort, quick sort, merge sort, heap sort, shell sort and radix sort, complexities of searching & sorting algorithms.	5

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Tenenbaum, Augenstein, & Langsam, Data Structures using C and C++, Prentice Hall of India	2009
2	R. S. Salaria, Data Structures & Algorithms Using C++, Khanna	2012

	Book Publishing Co. (P) Ltd.	
3	Seymour Lipschutz, Data Structures, Schaum's Outline Series, Tata McGraw Hill	2005
4	Kruse, Data Structures & ProgramDesign, Prentice Hall of India.	1994
5	Michael T. Goodrich, Roberto Tamassia, & David Mount, Data Structures and Algorithms in C++ (Wiley India)	2016
6	Thomas H Cormen, Charles E Leiserson, Ronald L Rivest , and Clifford Stein, Introduction to Algorithms.	2009
7	Ellis Horowitz, Sartaj Sahni, & Dinesh Mehta, Fundamentals of Data Structures in C++.	2008
8	Malik , Data Structures using C++, Cengage Learning.	2012

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-2305**   Course Title: **Object Oriented Programming Using C++**

2. Contact Hours: **40**   **L: 3   T: 2   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:To introduce the principles and paradigms of Object Oriented Programming Language for design and implement the Object-Oriented System.

10. Course Outcomes:

CO1	To formulate the algorithms for simple problems and to translate given algorithms to a working and correct program.
CO2	Design object oriented solutions for small systems involving multiple objects
CO3	Apply knowledge to create complex programming applications using decision statements, looping structures and functions.
CO4	Justify programming skills learned by debugging the program using C++

11. Details of the Course:

S.No.	Content	Contact Hours
1.	Introduction to C++, C++ Standard Library, Illustrative Simple C++ Programs. Header Files, Namespaces, Application of object oriented programming.	4
2.	Object Oriented Concepts, Introduction to Objects and Object-Oriented Programming, Encapsulation, Polymorphism, Overloading, Inheritance, Abstract Classes, Accessifier (public/ protected/ private), Class Scope and Accessing Class Members, Controlling Access Function, Constant, Class Member, Structure and Class	6

3.	Friend Function and Friend Classes, This Pointer, Dynamic Memory Allocation and De-allocation (New and Delete), Static Class Members, Constructors, parameter Constructors and Copy Constructors, De-constructors,.	5
4.	Introduction of inheritance, Types of Inheritance, Overriding Base Class Members in a Derived Class, Public, Protected and Private Inheritance, Effect of Constructors and Deconstructors of Base Class in Derived Classes. problems - dangling/wild pointers, null pointer assignment, memory leak and allocation failures.	5
5.	Polymorphism, Pointer to Derived class, Virtual Functions, Pure Virtual Function, Abstract Base Classes, Static and Dynamic Binding, Virtual Deconstructors	5
6.	Fundamentals of Operator Overloading, Rules for Operators Overloading, Implementation of Operator Overloading Like <<, >> Unary Operators, Binary Operators	5
7.	Text Streams and binary stream, Sequential and Random Access File, Stream Input/ Output Classes, Stream Manipulators.	4
8.	Basics of C++ Exception Handling, Try, Throw, Catch, multiple catch, Re-throwing an Exception, Exception specifications.	3
9.	Templates: Function Templates, Overloading Template Functions, Class Template, Class Templates and Non- Type Template arguments	3
	TOTAL	40

11.Suggested Books:

S.No.	Name of Book/Author/Readings	Year of publication
1.	Robert Lafore, 'Object Oriented Programming in Turbo C++', 2nd Edn., The WAITE Group Press	1994
2.	Herbert shield, 'The Complete Reference C ++', 4th Edn., Tata McGraw Hill	2003
3.	Shukla, 'Object Oriented Programming in C++', Wiley India.	2008.
4.	H.M. Deitel and P.J. Deitel, 'C++ How to Program', 2nd Edn., Prentice Hall.	1998

5.	D. Ravichandran, 'Programming with C++', 3rd Ed., Tata McGraw Hill.	2003
6.	BjarneStroustrup, 'The C++ Programming Language', 4th Edn., Addison Wesley	2013
7.	R.S. Salaria, 'Mastering Object-Oriented Programming with C++', Salaria Publishing House	2016

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RIMT UNIVERSITY

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Name of Department**:** **Computer Science and Engineering**

BTCS-
1. Subject Code**: 23AAA**   Course Title :**Computer Architecture**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 Elective I**

9.Objective: To have a thorough understanding of the basic structure, operation of a digital computer and study the different ways of communicating with I/O devices and standard I/O interfaces, the hierarchical memory system including cache memories and virtual memory.

10. Course Outcome:

CO1	Applythe Knowledge of the computer architecture and its components
CO2	Evaluate the performance of various system based on CPU organization
CO3	Evalauate the design of the Control Unit and compare Hardwired and Microprogrammed control unit
CO4	Evaluate various memory and input output units and components with its organization

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**General System Architecture**: Store program control concept, Flynn's classification of computers (SISD, MISD, MIMD); Multilevel viewpoint of a machine: digital logic, micro architecture, ISA, operating systems, high level language; structured organization; CPU, caches, main memory, secondary memory units & I/O; Performance metrics; MIPS, MFLOPS.	4
2	**Instruction Set Architecture**: Instruction set based classification of processors (RISC, CISC, and their comparison); addressing modes: register, immediate, direct, indirect, indexed; Operations in the instruction set; Arithmetic and Logical, Data Transfer, Machine Control Flow.	6

3	**Basic non pipelined CPU Architecture**: CPU Architecture types (accumulator, register, stack, memory/ register) detailed data path of a typical register based CPU, Fetch-Decode-Execute cycle (typically 3 to 5 stage); microinstruction sequencing, implementation of control unit, Enhancing performance with pipelining. Hardwired control design method, Micro programmed control unit.	11
4	**Memory Hierarchy & I/O Techniques**: The need for a memory hierarchy (Locality of reference principle, Memory hierarchy in practice: Cache, main memory and secondary memory, Memory parameters: access/ cycle time, cost per bit); Main memory (Semiconductor RAM & ROM organization, memory expansion, Static & dynamic memory types); Cache memory (Associative & direct mapped cache organizations. Allocation & replacement polices, segments, pages & file organization, virtual memory.	8
5	**Introduction to Parallelism:** Goals of parallelism (Exploitation of concurrency, throughput enhancement); Amdahl's law; Instruction level parallelism (pipelining, super scaling –basic features); Processor level parallelism (Multiprocessor systems overview).	4
6	**Computer Organization [80x86]:** Instruction codes, computer register, computer instructions, timing and control, instruction cycle, type of instructions, memory reference, register reference. I/O reference, Basics of Logic Design, accumulator logic, Control memory, address sequencing, micro-instruction formats, micro-program sequencer, Stack Organization, Instruction Formats, Types of interrupts; Memory Hierarchy. Programmed I/O, DMA & Interrupts.	7

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	M. Moris Mano, Computer System Architecture, Prentice-Hall, Revised edition	2017
2	William Stallings, 'Computer Organisation & Architecture: Designing for Performance', 4th Edn., Prentice-Hall International Edition	1996
3	David A. Patterson and John L. Hennessy, 'Computer Organization and Design', 2nd Edn., Morgan Kauffmann Publishers	1997
4	John P. Hayes, 'Computer Architecture and Organization', 3rd Edn.,	1998

	TMH	
5	Carl Hamacher and Zvonko Vranesic, 'Computer Organization', 5th Edn., SafwatZaky	2002
6	A.S. Tanenbaum, 'Structured Computer Organisation', 4th Edn., Prentice-Hall of India, Eastern Economic Edition	1999
7	W. Stallings, 'Computer Organisation & Architecture: Designing for Performance', 4th Edn., Prentice-Hall International Edition	1996
8	Nicholas Carter, 'Computer Architecture', T.M.H	2002

RIMT UNIVERSITY

Name of Department**: Computer Science and Engineering**

1. Subject Code**: BTCS-2306**   Course Title: **Data Structures Lab**

2. Contact Hours: **32**   **L: 0**   **T: 0**   **P: 4**

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

4. Relative Weight**:**   **CWA** | | **LWA** | 60 | **MTE** | | **ETE** | | **EPE** | 40 |

5. Credits**:** | 0 | 2 | 6. Semester **3**

SNO.	CONTENTS	CONTACT HOURS
1	Introduction to Basics of Data Structures, algorithms and pseudo codes.	2
2	Write a program for Linear search methods	2
3	Write a program for Binary search methods.	2
4	Write a program for insertion sort, selection sort and bubble sort.	2
5	Write a program to implement Stack and its operation.	3
6	Write a program for quick sort and merge sort.	3
7	Write a program to implement Queue and its operation.	3
8	Write a program to implement Circular Queue and its operation.	3
9	Write a program to implement singly linked list for the following operations: Create, Display, searching, traversing and deletion.	3
10	Write a program to implement doubly linked list for the following operations: Create, Display, inserting, counting, searching, traversing	3

	and deletion.	
11	Write a program to implement circular linked list for the following operations: Create, Display, inserting, counting, searching, traversing and deletion.	3
12	Write a program to implement insertion, deletion and traversing in B tree	3

RIMT UNIVERSITY

Name of Department**: Computer Science and Engineering**

1. Subject Code**: BTCS-2307**   Course Title: **Digital Circuits & Logic Design Lab**

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

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

4. Relative Weight**:**   **CWA** | **LWA** 60 | **MTE** | **ETE** || **EPE** 40

5. Credits**:**   **0** **2**   6. Semester **3**

SNO.	CONTENTS	CONTACT HOURS
1	Study of Logic Gates: Truth-table verification of OR, AND, NOT, XOR, NAND and NOR gates;	2
2	Realization of OR, AND, NOT and XOR functions using universal gates.	2
3	Half Adder / Full Adder: Realization using basic and XOR gates.	2
4	Half Subtractor / Full Subtractor: Realization using NAND gates.	2
5	4-Bit Binary-to-Gray & Gray-to-Binary Code Converter: Realization using XOR gates.	3
6	4-Bit and 8-Bit Comparator: Implementation using IC7485 magnitude comparator chips.	3
7	Multiplexer: Truth-table verification and realization of Half adder and Full adder using IC74153 chip.	3
8	Demultiplexer: Truth-table verification and realization of Half subtractor and Full subtractor using IC74139	3
9	Flip Flops: Truth-table verification of JK Master Slave FF, T-type and D-type FF using IC7476 chip.	3
10	Asynchronous Counter: Realization of 4-bit up counter and Mod-N counter using IC7490 & IC7493 chip.	3

RIMT UNIVERSITY

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

1. Subject Code**:** BTCS-2308   Course Title:**Object Oriented Programming Using C++ Lab**

2. Contact Hours:32   **L: 0   T: 0   P: 4**

3. Examination Duration (Hrs.):   **Theory   0   0   Practical   0   4**

4. Relative Weight**:**   **CWA   LWA 60 MTE   ETE   EPE   40**

5. Credits**:   0   2**   6. Semester **3**

S. No	List of Experiments	Contact Hours
1.	Introduction to Basics of C++	2
2.	Introduction to OOP concepts.	2
3.	**Classes and Objects**- Write a program that uses a class where the member functions are defined inside a class.	2
4.	**Classes and Objects**- Write a program that uses a class where the member functions are defined outside a class	2
5.	**Classes and Objects**- Write a program to demonstrate the use of static data members.	2
6.	**Classes and Objects**- Write a program to demonstrate the use of constant data members.	3

7.	**Constructors and Destructors**- Write a program to demonstrate the use of zero argument and parameterized constructors.	3
8.	**Constructors and Destructors**- Write a program to demonstrate the use of dynamic constructor.	2
9.	Write a program to demonstrate the overloading of increment and decrement operators.	2
10	Write a program to demonstrate the overloading of binary arithmetic operators	2
11	Write a program to demonstrate the typecasting : basic to class and class to basic.	2
12	Write a program to demonstrate the multilevel inheritance and multiple inheritance.	2
13	Write a program to demonstrate the runtime polymorphism.	2
14	Write a program to demonstrate the exception handling.	2
15	Write a program to copy the contents of a file to another file byte by byte.	2
	TOTAL	32

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

1.Subject Code**: BTCS-2401**   Course Title: **Operating System**

2.Contact Hours: **40**   **L: 3**   **T: 2**   **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 **x56** | 4 |

7.Pre-requisite:

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

9. Objective: To understand the services and design of Operating Systems. To understand the organization of file systems and process scheduling and memory management.

10. Course Outcomes:

CO1	Explain the structure of the operation system and Implements the process management mechanism and applications
CO2	Identify and solve the problems of deadlocks
CO3	Implement the various features such as memory management, device management and file management of operating system
CO4	Categorize the security threats.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Introductory Concepts:** Operating System functions and characteristics, historical evolution of operating systems, Real time systems, Distributed systems, Methodologies for implementation of O/S service, system calls, system programs, interrupt mechanisms.	5
2.	**Processes:** Processes model, process states, process hierarchies, implementation of processes,data structures used such as process table, PCB creation of processes, context switching, exit of processes. Interprocess communication: Race conditions, critical sections, problems of mutual exclusion, Peterson's solution, producer-consumer problem,	6

	semaphores, counters, monitors, message passing.	
3.	**Process scheduling:** objective, preemptive vs non- preemptive scheduling, comparativeassessment of different algorithms such as round robin, priority bases scheduling, FCFS, SJF, multiple queues with feedback	5
4.	**Deadlocks:** conditions, modeling, detection and recovery, deadlock avoidance, deadlock prevention. **Memory Management:** Multiprogramming with fixed partition, variable partitions, virtual partitions, virtual memory, paging, demand paging design and implementation issues in paging such as page tables, inverted page tables, page replacement algorithms, page fault handling, working set model, local vs global allocation, page size, segmentation and paging	7
5.	**File Systems**: File type, attributes, access and security, file operations, directory structures,path names, directory operations, implementation of file systems, implementation of file and file operations calls, implementation of directories, sharing of files, disk space management, block allocation, free space management, logical file system, physical file system.	4
6.	**Device Management**: Techniques for device management, dedicated devices, shred devices,virtual devices, device characteristics -hardware considerations: input and output devices, storage devices, independent device operation, buffering, multiple paths, device allocation considerations.	5
7.	**Distributed Systems:** Introduction to II/W and S/W concepts in distributed systems, Networkoperating systems and NFS, NFS architecture and protocol, client- server model, distributed file systems, RPC- Basic operations, parameter passing, RPC semantics in presence of failures threads and thread packages. **Case Studies**: LINUX / UNIX Operating System and Windows based operating systems.Recent trends in operating system	8

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	William Stallings, 'Operating System', 10th Edn., Pearson Education India,	2016
2	Gary Nutt, 'Operating Systems Concepts', 3rd Edn., Pearson/Addison Wesley	2004
3	Brinch, Hansen, 'Operating System Principles', PHI	2001
4	Dhamdhere, 'Systems Programming & Operating Systems', Tata McGraw-Hill Education	1999

5	J.L. Peterson & Silberschatz, 'Operating System Concepts', 4th Edn., Addison Wesley	1994
6	A.S. Tenanbaum, 'Operating System', PHI	

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-2402**   Course Title: **DISCREATE STRUCTURE**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 | 4 |

7.Pre-requisite:

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

9. Objective:

10. Course Outcome:

CO1	Describe the fundamentals of set theory and the related concepts of functions and relations
CO2	Analyze the working of recursion and recurrence relations along with example
CO3	Apply the knowledge of the fundamentals related to the algebraic structures.
CO4	Compare the combinational mathematics along with the concepts of trees and graphs.

7.   Detail of the Course

Sr. No	Contents	Contact Hours
UNIT-I	**Sets, relations and functions:** Introduction, Combination of Sets, ordered pairs, proofs of general identities of sets, relations, operations on relations, properties of relations and functions, Hashing Functions, equivalence relations, compatibility relations, partial order relations	**15**
UNIT-II	**Combinatorial Mathematics:** Basic counting principles Permutations and combinations Inclusion and Exclusion Principle Recurrence relations,	**15**

	Generating Function, Application.	
UNIT-III	**Graph Theory:** Graph- Directed and undirected, Eulerian chains and cycles, Hamiltonian chains and cycles Trees, Chromatic number Connectivity, Graph coloring, Plane and connected graphs, Isomorphism and Homomorphism. Applications	**15**
UNIT-IV	**Monoids and Groups:** Groups Semi groups and monoids, cyclic group and submonoids, Subgroups and Cosets. Congruence relations on semi groups. Morphisms. Normal subgroups. **Rings and Boolean algebra:** Rings, Subrings, morphism of rings ideals and quotient rings. Euclidean domains Integral domains and fields, Boolean algebra direct product morphisms Boolean sub-algebra Boolean Rings Application of Boolean algebra	**15**

8. Suggested books

Sl. No.	Name of Books / Authors	Year of Publication
1	Lipschutz, 'Discrete Mathematics (Schaum Series)', 3 rdEdn., McGraw Hill, 2009.	2009
2	Alan Doerr and Kenneth Levarseur, 'Applied Discrete Structures for Computer Science', Galgotia Publications, 2009.	2009
3	N. Ch SN Iyengar, V.M. Chandrasekaran, 'Discrete Mathematics', 1 stEdn., Vikas Publication House, 2003.	2003
4	Kenneth H. Rosen, 'Discrete Mathematics and its Applications', 7 thEdn., McGraw Hill, 2008.	2008
5	SatinderBal Gupta, 'Discrete Mathematics and Structures', 4 thEdn.,Laxmi Publications, 2008.	2008
6	C.L. Liu, 'Elements of Discrete Mathematics', 4 thEdn., McGraw Hill, 2012.	2012

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-2403**   Course Title: **Computer Network-I**

2. Contact Hours: 40   **L: 3**   **T: 2**   **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: | **4** |

7. Pre-requisite:

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

9. Objective: This course introduces students to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. It is based around the OSI Reference Model which deals with the major issues in the bottom four (Physical, Data Link, Network and Transport) layers of the model. They are also introduced to the areas of Network Security and Mobile Communications.

10. Course Outcomes:

CO1	Apply the knowledge of data communication to define various networking and communication terminology
CO2	Compare the available solution and apply the knowledge to fix the issues at various layers related to networking
CO3	Develop the network with the knwoledge of subnetting, networking, supernetting and addresses.
CO4	Evaluate the performance of various network algorithms and protocols for effective and efficient networking.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	Introduction to Computer Networks: Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model	8

2.	**Physical Layer:** Concept of Analog & Digital Signal, Bandwidth, Transmission Impairments: Attenuation, Distortion, Noise, Data rate limits: Nyquist formula, Shannon Formula, Multiplexing: Frequency Division, Time Division, Wavelength Division, Introduction to Transmission Media: Twisted pair, Coaxial cable, Fiber optics, Wireless transmission (radio, microwave, infrared), Switching: Circuit Switching, Message Switching, Packet Switching & their comparisons. **Data Link Layer:** Framing, Error detection and correction codes: checksum, CRC, hamming code, Data link protocols for noisy and noiseless channels, Sliding Window Protocols: Stop & Wait ARQ, Go-back-N ARQ, Selective repeat ARQ, Data link protocols: HDLC and PPP.	12
3.	**Medium Access Sub-Layer:** Static and dynamic channel allocation, Random Access: ALOHA, CSMA protocols, Controlled Access: Polling, Token Passing, IEEE 802.3 frame format, Ethernet cabling, Manchester Encoding, collision detection in 802.3, Binary exponential back off algorithm. **Network Layer**: Design issues, IPv4 classful and classless addressing, subnetting, IPv6, Routing algorithms: distance vector and link state routing, Congestion control: Principles of Congestion Control, Congestion prevention policies, Leaky bucket and token bucket algorithms	11
4.	**Transport Layer**: Elements of transport protocols: addressing, connection establishment and release, flow control and buffering, multiplexing and de-multiplexing, crash recovery, introduction to TCP/UDP protocols and their comparison, Sockets. **Application Layer**: World Wide Web (WWW), Domain Name System (DNS), E-mail, File Transfer Protocol (FTP), SMTP, POP, HTTP, Introduction to Network security	9

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	W. Stallings, 'Data & Computer Communications', 9th Edn., PHI	2014
2	James F. Kurose and Keith W. Ross, 'Computer Networking', 3rd Edn., Pearson Education	2012
3	Greg Tomsho, 'Guide to Networking Essentials', 6th Ed.., Cengage Learning,	2011
4	Behrouz A. Forouzan, 'Data Communication & Networking', 4th Edn., Tata McGraw Hill,	2006
5	Andrew S. Tanenbaum, 'Computer Networks', 4th Edn., Pearson Education	2002

6	Douglas E. Comer, 'Internetworking with TCP/IP', Volume-I, 2nd Edn., Prentice Hall, India, 1996.	1996
7	Michael W. Graves, 'Handbook of Networking', Cengage Learning	2014

RIMT UNIVERSITY

Name of Department**:**   **Computer Science and Engineering**

Course Title:**Microprocessor& Assembly**
Language Programming.

1. Subject Code**: BTCS-2404**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 **4**

9. Pre-requisite:

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

9. Objective: Objective/s: The course is intended to give students good understanding of internal architectural details and functioning of microprocessors.

10. Course Outcome:

CO1	To understand the taxonomy of microprocessors and knowledge of contemporary microprocessors.
CO2	Describe the architecture, bus structure and memory organization of 8085 as well as higher order microprocessors.
CO3	Explore techniques for interfacing I/O devices to the microprocessor 8085 including several specific standard I/O devices such as 8251 and 8255
CO4	Demonstrate programming using the various addressing modes and instruction set of 8085 microprocessor
CO5	Design structured, well commented , understandable assembly language programs to provide solutions to real world control problems

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS

1	**Introduction:** Introduction to Microprocessors, history, classification, recent microprocessors.	4
2	**Microprocessor Architecture**: 8085 microprocessor Architecture. Bus structure, I/O, Memory & Instruction execution sequence & Data Flow, Instruction cycle. System buses, concept of address Bus, Data Bus & Control Bus, Synchronous & Asynchronous buses.	6
3	**I/O memory interface**: Data transfer modes: Programmable, interrupt initiated and DMA. Serial & parallel interface, Detail study of 8251 I/O Processor & 8255 programmable peripheral interfaces.	11
4	**Instruction set & Assembly Languages Programming:** Introduction, instruction & data formats, addressing modes, status flags, 8085 instructions, Data transfer operations, Arithmetic operations, Logical operations, Branch operations.	8
5	**Case structure & Microprocessor application**: Interfacing of keyboards and seven segment LED display, Microprocessor controlled temperature system (MCTS), Study of traffic light system, stepper motor controller, Microprocessor based micro computers.	4
6	**Basic architecture of higher order microprocessors**: Basic introduction to 8086 family, Motorola 68000, Pentium processors.	7

11. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Ramesh Gaonkar, "8085 Microprocessor ",PHI Publications.	2017
2	Daniel Tabak, "Advanced Microprocessors", McGraw- Hill, Inc., Second Edition 1995.	1995
3	Douglas V. Hall, "Microprocessors and Interfacing: Programming and Hardware", Tata McGraw Hill Edition,1986.	1986
4	Charles M.Gilmore," Microprocessors: Principles and Applications", McGraw Hill.	1998
5	Ayala Kenneth, "The 8086 Microprocessor Programming and Interfacing", Cengage Learning	2002

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-2405**   Course Title: **Database Management Systems**

2.Contact Hours: **40**   **L: 3**   **T: 2**   **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 **x56** | 4 |

7. Pre-requisite:

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

9. Objective: To familiarize the students with Data Base Management system.

10. Course Outcomes:

CO1	Develop conceptual understanding of database management system
CO2	Identify, analyze and define database objects, enforce integrity constraints on a database using DBMS.
CO3	Use Structured Query Language (SQL) for database manipulation.
CO4	Design and build simple database systems and advanced applications

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Introduction to Database Systems:** File Systems Versus a DBMS, Advantages of a DBMS, Describing and Storing Data in a DBMS, Database System Architecture, DBMS Layers, Data independence. **Data Models:** Relational Model, Network Model, Hierarchical Model, ER Model: Entities, Attributes and Entity Sets, Relationships and Relationship Sets, Constraints, Weak Entities, Class Hierarchies, Aggregation, Conceptual Database Design with the ER Model, Comparison of Models.	8
2.	**The Relational Model:** Introduction to the Relational Model, ER to Relational Model Conversion, Integrity Constraints over Relations, Enforcing Integrity Constraints, Relational Algebra, Relational Calculus, Querying Relational Data **Relational Query Languages: SQL:** Basic SQL Query, Creating Table and	12

	Views, SQL as DML, DDL and DCL, SQL Algebraic Operations, Nested Queries, Aggregate Operations, Integrity Constraints in SQL.	
3.	**Database Design:** Functional Dependencies, Reasoning about Functional Dependencies, Normal Forms, Schema Refinement, 1NF, 2NF, 3NF, BCNF, 4NF, 5NF, Domain Key Normal Forms. **Transaction and Concurrency Management:** ACID Properties, Serializability, Two-phase Commit Protocol, 2PL protocol, Lost Update Problem, Inconsistent Read Problem. Concurrency Control, Lock Management, Read-Write Locks, Deadlocks Handling.	12
4.	**Database Protection:** Threats, Access Control Mechanisms: Discretionary Access Control, Mandatory Access Control, Grant and Revoke, Role Based Security, Encryption and Digital Signatures.	8

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	Raghu Ramakrishnan, Johannes Gehrke, 'Database Management Systems', 3rd Edn., Tata McGraw-Hill	2014
2	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, 'Database System Concepts', 6th Edn., Tata McGraw-Hill,	2011
3	S.K. Singh, 'Database Systems Concepts, Design and Applications', 2nd Edn., Pearson Education	2011
4	Ramez Elmasri, Shamkant Navathe, 'Fundamentals of Database Systems', 5th Edn., Pearson Education	2010
5	Alexis Leon, Mathews Leon, 'Database Management Systems', Leon Press, 1st Edn.,	2008
6	C.J. Date, 'An Introduction to Database Systems', Pearson Education, 8th Edn.,	2006

RIMT UNIVERSITY

1. Subject Code**: BTCS-2406**　　　Course Title: **Operating System Lab**

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

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

4. Relative Weight**:**　**CWA** | | **LWA** | **60** | **MTE** | | **ETE** | | **EPE** | **40** |

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

7. Pre-requisite:

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

9. Objective: To understand the services and design of Operating Systems. To understand the organization of file systems and process scheduling and memory management

10. Details of the Course:

Sl. no	Contents	Contact Hours
1	Installation Process of various operating systems	6
2	Virtualization, Installation of Virtual Machine Software and installation of Operating System onVirtual Machine	6
3	**Commands for files & directories:** cd, ls, cp, md, rm, mkdir, rmdir. Creating and viewing filesusing cat. **File comparisons.** Disk related commands: checking disk free spaces. Processes in linux,connecting processes with pipes, background processing, managing multiple processes. Manualhelp. **Background process:** changing process priority, scheduling of processes at command, batchcommands, kill, ps, who, sleep. Printing commands, grep, fgrep, find, sort, cal, banner, touch,file. File related commands ws, sat, cut, grep.	10
4	**Shell Programming:** Basic of shell programming, various types of shell, Shell Programming inbash, conditional & looping statement, case, parameter passing and arguments, shellvariables, shell keywords, creating shell programs for automate system tasks, report printing.	10
	Total	32

RIMT UNIVERSITY

1. Subject Code**: BTCS-2407**   Course Title: **Computer Network-I Lab**

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

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

4. Relative Weight**:**   CWA | | LWA | **60** | MTE | | ETE | | EPE | **40** |

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

9. Pre-requisite:

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

9. Objective: To familiarize the students with Networking Components..

10. Details of the Course:

S. No	Contents	Contact Hours
1	Write specifications of latest desktops and laptops.	1
2	Familiarization with Networking Components and devices: LAN Adapters, Hubs, Switches, Routers etc.	1
3	Familiarization with Transmission media and Tools: Co-axial cable, UTP Cable, Crimping Tool, Connectors etc.	2
4	Preparing straight and cross cables	1
5	Study of various LAN topologies and their creation using network devices, cables and computers.	2
6	Configuration of TCP/IP Protocols in Windows and Linux.	1
7	Implementation of file and printer sharing.	1
8	Designing and implementing Class A, B, C Networks.	1
9	Subnet planning and its implementation	1
10	Installation of ftp server and client.	1

11	Case study on networking using Netsim.	4
Total		16

RIMT UNIVERSITY

1. Subject Code**: BTCS-2408**   Course Title: **Database Management System Lab**

2. Contact Hours: **32**   **L: 0**   **T: 0**   **P: 4**

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

4. Relative Weight**:**   CWA | | LWA | **60** | MTE | | ETE | | EPE | **40** |

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

10.   Pre-requisite:

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

9. Objective:
1 To understand basic DDL, DML, DCL commands
2 To understand the SQL queries using SQL operators

3 To understand the concept of relational algebra, date and group functions.
4 To learn view, cursors and triggers.
10. Details of the Course:

Sl. no	Contents	Contact Hours
1.	Write the queries for Data Definition Language (DDL) in RDBMS.	2
2.	Write the queries for Data Manipulation Language (DML) in RDBMS.	2
3.	Write the queries for Data Control Language (DCL) in RDBMS.	2
4.	Write SQL queries using logical operations (=, etc)	2
5.	Write SQL queries using SQL operators	2
6.	Case Study on Database Languages	2
7.	Write SQL query using character, number, date and group functions	2

8.	Write SQL queries for relational algebra	2
9.	Case Study on relational algebra	2
10.	Write SQL queries for extracting data from more than one table	2
11.	Case Study highlighting ROLLBACK AND COMMIT.	2
12.	Write SQL queries for sub queries, nested queries	2
13.	Concepts for ROLL BACK, COMMIT & CHECK POINTS	2
14	Create VIEWS, CURSORS and TR.	2
15	Case Study highlighting VIEWS, SAVE POINT.	2
16	Case Study highlighting Data storage and extraction	2
	Total	32

RIMT UNIVERSITY

Course Title: **Microprocessor& Assembly Language Programming Lab**

1. Subject Code**: BTCS-2409**

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

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

4. Relative Weight**:** **CWA** ☐ **LWA** **60** **MTE** ☐ **ETE** ☐ **EPE** **40**

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

12.   Pre-requisite:

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

9. Objective: To understand the services and design of Operating Systems. To understand the organization of file systems and process scheduling and memory management

10. Details of the Course:

Sl. no	Contents	Contact Hours
1	Introduction to 8085 kit.	2
2	Addition of two 8 bit numbers, sum 8 bit.	2
3	Subtraction of two 8 bit numbers.	2
4	Find 1's complement of 8 bit number.	2
5	Find 2's complement of 8 bit number.	2
6	Shift an 8 bit no. by one bit.	2
7	Find Largest of two 8 bit numbers	2
8	Find Largest among an array of ten numbers (8 bit).	2
9	Sum of series of 8 bit numbers	2
10	Introduction to 8086 kit	2
11	Addition of two 16 bit numbers, sum 16 bit.	2
12	Subtraction of two 16 bit numbers.	2
13	Find 1's complement of 16 bit number.	2
14	Find 2's complement of 16 bit number	2
	Total	28

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3501** **Course Title**: **Computer Networks-II**

2. Contact Hours: **40** **L: 3** **T: 2** **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 | **5** |

7. Pre-requisite:

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

9. Objective: This course introduces students to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. It is based around the OSI Reference Model which deals with the major issues in the bottom four (Physical, Data Link, Network and Transport) layers of the model. They are also introduced to the areas of Network Security and Mobile Communications.

10. Outcomes:

CO1	Understand the concepts of network security, wireless, Adhoc and various emerging network technologies
CO2	Learn and design the efficient wireless systems.
CO3	Evaluate the performance of various advanced network algorithms and protocols for effective and efficient networking.
CO4	Categorize the network security threats and how to resolve security issues.

11. Details of the Course:

S.No.	Content	Contact Hours
1.	**Network Security**: Fundamentals of network security, Basics of IPv6, IPsec: overview of IPsec, IP and IPv6, Authentication header (AH), Encapsulating Security Payload (ESP)	6
2.	**Internet Key Exchange (IKE):** History, Photuris, Simple Key-management for Internet protocols (SKIP), IKE phases, IKE encoding.	6
3.	**Adhoc networks**: Features, advantages and applications, Adhoc versus Cellular networks, Network architecture, Protocols: MAC protocols, Routing protocols, Technologies.	7
4.	**Wireless Communication Systems**: Evolution, examples of wireless communication systems, 2G Cellular networks, Evolution for 2.5G TDMA Standards, IS-95B for 2.5G CDMA	7
5.	**3G wireless networks**: wireless local loop (WLL), Local Multipoint Distribution System (LMDS), Wireless local Area Networks (WLANs), Bluetooth and Personal Area Networks.	7
6.	**Wireless System Design:** Introduction, Frequency reuse, channel assignment strategies, handoff strategies, interference and system capacity, improving coverage and capacity in cellular systems.	7

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Theodore S. Rappaport, Wireless Communication: Principles and Practices (2nd Edition), Pearson education	2002
2	Charlie Kaufman, Radio Perlman, Mike Speciner, Neywork security, 2nd ed., PHI.	
3	Sunilkumar S. Manvi, Mahabaleshwar S. Kakkasageri, Wireless and mobile networks: concepts and protocols,	

	Wiley India	
4	Michael A. Gallo & William M. Hancock, "Computer Communications and Networking Technologies", Cengage Learning / Thomson Brooks / Cole	
5	S. Keshav, "An Engineering Approach to Computer Networking", Pearson Education	
6	Mayank Dave, "Computer Networks", Cengage Learning	

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-3502**   Course Title: **Relational Database Management System-II**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 **5**

    7. Pre-requisite:

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

9. Objective: To familiarize the students with Relational Data Base Management system.   To describe a sound introduction to the discipline of database management systems.To give a good formal foundation on the relational model of data and usage of Relational Algebra.To introduce the concepts of basic SQL as a universal Database language. To enhance knowledge to advanced SQL topics like embedded SQL, procedures connectivity through JDBC.

10. Outcomes:

CO1	Compare the Relational Algebra with Relational Calculus and describe various operations
CO2	Analyze the functional dependencies and Implement normalization with original examples
CO3	Classify various threats under Database security and understand measures to control
CO4	Investigate all packages & procedures and Discuss Transaction management with data recover

.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Introduction to Database Systems:** Database System Concepts and Architecture, Data Models, Data Independence, SQL: DDL, DML, DCL, Normalization: 1NF, 2NF, 3NF, BCNF, 4NF, 5NF.	3
2	**Query Processing and Optimization:** Query Processing, Syntax Analyzer, Query Decomposition, Query Optimization, Heuristic Query Optimization, Cost Estimation, Cost Functions for Select, Join, Query	6

	Evaluation Plans.	
3	**Transaction Processing and Concurrency Control:** Transaction Processing Concepts, Concurrency Control Techniques: Two-phase Locking, TimestampOrdering, Multiversion, Validation, Multiple Granularity Locking.	6
4	**Object Oriented and Object Relational Databases:** Object Oriented Concepts, Object Oriented Data Model, Object Definition Language, Object QueryLanguage, Object Relational Systems, SQL3, ORDBMS Design.	4
5	**Distributed Databases:** Distributed Database Concepts, Advantages and Disadvantages, Types of Distributed Database Systems, Data Fragmentation, Replication and Allocation Techniques for Distributed Database Design, Five Level Schema Architecture, Query Processing, Concurrency Control and Recovery in Distributed Databases.	6
6	**Backup and Recovery:** Types of Database Failures, Types of Database Recovery, Recovery Techniques: Deferred Update, ImmediateUpdate, Shadow Paging, Checkpoints, Buffer Management.	5
7	**Introduction to Data Warehousing and Data Mining:** Introduction to OLAP, OLTP, Data Warehouse, Data Marts, Data Mining, Data Mining Process, Big Data.	5
8	**Enterprise Database Products:** Enterprise Database Products, Familiarity with IBM DB2 Universal Database, Oracle, Microsoft SQL Server,MySQL, their features.	5

11. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Ramez Elmasri, Shamkant Navathe, Fundamentals of Database Systems, 7th Edition, Pearson Education	2016
2	Raghu Ramakrishnan, Johannes Gehrke, Database Management Systems, Tata McGraw-Hill.	2010
3	C.J. Date, An Introduction to Database Systems, Eighth Edition, Pearson Education.	2009

4	Alexis Leon, Mathews Leon, Database Management Systems, Leon Press.	2012
5	Abraham Silberschatz, Henry F. Korth, S. Sudarshan, Database System Concepts, Tata McGraw-Hill.	2006
6	S. K. Singh, Database Systems Concepts, Design and Applications, Pearson Education.	2015
7	Chris Eaton, Paul Zikopoulos, Understanding Big Data: Analytics for Enterprise Class Hadoop and Streaming Data.	2009

RIMT UNIVERSITY

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

Design & Analysis of
1.Subject Code**: BTCS-3503**　　Course Title: **Algorithm**

2. Contact Hours:**40**　　　　**L: 3**　　　**T: 2**　　　**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 | **5** |

7.　Pre-requisite:

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

9.　Objective: To learn the ability to distinguish between the tractability and intractability of a given computational problem. To be able to devise fast and practical algorithms for real-life problems using the algorithm design techniques and principles learned in this course.

10. Outcomes:

CO1	Apply the knowledge of effeciency evaluation of algorithm with respect to time and space complexity of algorithms.
CO2	Describe the various algorithm development approches to solve the problems like divide and conquer, graph based, tree based, etc.
CO3	Evaluate the complexity of the algorithms to evaluate the effectiveness as greedy strategy, dynamic programming strategy and will able to gain knowledge about backtracking, branch and bound and string matching techniques to deal with some hard problems.
CO4	Analyze the various classes for complex problems like P, NP, and NP-Complete and Correlate existing algorithms to improve efficiency.

11. Details of the Course:

S. No	Contents	Contact Hours
1.	**Introduction**. Algorithms and its Properties, Time and space complexity of an algorithm.Comparing the performance of different algorithms for the same problem. Different orders of growth. Asymptotic notation. Polynomial vs.	11

	Exponential running time. **Basic Algorithm Design Techniques.** Divide-and-conquer, greedy, Backtracking, Branch andBound, dynamic programming and randomization. Overall technique with example, problems and algorithms illustrating the use of these techniques.	
2.	**Graph Algorithms**. Graph traversal: breadth-first search (BFS) and depth-first search (DFS).Applications of BFS and DFS. Topological sort. Shortest paths in graphs: Dijkstra and Bellman-Ford (Single source shortest path, And All pair shortest path (Floyd Warshal algorithm). Minimum spanning Trees: Prim's and Kruskal Algorithm.	12
3.	**Sorting and searching**. Binary search in an ordered array. Sorting algorithms such as Mergesort, Quick sort, Heap sort, Radix Sort, and Bubble sort with analysis of their running times. Lower bound on sorting, searching and Merging, Median and order statistics. **NP-completeness**. Definition of class P, NP. NP-hard and NP-complete problems. 3SAT isNP-complete. Proving a problem to be NP-complete using polynomial-time reductions. Examples of NP-complete problems. Approximation algorithms for various NP-complete problems: TSP, Hamiltonian Cycle, Knapsack.	12
4.	**Advanced topics**. Pattern matching algorithms: Knuth-Morris-Pratt algorithm, Brute Force.	5

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	H. Cormen, Charles E. Leiserson, Ronald L. Rivest, and Clifford Stein, Introduction to Algorithms, 3^{rd}Edn., The MIT Press Ltd,	2009
2	Michael T. Goodrich and Roberto Tamassia, 'Algorithm Design: Foundations, Analysis, and Internet Examples', 1^{st}Edn., Wiley India Pvt Ltd,	2006
3	S. Dasgupta, C.H. Papadimitriou, and U.V. Vazirani, 'Algorithms', McGraw-Hill Education	2006
4	J. Kleinberg and E. Tardos, 'Algorithm Design', 1^{st}Edn., Pearson Publications	2005
5	Donald Knuth, 'The Art of Computer Programming', Volumes 1, 2, and 3, 2^{nd}Edn., Addison-Wesley Professional	1998

6	Rupinder Kaur Gurm, Jasmeet Singh Gurm 'Design Analysis of Algorithms', Kalyani Publishers	2014

Program Name: B. Tech. Computer Science and Engineering
Program Code: CSE-301

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3504**   Course Title: **Computer Graphics**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 | 5 |

7. Pre-requisite:

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

9. Objective: Understanding the fundamental graphical operations and the implementation on computer, Get a glimpse of recent advances in computer graphics, Understanding user interface issues that make the computer easy for the novice to use.

10. Course Outcomes:

CO1	Apply the knowledge of basic concepts of Computer Graphics , its need and applications in real life uses.
CO2	Analyse computer algorithms to apply various types of trasformations required for two dimentional and three dimensional graphics
CO3	Implement the use of geometric transformations for various graphic operations like clipping, scaling with the help of real life examples.
CO4	Formulate the use of computer graphics concepts, operations and functions for rendering, spline curves and anti-aliasing concepts.

11. .

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1	**Introduction**: Computer Graphics and its applications, Elements of a Graphics, Graphics Systems: Video Display Devices, Raster Scan Systems, Random Scan Systems, Input devices.	5
2	**Basic Raster Graphics**: Scan conversion- Point plot technique, Line drawing, Circle generating and Ellipse generating algorithms.	4

3	**Two-dimensional Geometric Transformations**: Basic Transformations-Translation, Rotation and Scalling, Matrix Representation and Homogeneous Coordinates, Composite Transformations, Reflection and Shearing transformations	6
4	**Clipping:** Window to viewport transformation, Clipping Operations-Point Clipping, Line Clipping, Polygon Clipping and Text Clipping.	5
5	**Filling Techniques**: Scan line algorithms, Boundary-fill algorithm, Flood-fill algorithm, Edge fill and fence fill algorithms,	5
6	**Elementary 3D Graphics**: 3D geometric transformation ,parallel and prospective projection	4
7	**Visibility**: Image and object precision, Hidden edge/surface removal or visible edge/surface determination techniques; z buffer algorithms, Depth sort algorithm, Scan line algorithm and Floating horizon technique.	6
8	**Advance Topics**: Introduction of Rendering, Raytracing, Antialiasing, Fractals, Gourard and Phong shading.	5

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	Donald Hearn and M.Pauline Baker, **"Computer Graphics", Second Edition,** PHI/Pearson Education	2012
2	Zhigand xiang, Roy Plastock, Schaum's outlines, **"Computer Graphics Second Edition",** Tata Mc-Grawhill edition.	2010
3	C, Foley, VanDam, Feiner and Hughes, **"Computer Graphics Principles & Practice", Second Edition**, Pearson Education	2014

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3505**   Course Title: **Computer Peripherals and Interfaces**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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   **5**

7. Pre-requisite:

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

9. Objective: To learn the functional and operational details of various peripheral devices

10.   Course Outcomes:

CO1	Understand basics of different computer peripherals and interfaces.
CO2	Describe architecture of various computer hardware devices and their functioning.
CO3	Study the details of system buses, memory system, and I/O interfaces.
CO4	Identify the existing configuration of the computers and peripherals.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1	**SYSTEM RESOURCES**: Interrupt, DMA Channel, I/O Port Addresses and resolving and resolving the conflict of resources. I/O buses- ISA, EISA, Local bus, VESA Local bus, PCI bus, PCI Express, Accelerated graphics port bus.	6
2	**IDE & SCSI Interfaces**: IDE origin, IDE Interface ATA standards ATA1 to ATA7. ATA feature, ATA RAID and SCSI RAID, SCSI Cable and pin Connector pin outs SCSI V/s IDE Advantages and	6

	limitation	
3	**Video Hardware:** Video display technologies, DVI Digital signals for CRT Monitor, LCD Panels, Video adapter types, Integrated Video/ Motherboard chipset, Video RAM, Video driver and multiple Monitor, Graphic accelerators. Advanced 3D Technologies, TV Tuner and Video Capture upgrades troubleshooting Video Cards and Drivers.	6
4	**I/O Interfaces:** I/O Interfaces from USB and IEEE1394, I/O Interface from serial and Parallel to IEEE1394 and USB 961, Parallel to SCSI converter. Testing of serial and parallel port, USB Mouse/ Keyboard Interfaces.	6
5	**Input/ Output Driver software aspects:** Role of device driver DOS and UNIX/ LINUX device drivers.	5
6	Design & Integration of Peripheral devices to a computer system as a Case Study	5
7	**Future Trends:** Detailed Analysis of recent Progress in the Peripheral and Bus systems. Some aspects of cost Performance analysis while designing the system	6

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publicat ion
1	Douglas V. Hall ,**"Microprocessors and Interfacing"**, Tata McGraw Hill.	2006
2	Barry B. Brey&C.R.Sarma**" The intel microprocessors,"** Pearson	2003
3	P. Pal Chandhari , **"Computer Organization and design"** Prentice Hall of India Pvt. Ltd.	1994
4	Del Corso, H.Kirrman, JD Nicond**"Microcomputer buses & links"** Academic Press	1986

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3506**   Course Title: **Computer Network-II Lab**

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

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

4. Relative Weight**:**   **CWA**   **LWA 60** **MTE**   **ETE**   **EPE 40**

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

12.   Pre-requisite:
13.
14.   Subject Area: **Departmental Course (DC)**
15.

9. Objective:To familiarize the students with Networking Components.

10. Details of the Course:

S. No	Contents	Contact Hours
1	To configure the IP address for a computer connected to LAN and to configure network parameters of a web browser for the same computer.	2
2	To plan IPv6 address scheme for a local area network comprising of 'n' terminals.	2
3	To develop programs for implementing / simulating routing algorithms for Adhoc networks.	2
4	To install any one open source packet capture software like wireshark etc.	2
5	To configure Wireless Local Loop.	1
6	To plan Personal Area Network.	1
7	To configure WLAN.	1

8	To configure Adhoc networks.	1
9	To install and configure wireless access points.	2
10	To configure the IP address for a computer connected to LAN and to configure network parameters of	2

RIMT UNIVERSITY

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

1. Subject Code**:**　**BTCS-3507**　　Course Title**:** **Relational Database Management System-II Lab**

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

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

4. Relative Weight**:**　　**CWA** | |　**LWA** | **60** |　**MTE** | |　**ETE** | |　**EPE** | **40** |

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

16.　　Pre-requisite:

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

18.　　Objective:　To offer a good understanding of advanced database concepts and technologies

Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	Case studies on normalization	4
2	Study and usage of query optimization techniques.	4
3	Study and usage of backup and recovery features of database management software.	6
4	Server administration of any database management software.	6
5	Study and usage of any object oriented or object relational database management software.	6
6	Study of web databases.	4
7	Development of a project by making use of tools studied above.	6
8	To study the concept of Procedures and Functions using PL/SQL	4

RIMT UNIVERSITY

1.Subject Code**: BTCS-3508**   Course Title: **Computer Graphics Lab**

2. Contact Hours: **16**   **L: 0**   **T: 0**   **P: 02**

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

4. Relative Weight**:**   CWA | | LWA | **60** | MTE | | ETE | | EPE | **40** |

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

19.   Pre-requisite:

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

9. Objective:To familiarize the students with Data Base Management system.

10. Details of the Course:

S. No.	Contents	Contact Hours
1	To plot a point (pixel) on the screen.	1
2	To draw a straight line using DDA Algorithm.	2
3	To draw a straight line using Bresenham's Algorithm.	2
4	Implementation of mid-point circle generating Algorithm.	1
5	Implementation of ellipse generating Algorithm.	1
6	To translate an object with translation parameters in X and Y directions	2
7	To scale an object with scaling factors along X and Y directions.	2
8	To rotate an object with a certain angle about origin	1
9	Perform the rotation of an object with certain angle about an	2

	arbitrary point.	
10	To perform composite transformations of an object.	1
11	To perform the reflection of an object about major axis.	1

RIMT UNIVERSITY

1. Subject Code**: BTCS-3509**   Course Title: **Design and Analysis of Algorithms LAB**

2. Contact Hours: **16**   **L: 0**   **T: 0**   **P: 02**

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

4. Relative Weight**:**   **CWA** | | **LWA** | **60** | **MTE** | | **ETE** | | **EPE** | **40** |

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

21.   Pre-requisite:

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

9. Objective: To get a first-hand experience of implementing well-known algorithms in a high-level language. To be able to compare the practical performance of different algorithms for the same problem

10. Details of the Course:

S.No	Contents	Contact Hours
1	Code and analyse to compute the greatest common divisor (GCD) of two numbers.	1
2	Code and analyze to find the median element in an array of integers	1
3	Code and analyze to find the majority element in an array of integers.	1
4	Code and analyze to sort an array of integers using Heap sort.	1
5	Code and analyze to sort an array of integers using Merge sort.	1
6	Code and analyze to sort an array of integers using Quick sort.	1
7	Code and analyze Knapsack problem using dynamic programming	1
8	Code and analyze to find the shortest path for single source shortest path using dynamic programming.	1

9	Code and analyze to find the shortest path for All pair shortest path using dynamic programming	1
10	Code and analyze to do a depth-first search (DFS) on an undirected graph. Implementing an application of DFS such as to find the topological sort of a directed acyclic graph	1
11	Code and analyze to do a breadth-first search (BFS) on an undirected graph. Implementing an application of BFS such as (i) to find connected components of an undirected graph, OR (ii) to check whether a given graph is bipartite.	1
12	Code and analyze to find the minimum spanning tree in a weighted, undirected graph	1
13	Code and analyze to find all occurrences of a pattern P in a given string S using KMP Method	2
14	Code and analyze to compute the convex hull of a set of points in the plane.	2

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-3601**   **Course Title**: **Simulation and Modeling**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 | **6** |

7. Pre-requisite:

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

9.   Objective: This course should provide the students with good understanding of various techniques of Simulation.

10. Outcome:

CO1	Describe the role of important elements of discrete event simulation and modeling paradigm.
CO2	Conceptualize real world situations related to systems development decisions, originating from source requirements and goals.
CO3	Interpret the model and apply the results to resolve critical issues in a real world environment.
CO4	Apply random number variates to develop simulation models
CO5	Analyze output data produced by a model and test validity of the model

11. Details of the Course:

S.No.	Content	Contact Hours

1.	**Introduction-** When simulation is appropriate and when not, advantages and disadvantages of simulation, application areas in communication, computer and software design, systems and systems environment, components of a system, discrete and continuous systems, model of a system, types of models, discrete-event simulation, steps in a simulation study. Simulation Examples- Simulation of queueing systems, on-demand and inventory systems, simulation for reliability analysis etc	3
2.	**General Principles-** Concepts in discrete event simulation: event scheduling /time advance algorithms, world views. List Processing: properties and operations, data structures and dynamic allocation, techniques.	3
3.	**Simulation Software**- Integrated environments. Examples and review of some existing software popular and useful in the industry, e.g., Arena, AutoMod, Extend, Flexsim, Micro Saint, ProModel, Quest, SIMUL8, WITNESS etc. Simulation using languages and environments like C++/Java/GPSS/SSF etc.Experimentation and Statistical-Analysis Tools: common features and relevant current problems.	4
4.	**Statistical Models in Simulation**- Terms and concepts. Statistical Models. Review of discrete and continuous distributions. Review of Poisson (stationary and non-stationary) processes. Empirical Distributions; Elementary Queueing Theory- Basic Structure of Queueing Models. Input Source (Calling Population). Queue, Queue Discipline, Service Mechanisms. Notations and relationships between $L, W, Lq,$ and Wq. Little's Formula. Role of Exponential Distribution and Properties. Birth and Death Processes. M/M/s queues. Finite queue variation in M/M/s/K models with different s values. Finite Calling Population cases. Queueing Models involving Non-Exponential Distributions: M/G/1, M/D/s, M/Ek/s (involving Erlang distribution), Models without a Poisson Input, Models involving hyperexponential distributions, Priority Discipline Queueing Models: Preemptive and Non- Preemptive with results, properties and server number variations, Queueing Networks:Equivalence Property. Infinite Queues in Series and Product Form Solutions.Jackson Networks,	8

5.	**Application of Queueing Models**- Review of Characteristics (calling population system capacity, arrival processes, behavior and disciplines, service times and mechanisms etc) and notations, Application of Long-Run Measures of Performance: Time average in system, average time spent per customer, Little's Formula and server utilization, costs. Steady State behaviour of Infinite (M/G/1, M/M/c/infinity, M/M/c/N/infinity) and finite (M/M/c/K/K) Calling Population Models, Use of Network of Queues	8
6.	**Random Number Generation**- Properties. Generation of Pseudo-Random Numbers, Techniques for Generation of Pseudo-Random Numbers: Linear Congruential, Combined Linear Congruential, Random Number Streams. Tests for Random Numbers: Frequency Tests and Tests for autocorrelation. Random Variate Generation- Inverse Transform Techniques for Exponential, Uniform, Weibull, Triangular and for Empirical Continuous Distributions. Acceptance-Rejection Techniques for Poisson (Stationary and Non-Stationary) Distribution and Gamma Distribution. Special Properties like the Direct Transformation for the Normal and Lognormal Distributions, Convolution Method and others	8
7.	**Input Modeling**- Data collection, Identifying the Distribution with Data: Histograms, Selection of the Appropriate Family of Distributions, Quantile-Quantile Plots.100 Parameter Estimation: Sample Mean and Sample Variance and various biased and unbiased Estimators. Goodness of Fit applied to Simulation inputs: Chi-Square and Chi-Square with Equal Probabilities, Kolmogorov-Smirnov Tests, p- Values and Best Fits.Verification and Validation of Simulation Models- Verification and Validation of Simulation Models. Calibration and Validation: Face Validity, Validation of Assumptions, Input-Out Transformation Validation.	8
8.	**Output Analysis of a Single Model**- Output analysis and types of simulation. Stochastic Nature of the Output Data. Measures of Performance and Estimation: Point Estimation and Confidence-Interval Estimation. Output Analysis for Terminating Simulations and Estimation of probabilities. Output Analysis of Steady State Simulations: Initialization Bias, Error Estimation, Replications, Sample Size and Batch Means for Interval Estimation.	6

| 9. | **Comparison and Evaluation of Alternative System Designs**- Comparison of Two System Designs. Sampling with Equal and Unequal Variances. Common Random Numbers. Confidence Intervals with Specified Precision. Comparison of Several System Designs: Bonferroni Approaches to Multiple Comparisons and to Screening and to Selection of the Best. MetamodelingL Sample Linear Regression, Testing for Significance, Multiple Linear Regressions. Random Number Assignment for Regression. Optimization via Simulation: Robust Heuristics | 6 |

12. Suggested Books:

S.No.	Name of Book/Author/Readings	Year of Publication
1.	1.Jerry Banks, John S. Carson II, Barry L. Nelson and David M. Nicol, Discrete-Event System and Simulation, Prentice Hall of India, New Delhi	2005
2.	Averill M. Law, Simulation modeling and analysis (SIE), Tata McGraw Hil India	2007
3.	David Cloud, Larry Rainey, Applied Modeling and Simulation, Tata McGraw Hill, India	2008
4.	Gabriel A. Wainer, Discrete-event modeling and simulation: a practitioner's approach, CRC Press	2009
5.	Bernard P. Zeigler, Herbert Praehofer, Tag Gon Kim, Theory of modeling and simulation: integrating discrete event and continuous complex dynamic systems, Academic Press,	2000
6.	Walter J. Karplus, George A. Bekey, Boris YakobKogan, Modeling and simulation: theory and practice, Springer.	2003
7.	Stanislaw Raczynski, Modeling and simulation: the computer science of illusion, Wiley,	2006

8.	Mohammad SalamehObaidat, Georgios I. Papadimitriou, Applied system simulation: methodologies and application, Springer.	2003	
9,	Bhat, U. Narayan, An Introduction to Queueing Theory: Modeling and Analysis in Applications,Springer(Birkhäuser Boston).	2008	
10.	James J. Nutaro, Building software for simulation: theory and algorithms, with applications in C++. Wiley.	2010	

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3602** Course Title: **Compiler Design**

2. Contact Hours: **40** **L: 3** **T: 02** **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 | 6 |

7. Pre-requisite:

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

9. Objective: This course will provide the in-depth knowledge of different concepts involved while designing a compiler.

10. Outcome:

CO1	Understand fundamentals of compiler and identify the relationships among different phases of the compiler.
CO2	Understand the application of finite state machines, recursive descent, production rules, parsing, and language semantics.
CO3	Analyze & implement required module, which may include front-end, back-end, and a small set of middle-end optimizations.
CO4	Use modern tools and technologies for designing new compiler.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1	Module1: Overview of compilation- The structure of a compiler and applications of compiler technology; Lexical analysis - The role of a lexical analyzer, specification of tokens, recognition of tokens.	3
2	Module2: Introduction to syntax analysis -Role of a parser, use of context-free grammars (CFG) in the specification of the syntax of programming languages, techniques for writing grammars for programming languages (removal left recursion, etc.), non- context-free constructs in programming languages, parse	6

	trees and ambiguity, examples of programming language grammars.	
3	Module3: Top-down parsing- FIRST & FOLLOW sets, LL(1) conditions, predictive parsing, recursive descent parsing, error recovery. LR-parsing - Handle pruning, shift-reduce parsing, viable prefixes, valid items, LR(0) automaton, LR-parsing algorithm, SLR(1), LR(1), and LALR(1) parsing. .	5
4	Module 4: Syntax-directed definitions (attribute grammars)-Synthesized and inherited attributes, examples of SDDs, evaluation orders for attributes of an SDD, dependency graphs. S-attributed and L-attributed SDDs and their implementation using LR-parsers and recursive descent parsers respectively.	6
5	Module5: Semantic analysis- Symbol tables and their data structures. Semantic analysis of expressions, assignment, and control-flow statements, declarations of variables and functions, function calls, etc., using S- and L-attributed SDDs (treatment of arrays and structures included).	5
6	Module6: Intermediate code generation - Different intermediate representations – quadruples, triples, trees, flow graphs, SSA forms, and their uses. Translation of expressions (including array references with subscripts) and assignment statements. Translation of control-flow statements – it- then-else, while-do, and switch.	5
7	Module 7: Introduction to code optimization, machine independent optimization techniques. Storage Allocation: Static and Dynamic.	5
8	Module 8: Simple machine code generation, Directed Acyclic Graph (DAG), machine dependent optimization.	5

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	K.D. Cooper, and Linda Torczon, Engineering a Compiler, Morgan Kaufmann, 2nd edition	2011
2	K.C. Louden, Compiler Construction: Principles and Practice, Cengage Learning	1997
3	D. Brown, J. Levine, and T. Mason, LEX and YACC, O"ReillyMedia	1992
4	Holub: Compiler Design in C, PHI	2009
5	Aho, Ullman:Principles of Compiler Design. Narosa Publication	2002
6	Dhamdhere:Compiler Construction- Principles and Practice ,Macmillan, India	

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3603**   Course Title: **Software Engineering**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 **6**

7. Pre-requisite:

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

9. Objective: This course introduces the concepts and methods required for the construction of large software intensive systems. It aims to develop a broad understanding of the discipline of software engineering.

10. Outcome:

CO1	Justify the importance & applications of Airtificial Intelligennce & Expert System.
CO2	Categorize the various problem-solving techniques such as Uninformed search, Heuristic search, A* algorithm, AO* algorithm etc.
CO3	Analyze the knowledge representation processes through inference engine.
CO4	Define fundamental grounds on the various models of knowledge acquisition which include General learning models, Intelligent Editors, Learning by Induction.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	Evolution and impact of Software engineering, software life cycle models: Waterfall, prototyping, Evolutionary, and Spiral models. Feasibility study, Functional and Non-functional requirements, Requirements gathering, Requirements analysis and specification	10
2	Basic issues in software design, modularity, cohesion, coupling and layering, function-oriented software design: DFD and Structure chart, object modeling using UML, Object-oriented software development,	10

	user interface design. Coding standards and Code review techniques	
3	Fundamentals of testing, White-box, and black-box testing, Test coverage analysis and test case design techniques, mutation testing, Static and dynamic analysis, Software reliability metrics, reliability growth modeling.	10
4	Software project management, Project planning and control, cost estimation, project scheduling using PERT and GANTT charts, cost-time relations: Rayleigh-Norden results, quality management, ISO and SEI CMMI, PSP and Six Sigma. Computer aided software engineering, software maintenance, software reuse, Component-based software development	10

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Sommerville,"**Software Engineering, 7th edition**", Adison Wesley,	1996
2	Watts Humphrey,**" Managing software process**", Pearson education.	2003
3	James F. Peters and Witold Pedrycz, **" Software Engineering – An Engineering Approach"**, Wiley	2014
4	Pankaj Jalote, **"An integrated approach to Software Engineering"**, Springer/Narosa, 5th edition	2005

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3604**   Course Title: **Web Technologies**

2. Contact Hours: **40**   **L: 3   T: 2   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 **6**

7. Pre-requisite:

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

9. Objective This course offers a good understanding of advanced database concepts and technologies. It prepares the student to be in a position to use and design databases for a variety of applications.

10. Course Outcome:

CO1	Analyze a web page and identify its elements and attributes.
CO2	Create web pages using XHTML and Cascading Style Sheets.
CO3	Build dynamic web pages using JavaScript (Client side programming).
CO4	Create XML documents and Schemas.
CO5	Build interactive web applications using AJAX.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**INTERNET AND WORLD WIDE WEB:** Introduction, Internet Addressing, ISP, types of Internet Connections, Introduction to WWW, WEB Browsers, WEB Servers, URLS, http, WEB applications, Tools for WEB site creation.	4
2	**HTML:** Introduction to HTML, Lists, adding graphics to HTML page, creating tables, linking documents, frames, DHTML and Style sheets.	6

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3	**Java Script:** Introduction, programming constructs: variables, operators and expressions, conditional checking, functions and dialog boxes, JavaScript DOM, creating forms, introduction to Cookies.	6
4	**JAVA:** Introduction to java objects and classes, control statements, arrays, inheritance, polymorphism, Exception handling.	6
5	**XML:** Why XML, XML syntax rules, XML elements, XML attributes, XML DTD displaying XML with CSS.	6
6	**AJAX :**Introduction, HTTP request, XMHttpRequest, AJAX Server Script, AJAX Database.	6
7	**PHP:** Introduction, syntax, statements, operators, sessions, E-mail, PHP and MySQL, PHP and AJAX.	6

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Deitel, Deitel, Nieto, and Sandhu: XML How to Program, Pearson Education.	2012
2	Herbert Schildt: Java 2: The Complete Reference, Fifth Edition, TMH.	2002
3	Ivan Bayross: Web Enabled Commercial Application	2010
4	Schafer: Development, BPB	2010
5	HTML,CSS, JavaScript,Perl, Python and PHP, Wiley India Textbooks.	2014

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3611**   Course Title: **Digital Image Processing**

2. Contact Hours: **32**   **L: 3   T: 0   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 | 3 | 6. Semester | **6** |

7. **Pre-requisite**:
8. **Subject Area**: Departmental Course (DC)
9. **Objective**: To familiarize the students with Digital Image Processing system
10. **Outcome:**

CO1	understand the need for image transforms different types of image transforms and their properties.
CO2	develop any image processing application.
CO3	understand the rapid advances in Machine vision.
CO4	learn different techniques employed for the enhancement of images.

11. **Details of the Course:**

Sl. No.	Contents	Contact Hours
1	Introduction to Image Processing: Digital Image representation, Sampling & Quantization, Steps in image Processing, Image acquisition, color image representation	6
2	Image Transformation & Filtering: Intensity transform functions, histogram processing, Spatial filtering, Fourier transforms and its properties, frequency domain filters, color models, Pseudo coloring, color transforms, Basics of Wavelet Transforms	6

3	Image Restoration: Image degradation and restoration process, Noise Models, Noise Filters, degradation function, Inverse Filtering, Homomorphic Filtering	6
4	Image Compression: Coding redundancy, Interpixel redundancy, Psychovisual redundancy, Huffman Coding, Arithmetic coding, Lossy compression techniques, JPEG Compression.	7
5	Image Segmentation & Representation: Point, Line and Edge Detection, Thresholding, Edge and Boundary linking, Hough transforms, Region Based Segmentation, Boundary representation, Boundary Descriptors, Regional	7

12. Suggested Books:

Sl. No.	Name of Books / Authors
1	Boyle and Thomas: Computer Vision - A First Gurse 2nd Edition, ISBN 0-632-028-67X, Blackwell Science
2	Gonzalez and Woods: Digital Image Processing ISDN 0-201-600- 781, Addison Wesley
3	Low: Introductory Computer Vision and Image Processing, McGraw-Hill
5	Pakhera Malay K: Digital Image Processing and Pattern Recoginaton, PHI.
6	Trucco&Verri: Introductory Techniques for 3-D Computer Vision, Prentice Hall, Latest Edition

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-3612**   Course Title: **Mobile Application Development**

2. Contact Hours: **32**   **L: 3**   **T: 0**   **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** **3**   6. Semester: **6**

7. Pre-requisite:

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

9. **Objectives:** The student should be made to:
   - Understand the basic concepts of mobile computing
   - Be familiar with the network protocol stack
   - Learn the basics of mobile telecommunication system
   - Be exposed to Ad-Hoc networks
   - Gain knowledge about different mobile platforms and application development

10.   Outcome:

CO1	Model and manage mobile application development using a range of methods.
CO2	Designing and develop mobile applications using a chosen application development framework.
CO3	Evaluate alternative mobile frameworks, and contrast different programming platforms.

11. Details of the Course:

Sl. No	Content	Contact Hours
1	**Introduction:** Mobile Computing – Mobile Computing Vs Wireless Networking – Mobile Computing Applications – Characteristics of Mobile computing – Structure of Mobile Computing Application.	6
2	**Mobile Internet Protocol:** Overview of Mobile IP – Features of Mobile IP – Key Mechanism in Mobile IP – route Optimization. **MAC Protocols** – Wireless MAC Issues – Fixed Assignment Schemes – Random Assignment Schemes.	7
3	**Mobile Telecommunication System:** Global System for Mobile Communication (GSM) – General Packet Radio Service (GPRS) – Universal Mobile Telecommunication System (UMTS).	6
4	**Mobile Adhoc Network:** Ad-Hoc Basic Concepts – Characteristics – Applications – Celularvs Adhoc Networks- Routing – Routing Protocols – MANET Vs VANET.	6
5	**Mobile Platforms and Applications**: Mobile Device Operating Systems – Special Constrains & Requirements – Commercial Mobile Operating Systems – Software Development Kit: iOS, Android, BlackBerry, Windows Phone – Mobile Payment System – Security Issues.	7

12. Suggested Books:

Sr. No	Name of Book	Publication Year
1	Prasant Kumar Pattnaik, Rajib Mall, "Fundamentals of Mobile Computing", PHI Learning Pvt. Ltd, New Delhi .	2012
2	Jochen H. Schller, "Mobile Communications", Second Edition, Pearson Education, New Delhi.	2007
3	Dharma Prakash Agarval, Qing and An Zeng, "Introduction to Wireless and Mobile systems", Thomson Asia Pvt Ltd.	2005
4	UweHansmann, LotharMerk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2003.	2003

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3613**   Course Title: **Expert Systems**

2. Contact Hours: **32**   **L: 3   T: 0   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 | 3 | 6. Semester **6**

7. Pre-requisite:

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

9. **Objective:** The course provides the deep knowledge about expert systems

10. **Outcome:**

CO1	Recognize the problem domain.
CO2	Understand different techniques and methodologies available for knowledge acquisition.
CO3	Develop an expert system of moderate complexity in LISP or PROLOG.
CO4	Have practical exposure to expert system shell, neural network and simulator

11. Details of the Course:

S.No.	Contents	Contact Hours
1	Expert systems, Definitions types, components, expert system development process.	4

2	Knowledge representation techniques - Logic frames, semantic Nets Etc.	4
3	Regular grammars, regular expressions, equivalence between regular languages, properties of regular languages, pumping lemma.	6
4	Domain Exploration - knowledge elicitation, Conceptualization, battering formulizations methods of knowledge Acquisition, Interviewing sensor data capturing.	6
5	Learning planning and exploration in expert system, neural system, fuzzy expert system, and Real-time expert system.	6
6	Implementation Tools: Prolog, expert system shell expersys, etc, study of existing expert systems - RIERES, Myein& AM.	6

12. Suggested Books:

S. NO.	Name of Books / Authors	Year of Publication
1	Patterson, Introduction to AI Expert System, PHI	1993
2	Jackson, Building Expert System, John - Wiley	1991
4	Introduction to Expert System - Jackson - Addison Wesley Expert Systems by - Wichcoff	2006
5	AI & expert system - Patterson	2015

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3605**   Course Title: **Simulation and Modeling Lab**

2. Contact Hours: **16**   **L: 0   T: 0   P: 02**

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

4. Relative Weight**:**   **CWA** [   ]   **LWA** 60   **MTE** [   ]   **ETE** [   ]   **EPE** [40]

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

7. Pre-requisite:

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

9.   Objective:This course should provide the students with good understanding of various techniques of Simulation.

10.   Course Outcomes:

11.   Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Programming in MATLAB:** Introduction, Branching statements, loops, functions, additional data types, plots, arrays, inputs/outputs etc.	7
2	Introduction regarding usage of any Network Simulator.	6
3	Practical Implementationof Queuing Models using C/C++.	3

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3606**   Course Title: **Software Engineering Lab**

2. Contact Hours: **16**   **L: 0**   **T: 0**   **P: 02**

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

4. Relative Weight**:**   **CWA** | | **LWA** | 60 | **MTE** | | **ETE** | | **EPE** | 40 |

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

9. Pre-requisite:

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

9. Objective:It aims to develop a broad understanding of the discipline of software engineering.

10. Details of the Course:

S.No.	CONTENTS	CONTACT HOURS
1	Study and usage of OpenProj or similar software to draft of a project plan	2
2	Study and usage of OpenProj or similar software to track the progress of a project	2
3	Preparation of Software Requirement Specification Document, Design Documents and Testing Phase related documents for some problems	2
4	Preparation of Software Configuration Management and Risk Management related documents	2
5	Study and usage of any Design phase CASE tool	2
6	To perform unit testing and integration testing	2
7	To perform various white box and black box testing techniques	2
8	Testing of a web site	2

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-3607**   Course Title: **Web Technology Lab**

2. Contact Hours: **16**   **L: 0   T: 0   P: 02**

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

4. Relative Weight**:**   **CWA** | **LWA** | **60** | **MTE** | **ETE** | **EPE** | **40**

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

7. Pre-requisite:

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

9. Objective:To develop the ability to design and implement web enabled applications.

10. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	Introduction to Internet, web applications, web browser and web server.	3
2	Creation of Web pages using HTML.	3
3	Creation of Web pages using JAVASCRIPT.	3
4	Creation of Web pages using JAVA.	3
5	Creation of Web pages using PHP	3

Program Name: B. Tech. Computer Science and Engineering
Program Code: CSE-301

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-4701**   Course Title: **Artificial Intelligence**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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 | **7** |

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

8. Objective: To provide familiarization to the basics of Artificial intelligent machines, Hard AI and Machine learning.

9. Course Outcome:

CO1	To introduce basic concepts of AI with its working principle.
CO2	To understand different kindsof knowledge representations techniques to solve AI problems.
CO3	To understand different kinds of heuristic search algorithms to get feasible solution for AI problems.
CO4	To design decision making models to solve different problems.

10. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Introduction-**What is intelligence?, Turing Test, History of AI, Applications of AI, Traditional systems versus AI based Systems	3
2.	**Problem Solving-**Formulating problems, problem types, states and operators, state space, examples of problems.	3
3.	**Search Strategies-** Uninformed Search strategies and Informed Search Strategies, Best first search, A* algorithm, heuristic functions, Iterative deepening A*(IDA), small memory A*(SMA).	6

4.	**Game Playing-** Perfect decision game, imperfect decision game, min-max procedure, alpha-beta pruning.	3
5.	**Reasoning-** Representation, Inference, Propositional Logic, predicate logic (first order logic), logical reasoning, forward chaining, backward chaining; AI language- Prolog.	8
6.	**Planning-** Basic representation of plans, partial order planning, planning in the blocks world, hierarchical planning, conditional planning, representation of resource constraints, measures, temporal constraints.	6
7.	**Uncertainty and Learning-** Bayes rule, Belief networks, Fuzzy sets and fuzzy logic; Utility theory, decision trees, learning types, rule based learning, neural networks, genetic algorithms.	8
8.	**Communication-**Communication among agents, natural language processing, grammar.	3
	Total	**40**

11. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1.	Stuart Russell and Peter Norvig, Artificial Intelligence – A Modern Approach, Pearson Education Press, ed. 3rd.	2009
2.	Kevin Knight, Elaine Rich, B. Nair, Artificial Intelligence, McGraw Hill, ed. 3rd.	2009
3.	George F. Luger, Artificial Intelligence, Pearson Education.	2009
4.	Nils J. Nilsson, Artificial Intelligence: A New Synthesis, Morgan Kauffman.	2002

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4702**   Course Title:**Theory of Computation**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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: **7**

7. **Pre-requisite:** Nil

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

9. **Objective:** To give the students knowledge of number of areas in theoretical computer science and their interconnections.

10. **Course Outcome:**

CO1	Apply the knowledge of formal languages and operations on fomal language.
CO2	Implement Finite Automata and differentiate DFA and NFA with the help of examples
CO3	Verify the properties of Regular sets using pumping lemma and theorems with their closure properties.
CO4	Analyze finite automata with output and compare the Context Free Grammar, Regular grammar, Chomsky Normal Form (CNF), Griebach Normal Form (GNF)

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Concepts:** Basics of Strings and Alphabets, Kleene's closure	4
2	**Finite Automata:** Introduction,DFA, Transition graphs, Regular languages, Non-deterministic FA, Equivalence of DFA and NDFA,	6

	Myhill-nerode theorem	
3.	**Automata with output:** Moore Machine, Mealy Machine, Conversion from Moore to Mealy, Conversion from Mealy to Moore	4
4	**Regular Language and regular expressions**: Introduction, equivalence between regular languages, properties of regular languages, pumping lemma.	6
5	**Context Free Languages**: Leftmost and rightmost derivation, parsing and ambiguity, ambiguity in grammar and languages, normal forms; Chomsky and Greibach	7
6	**Pushdown Automata:** NDPDA, DPDA, context free languages and PDA, comparison of deterministic and non-deterministic versions, closure properties, pumping lemma for CFL	5
7.	**Turing Machines:** Variations, halting problem, PCP	3
8.	**Chomsky Hierarchy**: Hierarchy, LR(k) Grammars, properties of LR(k) grammars, Decidability and Recursively Enumerable Languages	5

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	K.L.P. Mishra and N. Chandrasekaran, "Theory of Computer Science, Third Edition", PHI Learning Private Limited	2013
2	Satinder Singh Chahal and Guljeet Kaur Chahal, "Introduction to theory of automata, Formal Language & Computation" ABS Publications	2015(reprint)
3.	Adesh Kumar Pandey, "Theory of Automata and Computation" S.K. Kataria& Sons	2013
4.	R.K. Shukla," Theory of Computation", Cengage Learning An Introduction to Formal Languages and Automata, by Peter Linz, Third Edition, Narosa Publishers	2016 (Reprint)

5.	M. Sipser, "Introduction to the Theory of Computation", Second Edition, Cengage Learning	2012

RIMT UNIVERSITY

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

1. Subject Code**: BTCS-4703**   Course Title:**Java Programming**

2. Contact Hours: **40**   **L: 3**   **T: 2**   **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: **7**

7. Pre-requisite:

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

9. **Objective**: This course will provide the knowledge of Java and prepare students to be in a position to write object oriented programs in Java

10. Course Outcomes (CO):

CO1	Develop the various concepts of object oriented programming paradigms with event driven and concurrent programming paradigms
CO2	Define fundamental grounds of java along with java classes and exception handling
CO3	Evaluate the complexity of the algorithms to evaluate the effectiveness as greedy strategy, dynamic programming strategy and will able to gain knowledge about backtracking, branch and bound and string matching techniques to deal with some hard problems.
CO4	Analyze the various classes for complex problems like P, NP, and NP-Complete and Correlate existing algorithms to improve efficiency.

11. **Details of the Course**:

SNO.	CONTENTS	CONTACT HOURS
1	**Overview of Java**: Object oriented programming, Two paradigms, abstraction, the three OOP principles, Java class libraries Date types, Variables and Arrays: Integers, floating-point types, characters, Boolean, Iterates, Variable, Data types and casting, automatic type promotion in expressions, arrays.	5

2	**Operators and Control Statements:** Arithmetic operators, bit wise operators, relational operators, Boolean logical operators, the ?Operator, operator precedence, Java's selection statements, iteration statements, jump statements.	4
3	**Introduction to Classes**: Class fundamentals, declaring object reference variable, Introducing methods, method. constructors, this keyword, garbage collection, the finalize () methods.	4
4	**Methods and Classes**: Overloading methods, using objects as parameters, recursion.	5
5	**Inheritance**: Inheritance basics, using super, method overriding, dynamic method dispatch, using abstract Classes, Using final with inheritance, Package and Interfaces, Package access protection, importing packages.	5
6	**Exception Handling**: Exception handling fundamentals, Exception types, Uncaught Exceptions Using try and catch, multiple catch clauses, nested try statements, throw, finally Java's built-in exceptions. exceptions, creating your own exception sub classes, using exceptions.	4
7	**Multithreaded Programming**: The Java thread model, the main thread, creating thread, creating multiple threads, using is alive () and join (), Thread priorities, synchronization, Inter thread communications, suspending resuming and stopping threads.	4
8	**String Handling**: The string constructors, string length, special string operations, character extraction, string comparison, searching string, modifying string, data conversion, changing the case of characters, string buffer.	4
9	**I/O and Applets**: I/O Basics, Reading Console Input, Writing Console Output, Reading and Writing Files, Applet Fundamentals, Applet Architecture, The HTML Applet tag, Passing parameters to Applets. Networking: Networking basics, Java and the Net, TCP/IP Client Sockets URL, URL Connection, TCP/IP Server Sockets, Database connectivity.	5

12. Suggested Books:

SNO.	Name of Books / Authors	Year of Publication
1	Herbert Schildt, The Complete Reference Java2, McGraw-Hill.	2015
2	Joyce Farrell, Java for Beginners, Cengage Learning	2014
3	Deitel and Deitel, Java: How to Program, 6th Edition, Pearson Education.	2008
4	James Edward Keogh, Jim Keogh, J2EE: The complete Reference, McGraw Hill	2015
5	Khalid A. Mughal, TorillHamre, Rolf W. Rasmussen, Java Actually , Cengage Learning.	2016
6	Shirish Chavan, Java for Beginners.	2009

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4714**   Course Title: **Software Testing and Quality Assurance**

2. Contact Hours: **40**   **L: 3   T: 0   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 | 3 | 6. Semester | **7** |

7. Pre-requisite:

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

9. Objective: This course discusses the general topic of defining software quality attributes and deploying techniques to ensure that these quality attributes are met. Special focus is placed on functional quality attributes, such as correctness, reliability, safety, security, etc.

10. Course Outcome:

CO1	Describe fundamental concepts of software quality assurance.	
CO2	Explore test planning and its management.	
CO3	Understand fundamental concepts of software automation.	
CO4	Apply Selenium automation tool for testing web based application.	
CO5	Demonstrate the quality management, assurance, and quality standard to software system.	
CO6	Demonstrate Software Quality Tools and analyze their effectiveness.	

11. Details of the Course:

S.No	Contents	Contact Hours

1.	**Software Quality**: Quality Concepts, Quality Movement, Software Quality Assurance,Software Reviews, Formal Technical Reviews, Formal Approaches to SQA, Statistical Software Quality Assurance, Software Reliability, Reliability metrics, Reliability Growth Modelling, The SQA Plan	9
2.	**Software Quality Management**: Quality Metrics, Risk Management, Quality management,Software maintenance, Software Configuration Management, Component-based software development.	6
3.	**Software Quality Standards:** The ISO 9000 Quality Standards and SEI CMMI, Six Sigma, Computer aided software engineering	5
4.	**Testing Fundamentals**: Testing Fundamentals, Unit Testing, Test cases design Techniques,White Box Testing and Black Box Testing, Integration Testing, System and acceptance testing, Testing of Object Oriented Systems, Usability and Accessibility Testing.	10
5.	Test Planning, Management, Execution and Reporting. Software Test Automation, Testing Metrics and Measurements.	10

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	Roger S Pressman, 'Software Engineering Concepts and Practices', 7thEdn., TMG.	2009
2	SrinivasanDesikan, Gopalaswamy Ramesh, 'Software Testing', Pearson Education	2006
3	Louis Tamres, 'Introducing Software Testing', 1stEdn., Addison Wesley Publications	
4	Ron Patten, 'Software Testing', SAMS Techmedia, Indian Edition	2001
5	Mordechai Ben-Menachem, Gary S Marliss, 'Software Quality-Producing Practical, Consistent Software', Thomson COURSE	2003
6	KshirsagerNaik and Priyadarshini Tripathi, 'Software Testing and Quality Assurance',Wiley	2008
7	NageswaraRaoPusuluri, 'Software Testing Concepts and Tools', Dream Tech. Press,	2006
8	M.G. Limaye, "Software Testing – Principles, Techniques and	2011

	Tools", McGraw Hill,	
9	KshirasagarNaik, PriyadarshiTripathy, 'Software Testing and Quality Assurance Theory and Practice', John Wiley & Sons, Inc., Publication	2009

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4715**   Course Title:**Introduction to Business Systems.**

2. Contact Hours: **32**   **L: 3   T: 0   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 | 3 | 6. Semester: **7**

7. Pre-requisite: Nil

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

9. Objective: To familiarize students with basics of data processing, COBOL and data management packages. It also introduces students to basics of Software Engineering.

10. Course Outcome:

CO1	Understand the core principles and definitions of Business Information Systems.
CO2	2. Recognise how Business Information Systems collect and process information to support business decisions.
CO3	Evaluate the role of Information Systems in supporting management decision-making in the areas of accounting, finance, and marketing.
CO4	4. Describe the ethical procedure when handling personal information in Business Information Systems.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	**Introduction to Business System**: Data capture, Processing dissemination storage/retrieval I/O and storage devices terminals printers and disks.	6
2	**Principles of Data Processing**: Data representation and file management in COBOL Sequential indexed and relative files, User interfaces, report writer screen management.	7
3	**Data Management Software**: Packaged software: Word processors spread sheets, Data management packages such as DBASE and FOXPRO.	6
4	**Principles of Software Engineering**: Software development methodology: System analysis, DFD, ER Model design concepts software architecture file (table) and process design issues in system implementation. Enterprise Resource Planning (ERP) management, Resource Planning (MRP-2) Software like SAP, MARCAN	7
5	Introduction to Management Information Systems and Decision Support Systems.	6

12. Suggested Books:

S. NO.	NAME OF BOOKS / AUTHORS	Year of Publication
1	N. L. Sarda, Structured COBOL Programming with Business application, Pitmbar Publishing Co.	2010
2	M. K. Roy and D. GhoshDastidar, COBOL Programming, Tata McGraw Hill.	2009
3	Foxpro by R.K.Taxali .	2010
4	R.S. Pressman, Software Engineering, McGraw Hill Inc.,	2014
5	Introduction to Business Systems, Amardeep Singh,21 Century Publications.	1996

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4716**   Course Title:**Wireless Sensor Network**

2. Contact Hours: **32**   **L: 3**   **T: 0**   **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** | **3** | 6. Semester: **7**

7. Pre-requisite: Nil

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

9. **Objective:** To familiarize students with basics of data processing, COBOL and data management packages. It also introduces students to basics of Software Engineering.

10. **Course Outcome**:

CO1	Understand and explain common wireless sensor node architectures.
CO2	Be able to carry out simple analysis and planning of WSNs
CO3	Demonstrate knowledge of MAC protocols developed for WSN.
CO4	Demonstrate knowledge of routing protocols developed for WSN.
CO5	Understand and explain mobile data-centric networking principles.

11. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS

1	**Introduction to Wireless Sensor Networks:** Course Information, Introduction to Wireless Sensor Networks: Motivations, Applications, Performance metrics, History and Design factors	4
2	**Network Architecture and Hardware Platform:** Traditional layered stack, Cross-layer designs, Sensor Network Architecture, Motes, Hardware parameters	3
3	**Network Simulator:** Introduction to Network Simulator 3 (ns-3), Description of the ns-3 core module and simulation example	3
4	**Medium Access Control Protocol design:** Fixed Access, Random Access, WSN protocols: synchronized, duty-cycled	3
5	**Markov Chain:** Discrete time Markov Chain definition, properties, classification and analysis, Asynchronous duty-cycled. X-MAC Analysis (Markov Chain), Analysis of opportunistic routing (Markov Chain)	4
6	**Routing protocols:** Introduction, MANET protocols, Resource-aware routing, Data-centric, Geographic Routing, Broadcast, Multicast	3
7	**Clustering**: Clustering goals, types, high-level overview, clustering in WSN	3
8.	**QoS management:** Basic functions, centralized solution, Topology control, Sensor mode selection	3
9.	**Localization and Time Synchronization:** Overview of different localization techniques, Overview of different time synchronization protocols	3
10.	**Security:** Possible attacks, countermeasures, SPINS, Static and dynamic key distribution	2
11.	Case Study	1

12. Suggested Books:

S. NO.	NAME OF BOOKS / AUTHORS	Year of Publication
1	N. L. Sarda, Structured COBOL Programming with Business application, Pitmbar Publishing Co.	2010
2	M. K. Roy and D. GhoshDastidar, COBOL Programming, Tata McGraw Hill.	2009
3	Foxpro by R.K.Taxali .	2010
4	R.S. Pressman, Software Engineering, McGraw Hill Inc.,	2014
5	Introduction to Business Systems, Amardeep Singh,21 Century Publications.	1996

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4711**   Course Title:**Data communication and Networks**

2. Contact Hours: **40**   **L: 3**   **T: 0**   **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 | 3 | 6. Semester | **7** |

7. Pre-requisite:

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

9. Objective: This course introduces students to computer networks and concentrates on building a firm foundation for understanding Data Communications and Computer Networks. It is based around the OSI Reference Model which deals with the major issues in the bottom four (Physical, Data Link, Network and Transport) layers of the model. They are also introduced to the areas of Network Security and Mobile Communications.

10. Outcomes :   Describe the components of a data communications system.   Identify key considerations in selecting various transmission media in networks.   Explain the role of line codes in a data communications network. Explain the role of digital communications devices in a data communications network. Describe the various types of signals and their features. Identify and de.ne roles and features of various data transmission protocols. Describe the features and functions of multiplexing and modulation.   Describe the various error detection and correction schemes.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Introduction:** Introduction to Computer Networks: Data Communication System and its components, Data Flow, Computer network and its goals, Types of computer networks: LAN, MAN, WAN, Wireless and wired networks, broadcast and point to point networks, Network topologies, Network software: concept of layers, protocols, interfaces and services, ISO-OSI reference model, TCP/IP reference model.	8

2.	**Network Protocols:**ALOHA, Carrier Sense Multiple Access Protocols, ARP, RARP, Framing, One-Bit Sliding Window Protocol, Protocol Using Go Back N, Protocol Using Selective Repeat, High-Level Data Link Control (HDLC).	9
3.	**Congestion Control in Data Networks:**Congestion Prevention Policies, Congestion Control in Virtual-Circuit Subnets, Congestion Control in Datagram Subnets, Effects of Congestion, Load Shedding, Jitter Control, Congestion Control in Packet-Switching Networks.	8
4.	**Routing Algorithms**: The Optimality Principle, Shortest Path Routing, Flooding, Distance Vector Routing, Link State Routing, Hierarchical Routing, Broadcast Routing, Multicast Routing, Routing for Mobile Hosts, Routing in Ad Hoc Networks, Node Lookup in Peer-to-Peer Networks .	8
5.	**Internetwork Protocols:**Internet Protocol & IP Addresses, Principles of Internetworking, Internet Protocol Operation, IPv6, Virtual Private Networks and IP Security.	7

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1	W. Stallings, 'Data & Computer Communications', 9th Edn., PHI	2014
2	James F. Kurose and Keith W. Ross, 'Computer Networking', 3rd Edn., Pearson Education	2012
3	Greg Tomsho, 'Guide to Networking Essentials', 6th Ed.., Cengage Learning,	2011
4	Behrouz A. Forouzan, 'Data Communication & Networking', 4th Edn., Tata McGraw Hill,	2006
5	Andrew S. Tanenbaum, 'Computer Networks', 4th Edn., Pearson Education	2002
6	Douglas E. Comer, 'Internetworking with TCP/IP', Volume-I, 2nd Edn., Prentice Hall, India, 1996.	1996
7	Michael W. Graves, 'Handbook of Networking', Cengage Learning	

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4712**   Course Title: **Cloud Computing**

2. Contact Hours: **40**   **L: 3**   **T: 0**   **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 | 3 | 6. Semester | 7 |

7. Pre-requisite:

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

9. Objective: To learn the ability to understand what is cloud storage, characteristics of cloud computing, cloud computing services and cloud hosting, cloud data storage and deployment models, cloud computing companies and cloud service providers, cloud infrastructure, advantages of cloud computing and issues with cloud computing.

10. Outcomes:

CO1	Describe the main concepts, key technologies, strengths, and limitations of cloud computing and the possible applications for state-of-the-art cloud computing.
CO2	Explain the architecture and infrastructure of cloud computing, including SaaS, PaaS, IaaS, public cloud, private cloud, hybrid cloud, etc.
CO3	Collaboratively research and write a paper on the state of the art (and open problems) in cloud computing.
CO4	Identify problems, and explain, analyze, and evaluate various cloud computing solutions.
CO5	Choose the appropriate technologies, algorithms, and approaches for the related issues

11. Details of the Course:

S.No	Contents	Contact Hours
1.	**Overview of cloud computing** : What is a cloud, Definition of cloud , Definition of cloud ,characteristics of cloud ,Why use clouds, How clouds are changing , How clouds are changing , Driving factors towards cloud, Comparing grid with cloud and other computing systems,	6

	workload patterns for the cloud, "Big Data", IT as a service.	
2.	**Cloud computing concepts:** Concepts of cloud computing, Cloud computing leverages the Internet, Positioning cloud to a grid infrastructure, Elasticity and scalability, Virtualization, Characteristics of virtualization, Benefits of virtualization, Virtualization in cloud computing, Hypervisors, Multitenancy, Types of tenancy, Application programming interfaces (API), Billing and metering of services , Economies of scale, Management, tooling, and automation in cloud computing, Management: Desktops in the Cloud, Security.	10
3.	**Cloud service delivery:** Cloud service , Cloud service model architectures, Infrastructure as a service (IaaS) architecture, Infrastructure as a service (IaaS) details, Platform as a service (PaaS) architecture, Platform as a service (PaaS) details, Platform as a service (PaaS) , Examples of PaaS software, Software as a service (SaaS) architecture, Software as a service (SaaS) details, Examples of SaaS applications, Trade-off in cost to install versus , Common cloud management platform reference architecture: Architecture overview diagram, Common cloud management platform.	10
4.	**Cloud deployment scenarios**: Cloud deployment models, Public clouds, Hybrid clouds, Community, Virtual private clouds, Vertical and special purpose, Migration paths for cloud, Selection criteria for cloud deployment.	3
5.	**Security in cloud computing** : Cloud security reference model, How security gets integrated , Cloud security , Understanding security risks, Principal security dangers to cloud computing, Virtualization and multitenancy, Internal security breaches, Data corruption or loss, User account and service hijacking, Steps to reduce cloud security breaches, Steps to reduce cloud security breaches, Reducing cloud security, Identity management: Detection and forensics, Identity management: Detection and Identity management, Benefits of identity, Encryption techniques, Encryption & Encrypting data , Symmetric key encryption, Asymmetric key encryption, Digital signature, What is SSL?	9
6.	IBM Smart Cloud, Amazon Web Services, Google Cloud platform, Windows Azure platform, A comparison of Cloud Computing Platforms, Common building Blocks.	2

12. Suggested Books:

Sl. 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.	2008
3	Judith Hurwitz, Robin Bllor, Marcia Kaufman, Fern Halper, Cloud Computing for dummies	2009
4	Anthony T. Velte, Toby J. Velte and Robert Elsenpeter, Cloud Computing: A practical Approach, McGraw Hill	2010
5	Barrie Sosinsky, Cloud Computing Bible, Wiley	2011
6	BorkoFurht, Armando Escalante (Editors), Handbook of Cloud Computing, Springer	2010

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4713**   Course Title: **Internet of Things**

2. Contact Hours: **32**   **L: 3   T: 0   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 | 3 | 6. Semester: **7**

7. Pre-requisite:

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

9. Objective: To Understand IoT Market perspective, Data and Knowledge Management and use of Devices in IoT Technology. To understand the real World IoT Design Constraints, Industrial Automation and Commercial Building Automation in IoT.

10. Outcome: understand the various network protocols used in IoT. be familiar with the key wireless technologies used in IoT systems, such as WiFi, 6LoWPAN, Bluetooth and ZigBee. understand and be able to explain the role of big data, cloud computing and data analytics in a typical IoT system.

11. Details of the Course:

Sl. No.	Contents	Contact Hours
1.	**Internet in general and Internet of Things**: layers, protocols, packets, services, performance parameters of a packet network as well as applications such as web, Peer-to-peer, sensor networks, and multimedia.	5
2.	**Transport services:** TCP, UDP, socket programming, Network layer: forwarding & routing algorithms (Link, DV), IP-addresses, DNS, NAT, and routers.	5
3.	**Local Area Networks, MAC level, link protocols such as:** point-to-point protocols, Ethernet, WiFi 802.11, cellular Internet access, and Machine-to-machine.	5
4.	**Mobile Networking**: roaming and handoffs, mobile IP, and ad hoc and infrastructure less networks.Real-time networking: soft and real time, quality of service/information, resource reservation and scheduling, and performance measurements.	5
5.	**Internet Protocols:** **Transmission control/ Internet Protocol, Used datagram protocol, Network topologies, Understanding IPv4 & IPv6.**	6
6.	**IoT definitions:** **overview, applications, potential & challenges, and architecture. IoT examples: Case studies, e.g. sensor body-area-network and control of a smart home.**	6

12. Suggested Books:

Sl. No.	Name of Books / Authors	Year of Publication
1.	Kurose, James F.; Ross, Keith W. "Computer networking: a top-down approach", International edition.: Boston, Mass.: Pearson.	2010

2.	Vijay Madisetti and ArshdeepBahga, "Internet of Things (A Hands-on-Approach)", 1stEdition, VPT.	2014
3.	Francis daCosta, "Rethinking the Internet of Things: A Scalable Approach to Connecting Everything", 1st Edition, Apress Publications.	2013

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4704**   Course Title:**Artificial IntelligenceLab**

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

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

4. Relative Weight**:**   **CWA** | | **LWA** | **60** | **MTE** | | **ETE** | | **EPE** | **40** |

5. Credits**:** | **0** | **1** | 6. Semester **7**

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

8. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	Write A Program For DEPTH FIRST SEARCH	2
2	Write A Program For Best First Search	2
3	Write A Program to Generate the output for A* Algorithm.	2
4	Write a Lisp Program to solve Water Jug Problem Using Heuristic Function.	1
5	Write a Program To Show the Tic Tac Toe Game for 0 and X.	1
6	Write A Program For Expert System By Using Forward Chaining.	2
7	Write a program to implement tower of hanoi.	1
8	Write a program to implement a heuristic search procedure.	2
9	Write a program to implement a production system.	1
10	Write a program to implement search problems of 3 x 3 puzzle.	2

RIMT UNIVERSITY

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

1.Subject Code**: BTCS-4705**   Course Title: **Java Programming Lab**

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

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

4. Relative Weight**:**   **CWA** | |**LWA**| **60** |**MTE**| |**ETE**| |**EPE**| **40** |

5. Credits**:** | **0** | **1** | 6. Semester **7**

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

8. Details of the Course:

SNO.	CONTENTS	CONTACT HOURS
1	Implementation of classes	2
2	Implementation of Inheritance	2
3	Implementation of Packages and Interfaces.	2
4	Implementation of Threads.	1
5	Using exception handling mechanisms	1
6	Implementation of Applets	2
7	Implementation of mouse events and keyboard events.	1
8	Implementing basic file reading and writing methods	2
9	Using basic networking features.	1
10	Connecting to Database using JDBC.	2